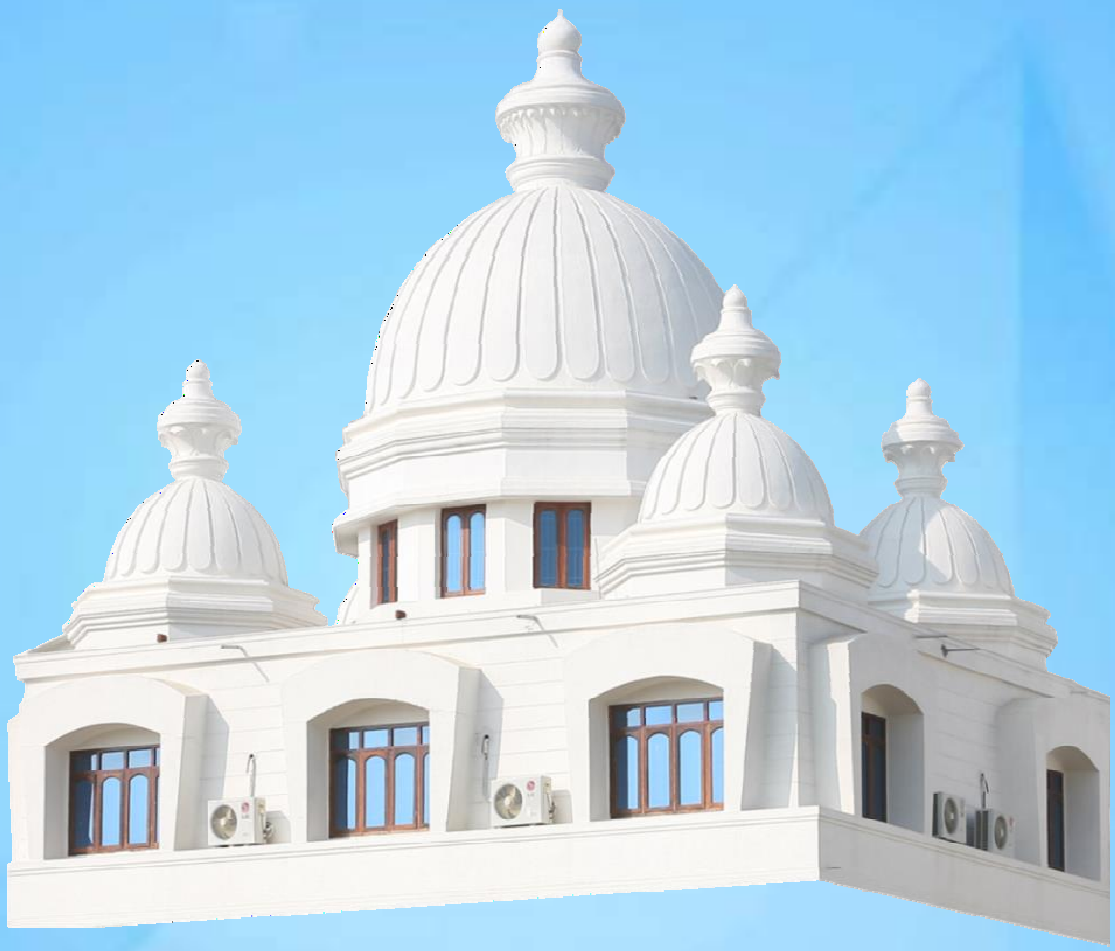
B.E. - ELECTRICAL AND ELECTRONICS ENGINEERING

R-2023: Curriculum & Syllabus

(2024 Admitted Batch Students)

VERSION 2.0



ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

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KOMARAPALAYAM – 637303

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KOMARAPALAYAM -637303
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

REGULATION – 2023
CHOICE BASED CREDIT SYSTEM

I TO VIII SEMESTERS CURRICULUM AND SYLLABI

I SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23MA102	Matrices and Calculus	BS	3	2	0	4	40	60	100
23EE101	Fundamentals of Electrical Engineering	ES	3	0	0	3	40	60	100
23LET07	Heritage of Tamils (தமிழர்மரபு)	HSS	1	0	0	1	100	0	100
Theory with Practical Course(s)									
23ENEXX	Language Elective – I	HSS	2	0	2	3	50	50	100
23CH101	Chemistry for Electrical Sciences	BS	3	0	2	4	50	50	100
23CS104	Problem Solving Using Python	ES	3	0	2	4	50	50	100
Practical Course									
23EE102	Electrical Engineering Practices Lab	ES	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory course -I	MC	2	0	0	0	100	0	100
TOTAL			**17**	**2**	**8**	**20**	**490**	**310**	**800**

Language Electives – I									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23ENE01	Communicative English	HSS	2	0	2	3	50	50	100
23ENE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100

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II SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23MA202	Mathematical Foundations for Engineering	BS	3	2	0	4	40	60	100
23EE201	Electric Circuits	ES	3	0	0	3	40	60	100
23HS202	Tamils & Technology (தமிழரும் தொழில்நுட்பமும்)	HSS	1	0	0	1	100	0	100
Theory with Practical Course(s)									
23LEEXX	Language Elective – II	HSS	2	0	2	3	50	50	100
23PH201	Solid State Physics	BS	3	0	2	4	50	50	100
23ME203	Engineering Graphics	ES	1	0	4	3	50	50	100
Practical Course									
23EE202	Electric Circuits Laboratory	ES	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory course -II	MC	2	0	2	0	100	0	100
Total			**15**	**2**	**12**	**19**	**490**	**310**	**800**

Language Electives – II									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23LEE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100
23ENE03	Hindi	HSS	2	0	2	3	50	50	100
23ENE04	French	HSS	2	0	2	3	50	50	100
23ENE05	German	HSS	2	0	2	3	50	50	100
23LEJ06	Japanese	HSS	2	0	2	3	50	50	100

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III SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23EE301	Electromagnetic field theory	PC	3	0	0	3	40	60	100
23EE302	DC Machines and Transformers	PC	3	1	0	4	40	60	100
23CS308	Programming in C and C++	ES	3	0	0	3	40	60	100
23UH001	Universal Human Values	HSS	3	0	0	3	100	0	100
Theory with Practical Course(s)									
23EE303	Electronic Devices and Circuits	PC	3	0	2	4	50	50	100
23MA301	Transforms and Boundary Value Problems	BS	3	0	2	4	50	50	100
Practical Course(s)									
23EE304	DC Machines and Transformers Laboratory	PC	0	0	2	1	60	40	100
23CS309	Programming in C and C++ Laboratory	ES	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory Course - III	MC	2	0	0	0	100	0	100
Total			**20**	**1**	**8**	**23**	**530**	**370**	**900**

IV- SEMESTER									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23EE401	Digital System Design	PC	3	1	0	4	40	60	100
23EE402	Synchronous and Induction Machines	PC	3	1	0	4	40	60	100
23EE403	Linear Integrated Circuits	PC	3	0	0	3	40	60	100
23EE404	Measurements and Instrumentation	PC	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23EE405	Microprocessors, Microcontrollers and Its Interfacing	PC	3	0	2	4	50	50	100
23MA401	Numerical Methods	BS	3	0	2	4	50	50	100
Practical Course									

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23EE406	Synchronous and Induction Machines Laboratory	PC	0	0	2	1	60	40	100
23EE407	Linear and Digital Instrumentation Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory Course -IV	MC	2 Weeks			0	100	0	100
Total			**18**	**2**	**8**	**24**	**470**	**430**	**900**

V- SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23EE501	Transmission and Distribution	PC	3	0	0	3	40	60	100
23EE502	Power Electronics	PC	3	0	0	3	40	60	100
23EEEXX	Professional Elective I	PE	3	0	0	3	40	60	100
23EEOXX	Open Elective I	OE	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23EE503	Control System	PC	3	0	2	4	50	50	100
23EE504	Control of Electrical Machines	PC	3	0	2	4	50	50	100
Practical Course									
23EE505	Power Electronics Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MCXXX	Mandatory Course -V	MC	2	0	0	0	100	-	100
Total			**20**	**0**	**6**	**21**	**420**	**380**	**800**

VI- SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23EE601	Solid State Drives	PC	3	0	0	3	40	60	100
23EE602	Electric Vehicle Design, Mechanics and Control	PC	3	0	0	3	40	60	100
23EE603	Professional Ethics	PC	3	0	0	3	40	60	100
23EEEXX	Professional Elective II	PE	3	0	0	3	40	60	100
23EEOXX	Open Elective - II	OE	3	0	0	3	40	60	100

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Theory with Practical Course									
23EE604	Power System Analysis and Stability	PC	3	0	2	4	50	50	100
Practical Course									
23EE605	Renewable System Laboratory	PC	0	0	2	1	60	40	100
Employability Enhancement Course(s)									
23EE606	Mini Project	EEC	4	0	2	2	60	40	100
23EE607	Internship	EEC	2 Weeks			1	100	0	100
Total			**22**	**0**	**6**	**23**	**510**	**490**	**1000**

VII- SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23EE701	Power System Protection and Switch Gear	PC	3	0	0	3	40	60	100
23EE702	Smart Grid	PC	3	0	0	3	40	60	100
23EE703	Special Electrical Machines	PC	3	0	0	3	40	60	100
23EEEXX	Professional Elective -III	PE	3	0	0	3	40	60	100
23EEEXX	Professional Elective -IV	PE	3	0	0	3	40	60	100
23EEOXX	Open Elective -III	OE	3	0	0	3	40	60	100
Practical Course									
23EE704	Basic Software Laboratory	PC	0	0	2	1	60	40	100
23EE705	Design Project	EEC	0	0	4	2	60	40	100
Total			**18**	**0**	**8**	**21**	**360**	**440**	**800**

VIII- SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23EEEXX	Professional Elective -V	PE	3	0	0	3	40	60	100
23EEEXX	Professional Elective -VI	PE	3	0	0	3	40	60	100
Practical Course									
23EE801	Project	EEC	0	0	16	8	50	50	100
Total			**6**	**0**	**20**	**14**	**130**	**170**	**300**

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MANDATORY COURSES (MC)									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23MC001	Induction Programme	MC	2	0	0	0	100	0	100
23MC002	Environmental Sciences	MC	2	0	0	0	100	0	100
23MC003	Interpersonal skills	MC	2	0	0	0	100	0	100
23MC004	Indian Constitution	MC	2	0	0	0	100	0	100
23MC005	Yoga and Values for Holistic Development	MC	0	0	2	0	100	0	100
23MC006	Soft Skills	MC	0	0	2	0	100	0	100

PROFESSIONAL ELECTIVES (PE)									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
STREAM – I EMBEDDED AND CONTROL DRIVES									
23EEE01	Embedded Systems and IoT	PE	3	0	0	3	40	60	100
23EEE02	Modern Power Converters	PE	3	0	0	3	40	60	100
23EEE03	Embedded System for Automotive Applications.	PE	3	0	0	3	40	60	100
23EEE04	Smart System Automation	PE	3	0	0	3	40	60	100
23EEE05	Advanced Control System	PE	3	0	0	3	40	60	100
23EEE06	Microcontroller Based System Design	PE	3	0	0	3	40	60	100
23EEE07	Machine Learning for Electrical Engineers	PE	3	0	0	3	40	60	100
23EEE08	Communication Engineering	PE	3	0	0	3	40	60	100
23EEE09	DSP for Electrical Engineering	PE	3	0	0	3	40	60	100
23EEE10	Control of Power Electronics Circuits	PE	3	0	0	3	40	60	100
STREAM – II DESIGN AND ELECTRICAL MANAGEMENT									
23EEE21	Electric Machine Design	PE	3	0	0	3	40	60	100
23EEE22	Design of Electric Drives with Control methods	PE	3	0	0	3	40	60	100
23EEE23	SMPS and UPS	PE	3	0	0	3	40	60	100
23EEE24	Energy Management and Auditing	PE	3	0	0	3	40	60	100

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23EEE25	Power System Transients	PE	3	0	0	3	40	60	100
23EEE26	Total Quality Management	PE	3	0	0	3	40	60	100
23EEE27	Computer Aided Design of Electrical Apparatus	PE	3	0	0	3	40	60	100
23EEE28	Safety Measures in Electrical Management	PE	3	0	0	3	40	60	100
23EEE29	Analysis and Synthesis of Electrical Networks	PE	3	0	0	3	40	60	100
23EEE30	Intellectual Property Rights	PE	3	0	0	3	40	60	100
STREAM – III POWER AND ENERGY SOURCES									
23EEE31	Energy Storage Systems	PE	3	0	0	3	40	60	100
23EEE32	Substation Engineering and Automation	PE	3	0	0	3	40	60	100
23EEE33	Flexible AC Transmission Systems	PE	3	0	0	3	40	60	100
23EEE34	Power Quality	PE	3	0	0	3	40	60	100
23EEE35	Industrial Automation	PE	3	0	0	3	40	60	100
23EEE36	High Voltage Engineering	PE	3	0	0	3	40	60	100
23EEE37	Power System Operation and Control	PE	3	0	0	3	40	60	100
23EEE38	Power Electronics for Renewable Energy Systems	PE	3	0	0	3	40	60	100
23EEE39	Under Ground Cable Engineering	PE	3	0	0	3	40	60	100
23EEE40	Hybrid Energy Technology	PE	3	0	0	3	40	60	100

OPEN ELECTIVE COURSES (For Other Branches)

Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
23EEO01	Wind Energy conversion System	OE	3	0	0	3	40	60	100
23EEO02	Intertie Energy Systems	OE	3	0	0	3	40	60	100
23EEO03	Sensors and Transducers	OE	3	0	0	3	40	60	100
23EEO04	Design and Modeling of Sustainable Energy Systems	OE	3	0	0	3	40	60	100
23EEO05	Electrical Safety Standards and Practices	OE	3	0	0	3	40	60	100
23EEO06	IOT for Electrical Engineers	OE	3	0	0	3	40	60	100

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23EEO07	Electric Vehicle and Power Management	OE	3	0	0	3	40	60	100
23EEO08	Electrical Estimation and Costing	OE	3	0	0	3	40	60	100

ONE CREDIT COURSES									
Code No.	Course	Category	Periods / Week			C	Maximum Marks		
			L	T	P		CA	FE	Total
Theory Course(s)									
23EEA01	PLC Automation	EEC	1	0	0	1	100	0	100
23EEA02	MATLAB Design	EEC	1	0	0	1	100	0	100
23EEA03	Industrial Automation	EEC	1	0	0	1	100	0	100
23EEA04	Quality Management Systems	EEC	1	0	0	1	100	0	100
23EEA05	PCB Design	EEC	1	0	0	1	100	0	100
23EEA06	Electrical Cad	EEC	1	0	0	1	100	0	100

SUMMARY

S.No	CATEGORY	CREDITS PER SEMESTER								TOTAL CREDIT (AICTE)	CREDITS in %
		I	II	III	IV	V	VI	VII	VIII		
1.	HSS	4	4	3						11 (10-14)	6.67%
2.	BS	8	8	4	4					24 (22-28)	14.54%
3.	ES	8	7	4						19 (24)	11.51%
4.	PC			12	20	15	14	10		71 (48)	43.03%
5.	PE					3	3	6	6	18 (18)	10.90%
6.	OE					3	3	3		9	5.45%
7.	EEC						3	2	8	13 (12-16)	7.87%
Total		20	19	23	24	21	23	21	14	165	100.00 %

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HSS - Humanities and Social Sciences

BS - Basic Sciences

ES - Engineering Sciences

PC - Professional Core

PE - Professional Electives

OE - Open Electives

EEC - Employability Enhancement Courses

MC - Mandatory Courses (Non-Credit Courses)

CA - Continuous Assessment

FE - Final Examination

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23MA102	MATRICES AND CALCULUS (Common to all B.E/B.Tech Programmes)	L	T	P	C
		3	1	0	4
Nature of Course	Basic Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Introduce the concept of orthogonal transformation to convert the square matrix into diagonal form.
2. Acquaint the student with mathematical tools needed in evaluating derivatives and differentiation of one variable.
3. Familiarize the functions of two variables, Taylor series and Jacobian techniques
4. Impart knowledge of double integral techniques in evaluating volume of the solid.
5. Learn the Green's theorem, Stoke's theorem and the Divergence theorem to compute integrals

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Apply the concept of orthogonal reduction for diagonalization of the given matrix	Apply
CO 2	Execute the rules of differentiation to differentiate the functions.	Apply
CO 3	Demonstrate the maxima and minima for a given function with two variables	Apply
CO 4	Apply integration to compute area and volume using multiple integrals	Apply
CO 5	Interpret the Green's theorem, Stokes' theorem and Divergence theorem to evaluate integrals.	Apply

Course Contents

Module – I MATRICES 9+3

Eigen values and Eigenvectors of a real matrix – Characteristic Equation- Properties - Cayley Hamilton Theorem - Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of Quadratic Forms.

Module – II DIFFERENTIAL CALCULUS 9+3

Functions of single Variable -Limits and Continuity - Derivatives - Differentiation rules(sum, product, quotient, chain rule) – Implicit differentiation-Logarithmic differentiation-Maxima and Minima of function of one variable –Taylors series.

Module – III FUNCTIONS OF TWO VARIABLES 9+3

Limits and Continuity –Partial differentiation–Homogeneous functions and Euler's theorem– Jacobians –Partial differentiation of implicit functions–Taylor's series– Maxima and minima – Lagrange's method of multipliers.

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Module – IV **MULTIPLE INTEGRALS** 9+3

Double integrals – Change of order of integrations- Double integrals in polar coordinates – Areaenclosed by plane curves – Triple integrals – Volume of solids.

Module – V **VECTOR CALCULUS** 9+3

Gradient and directional derivative — Divergence and curl — Green's, Gauss divergence and Stoke's theorems — Verification andapplicationinevaluatingline, surfaceandvolumeintegrals (cube, rectangular parallelepiped)

Total : 60 Periods

Text Books

1. B.K.Pal and K.Das , "Engineering Mathematics", Volume-1, 10th Edition, U.N.Dhur and Sons private limited,2020
2. Grewal B.S. "Higher Engineering Mathematics", Khanna Publishers, Delhi, 44th Edition, 2019.

Reference Books

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 1st Edition, 2018
2. N.P.Bali, Manish Goyal, "A text book of Engineering Mathematics Semester II", Laxmi Publications, 6th Edition 2015.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill, 3rd Edition 2017.

Additional References

1. NPTEL-https://nptel.ac.in/courses/111105035
2. NPTEL-https://nptel.ac.in/courses/111104144
3. NPTEL - https://nptel.ac.in/courses/111105122

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2										1	
CO 2	3	3	2										1	
CO 3	3	1	1										1	
CO 4	3	2	1										1	
CO 5	3	2	2										1	
	3-High				2-Medium				1-Low					

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Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	60
Remember	10	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyse				
Evaluate				
Create				

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23EE101	FUNDAMENTALS OF ELECTRICAL ENGINEERING	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core (PC)				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Learn the basic electrical elements.
2. Recall the overall process flow in Thermal power plant.
3. Infer the knowledge regarding Equipment, Plant layout, principle of working of various diesel and gas turbine plants.
4. Examine the working principles of various nuclear reactors
5. Express the working principle, construction of power generation from non-conventional sources of energy.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Illustrate the various basic parameters used in electrical circuit.	Understand
CO 2	Describe the power generation scenario, the layout components of thermal power plant ,Improved Rankine cycle and Cogeneration cycle	Understand
CO 3	Illustrate the elements and its functions of Diesel and gas turbine power plants	Understand
CO 4	Compare the various types of the nuclear power plant and its safety principles.	Analyse
CO 5	Discuss the layout, construction and working of the components inside Renewable energy power plants.	Understand

Course Contents

MODULE – I	BASIC ELECTRICAL PARAMETERS	9
Direct current (DC), Alternating current (AC), Voltage source and current source (Ideal and practical), Electrical work, power and energy, types of resistor and their applications, v		
MODULE– II	**COAL BASED THERMAL POWER PLANTS**	**9**
Rankine cycle – improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.		
MODULE– III	**DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS**	**9**
Otto, Diesel, Dual & Brayton Cycle – Analysis & Optimisation. Components of Diesel and Gas Turbine power plants, Combined Cycle Power Plants, Integrated Gasifier based Combined Cycle systems.		

MODULE– IV	NUCLEAR POWER PLANTS	9
Basics of Nuclear Engineering. Layout and subsystems of Nuclear Power Plants. Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium- Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants		
MODULE– V	POWER FROM RENEWABLE ENERGY	9
Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines, Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Geo-Thermal, Biogas and Fuel Cell power systems.		
		Total : 45 Periods

Text Books

1. D. P. Kothari & I. J. Nagrath, Basic Electrical Engineering,McGraw Hill education (India) PrivateLimited, 4th edition,2020
2. Theraja .B.L, Theraja .A.K, A Text Book of Electrical Technology Vol I, S Chand and co, New Delhi, 2014.
3. Energy Efficiency in Electric Utilities, BEE Guide Book, 2010.

Reference Books

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. Rajendra Prasad Fundamentals of Electrical Engineering, Prentice Hall of India, 3rd edition, 2014
3. Pratab.H, Art and science of Utilization of Electrical Energy, DhanpatRai and co, New Delhi, 2004.

Additional References

1. NPTEL-https://www.classcentral.com/course/swayam-fundamentals-of-electrical-engineering-14074
2. https://www.udemy.com/course/fundamentals-of-electrical-engineering/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2	1	1										1	2
CO 2	2	1	1										1	2
CO 3	2	1	1										1	2
CO 4	3	3	2										1	2
CO 5	2	1	1										1	2
	3-High				2-Medium				1-Low					

Passed in Board of Studies Meeting(12-04-2023)

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Approved in Academic Council Meeting(26-04-2023)

Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**60**
Remember	20	20	10	20
Understand	30	30	30	50
Apply			10	30
Analyse				
Evaluate				
Create				

Passed in Board of Studies Meeting(12-04-2023)

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Approved in Academic Council Meeting(26-04-2023)

23LET07	தமிழர் மரபு	L T P C 1 0 0 1

அலகு I மொழி மற்றும் இலக்கியம்: 3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை: 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்: 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

TEXT BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

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REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subbaramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23LET07 **HERITAGE OF TAMILS** L T P C
1 0 0 1

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry – Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze Icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kanyan Koothu, Oyilattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

TEXT BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subalamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23ENE01	COMMUNICATIVE ENGLISH Common to all B.E./B.Tech Programmes	L	T	P	C
		2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Improve lexical, grammatical and semantic competence.
2. Enhance communicative skills in real life situations
3. Augment thinking in all forms of communication.
4. Equip with oral and written communication skills.
5. Gain employability skills.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Use effectively the lexical, grammatical and semantic knowledge	Understand
CO2.	Communicate with clarity using intentional vocabulary in English	Apply
CO3.	Articulate perfectly and express their opinions confidently	Apply
CO4.	Accomplish listening and reading skills for life long learning	Apply
CO5.	Comprehend, interpret and present data	Understand

Course Contents:

MODULE I BASIC GRAMMAR AND USAGE 9

Grammar: Parts of Speech – Verb (Primary & Modal Auxiliary) – Prefixes and Suffixes **Listening:** Listening Skills: Importance and Types of Listening – Barriers of Listening - Listening to short monologues **Speaking:** Introducing oneself – Role play **Reading:** Types of Reading – Intensive reading – Extensive Reading – Reading Comprehension **Writing:** Permission letter (Industrial Visit) – Informal letter – Dialogue writing

MODULE II APPLICATIONS OF LANGUAGE SKILLS 9

Grammar: Tenses (Present, Past and Future) – Different Forms of a word – Types of Questions **Listening:** Listening strategies – Listening to Announcements **Speaking:** Likes and dislikes- Movie Reviews – **Reading:** Skimming - Scanning - Reading Newspaper and Articles **Writing:** Inviting Dignitaries – Accepting Invitation – Declining Invitation.

MODULE III CONVERSATIONAL SKILLS 9

Grammar: If conditionals – Numerical Adjectives **Listening:** - Listening to Telephone calls and taking notes – Listening Lectures **Speaking:** Technical Presentation – Group Discussion **Reading:** Reading Magazines - Cloze Test **Writing:** Calling for Quotation – Compleint Letter – Process Description

MODULE IV GRAMMATICAL ACCURACY COMPETENCE 9

Grammar: Subject verb agreement – Discourse markers - One word substitution **Listening:** Listening and gap filling – Listening and Match the answers **Speaking:** Narrating Story - Asking and giving directions **Reading:** Rearranging Jumbled sentence - Note making **Writing:** Instructions – Hints Developing – Report Writing (Fire and Accident Report)

Passed in Board of Studies Meeting on 17.03.23 *Passed in Academic Council Meeting on 27.04.23*

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MODULE V TECHNICAL WRITING SKILLS **Grammar:** Homophones and Homonyms - Abbreviation and Acronyms **Listening:** Listening announcements – Listening and Summing up **Speaking:** Impromptu speech – Presentation at a business meeting **Reading:** Reading and summarizing articles **Writing:** Paragraph Writing – Checklist – Story writing.

Total: 45 Periods

Laboratory Components

S.No.	List of Exercises	CO Mapping	RBT
1	Self Introduction	1	Understand
2	Movie Review	2	Apply
3	Group Discussion	3	Apply
4	Asking and Giving Directions	4	Apply
5	Impromptu Speech	5	Apply
6	Listening to short monologues	1	Understand
7	Listening to Announcement	2	Understand
8	Listening Telephone calls	3	Understand
9	Listening and Gap Filling	4	Apply
10	Listening and Match the answers	4	Apply

Text Books

1. Rizvi, Ashraf.M, "Effective Technical Communication",Tata McGraw Hill Publishing company Limited,New Delhi, 2nd Edition, 2018.
2. Hewings, M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books:

1. Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press,USA,13thEdition,2018.
2. Norman Whitby, Business Benchmark – "Pre-Intermediate to Intermediate, Students Book", Cambridge University Press, 1st Edition, 2006.
3. Dhanavel S. P., "English and Soft Skills", 1stEdition, Orient Black Swan Private Limited, Hyderabad, 1st Edition, 2010.

Web References:

1. https://www.englishclub.com/grammar/
2. https://learnenglish.britishcouncil.org
3. https://www.indiabix.com/verbal-ability/questions-and-answers/
4. https://www.ello.org
5. https://englishforeveryone.org/Topics/Reading-Comprehension.html

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Passed in Board of Studies Meeting on 17.03.23 *Passed in Academic Council Meeting on 27.04.23*

Mapping of Course Outcomes (CO) with Programming Outcomes (PO) Programme Specific Outcomes (PSO)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1										3	1	2	2		
CO2										3	1	2	2		
CO3										3	1	2	2		
CO4										3	1	2	2		
CO5										3	1	2	2		
	3	High			2	Medium				1	Low				

Summative assessment						
Bloom's Level	Continuous Assessment					Final Examination (Theory) (50 marks)
	Theory Marks				Practical	
	IAE-I (5)	IAE-II (10)	IAE -III (10)	Attendance (5)	Rubric based CIA (20 Marks)	
Remember	-	-	-		-	-
Understand	40	40	40		40	40
Apply	60	60	60		60	60
Analyse	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

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Passed in Board of Studies Meeting on 17.03.23

Passed in Academic Council Meeting on 27.04.23

23CH101	CHEMISTRY FOR ELECTRICAL SCIENCES (Common to BME, ECE and EEE courses)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Impart knowledge and understanding about the constituents present in water and the need for purification of water.
2. Provide knowledge about the basic principles, preparatory methods and applications of nanomaterials.
3. Understand the fundamentals and classifications of batteries.
4. Develop the understanding and applications of basic concepts of electrochemistry.
5. Understand the causes and control measures of corrosion

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Develop innovative and eco-friendly method for water purification to meet the growing industrial demand.	Apply
CO 2	Discuss the basic principles, synthesis and applications of nanomaterials.	Understand
CO 3	Discuss the basic principles and mechanism of working of batteries and fuel cells.	Understand
CO 4	Illustrate the principles of electro chemical cells, EMF, electroplating and electrolysis.	Understand
CO 5	Demonstrate the importance of protection of metals from corrosion.	Apply

Course Contents

Module – I WATER ANALYSIS AND WATER TREATMENT 9

Water analysis: Sources of water, hard water and soft water, Hardness of water, acidity, alkalinity and pH value. Biological Oxygen Demand (BOD), Chemical Oxygen Demand(COD). Water treatment: Definition, Zeolite process, Conditioning methods: internal conditioning (Phosphate, Calgon) and external conditioning (Demineralization), Desalination, Reverse osmosis (RO).

Module – II NANOCHEMISTRY 9

Basics: Distinction between molecules, nanomaterials and bulk materials. Size-dependent properties, Types of nanomaterials: Definition, properties, and uses of nanoparticle, nanocluster, nanorod, nanowire and nanotube. Synthesis: Sol-Gel and laser ablation methods. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

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Passed in Board of Studies Meeting on 17.03.23 *Passed in Academic Council Meeting on 27.04.23*

Module – III ELECTROCHEMISTRY 9

Electrode potential, Nernst equation and problems, Reference electrodes, Standard hydrogen electrode, Calomel electrode, Ion selective electrode, Measurement of pH by glass electrode, Electro chemical series. Electro chemical cell, Galvanic cell: measurement of EMF.

Module – IV ENERGY STORAGE DEVICES 9

Batteries: Definition, characteristics and classification, Primary battery: Alkaline battery, Secondary battery: lead acid battery, lithium-ion and lithium phosphate battery, Fuel cells: construction and working of H_2-O_2 fuel cell.

Module – V CORROSION AND ITS CONTROL 9

Corrosion: Classification, Types: Chemical corrosion and Electrochemical corrosion. Corrosion control: Corrosion inhibitors, cathodic protection (sacrificial anodic protection, impressed current cathodic protection), Protective coating, Paint and Electroplating.

Total : 45 Periods

Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Determination of hardness of water	3	Apply
2	Determination of chloride content in water sample.	3	Apply
3	Conductometric titration of strong acid versus strong base.	3	Apply
4	Determination of strength of HCl by pH metry.	3	Apply
5	Estimation of copper in brass by EDTA method.	3	Apply
6	Determination of rate of corrosion by weight loss method	3	Apply
7	Estimation of strength of iron by potentiometric titration	3	Apply
8	Determination of strength of acids in a mixture of acids using conductivity meter	3	Apply

Total Periods: 30

Text Books

1. Dr. A. Ravikrishnan, "Engineering Chemistry" Sri Krishna Hitech Publishing Company, Chemistry, 2021.
2. A Textbook of Engineering Chemistry by Ushamani M George KE, Rani Joseph,2021.
3. Dr Sunita Rattan. Publisher, S.K. Kataria & Sons, Reprint, 2020.

Reference Books

1. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
2. B.S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, 'Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
3. Monica Jain P. C. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, 17th Edition, 2019.

Additional References

1. https://nptel.ac.in/downloads/122101001
2. https://nptel.ac.in/courses/103103033/module9/lecture1.pdf
3. https://nptel.ac.in/courses/102103044/3
4. https://www.youtube.com/watch?v=FQeDef6bug

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Passed in Board of Studies Meeting on 27.05.23 *Passed in Academic Council Meeting on 27.04.23*

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2			3						1			
CO 2	3	2			3						1			
CO 3	3	2			3						1			
CO 4	3	2			3						1			
CO 5	3	1			3						1			
	3-High				2-Medium				1-Low					

Summative Assessment						
Bloom's Level	Continuous Assessment					Final Examination (Theory) [50]
	Theory				Practicals	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20]	
Remember	20	20	20		-	30
Understand	25	25	25		40	60
Apply	5	5	5		60	10
Analyze	-	-	-		-	
Evaluate	-	-	-		-	
Create	-	-	-		-	

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Passed in Board of Studies Meeting on 17.03.23 *Passed in Academic Council Meeting on 27.04.23*

23CS104	PROBLEM SOLVING USING PYTHON (Common to BME, ECE, EEE)	L	T	P	C
		3	0	2	4
Nature of Course	Engineering Sciences				
Prerequisites	Mathematical and Logical Knowledge				

Course Objectives

The course is intended

1. Learn the basics of algorithmic problem solving.
2. Think logically and write algorithms and draw flow charts for problems.
3. Make use of python functions and call them.
4. Utilize the Python data structures — lists, tuples, dictionaries and files.

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Recall algorithmic solutions to simple computational problems and read, write, execute by simple python programs	Remember
CO 2	Classify and Read, Write, Execute by hand simple python programs.	Understand
CO 3	Structure simple python programs for solving problems.	Understand
CO 4	Examine simple Python programs using conditionals and loops for solving problems	Apply
CO 5	Show the python string functions and lists	Apply
CO 6	Practice the compound data using python Tuples, Dictionaries, Files and Packages	Apply

Course Contents

MODULE – I Basics of Computers & Problem solving 9

Computer Basics–Components-Computer organization-Computer Software-Types of software - Software Development steps -Need for logical analysis and thinking- Algorithms –Flowchart.

MODULE – II Introduction of Python Programming 9

Introduction- Python IDLE Installation- Python Interpreter- Interactive and script mode-Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, Input and Output Statements.

MODULE – III Control statements and Functions 9

Conditional (if), alternative (if-else), chained conditional (if-elif-else)- Iteration- while,for,break,continue, pass – Functions - Introduction, inbuilt functions, user defined functions, recursion.

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MODULE – IV Strings, Lists 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.

MODULE – V Tuples, Dictionaries, Files and Packages 9

Tuples- Tuple assignment, lists and tuples, Tuple as return value- Dictionaries- operations and methods, Files and Exception-Text files, reading and writing files.

Total : 45 Periods

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Write a algorithm & draw flowchart for simple Computational problems.	CO1	Apply
2	Write a program to perform different arithmetic operations on numbers in python.	CO1	Apply
3	Write a python program to implement the various control structures.	CO2	Apply
4	Write a python program for computational problems using recursive function.	CO2	Apply
5	Demonstrate use of list for data validation.	CO3	Apply
6	Develop a python program to explore string functions.	CO3	Apply
7	Write a python program to find a given number is ODD or EVEN	CO4	Apply
8	Write a python class to reverse a string word by word	CO4	Apply
9	Develop python programs to perform operations on dictionaries.	CO5	Apply
10	Write a python program to read and write into a file.	CO5	Apply

Text Books

1. Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 1st Edition 2021.
2. Dr. R. Nageswara Rao, "Core Python Programming", Dream tech Press, 1st Edition 2019.

Reference Books

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2nd Edition 2021.
2. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 1st Edition 2020.
3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2nd Edition 2019.
4. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 1st Edition 2015.

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Additional References

1. **Python Research Association of India** - https://www.araiindia.com/services/technology-and-products
2. **NPTEL** - https://nptel.ac.in/courses/107/106/107106088/
3. **MOOC Courses** - https://www.mooc-list.com/tags/automotive-engineering

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	3	3	2	3							3	3	3	3
CO 2	3	3	3	2	3							3	3	3	3
CO 3	3	3	3	2	3							3	3	3	3
CO 4	3	3	3	2	3							3	3	3	3
CO 5	3	3	3	2	3							3	3	3	3
CO 6	3	3	3	2	3							3	3	3	3
	3	High				2	Medium					1	Low		

Bloom's Level	Summative Assessment						
	Continuous Assessment						Final Examination (Theory) [50]
	Theory				Practicals		
	IAE-I[5]	IAE-II[10]	IAE-III[10]	Attendance[5]	Rubric Based CIA [10]	Model Examination [10]	
Remember	10	10	10		20		20
Understand	20	20	20		20		40
Apply	20	20	20		10		40
Analyze							
Evaluate							
Create							

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23EE102	ELECTRICAL ENGINEERING PRACTICES LAB	L	T	P	C
		0	0	2	1
Nature of Course	Professional Core (PC)				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Provide hands on experience on various house hold Appliances
2. Understand the correct function of electrical parameters and calibration of voltage, current
3. Provide a comprehensive understanding of basic electronic components and equipments
4. Study the basic circuits using Active and Passive Components
5. Understand the fundamental principles of logic gates

Course Outcomes

On successful completion of the course, students will be able to

1. Construct the basic house hold electrical wirings
2. Measure the electrical quantities using Meters
3. Demonstrate sine, square and triangular waveforms with required frequency and amplitude using function generator
4. Identify the RLC Components and Logic gates
5. Design the simple electronic circuits using PCB Design

CYCLE-1

S.No.	Course Content	CO	Bloom's Level
1	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	CO 1	Understanding
2	Fluorescent lamp wiring	CO 1	Applying
3	Stair case wiring	CO 1	Applying
4	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit	CO 2	Understanding
5	Measurement of energy using single phase energy meter	CO 2	Understanding

CYCLE-2

S.No	Course Content	CO	Bloom's Level
1	Study of Electronic components and equipments – Resistor - Color coding. Measurement of AC signal parameter (peak-peak Voltage, RMS Voltage, frequency) using CRO	CO 4	Understanding
2	Study of logic gates AND, OR, EX-OR and NOT	CO 4	Understanding
3	Generation of Clock Signal	CO 3	Remembering
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB	CO 5	Applying
5	Measurement of ripple factor of HWR & FWR	CO 3	Analyzing

Mapping of Course Outcomes (COs) with Program Outcomes (POs) Program Specific Outcomes (PSO)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	1		1	1							3	1	1
2	3	1	1		1	1							3	1	1
3	3	1	1		1	1							3	1	1
4	3	1	1		1	1							3	1	1
5	3	1	1		1	1							3	1	1
	3	High				2	Medium					1	Low		

Summative assessment based on Continuous and Final Examination		
Bloom's Level	Rubric based Continuous Assessment [60 marks]	Final Examination [40 marks]
Remember	10	10
Understand	50	50
Apply	30	30
Analyze	10	10
Evaluate	-	-
Create	-	-

Passed in Board of Studies Meeting (12.04.2023)

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Approved in Academic Council Meeting (26-04-2023)

23MC101	Induction Programme	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	Completion of Schooling at Higher Secondary Level				

Course Objectives

The course is intended to

1. To nurture the character and behavior as a student.
2. To have broad understanding of society and relationships.
3. To impart interpersonal and soft skills.
4. To inspire the students in the field of engineering.
5. To provide exposure to industries.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Perform curricular and co-curricular activities excellently.	Knowledge
CO 2	Do the skill based training with excellence.	Understand
CO 3	Work as team for the given task	Apply
CO 4	Gain character and behaviour	Knowledge
CO 5	Demonstrate the acquired skills effectively	Apply

Course Contents

PHYSICAL ACTIVITY

Yoga, Sports

CREATIVE ARTS (students can select any one of their choice)

Painting, sculpture, pottery, music, craft making and so on

UNIVERSAL HUMAN VALUES

Enhancing soft skills

LITERARY AND PROFICIENCY MODULES

Reading, Writing, Speaking- Debate, Role play etc., Communication and computer skills

LECTURES BY EMINENT PEOPLE

Guest lecture by subject experts

VISIT TO LOCAL CITIES

Meditation centers / Industry

FAMILARIZATION TO DEPARTMENT / BRANCH INNOVATION

Lectures by Departments Head and senior faculty members

Total Hours: 45

Mapping of COs with POs and PSOs

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1						2	1	2				3	2		
CO2						2	1	2				3	2		
CO3						2	1	2				3	2		
CO4						2	1	2				3	2		
CO5						2	1	2				3	2		
	3	High				2	Medium					1	Low		

Bloom's Level	Continuous Assessment (Non-Credit, Mandatory)				
	Test -I [20]	Test -II [20]	Test - III [20]	Assignment/ Activity [20]	Attendance [20]
Remember	10	10	10		
Understand	20	20	20	10	
Apply	20	20	20	10	
Analyse					
Evaluate					
Create					

Passed in Board of Studies Meeting (12.04.2023)

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20LEJ06	Japanese	L	T	P	C
		2	0	2	3
Nature of Course	HSS				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Read & Write Hiragana and Katakana (Japanese Alphabets) letters
2. Use words and phrases of greeting in Japanese, identify names of objects and do a self-introduction using short and simple sentences.
3. Learn the use of time-related words, verb conjunctions and make light conversation asking for directions and answering questions.
4. Express their likes and dislikes, hobbies, describe the locations of different things and demonstrate counting in Japanese.
5. Learn the minimum day to day conversation and describe their ability and experiences.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Read and write Hiragana and Katakana (Japanese Alphabets) letters	Understand
CO2.	Identify names of objects and do self-introduction using short and simple sentences	Apply
CO3.	Demonstrate the use of time-related words	Apply
CO4.	Articulate their likes and dislikes, hobbies and describe the locations of different things	Apply
CO5.	Able to communicate effectively in day to day life	Understand

Course Contents

S.No.	Topic	Periods
1	INTRODUCTION- はじめまして,ALPHABET-Hiragana	5.0
2	NUMBERS- すうじ	1.5
3	Classroom Words- きょうしつのことば	1.5
4	ALPHABET-Katakana	1.5
5	BASIC SENTENCE- じぶんのなまえ	1.5
6	COUNTRYNAMES- くにのなまえ	1.5
7	SAYINGAGE- なんさいですか	1.5
8	SAYINGMONTH- なにつき	1.5
9	SAYINGBIRTHDAY- たんじょうび	1.5
10	KAZOKU- かぞく	1.5
11	KNOWINGTHINGS- あれこれ	1.5
12	PRONOUNS	1.5
13	ADJECTIVES	1.5
14	SAYINGTIME,SHOPPING	1.5

15	SELFINTRODUCTION	1.5
16	MYTOWN-Watashino machi	1.5
17	GO,COME,RETURN	1.5
18	BASICVERBS	1.5
19	TRANSPORT	1.5
20	LISTENING	4.0
21	REVISION	4.0
22	ORAL&WRITTENEXAMS	5.0
	Total Periods	45.0

Text Books

1. Minna no Nihongo – Elementary Japanese 1
2. Minna no Nihongo- Translation & Grammar Notes 1
3. Gateway to Japan Japanese Language school e-handouts / e-course materials.

Summative assessment						
Bloom's Level	Continuous Assessment					Final Examination (Theory) [50 marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE -III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	-	-	-		-	-
Understand	20	20	20		20	40
Apply	30	30	30		30	60
Analyse	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

Passed in Board of Studies Meeting

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23MA202	MATHEMATICAL FOUNDATIONS FOR ENGINEERING (Common to all B.E. / B.Tech Programme)	L	T	P	C
		3	1	0	4
Nature of Course	Basic Sciences				
Pre requisites	Fundamentals of Basic Mathematics				

Course Objectives

The course is intended to

1. Understand the curvature and calculate the radius of curvature, centre, evolutes, involutes.
2. Acquire the mathematical skills required to solve ordinary differential equations.
3. Familiarizethe concepts of Laplace transform and its inverse.
4. Gain knowledge of analytic approach to analyse the conformal mapping.
5. Obtainthe knowledge of evaluating contour integrals using residue theorem.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the circle of curvature, evolutes and involutes of the curves.	Apply
CO2	Demonstrate various techniques to solve ordinary differential equations.	Apply
CO3	Select Laplace transform to standard functions and solve initial value problems / differential equations .	Apply
CO4	Find an analytic function ,when its real or imaginary part is known	Apply
CO5	Classify the Singularities and its corresponding Residues for the given function	Apply

Course Contents:

Module – I	APPLICATION OF DIFFERENTIAL CALCULUS	12
Curvature – Curvature in Cartesian co-ordinates - Centre and Radius of curvature- Circle of curvature- Evolutes and Involutes.		
Module – II	**ORDINARY DIFFERENTIAL EQUATION**	**12**
Higher order linear differential equations with constant coefficients – Method of variation of parameters – non-Homogenous equation - Euler and Legendre Equations.		
Module – III	**LAPLACE TRANSFORMS**	**12**
Laplace transform –Transform of elementary functions –Properties –Transforms of derivatives and integrals -Transform of periodic functions. Inverse Laplace transform –Statement and applications of Convolution theorem - Method of solving second order ordinary differential equations with constant coefficients by using Laplace transform technique.		

Module – IV	ANALYTIC FUNCTIONS	12
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping : w = a+z, az, 1/z – Bilinear transformation.		
Module – V	**COMPLEX INTEGRATION**	**12**
Line integral - Cauchy's integral theorem –Cauchy's integral formula – Taylor's and Laurent's series — Singularities — Residues — Residue theorem — Application of residue theorem for evaluation of real integrals.		
		Total: 60 Periods

Text Books:

1. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2019.
2. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons (Asia) Limited, 10th Edition, 2016.

Reference Books:

1. Bali.N.P and ManishGoyal N.P, "A text book of Engineering Mathematics", Laxmi Publications, 6th Edition, 2015.
2. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, 1st Edition, 2018.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill, 3rd Edition 2017.

Additional References:

1. https://onlinecourses.nptel.ac.in/noc24_ma12/preview
2. https://onlinecourses.swayam2.ac.in/cec24_ma10/preview
3. https://onlinecourses.nptel.ac.in/noc24_ma37/preview

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

	Pos												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3												
CO2	3	3	2												
CO3	3	2	2												
CO4	3	3	3												
CO5	3	3	3												
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Tutorial Class /Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Exam			Final Examination (60)
	IAE I (5)	IAE II (10)	IAE III (10)	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

23EE201	Electric Circuits	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Engineering Physics				

Course Objectives

The course is intended to

1. Understand the basics of electric circuits and its analysis.
2. Develop key concepts to analyze and understand electrical circuits
3. Simplify the network theorems for the analysis of electrical circuits
4. Explain the circuits in sinusoidal steady-state.
5. Infer phasor diagrams and analysis of three phase circuits

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Generalize the basics of electrical circuits with nodal and mesh analysis.	Understand
CO 2	Determine behaviour of the given AC circuit by applying mesh analysis/ nodal analysis.	Apply
CO 3	Evaluate the complex circuits using the network theorems.	Analyze
CO 4	Express the Steady state responses and network functions	Understand
CO 5	Describe the basic concepts of Power Measurements.	Understand

Course Contents

MODULE – I	DC CIRCUITS	9
Basic Definitions – Ohm's Law & its Limitations – Kirchhoff's Laws – Resistors in Series and Parallel circuits –Voltage and Current division Techniques – Mesh Current and Node Voltage Methods (DC Circuits only).		
MODULE – II	**AC CIRCUITS**	**9**
Characteristics of Sinusoids – Average and RMS Value –Form Factor – Peak Factor – Phase Difference – Phasor Representation – Concept of Impedance and Admittance. Real and Reactive Power, Power Factor, Energy -Mesh current and node voltage methods of analysis A.C Circuits		
MODULE – III	**REDUCTION TECHNIQUES AND NETWORK THEOREMS**	**9**
Source Transformation – Star Delta Conversion – Thevenin's Theorem – Norton Theorem – Superposition Theorem – Maximum Power Transfer Theorem – Reciprocity Theorem (DC Circuits only).		
MODULE – IV	**SINUSOIDAL STEADY STATE ANALYSIS**	**9**
Analysis of Purely Resistive Circuit – Purely Inductive Circuit – Purely Capacitive Circuit – Series RL, RC and RLC Circuit: Phasor diagram – Voltage Triangle, Impedance Triangle, Power Factor, Power Triangle.		
MODULE – V	**POWER MEASUREMENTS AND RESONANCE**	**9**

Three Phase Circuits. Advantages of Three Phase System – Star and Delta Connected Balanced and Unbalanced Loads – Two Wattmeter Method of Power Measurements. Series resonance, parallel resonance – Q factor – Bandwidth

Total : 45 Periods

Text Books

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, 9thedition, New Delhi, 2020.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2019.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2018

Reference Books

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai& Sons, New Delhi, 2020.
2. Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum's series, McGraw-Hill, First Edition, 2019
3. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley Sons, Inc 2018.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2018.

Additional References

1. **NPTEL** - https://archive.nptel.ac.in/courses/108/102/108102042/
2. **COURSERA Courses** - https://www.coursera.org/courses?query=circuits

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	1	3	3	2	2								2	2
CO 2	1	2	1	3	2								2	3
CO 3	2	3	2	3	2								3	2
CO 4	1	2	3	3	2								2	2
CO 5	2	3	3	3	2								2	1
	3-High				2-Medium				1-Low					

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Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**60**
Remember	10	10	10	20
Understand	40		40	30
Apply		20		30
Analyse		20		20
Evaluate				
Create				

Passed in Board of Studies Meeting (13.12.2023)

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Approved in Academic Council Meeting (11.01.2024)

CHAIRMAN - ACADEMIC COUNCIL

23LET08	தமிழரும் தொழில்நுட்பமும் TAMILS AND TECHNOLOGY (Common to all B.E. / B.Tech Programme)	L	T	P	C
		1	0	0	1
Nature of Course	Humanities and Sciences				
Pre requisites	Tamil				

Course Objectives

The course is intended to

1. Introduce students to the great technology of ancient Tamil society.
2. Realize the contribution of various technologies for the development of governing area.
3. Highlighting the different manufacturing technology to make the coins, jewels, stones, art etc.
4. Know the role of agriculture, water management system and food processing.
5. Learn about the Scientific Tamil and Tamil computing of the past and how it has evolved over the generations.

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Remember the life style and technology of the Sangam people.	Remember
CO 2	Get an updated knowledge of ancient designing and construction of House, Temple, hero stones etc.	Understand
CO 3	Learnt the speciality of manufacturing technology types and usages.	Understand
CO 4	Gain the knowledge on production of agricultural products based on the ancient technologies.	Understand
CO 5	Understand the evaluation of Tamil language through the digital system.	Understand

Course Contents (in Tamil)

அலகு - I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	2
சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில் நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.		
அலகு - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	2
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு கட்டிடக் கலை - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.		

அலகு - III	உற்பத்தித் தொழில் நுட்பம்	2
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் -நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.		
அலகு - IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	2
அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழிகள் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார்.		
அலகு - V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	2
அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் · தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.		
		Total : 10 Periods

Course Contents (in English)

Module – I	WEAVING AND CERAMIC TECHNOLOGY	2
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.		
Module – II	DESIGN AND CONSTRUCTION TECHNOLOGY	2
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.		
Module – III	MANUFACTURING TECHNOLOGY	2
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold Coins as source of history - Minting of Coins – Beads making-industries Stone beads –Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.		
Module – IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	2
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea – Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		
Module – V	SCIENTIFIC TAMIL & TAMIL COMPUTING	2

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.
Total : 10 Periods

பார்வை நூல்கள் (TEXT-CUM-REFERENCE BOOKS)

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நகரிகம் (தொல்லியல் துறைவெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

23LEE02	ADVANCED COMMUNICATIVE ENGLISH (Common to all B.E. / B.Tech Programme)	L	T	P	C
		2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Communicative English				

Course Objectives

The course is intended to

1. Hone professional communication skills, including email etiquette and formal presentation.
2. Develop advanced vocabulary and collocation for official communication.
3. Communicate effectively and actively in social interactions.
4. Improve writing skills such as project and report writing for various purposes.
5. Foster collaborative communication abilities through group discussion in diverse contexts.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Communicate professionally in various contexts.	Understand
CO 2	Make use of common English phrases and vocabulary.	Understand
CO 3	Integrate basic English communication skills at a personal and a professional level in day-to- day interaction.	Apply
CO 4	Implement listening, reading and writing skills in real - life situations	Apply
CO 5	Decipher collaborative communication skills through diversified contexts.	Understand

Course Contents

Module – I	TECHNICAL VOCABULARY AND USAGE	9
Grammar: Technical Vocabulary (Synonyms and antonyms) - Articles - Reported Speech - **Listening**: Listening to video lectures (TED / INK Talks) **Speaking**: Describing pictures, places – Speaking practice to improve pronunciation **Reading**: Critical reading from the given text **Writing**: Job Application with Resume - E mail writing.		
Module – II	**EFFECTIVE OFFICIAL COMMUNICATION**	**9**
Grammar: Collocation – Question tags – Prepositions **Listening:** Listening to telephonic conversation **Speaking:** Role plays – Telephonic Etiquette and telephonic phrases **Reading:** Company profile - Advertisement (job / product) **Writing:** – Preparing Memo – Prepare Circular, Agenda and Minutes – Placing Order – Prepare Advertisement.		
Module – III	**TECHNICAL LANGUAGE SKILLS FOR CONVERSATION**	**9**
Grammar: Degrees of Comparison – Conjunctions **Listening:** Sports commentaries – Animated short stories **Speaking:** Asking for and giving directions – Describing simple process **Reading:** Reading and understand technical vocabulary **Writing:** Letter to the Editor – Review of Favourite Movie / Book – Recommendations.		

Module – IV	LANGUAGE FOR BUSINESS CORRESPONDENCE	9
Grammar: Idioms and Phrases – Single line definitions Phrasal verbs **Listening:** Listening to informal communication **Speaking:** Narrating personal experience **Reading:** Speed reading – reading passage within the time limit **Writing:** Project writing – Report writing (Accident and Survey) – Preparing welcome address and vote of thanks.		
Module – V	**VERBAL ABILITY FOR WRITING**	**9**
Grammar: Verbal Analogy – Cause and effect expressions **Listening:** Listening to Iconic Speeches - debate and reviewing the performance **Speaking:** Group communication skills – Discussing social issues and current affairs **Reading:** Short story – critical reading **Writing:** Itinerary –Interpretation of charts (Flow chart and Pie chart) - Essay Writing and Paragraph.		
		Total : 45 Periods

Laboratory Components:

S.No	List of Experiments	CO Mapping	RBT
1	Describing Picture / Place	1	Understand
2	Listening	1	Understand
3	Role Play	2	Understand
4	Prepare Circular, Agenda & Minutes	2	Understand
5	Asking and Giving Directions	3	Apply
6	Narrate a Favourite Movie / Book	3	Apply
7	Welcome Address	4	Apply
8	Vote of Thanks	4	Apply
9	Discussing Social Issues	5	Understand
10	Interpretation of Charts	5	Understand
		Total	**15 Periods**

Text Books

1. Rizvi, Ashraf.M, "Effective Technical Communication", Tata McGraw Hill Publishing Company Limited, New Delhi, 8th Edition, 2020.
2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books

1. Dr. Krishnakumar TP, "Rudiments of Communication Skills", Buddha Publication, 1st Edition, 2023.
2. Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press, USA, 13th Edition, 2018.
3. Dhanavel S. P., "English and Soft Skills", 1st Edition, Orient Black Swan Private Limited, Hyderabad, 2010.

Web References:

1. https://nptel.ac.in/courses/111104031
2. https://nptel.ac.in/courses/111106139
3. https://nptel.ac.in/courses/111105134

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1									1	3	1		2	
CO 2									1	3	1		2	
CO 3									1	3	1		2	
CO 4									1	3	1		2	
CO 5									1	3	1		2	
	3-High				2-Medium				1-Low					

Summative assessment						
Bloom's Level	Continuous Assessment (IAE)					Final Examination (FE) [50marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	25				4	10
Understand	25	25	25		8	20
Apply		25	25		8	20
Analyse						
Evaluate						
Create						

23PH201	SOLID STATE PHYSICS (Common to BME, ECE and EEE)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Fundamentals of Basic Physics				

Course Objectives

The course is intended to

1. Impart knowledge in production of laser and their applications in engineering and medical field.
2. Classify the types of fiber optics and their applications in advanced communication systems.
3. Understand on the concept and properties of matter like elasticity and its applications.
4. Learn the electronic properties of semiconductors and its applications.
5. Acquire the knowledge of dielectric and magnetic materials properties.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Compare the types of lasers for various industrial applications.	Understand
CO 2	Realize the importance of different fibre optic communication systems.	Understand
CO 3	Study the elastic behaviour and working of torsional pendulum.	Understand
CO 4	Differentiate the types of semiconductor materials and its applications.	Apply
CO 5	Solve the dielectric constant, susceptibility and losses.	Apply

Course Contents

Module – I	LASER PHYSICS	9
Lasers: Introduction- characteristics of laser - population of energy levels, Einstein's A and B coefficients derivation - resonant cavity - semiconductor lasers: homojunction and heterojunction - Applications of lasers - particle size determination and holography.		
Module – II	**FIBER OPTICS**	**9**
Fiber Optics: Introduction – features of optical fiber- principle, numerical aperture and acceptance angle - types of optical fibers - fabrication of optical fiber–applications - optical fiber communication system - fiber optic sensors – temperature and displacement sensors - fiber optic endoscope.		
Module – III	**PROPERTIES OF MATTER**	**9**
Elasticity - stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever - uniform and non-uniform bending - I-shaped girders.		

Module – IV	SEMICONDUCTOR PHYSICS	9
Introduction – properties – types - Intrinsic Semiconductors – energy band diagram – direct and indirect band gap semiconductors - carrier concentration of intrinsic semiconductors- extrinsic semiconductors (Qualitative) - N-type - P-type semiconductors –Hall effect – theory – experimental and its applications.		
Module – V	**DIELECTRIC AND MAGNETIC MATERIALS**	**9**
Dielectric materials - Electronic, Ionic, Orientational and space charge polarization – dielectric constant- dielectric loss –classification of insulating materials and their applications - Introduction to magnetic materials - Soft and Hard magnetic materials – Ferromagnetic materials – Anti-ferromagnetic materials – Ferrites.		
		Total : 45 Periods

Laboratory Components (Any Five)

S.No	List of Experiments	CO Mapping	RBT
1	Determination of wavelength and particle size of the given Laser beam.	CO1	Apply
2	Determination of numerical aperture and acceptance angle of an optical fiber.	CO2	Apply
3	Determination of the rigidity modulus of a given wire using Torsion pendulum.	CO3	Apply
4	Determination of Young's modulus of a material by non-uniform bending method.	CO3	Apply
5	Determination of Young's modulus of a material by uniform bending method.	CO3	Apply
6	Determination of the band gap of a given semiconductor.	CO4	Apply
		Total	**15 Periods**

Text Books

1. Bhattacharya, D.K and Poonam, T, "Engineering Physics", Oxford University Press, 2nd edition, 2015.
2. M.N. Avadhanulu, M.N. &Kshirsagar PG. "A Text book of Engineering Physics", S.Chand and company, Ltd., New Delhi, 10th edition, 2014.
3. William D.Callister,Jr and David. G.Bethwisch, "Materials Science and Engineering", John Wiley & Sons, Inc,9th edition, 2019.

Reference Books

1. Halliday, D, Resnick, R and Walker, J, "Principles of Physics", Wiley, 10th edition, 2014.
2. Serway, R.A. & Jewett, J.W, "Physics for Scientists and Engineers", Cengage Learning, 9th edition, 2019.
3. Raghavan, V. "Materials Science and Engineering, A First course", PHI Learning, 5th edition, 2015.

Web References:

1. https://nptel.ac.in/courses/115/107/115107095/
2. https://www.coursera.org/lecture/fe-exam/stresses-in-beams-strains-in-pure-and-nonuniform-bending-6aMRx
3. https://nptel.ac.in/courses/115/105/115105099/#
4. https://www.youtube.com/watch?v=uv0LxMoaIEQ

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	1											
CO 2	3	1	1											
CO 3	3	2	1											
CO 4	3	1	1											
CO 5	3		1											
	3-High				2-Medium				1-Low					

Summative Assessment						
Bloom's Level	Continuous Assessment (IAE)					Final Examination (FE) [50marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	12	12	12			30
Understand	34	34	28		40	60
Apply	4	4	4		60	4
Analyse			6			6
Evaluate						
Create						

23ME101	Engineering Graphics	L	T	P	C
		1	0	4	3
Nature of Course	Engineering Sciences				
Prerequisites	Nil				

Course Objectives:

The course is intended to

1. Understand technical drawings in various fields of engineering
2. Imagine and visualize the geometric details of engineering objects.
3. Translate the geometric information of engineering objects into engineering drawings.
4. Develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings.
5. Visualize and draw isometric and perspective views

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Develop the conic sections, special curves, and draw orthographic views from pictorial views.	Apply
CO 2	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.	Apply
CO 3	Construct the projections of simple solids like prisms, pyramids, cylinder and cone.	Apply
CO 4	Build the sectional views of solids like cube, prisms, pyramids, cylinders & cones and development of its lateral surfaces.	Apply
CO 5	Organize and draw isometric projections of simple solids.	Apply

Course Contents

Concepts and Conventions (Not for Examination) 1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

Module -I Plane Curves and Free Hand Sketching (3+12)

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

Module –II Projection of Points, Lines and Plane Surface (3+12)

Orthographic projection- principles-Principal Planes-First angle projection-projection of points Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module –III Projection of Solids **(3+12)**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

Module - IV Projection of Sectioned Solids and Development of Surface **(3+12)**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section, Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

Module -V Isometric Projections **(3+12)**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems.

TOTAL: (15+60) Periods

TEXT BOOKS

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2012.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2011

REFERENCE BOOKS

1. Parthasarathy N S and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
3. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

Web References

1. http://nptel.ac.in/courses/112103019/Engineering drawing
2. http://pioneer.netserv.chula.ac.th/~kjirapon/self-practice.html

Publication of Bureau of Indian Standards

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable only to Final Examinations of Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

Passed in Board of studies Meeting

CHAIRMAN - BOARD OF STUDIES

Approved in Academic Council Meeting

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2										1	2		
CO2	3	2										1	2		
CO3	3	2										1	2		
CO4	3	3										1	2		
CO5	3	2										1	2		
	3	High				2	Medium				1	Low			

Summative assessment						
Bloom's Level	Continuous Assessment					Final Examination (Theory) [50 marks]
	Theory				Practical	
	IAE-I [7.5]	IAE-II [7.5]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	10	10	10		20	20
Understand	20	20	20		40	40
Apply	20	20	20		40	40
Analyze						
Evaluate						
Create						

Passed in Board of Studies Meeting

CHAIRMAN - BOARD OF STUDIES

Approved in Academic Council Meeting

23EE202	ELECTRIC CIRCUITS LABORATORY	L	T	P	C
		0	0	2	1
Nature of Course	Professional Core				
Pre requisites	Engineering Physics				

Course Objectives

The course is intended to

1. Build the electrical circuits to verify the basic laws, mesh and nodal analysis
2. Develop practical experience on electric circuits and verification of Theorems.
3. Create various electric circuits using P spice / Matlab / Scilab
4. Design the Series and Parallel Resonance Circuits.
5. Identify the power in three phase circuits by Two Wattmeter method.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Simulate and build electrical circuits to verify the basic laws, mesh and nodal analysis	Apply
CO 2	Apply network reduction techniques and concepts in engineering applications	Apply
CO 3	Develop the transient and frequency responses of simple RL and RC circuits	Apply
CO 4	Analyze the series and parallel resonance circuits.	Analyze
CO 5	Determine the power of three phase circuits with balanced loads using Two-Wattmeter Method	Apply

Course Contents

S.No	List of Experiments	CO Mapping	Revised Blooms Taxonomy
1	Experimental Verification of Kirchhoff's Laws	CO1	Apply
2	Experimental Verification of Mesh and Nodal analysis	CO1	Apply
3	Determination of Thevenin's equivalent circuit with single voltage source and resistance using Thevenin's Theorem.	CO2	Apply
4	Determination of Norton's equivalent circuit with single current source and resistance using Norton's Theorem.	CO2	Apply
5	Simulation and Verification of Superposition Theorem	CO3	Apply
6	Simulation and Verification of Maximum Power Transfer Theorem.	CO3	Apply
7	Simulation and determination of frequency response of RL and RC circuit	CO4	Analyze
8	Simulation of Series RL and RC Transients.	CO4	Analyze
9	Design and Simulation of Series and Parallel Resonance Circuits	CO5	Apply

10	Experimental determination of power in three phase circuits by Two-Wattmeter method	CO5	Apply

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	3	3	3									2	2
CO 2	3	3	3	3									2	1
CO 3	3	3	3	2									2	2
CO 4	3	3	3	3									2	2
CO 5	2	3	3	3									2	1
	3-High				2-Medium				1-Low					

Summative assessment based on Continuous and Final Examination		
Bloom's Level	Rubric based Continuous Assessment [60marks]	Final Examination [40marks]
Remember		
Understand		
Apply	70	70
Analyze	30	30
Evaluate		
Create		

Passed in Board of Studies Meeting (13.12.2023)

CHAIRMAN - BOARD OF STUDIES

Approved in Academic Council Meeting (11.01.2024)

CHAIRMAN - ACADEMIC COUNCIL

23MC002	ENVIRONMENTAL SCIENCES (Common for all branches)	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Understand the concept of eco system and environment.
2. Become conversant with ecological balance and values of biodiversity.
3. Know the role of human in prevention of pollution and making a clean environment.
4. Get knowledge about conservation of non-conventional energy resources.
5. Study about the nature and management of e-waste and solid waste.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Explain the knowledge about ecosystem and environment	Understand
CO 2	Interpret the ecological balance and preservation of bio diversity	Understand
CO 3	Demonstrate various types of pollution in order to control pollution	Apply
CO 4	Classify the energy sources for the conservation of non conventional energy sources	Understand
CO 5	Identify the nature and management of e-waste and solid waste	Apply

Course Contents

Module – I	ECOSYSTEM	6
Eco system - Food chains, Food webs and Ecological pyramids. Ecosystem (a) Forest eco system, (b) Aquatic eco system (pond ecosystem and marine ecosystem).		
Module – II	**BIODIVERSITY**	**6**
Introduction to Bio diversity, Values of Bio diversity, Threads to Bio diversity, Endangered and Endemic species of India, Hotspots of biodiversity. Conservation of Biodiversity: In-Situ and Ex-Situ conservation of biodiversity.		
Module – III	**ENVIRONMENTAL POLLUTION**	**6**
Definition, Causes, Effects and Control of (a) Air pollution (b) Water pollution (c) Soil pollution. Electrostatic Precipitator for controlling air pollution.		
Module – IV	**NON-CONVENTIONAL ENERGY RESOURCES**	**6**
Introduction, Types, Working and Applications of: Solar Energy- Photovoltaic (PV) solar energy, Wind Energy-Onshore wind power- and Geo Thermal Energy-Geo thermal power plant.		

Passed in Board of Studies Meeting on 28.12.2023 *Passed in Academic Council Meeting on*

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Module – V	ENVIRONMENTAL MANAGEMENT	6
Sustainable Development, Waste Management: Types, sources and disposal of municipal, industrial solid Waste, Role of Information technology in Environment and Human. COVID-19 and JN-1 Virus.		
		Total : 30 Periods

Activity Components

S.No	List of Experiments	CO Mapping	RBT
1	Field study of simple eco system: pond, river and hill slopes	CO1	Understand
2	Case study regarding environmental management	CO5	Apply

Text Books

1. AnubhaKaushik and C.P. Kaushik, "Environmental Science and Engineering, New Age International Publishers, New Delhi, 2nd Edition, 2019.
2. V. Kumar, "An Introduction to Green Chemistry" Vishal publishing Co. Reprint Edition, 2020.

Reference Books

1. Santosh Kumar Garg and Rajeshwari Garg "Ecological and Environmental Studies", Khanna Publishers, Nai Sarak, Delhi, 2nd Edition, 2019.
2. Masters, Gilbert M, "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2nd Edition, 2020.

Web References:

1. https://nptel.ac.in/courses/122103039/38
2. https://bch.cbd.int/cms/ui/collaboration/download/download.aspx?id=909
3. https://nptel.ac.in/courses/105102089/air%20pollution%20(Civil)/Module-3/3a.htm
4. www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
5. nptel.ac.in/courses/120108004/module7/lecture8.pdf

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1		3					1					3		
CO 2		3					3					1		
CO 3		3					2					3		
CO 4		2					3					2		
CO 5		3					3					2		
	3-High				2-Medium				1-Low					

Passed in Board of Studies Meeting on 28.12.2023 *Passed in Academic Council Meeting on*

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Summative Assessment					
Bloom's Level	Continuous Assessment				
	IAE-I [20]	IAE-II [20]	IAE-III [20]	Attendance [20]	Activity [20]
Remember	20	20	15		
Understand	30	25	25		
Apply		5	10		
Analyze					
Evaluate					
Create					

23EE301	Electromagnetic Field Theory	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Physics for Electrical Sciences				

Course Objectives

The course is intended to

1. Classify the different co-ordinate systems to describe the spatial variations of the physical quantities.
2. Utilize the Concepts of Electrostatics, Electric potential and their applications.
3. Predict the electric field in material space and to solve boundary value problems**.**
4. Develop the various concepts and properties of magneto-static field.
5. Understand the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations.
6. Identify, formulate and solve fields and electromagnetic waves propagation problems.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Outline the basic mathematical concepts related to electromagnetic vector fields	Understand
CO2	Develop the principles of electrostatics related to electric field, Electric potential and applications	Apply
CO3	Determine the electric field intensity resulting from various configurations of charge distribution	Apply
CO4	Make use of the principles of magneto statics to get solutions for the problems related to magnetic field, magnetic potential, boundary conditions and magnetic energy density	Apply
CO5	Interpret the concepts related to Faraday ‘s law, induced emf and Maxwell ‘s equations	Understand
CO6	Solve the electromagnetic wave propagation in different medias using poynting vector and theorem	Apply

Course contents:

MODULE – I	VECTOR ANALYSIS	9
Sources and effects of electromagnetic fields; Review of scalar and vector fields, different coordinate systems: Cartesian, cylindrical and spherical; Coordinate transformation: Differential elements in different coordinate systems, Del-operator, divergence, curl and Gradient; Divergence theorem; Stoke's theorem.		
MODULE – II	**ELECTROSTATICS**	**9**
Coulomb's law, electric field intensity, electric flux, Gauss's law, potential due to point, line and surface charge distributions; Boundary conditions - Poisson’s and Laplace’s equations – Capacitance-determination of capacitance for cylindrical and parallel plate configurations- Energy density		
MODULE – III	**MAGNETOSTATIC FIELDS**	**9**
Magnetic field intensity (H) – Biot–Savart’s Law - Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, Boundary conditions, scalar and vector potential, Magnetic force, Torque, Inductance, Energy density, Applications: Magnetic Levitation.		
MODULE – IV	**ELECTRODYNAMIC FIELDS**	**9**

Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Ohm's law in point form, Relation between field theory and circuit theory – Applications – Wireless power transfer.

MODULE – V	**UNIFORM PLANE WAVES**	**9**

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting theorem.

Total: 45Periods

Text Books:

1. W. H. Hayt and John A. Buck, "Engineering Electro magnetics", 7th Edition, Tata McGraw Hill,New Delhi, 2020
2. Gangadhar, K.A, Field Theory, Khanna Publishers, New Delhi, Sixteenth Edition, 2020.
3. Mathew N. O. Sadiku, Elements of Electromagnetics, Oxford University Press, Seventh Edition, 2018.

References:

1. David J.Griffiths, Introduction to Electrodynamics, Pearson Education, Fourth Edition, 2020
2. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley Sons, Inc. 2018.
3. Joseph A. Edminister, "Theory and Problems of Electromagnetic Schaum's Outline Series", 5th Edition, Tata McGraw Hill Inc., New Delhi, 2017

Web References

1. **NPTEL** - https://archive.nptel.ac.in/courses/108/102/108102042/
2. **COURSERA Courses** - https://www.coursera.org/courses?query=circuits

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	**Pos**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1	-	-	-	1	-	-	-	-	-	2	3	
CO2	3	3	1	-	-	-	1	-	-	-	-	-	2	3	
CO3	3	3	1	-	-	-	1	-	-	-	-	-	2	3	
CO4	3	2	1	1	-	-	1	-	-	-	-	-	2	3	
CO5	3	2	1	1	-	-	1	-	-	-	-	-	2	3	
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Tutorial Class / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations**			**Final Examination (60)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	
Remember	10	10	10	20
Understand	40		20	40
Apply		40	20	40
Analyze				
Evaluate				
Create				

23EE302	DC MACHINES AND TRANSFORMERS	L	T	P	C
		3	1	0	4
Nature of Course	Professional core				
Pre requisites	Engineering Physics				

Course Objectives

The course is intended to

1. Identify the principles of electromechanical energy conversion and basic concepts in rotating machines.
2. Infer the construction, principle of operation and performance of DC generators.
3. Predict the principle of operation, performance, starting methods and speed control of DC motors.
4. Express the construction, principle of operation and performance of transformers.
5. Design the auto transformers and three phase transformer connections.
6. Relate the concept of electromechanical in DC Machines.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Match the concept of electromechanical energy conversion system in machines.	Remember
CO2	Illustrate the constructional details, operation, types, characteristics and parallel operation of DC generators	Understand
CO3	Organize the operation, performance, starting, and speed control of DC motors.	Apply
CO4	Summarize the construction, types, operation, performance, equivalent circuit of single phase two winding Transformers	Understand
CO5	Build the knowledge about construction and operation of autotransformers	Apply
CO6	Outline the Connection methods of Different types of three phase transformer.	Understand

Course contents:

MODULE – I	ELECTROMECHANICAL ENERGY CONVERSION	12
Fundamentals of Magnetic circuits- Statically and dynamically induced EMF - Principle of electromechanical energy conversion forces and torque in magnetic field systems- energy balance in magnetic circuits- magnetic force- co-energy in singly excited and multi excited magnetic field system mmf of distributed windings.		
MODULE – II	**DC GENERATORS**	**12**
Principle of operation, constructional details, armature windings and its types, EMF equation, wave shape of induced emf, armature reaction, demagnetizing and cross magnetizing Ampere turns, compensating winding, commutation, methods of improving commutation, interpoles, OCC and load characteristics of different types of DC Generators. Parallel operation of DC Generators, equalizing connections - applications of DC Generators. BIS standards for DC machines : IS 9320		
MODULE – III	**DC MOTORS**	**12**
Principle of operation, significance of back emf, torque equations and power developed by armature, speed control of DC motors, starting methods of DC motors, Types and load characteristics of DC motors, losses and efficiency in DC machine, condition for maximum efficiency. Testing of DC Machines: Brake		

test, Swinburne's test, Hopkinson's test, Separation of core losses-applications of DC motors.

MODULE – IV	**SINGLE PHASE TRANSFORMERS**	**12**

Construction and principle of operation, equivalent circuit, phasor diagrams, testing - polarity test, open circuit and short circuit tests, voltage regulation, losses and efficiency, all day efficiency, back-to-back test, separation of core losses, parallel operation of single-phase transformers, applications of single-phase transformer. BIS standards for transformers : IS 2026, IS 1180, IS 2026-3, IS 11171, IS 1181

MODULE – V	**AUTOTRANSFORMER AND THREE PHASE TRANSFORMER**	**12**

Construction and working of auto transformer, comparison with two winding transformers, applications of autotransformer. Three Phase Transformer- Construction, types of connections and their comparative features, Scott connection, applications of Scott connection.

Total :60 Periods

Text Books:

1. P. S. Bimbhra, "Electric Machinery", Khanna Publishers, 2nd Edition, 2021.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 6th Edition 2017.

References:

1.A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2018.

2.Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018.

3. R. K. Agarwal, "Principles of Electrical Machine Design", S. K. Kataria& Sons, Fifth Edition 2016,New Delhi.

Web References

1. **GATE - https://www.youtube.com/watch?v=9oKhlyEeYjw**
2. **NPTEL -** https://nptel.ac.in/courses/108/105/108105155/
3. **MOOC Courses - https://www.mooc-list.com/tags/electric-machines**

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2	1	1			1				1	3	2	
CO2	3	3	1	1	1			1				1	3	1	
CO3	3	3	1	1	1			1				1	3	3	
CO4	3	3	1	1	1			1				1	3	3	
CO5	3	3	1	1	1			1				1	3	3	
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Tutorial Class / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**(60)**
Remember	30	10	10	20
Understand	20	20	20	40
Apply		20	20	40
Analyze				
Evaluate				
Create				

23CS308	Programming in C and C++	L	T	P	C
		3	0	0	3
Nature of Course	Core				
Pre requisites	23CS102				

Course Objectives

The course is intended to

1. Learn the fundamental concepts of C programming.
2. Understand modular programming Concepts.
3. Familiarize the concept of OOPs.

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Design simple applications in C using basic constructs.	Understand
CO 2	Make use of arrays and strings to solve simple computing problems	Understand
CO 3	Develop and Implement applications using memory allocation and File concepts.	Apply
CO 4	Infer the proper class protection to provide security.	Understand
CO 5	Describe the reusability of code through Inheritance.	Understand
CO 6	Build the applications exception handling and templates	Apply

Course Contents

Module – I **BASICS OF C PROGRAMMING** 9

Introduction-Features - Structure of C program-Data Types-Tokens-Operators- Decision making and looping statement- Functions: Types of Functions –Recursion.

Module – II **ARRAY, STRING AND STRUCTURE** 9

Single and Multidimensional Arrays— Array as Function Arguments- Strings: String Handling Functions- Structure: Nested Structures – Array of Structures – Structure as Function Argument– Function that Returns Structure- Union.

Module – III **POINTERS AND FILE HANDLING** 9

Introduction, Array Using Pointers - Structure Using Pointers - Function Using Pointer, Pointer to Pointer- Dynamic Memory Allocation, Storage Classes, File Handling

Module – IV OBJECT ORIETED PROGRAMMING IN C++ 9

Introduction-Procedure vs object oriented programming-Concepts: Class and Object- Function-Inheritance-Polymorphism-Overloading - Virtual Functions-Streams

Module – V TEMPLATES AND EXCEPTION HANDLING 9

Function Templates and Class Templates – Name spaces – Standard Template Library - Casting – Exception Handling –case study

Total : 45 Periods

Text Books

1. Deitel and Deitel, C how to Program, 9th Edition, Pearson Education, 2020.
2. Brian W.Kernighan and Dennis M.Ritchie, The C Programming Language, Pearson Education, 2019.
3. E Balagurusamy, Object Oriented Programming with C++, 8th edition, Tata McGraw Hill, 2020.
4. HM Deitel and PJ Deitel "C++ How to Program", 10th Edition, 2017, Prentice Hall.

Reference Books

1. Yashavant Kanetkar, let us C, 18th Edition, Bbp Publications, 2021.
2. Herbert Schildt, "The Complete Reference in C++", 6th Edition, 2019, Tata McGraw Hill.
3. D.Ravinchandran, "Programming with C++", McGraw Hill Education, Third edition, 2017.

Additional References

1. **NPTEL** - https://onlinecourses.nptel.ac.in/noc22_cs40/preview/
2. **MOOC Courses** - https://www.mooc-list.com/course/power-object-oriented-programming-coursera

	Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)														
COs	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	3	3	3							2	2	3	2	
CO 2	3	3	3	3							2	2	3	2	
CO 3	3	3	3	3							2	2	3	2	
CO 4	3	3	3	3							2	2	3	2	
CO 5	3	3	3	3							2	2	3	2	
CO 6	3	3	3	3							2	2	3	2	
	3- High				2- Medium				1- Low						

Passed in Board of Studies CHAIRMAN - BOARD OF STUDIES *Approved in Academic Council*

Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Seminar / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE) (40)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**(60)**
Remember	10	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyse				
Evaluate				
Create				

23UH001	UNIVERSAL HUMAN VALUES (Common to all B.E. / B.Tech Programme)	L	T	P	C
		3	0	0	3
Nature of Course	Humanities and Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Encourage respect for the inherent dignity and worth of all individuals, regardless of differences in race, ethnicity, gender, religion, or socioeconomic status.
2. Cultivate empathy and compassion towards others, promoting understanding and solidarity across diverse communities.
3. Promote peaceful coexistence and harmony among individuals and communities.
4. Foster a sense of responsibility towards the environment and future generations, promoting sustainable practices and conservation efforts.
5. Hold and celebrate cultural diversity, recognizing the richness and value of different traditions, languages, and perspectives.
6. Contribute to the realization of universal human values and create a more just, compassionate, and sustainable world.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Embrace values such as empathy, tolerance, and respect can lead to decreased conflict and violence, both at interpersonal and societal levels.	Understand
CO 2	Support values like equality, justice, and human rights can lead to more equitable societies, where everyone has access to opportunities and resources	Understand
CO 3	Emphasize values such as empathy, compassion, and honesty fosters healthier and more meaningful relationships among individuals and groups.	Apply
CO 4	Grasp values of environmental stewardship and responsibility contributes to sustainable development practices that preserve natural resources.	Apply
CO 5	Celebrate cultural diversity and promoting values of inclusivity and acceptance enriches societies by fostering creativity, innovation, and mutual understanding	Understand
CO 6	Create a world that is more just, compassionate, and sustainable for all.	Apply

Course Contents

Module – I	NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION	9

Purpose and motivation for the course, recapitulation from Universal Human Values-I - Self-Exploration – what is it? – Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration – Continuous Happiness and Prosperity-A look at basic Human Aspirations - Right understanding, Relationship and Physical Facility - the basic requirements for fulfilment of aspirations of every human being with their correct priority – Understanding Happiness and Prosperity correctly -

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A critical appraisal of the current scenario – Method to fulfil the above human aspirations: understanding and living in harmony at various levels.		
Module – II	**UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF!**	**9**
Understanding human being as a co-existence of the sentient 'I' and the material 'Body' – Understanding the needs of Self ('I') and 'Body'- happiness and physical facility – Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) – Understanding the characteristics and activities of 'I' and harmony in 'I' – Understanding the harmony of I with the Body : Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health.		
Module – III	**UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN- HUMAN RELATIONSHIP**	**9**
Understanding values in human - human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship – Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship – Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals – Visualizing a universal harmonious order in society-Undivided Society, Universal Order- from family to world family.		
Module – IV	**UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE-WHOLE EXISTENCE AS COEXISTENCE**	**9**
Understanding the harmony in the Nature – Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature – Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence.		
Module – V	**IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS**	**9**
Natural acceptance of human values – Definitiveness of Ethical Human Conduct – Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics – Case studies of typical holistic technologies, management models and production systems – Strategy for transition from the present state to Universal Human Order: **a.** At the level of individual: as socially and ecologically responsible engineers, technologists and managers **b.** At the level of society: as mutually enriching institutions and organizations		
		Total : 45 Periods

Text Books

1. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.
2. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.
3. A N Tripathy, Human Values, New Age International Publishers, 2003.

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
3. Human Values, A. N. Tripathi, New Age Intl.Publishers, NewDelhi, 2004.

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Web References

1. https://www.studocu.com/in/document/i-k-gujral-punjab-technical-university/universal-human-values/uhv-complete-notes/46743542.
2. https://www.youtube.com/watch?v=NhFBzn5qKIM&list=PLWDeKF97v9SO8vvjC1KyqteziTbTjN1So
3. https://www.youtube.com/watch?v=Ff0LUTOCuLE&list=PLWDeKF97v9SO8vvjC1KyqteziTbTjN1So&index=16

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1									1	2	1		1	
CO 2									1	2	1		1	
CO 3									1	2	1		1	
CO 4									1	2	1		1	
CO 5									1	2	1		1	
	3-High				2-Medium				1-Low					

Formative assessment			
Bloom's Level	Continuous Assessment (IAE)		Total marks
	Assessment component	Marks	
Remember	Online Quiz	5	15
Understand	Tutorial class/Assignment	5	
	Attendance	5	

Summative assessment				
Bloom's Level	Continuous Assessment (IAE)			Final Examination [60 marks]
	Theory Marks			
	IAE-I [5]	IAE-II [10]	IAE-III [10]	
Remember	20	10	10	10
Understand	30	20	20	20
Apply		20	20	20
Analyse				
Evaluate				
Create				

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23EE303	Electronic Devices and Circuits	L	T	P	C
		3	0	1	4
Nature of Course	Professional Core				
Pre requisites	Physics				

Course Objectives

The course is intended to

1. Recall the operation of semiconductor diodes and its applications.
2. Illustrate the working principle and characteristics of Transistors types.
3. Examine the Characteristics of Amplifiers.
4. Construct the different stages of Amplifiers.
5. Outline the concept of feedback Amplifiers and Oscillators.
6. Develop the knowledge of devices and circuits.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Show the behaviour of PN junction diode and Zener diode in forward and reverse characteristics and develop the Half-wave, Full-wave and Bridge rectifier circuit.	Remember
CO2	Demonstrate the structure and operation of BJT, JFET, MOSFET and UJT analyze its input and output characteristics.	Understand
CO3	Compare the frequency response characteristics of Common emitter amplifier and calculate the voltage gain using BJT small signal model.	Analyze
CO4	Contrast about common mode and differential mode operation of Differential amplifier and construct the cascade and cascade model of amplifier and analysis it‘s performance.	Apply
CO5	Summarize the Concepts of feedback amplifiers.	Understand
CO6	Explain the working principle of oscillators	Understand

Course contents:

Module – I	**PN JUNCTION DEVICES**	**12**
PN junction diode – structure, operation, V-I characteristics and application, Opto Diode , Rectifiers – Half Wave and Full Wave Rectifier– Display devices - LED, Laser diodes, Zener diode characteristics- Zener Reverse characteristics – Zener as regulator, Diodes (refer the datasheets).		
Module – II	**TRANSISTORS FAMILIES**	**12**
BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Analysis of Saw tooth Wave Generator, Opto Transistor, Transistor (refer the datasheets).		
Module – III	**AMPLIFIERS**	**12**
BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response – MOSFET small signal model – Analysis of CS and Source follower.		
Module – IV	**MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER**	**12**
Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers.		
Module – V	**FEEDBACK AMPLIFIERS AND OSCILLATORS**	**12**
Advantages of negative feedback – voltage / current, series, Shunt feedback –positive feedback- Condition for oscillations, Wien bridge, Hartley, Colpitts and Crystal oscillators.		
		Total :60 Periods

List of Experiments:

S. No.	Name of the Experiment	CO Mapping	RBT
1	Characteristics of PN Junction diode and Zener diode	CO1	Understand
2	Characteristics of a NPN Transistor under common emitter and common base configurations	CO1	Understand
3	Characteristics of JFET and draw the equivalent circuit	CO2	Understand
4	Characteristics of UJT and generation of SAW TOOTH waveforms	CO2	Understand
5	Design and Frequency response of Common Emitter amplifier	CO3	Apply
6	Design and testing of RC phase shift and LC oscillators	CO3	Apply
7	Characteristics of photo diode& phototransistor	CO4	Analyze
8	Characteristics of Single-Phase half-wave and full wave rectifier swith inductive and capacitive filters	CO4	Understand
9	Study of light activated relay circuit.	CO5	Remember
10	Study of CRO for frequency and phase measurements	CO5	Remember

Text Books:

1.David A. Bell,"Electronic devices and circuits", Oxford University higher education, 5th Edition 2018.

2.Thomas L.Floyd, "Electronic devices" Conventional current version, Pearson prentice hall, 10th Edition, 2017.

3.Sedra and smith, "Microelectronic circuits",7th Ed., Oxford University Press 2017

References:

1. Balbir Kumar, Shail.B.Jain, "Electronic devices and circuits" PHI learning private limited, 2nd edition 2018.

2. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2016.

Web References

1. **NPTEL** - https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2. **MOOC Courses** - https://www.my-mooc.com/en/mooc/introtoelectronics/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	2	2							2	2	3	3	
CO2	3	1	2	2							2	2	3	3	
CO3	3	1	2	2							2	2	3	3	
CO4	3	1	2	2							2	2	3	3	
CO5	3	1	2	2							2	2	3	3	
	3	High				2	Medium					1	Low		

Summative Assessment						
Bloom's Category	**Internal Assessment Examinations**					**Final Examination (50)**
	Theory				**Practical**	
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**Attendance (5)**	**Rubrics Based CIA (20)**	
Remember	10	10	10	5	10	20
Understand	30	20	10		20	20
Apply	10		30		20	40
Analyze		20				20
Evaluate						
Create						

23MA301	TRANSFORMS AND BOUNDARY VALUE PROBLEMS (Common to Aero, Agri, Civil, ECE, EEE, FDT, Mech, PCT, S&F)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Foundations of Mathematics				

Course Objectives

The course is intended to

1. Learn about linear and non-linear partial differential equations and obtain their solutions using various techniques.
2. Gain familiarity with Fourier series.
3. Orient Fourier series techniques to solve one dimensional wave and heat equations.
4. Provide the concept of Fourier transforms and its inverse.
5. Introduce the concept of Z-transforms and difference equations.
6. Utilize advanced mathematical techniques to solve complex boundary value problems, reflecting mastery in mathematical transformations.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Identify linear and non-linear partial differential equations.	Apply
CO2	Construct the Fourier series of a given function and apply in the field of Engineering.	Apply
CO3	Interpret solutions of one dimensional wave and heat equations.	Apply
CO4	Implement Fourier transforms in engineering field .	Apply
CO5	Illustrate the Z-transforms and difference equations.	Apply
CO6	Develop mathematical techniques to solve the boundary value problems.	Apply

Course Contents:

Module – I	PARTIAL DIFFERENTIAL EQUATIONS	9
Solution of standard types of first order non-linear partial differential equations: (i) f(p,q)=0, (ii) Clairaut's type - Lagrange's linear equation - linear partial differential equations of second order with constant coefficients of homogeneous equations.		
Module – II	**FOURIER ANALYSIS**	**9**
Dirichlet's Conditions - Fourier series for periodic functions - Expansion of periodic functions with period $(0, 2\pi)$ and period $(-\pi, \pi)$ – Half Range Series - Root mean square value - Parseval's identity – Harmonic Analysis.		

Module – III	FOURIER TRANSFORMS	9
Statement of Fourier integral theorem – Fourier transforms pair: Fourier transforms and Inverse Fourier transforms – Fourier sine transforms -Fourier cosine transforms – Transforms of simple functions – Convolution Theorem - Parseval's identity.		
Module – IV	**Z - TRANSFORMS AND DIFFERENCE EQUATIONS**	**9**
Z-transforms - Properties – Inverse Z-transform: Partial fraction method and Convolution theorem - Formation of difference equations –Solution of difference equations using Z – transform.		
Module – V	**APPLICATIONS TO PARTIAL DIFFERENTIAL EQUATIONS**	**9**
Classification of second order Partial differential equations – Method of separation of variables – Solutions of one dimensional wave equation – Solutions of one dimensional heat equation – Application to Boundary value problems.		
		Total: 45 Periods

Text Books:

1. Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., 3rd edition, 2016.
2. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2021.
3. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 2014.

Reference Books:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Lakshmi Publications Pvt Ltd, 9th Edition, 2017.
2. Ramana.B.V,"Higher Engineering Mathematics", Tata Mc-Graw Hill Publishing Company Limited, 4th Edition, 2017.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Publications, 10th Edition, 2023.

Additional References:

1. https://archive.nptel.ac.in/courses/111/101/111101153
2. https://www.youtube.com/watch?v=ygOjw0_Kh8k.
3. https://archive.nptel.ac.in/courses/111/106/111106111.

Laboratory Components using MATLAB:

S.No	List of Experiments	CO Mapping	RBT
1	Solutions of Clauirat's form	1	Apply
2	Solution of second order homogeneous differential equations with constant coefficients	1	Apply
3	Fourier Series in $(0,2\pi)$	2	Apply
4	Harmonic Analysis in Fourier Series	2	Apply

5	Fourier Transform	3	Apply
6	Inverse Fourier Transform	3	Apply
7	Z - Transform	4	Apply
8	Inverse Z - Transform	4	Apply
9	One dimensional wave equation	5	Apply
10	One dimensional heat equation	5	Apply

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1										2		
CO2	3	2	2										2		
CO3	3	2	1										2		
CO4	3	2	1										1		
CO5	3	3	2										2		
CO6	3	2	2										2		
	3	High				2	Medium					1	Low		

Bloom's Level	Summative Assessment						
	Continuous Assessment						Final Examination (Theory) [50]
	Theory			Practical			
	IAE I (5)	IAE II (10)	IAE III (10)	Attendance [5]	Rubric based [10]	Model Exam [10]	
Remember	10	10	10				10
Understand	10	10	10		40	40	30
Apply	30	30	30		60	60	60
Analyze							
Evaluate							
Create							

CHAIRMAN-BOARD OF STUDIES

23EE304	DC Machines and Transformers Laboratory	L	T	P	C
		0	0	2	1
Nature of course	**Professional core**				
Pre requisites	**Electric Circuits laboratory**				

Course Objectives

The course is intended to

1. Illustration the concept of DC Generators.
2. Analyze the construction, principle of operation and performance of DC machines.
3. Examine the Principle of operation and performance of DC motors.
4. Outline the concept for starting and speed control of DC motors.
5. Interpret the construction, principle of operation and performance of single-phase transformer.
6. Enhance the knowledge of excitation of different D.C Machines.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Examine the experiments to obtain the performance characteristics of DC Generators	Understand
CO2	Demonstrate the load characteristics of D.C. shunt generators, D.C. compound generators,	Analyze
CO3	Test for determine the performance characteristics of DC motors (shunt, Series , Compound)	Analyze
CO4	Inspect the DC Shunt motor with above and below rated speed	Analyze
CO5	Demonstrate the determination of losses and efficiency of D.C. machines and Transformers.	Understand
CO6	Illustrate the performance characteristics and the equivalent circuit parameters of single phase Transformer.	Understand

List of Experiments

S.No	Name of Experiments	CO mapping	RBT Level
1	Open circuit and load characteristics of D.C separately and self-excited shunt generator	CO1	Analyze
2	Load characteristics of D.C. compound generator with differential and cumulative connections	CO1	Understand
3	Load characteristics of D.C. shunt motor	CO2	Understand
4	Load characteristics of D.C. compound motor	CO2	Understand
5	Load characteristics of D.C series motor	CO3	Understand
6	Swinburne’s test of D.C machine	CO3	Analyze
7	Speed control of D.C shunt motor	CO4	Analyze
8	Load test on single-phase transformer	CO4	Understand
9	Open circuit and short circuit tests on single phase transformer	CO5	Analyze
10	Separation of no-load losses in single phase transformer.	CO5	Analyze

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**Pos**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	3		2							2	3	3	
CO2	3	2	3		3							2	3	3	
CO3	3	2	3		2							2	3	3	
CO4	3	2	3		3							2	3	3	
CO5	3	2	3		2							2	3	3	
	3	High				2	Medium					1	Low		

Assessment	**Marks**	**Weightage**	**Marks**		
			CA	**FE**	**Total**
Rubrics based continuous assessment	100	30	60	40	100
Preparatory examination	100	25			
Attendance	5	5			

Bloom's Level	**Rubric based Continuous Assessment [30 marks]**	**Preparatory / Model examination (25 Marks)**	**Attendance (5)**	**Final Examination [40 marks]**
Remember			**5**	
Understand	10	5		30
Apply				
Analyze	20	20		70
Evaluate				
Create				

23CS309	Programming in C and C++ Laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Core				
Pre requisites	23CS102				

Course Objectives

The course is intended to

1. Learn the use of basic concept of conditional and looping statement.
2. Make familiar with Array, string and structures concept.
3. Impart knowledge of OOPs concept.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Create simple program using Conditional and looping statement	Understand
CO2	Design simple applications using array and structures	Understand
CO3	Apply the pointers concept to develop applications	Apply
CO4	Implement the concept of OOPs in c++ programs	Apply
CO5	Design simple program using overloading concept	Apply
CO6	Implement the exception handling concept in C++ programs.	Apply

List of Exercises

S.No	List of Exercises	CO Mapping	RBT
1	Create simple program using conditional and looping statements	CO1	Apply
2	Implement simple program using functions	CO1	Apply
3	Write a c program using array	CO2	Apply
4	Implement the concept of structures and union	CO2	Apply
5	Implement the concept of pointer	CO3	Apply
6	Write a c program to handle files.	CO3	Apply
7	Write a C++ program to understand Classes ,objects and inline functions	CO4	Apply
8	Implement Operator Overloading and Function Overloading in C++	CO4	Apply
9	Implement Virtual Functions in C++	CO5	Apply
10	Demonstrate the usage of Templates and Implement Exception handling in C++	CO6	Apply

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)														
COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2							2	2	2	3
CO2	3	3	3	2							2	2	2	3
CO3	3	3	3	2							2	2	2	3
CO4	3	3	3	2							2	2	2	3
CO5	3	3	3	2							2	2	2	3
CO6	3	3	3	2							2	2	2	3
	3-High				2-Medium				2- Low					

Assessment based on Continuous and Final Examination			
Bloom's Level	Continuous Assessment [50 marks] (Attendance-5 marks)		Final Examination [40 marks]
	Rubrics Continuous Assessment [40 marks]	Model Examination [20 Marks]	
Remember			
Understand	40	40	40
Apply	60	60	60
Analyze			
Evaluate			
Create			

23MC003	INTERPERSONAL SKILLS (Common to all B.E. / B.Tech Programme)	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory – Non Credit				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Evaluate current relationships and their communication style.
2. Identify ways for improving important relationships.
3. Explore how the Bible correlates with principles from the chapter.
4. Describe how the communication processes impacts our ability to effectively communicate.
5. Identify challenges that may arise from interpersonal communication.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Practice interpersonal communication skills to influence and build good relationships.	Remember
CO 2	Identify and pursue personal learning goals.	Understand
CO 3	Give evident feedback.	Apply
CO 4	Reveal group dynamics and amiable behaviour.	Apply
CO 5	Emphasis the communication process.	Understand

Course Contents

Module – I	**FUNDAMENTALS OF INTERPERSONAL COMMUICATION**	**6**
Facts of communication and Interpersonal communication - culture and gender - Communication and Self disclosure - Presentation of Interpersonal perception - Learning goals - Feeling and feedback.		
Module – II	**INTERPERSONAL COMMUNICATION IN ACTION**	6
Nature of language - language and culture - usage and abuse of language -Positive communication -Non verbal communication - Listening strategies - Barriers of listening.		
Module – III	**EMOTIONAL INTELLIGENCE**	6
Influence of emotional experience and expressions - Accepting the responsibilities and changes - Negotiation tactics - Dealing with criticism and appreciation - Collaborative Problem Solving - Resilience Building.		
Module – IV	**TRANSACTIONS**	6
Different types of transactions - Building Positive Relationship - Managing Conflict - Connecting across Difference -Factors hampering Interpersonal interactions - Assertiveness in communication.		

Module – V	**ESSENTIAL INTERPERSONAL COMPETENCIES**	6
Behaviour - understanding limiting behaviour - Interpersonal and small and lateral thinking-Win -Win attitude - Positive thinking - Stress feedback - Personal Evaluation of Interpersonal Relationship Skills group behavior - Critical management - Assertive		
		Total : 30 Periods

Text Books

1. Bozeman, Jeanine C and Argile Smith, “Interpersonal Relationship Skills for Ministers” Gretna, LA: Pelican Publishing Company, 1st Edition, 2004.
2. Floyd, Kory, “Interpersonal Communication”, 2d. Boston: Mccraw-Hill, 2nd Edition, 2011.

Reference Books

1. Augsburger, David, “Caring Enough to Confront How to Understand and Express Your Deepest Feelings Towards Others”, updated ed Ventura, CA: Regal Books, 2nd Edition 2009.
2. Vohs, Kathleen D., and Eli J., Finkel, eds, “Self and Relationships: Connecting Intrapersonal and interpersonal Processes”. New York Guilford Press, 1st Edition, 2006.

Web References:

1. https://nptel.ac.in/courses/111104031
2. https://nptel.ac.in/courses/111106139
3. https://nptel.ac.in/courses/111105134

Laboratory Components:

S.No	List of Experiments	CO Mapping	RBT
1	Presentation of Interpersonal perception	1	Remember
2	Non-Verbal Communication	2	Understand
3	Negotiation tactics	3	Apply
4	Managing Conflict	4	Apply
5	Stress Management	5	Understand

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO 1										3	2	1	2	
CO 2										3	2	1	2	
CO 3										3	2	1	2	
CO 4										3	2	1	2	
CO 5										3	2	1	2	
	3-High				**2-Medium**				**1-Low**					

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment 1 (50 Marks)	**Assessment 2 (50 Marks)**
Remember	20	20
Understand	10	10
Apply	20	20
Analyse		
Evaluate		
Create		

23EE401	Digital System Design	L	T	P	C
		3	1	0	4
Nature of Course	Professional Core				
Pre requisites	Electronic Devices and Circuits				

Course Objectives

The course is intended to

1. Understand the operation of basic logic gates and logic families.
2. Develop the combinational digital circuits using logic gates
3. Classify the basic Sequential logic components (latch, D flip-flop) and their usage.
4. Built the Various counters circuits using Flip-flops..
5. Explain various semiconductor memories and related technology.
6. Develop the knowledge about Digital Systems in Electronics.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Interpret the Digital logic functions and minimization of logic circuits.	Understand
CO2	Develop the various combinational digital circuits using logic gates.	Apply
CO3	Outline the concepts of sequential logic components and their usage	Understand
CO4	Construct various Synchronous sequential circuits	Apply
CO5	Compare various asynchronous sequential circuits.	Understand
CO6	Illustrate the semiconductor memories and Programmable Logic devices.	Understand

Course contents:

MODULE – I	NUMBER SYSTEM AND DIGITAL INTEGRATED CIRCUITS	10
Number Systems - Decimal, Binary, Octal, Hexadecimal, radix conversion, 1s and 2s complements, Codes - Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems & Postulates, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh Map Minimization, Characteristics of Digital Logic families: TTL and CMOS logic.		
MODULE – II	**DESIGN OF COMBINATIONAL LOGIC CIRCUITS**	**11**
Design of Half and Full Adders, Subtractors, Binary Parallel Adder - Carry look ahead Adder, BCD Adder, Binary Multiplier, Multiplexer, De Multiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Parity Checker & Generator.		
MODULE – III	**FLIPFLOPS AND COUNTERS**	**14**
Latches, Flip flops - SR, JK, T, D, Master/Slave FF - operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits - Design - Moore/Mealy models, state minimization, state assignment, circuit implementation - Design of Counters - Ripple Counters, Synchronous Counter, Ring Counters, Shift registers, Universal Shift Register.		
MODULE – IV	**ASYNCHRONOUS SEQUENTIAL CIRCUITS**	**12**
Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Design of Hazard free circuits, Algorithmic State Machine.		

MODULE – V	**MEMORY DEVICES**	**13**
Basic memory structure - ROM - PROM - EPROM - EEPROM - EAPROM- Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using PLA, PAL.		
		Total : 60 Periods

Text Books:

1. Morris Mano.M and Michael D. Ciletti,"Digital Design", Pearson Publication, Sixth Edition 2018.
2. Salivahanan.S and Arivazhagan.S,"Digital Electronics",Vlikas Publishing House Pvt Ltd, Fifth Edition ,2018
3. Thomas L. Floyd," Digital Fundamentals", Pearson Education Inc, Eleventh Edition, 2015.

References:

1. A.Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Private Limited, Fourth Edition, 2016.
2. Charles H.Roth,"Fundamentals of Logic Design", Thomson Learning, Sixth Edition,2013.

Web References

1. **NPTEL** - https://nptel.ac.in/courses/108/105/108105132/
2. **COURSERA**– https://www.coursera.org/learn/digital-systems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	**Pos**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	3	-	-	-	-	-	-	-	-	-	1	3	
CO2	3	3	3	2	-	-	-	-	-	-	-	-	1	3	
CO3	3	3	3	2	-	-	-	-	-	-	-	-	2	3	
CO4	3	3	2	2	-	-	-	-	-	-	-	-	2	3	
CO5	3	2	2	-	-	-	-	-	-	-	-	-	1	3	
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
Apply		5	
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations**			**Final Examination (60)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	
Remember	10	10	10	20
Understand	40		40	40
Apply		40		40
Analyze				
Evaluate				
Create				

23EE402	SYNCHRONOUS AND INDUCTION MACHINES	L	T	P	C
		3	1	0	4
Nature of Course	Professional Core				
Prerequisites	DC Machines and Transformer				

Course Objectives

The course is intended to

1. Relate the Construction and performance of different types of synchronous generators
2. Organize the principle of operation and performance of synchronous motor
3. Infer the Construction, principle of operation and performance of three-phase induction motors
4. Select the Starting and speed control of three-phase induction motors
5. Rephrase the Construction, principle of operation and performance of single-phase induction mc and special machines
6. Advancement of significance in electrical machines.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Explain the basic construction and working principle of synchronous and induction machines	Understand
CO2	Develop the performance of AC machines with different parameters	Apply
CO3	Extend the performance characteristics of induction machines	Understand
CO4	Identify the starting and speed control methods to AC motors	Apply
CO5	Demonstrate the operation of single phase induction machine	Understand
CO6	Interpret the construction and working of special electrical machines	Understand

Course contents:

MODULE – I	SYNCHRONOUS GENERATOR	12
Introduction to Rotating MMF – Construction and Operation Details – Types of Rotors – EMF Equation – Synchronous Reactance – Armature Reaction – Voltage Regulation: EMF, MMF and ZPF Methods – Synchronization and Parallel Operation – Slip test- Power Output Equations – Change of Excitation and Mechanical Input		
MODULE – II	**SYNCHRONOUS MOTOR**	**12**
Principle of Operation – Torque and power Equations – Starting Methods – Operation on Infinite Bus bars – V and Inverted V Curves – Power Angle characteristics – Hunting & its Prevention – Damper winding-Synchronous Condenser and Phase modifiers. Testing of Synchronous Machines- IS 7132		
MODULE – III	**THREE PHASE INDUCTION MOTOR**	**12**
Construction and Operation Details – Types of Rotors – Squirrel Cage and Slip Ring – Slip – Torque Equations–Slip Torque Characteristics–Losses and Efficiency–Load Test–No Load and Blocked Rotor Tests–Equivalent Circuit–Separation of No-Load Losses –Crawling and Cogging–Double Cage Rotors –Induction Generator–Applications – Energy Efficiency standards: IE1,IE2,IE3,IE4.		
MODULE – IV	**STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR**	**12**
Need for Starters – Types of Starters – Speed Control by Varying Voltage, Frequency, Poles and Rotor Resistance – Slip Power Recovery Scheme, Braking Methods of Induction motor:		
MODULE – V	**SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES**	**12**
Construction and Operation Details – Double Revolving Field Theory – Equivalent Circuit – Starting		

Methods of Induction motor-Linear Induction motor-AC series motor-Servo motor, Testing standards - IS 996
Total :60 Periods
Text Books:
1.KothariD.P and NagrathI.J.,"Electric Machines", Tata McGraw Hill Publishing Company Ltd, Edition, 2017.
2. "Theory and performance of electrical machines" by J.B.Gupta, S.K. Kataria& Sons pvt Ltd New Delhi, 15th Edition 2015.
3. B.LTheraja and A.K .Theraja "A Textbook of Electrical Technology VolumeII AC and DC Machines" S. Chand Publishing New Delhi, January 2015
References:
1.Vincent Del Toro,'Basic Electric Machines'PearsonIndiaEducation,2020
2. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, and Reprint 2017
3. MurugeshKumarK, "Induction and synchronous machines" Vikas publishing house Pvt Ltd., 2016
Web References
1. **NPTEL**-https://nptel.ac.in/courses/108/105/108105131/ 2.**UDEMY**-https://www.udemy.com/course/complete-induction-motors-indetail/?couponCode=ST20MT50724

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2					2					3	1	2	
CO2	1	1					2					2	1	2	
CO3	2	3					1				2	1	2	1	
CO4	2	2					2					2	2	2	
CO5	3	2					3				2	2	1	2	
	3	High				2	Medium					1	Low		

Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class/Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations**			**Final Examination (60)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	
Remember	20	10	10	20
Understand	30	20	20	50
Apply		20	20	30
Analyze				
Evaluate				
Create				

23EE403	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3
Nature of course	**Professional core**				
Pre requisites	Electronic Devices and Circuits				

Course Objectives

The course is intended to

1. Understand the function and fabrication process of ICs
2. Develop the characteristics of operational amplifiers
3. Infer the applications of operational amplifiers
4. Make the student to understand about unique IC and applications of ICs
5. Outline the concepts of Waveform generation and introduce some special function IC'S
6. Build the concepts of filters and regulators.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Summarize the concepts of IC fabrication.	Understand
CO2	Identify the characteristics of OP-AMP	Apply
CO3	Illustrate the applications of OP-AMP.	Understand
CO4	Construct the various application circuits using 555 timer.	Apply
CO5	Summarize the lock range and capture range of PLL and use in various application	Understand
CO6	Identify the appropriate filters for AC and DC circuits	Apply

Course contents:

MODULE – I	IC FABRICATION	9
IC classification -Fundamental of monolithic IC technology: epitaxial growth, masking and etching, diffusion of impurities - Realization of monolithic ICs and packaging -Fabrication of diodes, capacitance, resistance.		
MODULE – II	**CHARACTERISTICS OF OPAMP**	**9**
Ideal OP -AMP characteristics: DC characteristics, AC characteristics -Differential amplifier - Basic applications of op-amp –Inverting and Non-inverting Amplifiers -V/I & I/V converters –Summer - Differentiator and integrator.		
MODULE – III	**APPLICATIONS OF OPAMP**	**9**
Instrumentation amplifier -Comparators – Multivibrators - Clippers – Clampers - D/A converter (R-2R ladder and weighted resistor types) - A/D converters using op amps.		
MODULE – IV	**UNIQUE ICs AND APPLICATIONS OF ICs**	**9**
Functional block, characteristics & application circuits with 555 Timer –IC 566 voltage-controlled oscillator - IC 565 phase lock loop - 723 Variable voltage regulators - LM 380 power amplifier.		
MODULE – V	**RECTIFIERS,ACTIVE FILTERS AND REGULATORS**	**9**
First and Second order low pass and high pass filters. Rectifiers-Hall wave rectifier-full wave rectifier. Regulators-Voltage Regulators IC: Series op-amp regulators(78XX).General Purpose regulator (IC 723)-Switching regulators , LM 723 (refer datasheet)		
		Total :45 Periods

Text Books:

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuits" , Fourth Edition New Age International,4th ed., 2011.
2. Jacob Millman, Christos C.Halkias, "Integrated Electronics - Analog and Digital Circuits

System", McGraw Hill Education, 2nd ed., 2011.

3. Gayakwad R.A., 'Op-amps & Linear Integrated Circuits', Prentice Hall of India, New Delhi,4 th Edition, 2009.

References:

1. Sedha R.S., "A Textbook of Applied Electronics ", 4th Edition, S.Chand& Co. Ltd., New Delhi, 2014 for Units I,II
2. Roy Choudhry D. and Shail Jain, " Linear Integrated Circuit ", 5th Edition, New Age International, New Delhi, 2018 for Units III, IV, V
3. Salivahanan S. and Suresh Kumar N., "Electronic Devices and Circuit ", 4th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017.
4. Sedra and Smith, "Microelectronics", 7th Edition, Oxford University Press, 2017

Web References

1. **NPTEL**-https://onlinecourses.nptel.ac.in/noc22_ee15/preview
2. **UDEMY**- https://www.udemy.com/topic/analog-circuits/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2			3		2						1	2	
CO2	1	1			2		2						1	1	
CO3	2	3			1		1						2	2	
CO4	2	2			2		2						2	2	
CO5	3	2			2		3						1	3	
	3	High				2	Medium					1	Low		

Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class/Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations**			**Final Examination (60)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	
Remember	10	10	10	20
Understand	40	40	20	50
Apply			10	20
Analyze			10	10
Evaluate				
Create				

23EE404	MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	0	0	3
Nature of Course	**Professional Core**				
Pre requisites	**DC Machines and Transformers**				

Course Objectives

The course is intended to

1. Outline the fundamental concepts and characteristics of measurement and errors.
2. Summarize the operating principle of various measuring instruments.
3. Organize the various DC bridge circuits.
4. Develop the AC bridges Circuits with its applications.
5. Build the types of transducers and display devices.
6. Infer the Principles of digital instrumentation.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Explain the functional art off measurement in engineering.	Understand
CO2	Evaluate the principle and operation of analog instruments.	Understand
CO3	Construct various bridge circuits for measurement of Resistance.	Apply
CO4	Outline the various bridge circuits for measurement of Inductance and Capacitance	Apply
CO5	Predict suitable transducers for measurement of non-electrical quantities.	Apply
CO6	Interpret the principle and working of digital instruments.	Understand

Course contents:

MODULE I	CHARACTERISTICS AND CONCEPTS OF MEASUREMENT	9
Functional Elements of Instrument – Standards of Measurements – Static and Dynamic Characteristics – Errors in Measurement – Statistical evaluation of measurement data: Mean, standard deviation, probability of error – Calibration of Instruments.		
MODULE II	**ANALOG INDICATING INSTRUMENTS**	**9**
PMMC Instruments – Moving Iron Instruments – Dynamometer type Instruments - measurement of power and energy- Dynamometer type wattmeter – single phase Induction type energy meter, Calibration of meters- Instrument Transformer (CT & PT).		
MODULE III	**DC AND AC BRIDGES**	**9**
DC Bridges: Wheatstone bridge, Kelvin double bridge and their merits and demerits. AC Bridges: Maxwell bridge, Hay's bridge, Schering Bridge and their Merits and Demerits.		
MODULE IV	**TRANSDUCERS AND DISPLAY DEVICES**	**9**
Classification of transducers- Selection of transducers- Resistive (Thermistor & Thermocouple) , capacitive and Linear Variable Differential Transducer, Piezoelectric and Hall effect Transducer-Working principle of Analog CRO, LED and LCD, Data Logger.		
MODULE V	**DIGITAL INSTRUMENTS & INTRODUCTION TO VIRTUAL INSTRUMENTATION**	**9**
Comparison of analog and digital techniques-Digital voltmeter- Millimeters - Smart meters- Measurement of frequency and phase- DSO- Introduction to Virtual Instrumentation.		
		Total: 45 Periods
Text Books:		

1. Sawhney A.K., "A Course in Electrical and Electronic Measurement and Instrumentation", Revised edition, Dhanapat Rai & Co., 2021.
2. Albert D Helfrick and William D Cooper, "Modern Electronic Instrumentation and Measurement Techniques", 1st edition, Pearson India Education, New Delhi, 2016.
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

References:

1. Jennings, Richard, and Fabiola De La Cueva. LabVIEW graphical programming, 2020, McGraw-Education.
2. E. O. Doebelin and D. N. Manik, "Measurement Systems – Application and Design", Tata McGraw-New Delhi, 6th Edition 2017.
3. David A. Bell, Electronic Instrumentation and Measurements, 2013, Oxford University Press.

Web References

1. NPTEL: https://nptel.ac.in/courses/108/105/108105153
2. UDEMY: -https://unacademy.com/course/comprehensive-course-on- measurement-and-instrumentation-307/ZI3YYQM7

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	2									1	2		
CO2	1	3	2									1	2		
CO3	2	2	1									1	2		
CO4	1	2	2									1	1		
CO5	1	3	2									1	2		
	3	High				2	Medium					1	Low		

Formative Assessment

Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	15
Understand	Tutorial class/Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations**			**Final Examination (60)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	
Remember	10	10	10	20
Understand	40	30	20	50
Apply		10	20	30
Analyze				
Evaluate				
Create				

23EE405	MICROPROCESSOR, MICROCONTROLLERS AND ITS INTERFACING	L	T	P	C
		3	0	2	4
Nature of Course	**Professional Core**				
Pre requisites	**Digital Logic Circuits**				

Course Objectives

The course is intended to

1. Infer knowledge on the Architecture of 8085 microprocessor.
2. Outline the architecture of 8051 microcontroller.
3. Build Microcontroller code for timer and Counters.
4. Extend the programming concept of microcontroller.
5. Examine the interfacing devices with microcontroller.
6. Illustrate and design the microcontroller applications.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Acquire knowledge in Architecture of 8085.	Understand
CO2	Assemble and execute assembly language programs for 8051 microprocessor level	
CO3	Interpret the architecture of microcontroller.	Understand
CO4	Outline the need and use of programming and interrupt structure 8085.	Understand
CO5	Discover the importance of interfacing A/D & D/A with 8051.	Analyze
CO6	Develop the applications of microcontroller	Apply

Course contents:

MODULE I	8085 MICROPROCESSORS	12
Introduction to 8085 Microprocessor – Architecture – Pin configuration – Interrupts – Instruction Set – Addressing Modes – Timing Diagrams – Memory Interfacing – Simple Assembly Language Programs for arithmetic operations.		
MODULE II	**8051 MICRO CONTROLLER**	**12**
Introduction to 8051 Microcontroller – Architecture – Memory Organization–Special Function Registers – Program Counter – PSW register – Stack – Instruction set – Addressing modes.		
MODULE III	**8051 PROGRAMMING**	**12**
I/O Ports – Timer (Mode1) / Counter – Serial Communication – Interrupt (Timer, Serial communication) – I/O port programming –Timer Programming-Counter programming – Serial port programming – Interrupt programming.		
MODULE IV	**INTERFACING I/O PERIPHERALS WITH 8051**	**12**
Programming in Embedded C: LED – Push button switch – Necessity of Relay and Opto-coupler – Keypad – LCD – Seven segments LED – A/D and D/A converters – Temperature sensor - DC Motor – Stepper motor.		
MODULE V	**CASE STUDY APPLICATIONS**	**12**
Microcontroller based Washing machine Control – Central Heating System Using a Super Loop – Simple Street Light control system, Water Level Indicator and Burglar Alarm System – Home Automation & Security systems Mobile phone - controlled ROBOT (Block diagram with programming approach).		

Total : 60 Periods

List of Experiments:

S. No.	Name of the Experiment	CO Mapping	RBT
1	Demonstrate the Arithmetic operations using 8085 Microprocessor.	CO1	Understand
2	Show the square root of a given number using 8051 microcontrollers	CO2	Understand
3	Find the maximum value in an array using 8051 microcontrollers.	CO2	Remember
4	Interpret the Arithmetic operations using 8051 Microcontroller	CO2	Understand
5	Develop a code to interface the stepper motor with 8051 microcontrollers	CO3	Apply
6	Experiment with LCD display interfacing with 8051 microcontrollers	CO3	Analyze
7	Construct a code to write seven segments with 8051 microcontrollers	CO4	Apply
8	Develop a code to interface the performance DC motor with 8051microcontroller	CO4	Apply
9	Examine a simple project using microcontroller 8051.	CO5	Analyze
10	Discover a simple closed loop application using microcontroller	CO5	Analyze

Text Books:

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2019

2. Sunil Mathur & Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Learning Pvt. Ltd, 2016.

3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085, 8086, 8051, McGraw Hill Education, 2013.

References:

1B.RAM," Computer Fundamentals Architecture and Organization" New age International Private Limited, Fifth edition, 2017.

2. Ajay V.Deshmukh, 'Microcontroller Theory &Applications', McGraw Hill Edu,2016

Web References

1. NPTEL: https://archive.nptel.ac.in/courses/108/105/108105102/
2. UDEMY: https://www.udemy.com/course/8051-microcontroller/

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1									1	2		
CO2	3	3	1									1	2		
CO3	3	2	1									1	2		
CO4	3	2	2									1	1		
CO5	3	3										1	2		
	3	High				2	Medium					1	Low		

Summative Assessment						
Bloom's Category	**Internal Assessment Examinations**					**Final Examination (50)**
	Theory				**Practical**	
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**Attendance (5)**	**Rubrics Based CIA (20)**	
Remember	20	20	10	5	5	20
Understand	30	30	20		5	50
Apply			10		10	20
Analyze			10			10
Evaluate						
Create						

23MA401	NUMERICAL METHODS (Common to AIDS ,BME, CSBS, CSE, ECE, EEE, IT and M.Tech CSE)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Foundations of Mathematics				

Course Objectives

The course is intended to

1. Introduce the basic concepts of algebraic and transcendental equations.
2. Indicate the Numerical techniques of interpolation in various intervals.
3. Learn the concept of numerical techniques of differentiation and integration.
4. Study the numerical techniques in solving ordinary differential equations.
5. Provide the Numerical techniques in solving one dimensional and two dimensional heat equations.
6. Acquire proficiency in employing computational techniques to solve mathematical problems efficiently and accurately.

Course Outcomes

On successful completion of the course, students will be able to

Co. No.	Course Outcome	Bloom's Level
CO1	Demonstrate the algebraic and transcendental equations.	Apply
CO2	Perform the numerical techniques of interpolation and error approximations in various Intervals.	Apply
CO3	Compute the numerical techniques of differentiation and integration for engineering problems.	Apply
CO4	Classify the numerical techniques for solving first order ordinary differential equations.	Apply
CO5	Illustrate the solution of boundary value problems.	Apply
CO6	Utilize computational techniques to solve mathematical problems efficiently and accurately.	Apply

Course Contents:

Module – I	SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	9
Solution of Algebraic and Transcendental equations – Newton - Raphson method- Solution of linear system of equations -Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi method and Gauss Seidel method.		
Module – II	**INTERPOLATION AND APPROXIMATION**	**9**
Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation – Interpolation with equal intervals – Newton's interpolation formulae.		

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Module – III	NUMERICAL DIFFERENTIATION AND INTEGRATION	9
Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3 rules – Two point and three point Gaussian quadrature formulae.		
Module – IV	**NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS**	**9**
Single step methods: Euler's method – Fourth order Runge - Kutta method for solving first order equations – Shooting Method – Multi step methods: Milne's predictor corrector methods for solving first order equations.		
Module – V	**BOUNDARY VALUE PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS**	**9**
Finite difference techniques for the solution of two dimensional Laplace's equations on rectangular domain – One dimensional heat flow equation – Bender Schmidt method by explicit – Crank Nicholson methods.		
		Total: 45 Periods

Text Books:

1. Grewal B.S, and Grewal J.S, " Numerical methods in engineering and science "Khanna Publishers, 10th Edition, 2015.
2. Burden, R.L. and Faires, J.D, "Numerical Analysis" Cengage Learning, 9th Edition, 2016.
3. Gupta, S.K., "Numerical Methods for Engineers", New Age Publishers, Third Edition, 2015.

Reference Books:

1. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, New Delhi, 4th Edition, 2017.
2. Sastry, S.S., "Introductory Methods of Numerical Analysis", PHI Learning pvt Ltd, 5th Edition, 2015.
3. Jain, M.K., Iyengar, S.R.K. and Jain, R.K., "Computational Methods for Partial Differential Equations", New Age Publishers, 2016.
4. Curtis F.Gerald, Patrick.O. Wheatley, "Applied Numerical Analysis", Pearson Education, 8th Edition, 2022.

Additional References:

1. https://nptel.ac.in/courses/111/107/111107105
2. https://nptel.ac.in/courses/127/106/127106019
3. https://archive.nptel.ac.in/content/storage2/courses/122104018/node126.html

Laboratory Components using MATLAB:

S.No	List of Excercises	CO Mapping	RBT
1	Gauss Elimination Method	1	Apply
2	Gauss Seidel Method	1	Apply
3	Lagrange's Interpolation Formula	2	Apply

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4	Newton's Forward and Backward difference formula	2	Apply
5	Trapezoidal Rule	3	Apply
6	Simpson's 1/3 rd rule	3	Apply
7	Euler's Method	4	Apply
8	Runge – Kutta Method	4	Apply
9	Finite Difference Method	5	Apply
10	Bender Schmidt method	5	Apply

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	-	-	-	-	-	-	-	-		2		
CO2	3	2	2	-	-	-	-	-	-	-	-		2		
CO3	3	2	1	-	-	-	-	-	-	-	-		2		
CO4	2	2	1	-	-	-	-	-	-	-	-		1		
CO5	3	3	1	-	-	-	-	-	-	-	-		2		
CO6	3	2	2	-	-	-	-	-	-	-	-		2		
	3	High				2	Medium					1	Low		

Bloom's Level	Summative Assessment						
	Continuous Assessment						Final Examination (Theory) [50]
	Theory			Practical			
	IAE I (5)	IAE II (10)	IAE III (10)	Attendance [5]	Rubric based [10]	Model Exam [10]	
Remember	10	10	10				10
Understand	10	10	10		40	40	30
Apply	30	30	30		60	60	60
Analyze							
Evaluate							
Create							

CHAIRMAN-BOARD OF STUDIES

23EE406	Synchronous and Induction Machines Laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Professional Core				
Pre requisites	DC Machines and Transformers laboratory				

Course Objectives

The course is intended to

1. Infer the concept of synchronous and asynchronous machines
2. Discover the Principle of operation and performance of synchronous motor
3. Examine the Construction, principle of operation and performance of induction machines.
4. Illustrate the operation and speed control of three-phase induction motors
5. Summarize the Construction, principle of operation and performance of single-phase induction motors and special machines
6. Create the sound knowledge in AC Machines.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Interpret the regulation of an Alternator by various methods namely EMF, MMF, ZPF.	Understand
CO2	Infer the direct axis and quadrature axis reactance of synchronous generator by slip test.	Understand
CO3	Categorize the positive, negative and zero sequence impedances of an Alternator and also to obtain V and inverted V curves of Synchronous motor.	Analyze
CO4	Inspect the performance characteristics, equivalent circuit and losses of three phase induction motors.	Analyze
CO5	Interpret the performance characteristics of and three phase induction motor by conducting load test.	Understand
CO6	Show the performance characteristics of single phase induction motor.	Understand

List of Experiments

S.No	Name of Experiments	CO mapping	RBT Level
1	Regulation of three phase alternator by EMF and MMF methods	CO1	Understand
2	Regulation of three phase alternator by ZPF method	CO1	Understand
3	Regulation of three phase salient pole alternator by slip test	CO2	Understand
4	Separation of No-load losses of three phase induction motor	CO3	Analyze
5	V and Inverted-V curves of Three Phase Synchronous Motor	CO3	Analyze
6	No load Test and Blocked Rotor Test on Three Phase Induction Motor	CO4	Analyze
7	Separation of No-load losses of three phase induction motor	CO4	Analyze
8	Load test on three-phase induction motor	CO5	Understand
9	Study of starters for synchronous and induction motors	CO5	Remember
10	Load test on single phase induction motor	CO6	Understand

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**Pos**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	3				3					2	2	1	
CO2	2	3	2				2					2	1	2	
CO3	1	2	1				1					1	2	2	
CO4	3	1	3				3					2	2	2	
CO5	2	2	1				2					2	2	2	
	3	High				2	Medium					1	Low		

Assessment	**Marks**	**Weightage**	**Marks**		
			CA	**FE**	**Total**
Rubrics based continuous assessment	100	30	60	40	100
Preparatory examination	100	25			
Attendance	5	5			

Bloom's Level	**Rubric based Continuous Assessment [30 marks]**	**Preparatory / Model examination (25 Marks)**	**Attendance**	**Final Examination [40 marks]**
Remember	5	2	5	20
Understand	5	3		20
Apply	10	10		30
Analyze	10	10		30
Evaluate				
Create				

23EE407	Linear and Digital Instrumentation Laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Professional Core				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Recall the pin diagram and Applications of various ICs.
2. Estimate the Performance of Analog to Digital and Digital to Analog converters
3. Inspect the operation of various DC Bridges.
4. Examine the operation of various AC Bridges.
5. Develop the concepts in pressure measurements.
6. Design the logical circuits to perform arithmetic operations.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Make use of ICs in different applications	Apply
CO2	Examine and verify the design of both Analog and Digital circuits using simulators	Apply
CO3	Implement the concept of multiplexer and Demultiplexer using gates.	Apply
CO4	Illustrate the concepts of DC bridges.	Understand
CO5	Inspect the concepts of AC bridges.	Understand
CO6	Utilize the concepts in pressure measurements.	Apply

List of Experiments

S.No	Name of Experiments	CO mapping	RBT Level
1	Implementation of Adder, Comparator, Integrator and differentiator using linear ICs	**CO1**	Apply
2	Design Differential Amplifier, Clippers and clampers.	**CO1**	Apply
3	Simulate the working of ADC and DAC using PSPICE	**CO2**	Understand
4	Organise the implementation of Multiplexer and Demultiplexer using Logic Gates	**CO2**	Apply
5	Study of IC 7445 and IC 74147	**CO3**	Understand
6	Measurement of DC resistance by Wheatstone Bridge and Kelvin Double Bridge.	**CO4**	Understand
7	Measurement of Inductance using Maxwell's Bridge	**CO4**	Understand
8	Measurement of capacitance using Schering Bridge	**CO4**	Understand
9	Measurement of pressure using Flow meter.	**CO5**	Apply
10	Measurement of pressure using strain gauge.	**CO5**	Apply

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	1										2	2	
CO2	3	2	1										2	1	
CO3	3	3	2										1	2	
CO4	3	2	1										2	2	
CO5	2	1	1										2	1	
	3	High				2	Medium					1	Low		

Assessment	Marks	Weightage	Marks		
			CA	FE	Total
Rubrics based continuous assessment	100	30	60	40	100
Preparatory examination	100	25			
Attendance	5	5			

Bloom's Level	Rubric based Continuous Assessment [30 marks]	Preparatory / Model examination (25 Marks)	Attendance	Final Examination [40 marks]
Remember	10	10	5	10
Understand	50			50
Apply	30	50		30
Analyze	10	40		10
Evaluate				
Create				

23MC004	INDIAN CONSTITUTION (Common to all B.E. / B.Tech Programme)	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory Course				
Pre requisites	Fundamentals of Indian Constitution				

Course Objectives

The course is intended to

1. Know about the basic structure with the key elements of the Indian Constitution.
2. Enable students to grasp the Fundamental Rights, Directive Principles of State Policy and Fundamental Duties of our constitution.
3. Promote the students about our Union Government, political structure and their functions.
4. Prepare the students with the Indian judiciary and Election systems.
5. Learn the State Legislature, State politics and State planning commission in India.
6. Study the powers and functions of various constitutional offices and institutions.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Utilize the basic structure of Indian Constitution in real life situation.	Understand
CO 2	Relate their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.	Understand
CO 3	Compare the Union Government, political structure and their powers and functions.	Understand
CO 4	Outline about our Indian Judiciary, Election Commission and Amendments.	Understand
CO 5	Summarize the power and functions of State Legislature.	Understand
CO 6	Realise the significance of the constitution and appreciate the role of constitution and citizen oriented measures in a democracy.	Understand

Course Contents

Module – I	INTRODUCTION TO INDIAN CONSTITUTION	6
The Historical background - Meaning of the term Indian Constitution - Necessity of the Constitution - Societies before and after the Constitution adoption - Introduction to the Indian constitution - Making of the Constitution, Role of the Constituent Assembly.		
Module – II	**FUNDAMENTAL RIGHTS**	**6**
Salient features of India Constitution - Preamble of Indian Constitution & Key concepts of the Preamble - Fundamental Rights (FR's) - its Restriction and limitations in different Complex Situations - Directive Principles of State Policy - its present relevance in Indian society - Fundamental Duties - its Scope and significance in Nation.		

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Module – III	UNION GOVERNMENT	6
Union Government – Union legislature – Lok sabha – Rajya sabha (with powers and functions) -Union Executive – President (with powers and functions), Prime Minister (with powers and functions), Union Cabinet.		
Module – IV	**INDIAN JUDICIARY AND ELECTION COMMISSION**	**6**
Structure of Judicial System in India - Supreme Court - High Courts - District Courts - Role of Judiciary in India - Judicial Reviews and Judicial Activism. Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today.		
Module – V	**STATE LEGISLATURE**	**6**
Organization and Composition of State Legislature - Legislative Council - Composition of the Council - Composition of the Assembly - Qualifications for the Houses - Legislative Assembly - Duration of State Legislature - Duration of Assembly - Duration of Council.		
		Total : 30 Periods

Text Books

1. Durga Das Basu, Introduction to the Constitution of India, Gurgaon; LexisNexis, (23rd edn.) 2018
2. J.N. Pandey, The Constitutional Law of India, Allahabad; Central Law Agency,(55th edn.) 2018.
3. P.M Bakshi, Constitution of India, Universal Law Publishing House, NewDelhi, 1999.

Reference Books

1. Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
2. KB Merunandan, Bharatada Samvidhana Ondu Parichaya, Bangalore, Meragu Publications, 2015
3. K.Sharma, Introduction to the Constitution of India, Prentice Hall of India, NewDelhi, 2002.

Web References:

1. https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf.
2. https://edukemy.com/blog/upsc-ncert-notes-indian-polity-state-legislature/#Organization_and_Composition_of_State_Legislature
3. https://blog.ipleaders.in/dpsp-and-fundamental-rights/

CHAIRMAN-BOARD OF STUDIES

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1								1				1		1
CO 2								1				1		1
CO 3								1				1		1
CO 4								1				1		1
CO 5								1				1		1
	3-High				2-Medium				1-Low					

Formative assessment			
Bloom's Level	Continuous Assessment (IAE)		Total marks
	Assessment component	Marks	
Remember	Online Quiz	20	50
Understand	Tutorial class/Assignment	25	
	Attendance	5	

Summative assessment			
Bloom's Level	Continuous Assessment (IAE)		
	Theory Marks		
	IAE-I [10]	IAE-II [20]	IAE-III [20]
Remember	20	10	10
Understand	30	20	20
Apply		20	20
Analyse			
Evaluate			
Create			

CHAIRMAN-BOARD OF STUDIES

23MC005	YOGA AND VALUES FOR HOLISTIC DEVELOPMENT (Common to all B.E. / B.Tech Programme)	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory Course				
Pre requisites	Fundamentals of Yoga				

Course Objectives

The course is intended to

1. Know the various types of yoga and their benefits.
2. Practice essential yoga postures and techniques.
3. Give mental clarity and focus through the practice of pranayama.
4. Incorporate relaxation technique into their daily routine works.
5. Use meditation to reduce stress and anxiety.
6. Promote positive health, prevention of stress related health problems and rehabilitation through Yoga.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Balance their full potential and confidence.	Understand
CO 2	Understand the knowledge of fundamental yoga postures.	Understand
CO 3	Realize the enhanced the functions of inner organs.	Understand
CO 4	Achieve a deep state of relaxation and release physical and mental tension.	Understand
CO 5	Cultivate a sense of calm and well-being.	Understand
CO 6	Experience enhanced flexibility, strength and balance as well as reduced stress.	Understand

Course Contents

Module – I	INTRODUCTION TO YOGA	6
Foundations of Yoga - History and Development of Yoga - Etymology and Definitions, Misconceptions, Aim and Objectives of Yoga, True Nature and Principles of Yoga - Introduction to Vedas – Upanishads - Prasthanatrayee - Purushartha Chatushtaya.		
Module – II	**POSTURES (ASANA)**	**6**
Trikonasana - Ardha-Kati – Chakrasana – Tadasana - Vrikshasana - Padmasana, Simhasana - Paschimottanasana, Uttanpadasana – Salabhasana - Shavasana Pawanmuktasana - Anti-Rheumatic Series - Digestive / Abdominal Group - Energy Bock Series - Back Strengthening Exercises - Sun Salutation (Surya Namaskar) - Classical Sequence.		
Module – III	**BREATHING**	**6**
The Foundations - Abdominal Breathing - Thoracic (mid-chest) breathing - Clavicular (upper chest breathing) - The Complete Yoga Breath. Pranayama Techniques - Breathing Ratios - Nadi Shodhana (Alternate Nostril Breathing) - Ujjayi (the 'whispering breath' or the 'psychic breath') - Bhramari (Humming Bee breath).		

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Module – IV	RELAXATION	6
Quick Relaxation techniques - Tense & Relax - Short Yoga Nidra (Power Nap) - Extended Shavasana - Yoga Nidra – Sankalpa.		
Module – V	**MEDITATION**	**6**
Develop a good, comfortable sitting posture - Kaya Sthairyam (Body Stillness) - Om Chanting - Trataka (Concentrated Gazing).		
		Total : 30 Periods

Text Books

1. Stephen Sturges, The Yoga Book. Motilal Banarsidass, Delhi, 2004.
2. Singh S.P & Yogi, Foundation of Yoga, Standard Publication, New Mukesh Delhi, 2010.
3. Sahay G.S. HathaYoga Pradeepika of Svatmarama, MDNIY Publication, 2013.

Reference Books

1. Bhat, Krishna K. The Power of Yoga: SuYoga Publications Mangalore,2006.
2. Fenerstein, George, The Yoga Tradition: It's History, Literature, Philosophy practice, Bhavana Books and Prints, 2002.
3. Tiwari, O.P, Asana Why and How? Kaivalyadhama, Lonavla, 2011.

Web References:

1. https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf.
2. https://edukemy.com/blog/upsc-ncert-notes-indian-polity-state-legislature/#Organization_and_Composition_of_State_Legislature
3. https://blog.ipleaders.in/dpsp-and-fundamental-rights/

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment 1 (50 Marks)	Assessment 2 (50 Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

CHAIRMAN-BOARD OF STUDIES

23MC006	SOFT SKILLS (Common to all B.E. / B.Tech Programme)	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory Course				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Improve language skills in personal and professional life.
2. Equip students with the vital communication and soft skills to succeed in the highly competitive international arena.
3. Focus on the fundamental soft skills and of their practical social and work place usage.
4. Learn to identify and overcome the barriers in interpersonal relationships.
5. Enhance employability skills and ensure career success.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Relate the significance and fundamental nature of soft skills.	Remember
CO 2	Take part in a wide range of Public speaking and professional group discussions.	Understand
CO 3	Plan one's time effectively and productively, especially at work.	Apply
CO 4	Make use of leadership skills to manage stress &conflict.	Apply
CO 5	Organize presentation effectively and participate in interview with confidence.	Apply

Course Contents

Module – I	INTRODUCTION TO SOFT SKILLS AND INTERPERSONAL COMMUNICATION	6
An Introduction – Definition and Significance of Soft Skills; Interpersonal communication-types of interpersonal communication.		
Module – II	**PUBLIC SPEAKING AND ORAL COMMUNICATION SKILLS**	**6**
Public Speaking: Skills, Methods, Strategies Group Discussion: Importance, Planning, Elements.		
Module – III	**TIME MANAGEMENT AND PERSONALITY DEVELOPMENT**	**6**
Time Management – concepts and essentials tips. Personality-development – meaning, SWOT analysis & goal setting- Stress and conflict management.		
Module – IV	**LEADERSHIP SKILLS AND EMOTIONAL INTELLIGENCE**	**6**
Leadership skills: Concept of Leadership and honing Leadership Skills- Problem-Solving Skills - Group and Ethical Decision-Making. Emotional Intelligence: Strategies to enhance Emotional Intelligence.		

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Module – V	INTERVIEW SKILLS	6
Interviewer - Interviewee perspectives - Self Introduction and Presentation: Types. Content and Essential Tips–before, during and after a presentation, Overcoming Nervousness - Mock Interview.		
		Total : 30 Periods

Text Books

1. Managing Soft Skills for Personality Development–edited by B.N.Ghosh, McGraw Hill India, 2018.
2. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
3. English and Soft Skills–S.P. Dhanavel, Orient Black swan India, 2017.

Reference Books

1. Soft Skill Business and Professional Communication Book by Sutapa Banerjee,2016.
2. Communication Skills Book by PushpLata and Sanjay Kumar,2015.
3. Klaus, Peggy, Jane Rohman & Molly Hamaker. The Hard Truth about Soft Skills. London: HarperCollins E-books, 2007

Web References:

1. https://nptel.ac.in/courses/109/107/109107121/
2. https://onlinecourses.nptel.ac.in/noc22_hs77/preview
3. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1								1	2	3		2			
CO2								1	2	3		2			
CO3								1	2	3		2			
CO4								1	2	3		2			
CO5								1	2	3		2			
	3	High				2	Medium				1	Low			

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment 1 (50 Marks)	Assessment 2 (50 Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

CHAIRMAN-BOARD OF STUDIES

23EEA01	PLC AUTOMATION	L	T	P	C
		1	0	0	1
Nature of course	Employability Enhancement Course				
Pre requisites	Fundamentals of Electrical Engineering				

Course Objectives

The course is intended to

1. We will provide real time project training with hardware implementation. •
2. Student will get strong knowledge of hardware Implementation and thinking capability on real time products.
3. We will provide the required components for the products

Course Outcomes

On successful completion of the course, students will be able to

CO. No	Course Outcome	Bloom's Level
CO1	Understand the basics concept of various energy Technologies	Understand
CO2	Importance of energy auditing and energy management	Apply

Course Contents

Module-I PLC Fundamentals **7**

PLC Fundamentals - (Block diagram of PLC's)Applications and Types of Transformers - Selection of PLC components(Power supply, CPU, I/O's List , Communication bus Various ranges available in PLC's) - I/O list selection - Open-Circuit and Short - Circuit Tests - Types of Inputs & outputs / Source Sink Concepts - Parallel Operation of Transformers - Wiring of the I/O devices - Architectural Evolution of PLC - Introduction to the field devices - Types of Inputs & outputs / Source Sink Concepts - Wiring of the I/O devices - Concept of flags and Scan cycle execution.

Module-II Logical operations of PLC **8**

Concept of flags and Scan cycle execution - Setting up PLCs / Connecting CPU, I/O modules, Rack, Backplane and Communication bus - Connecting Field devices to PLCs I/O's - Programming instructions arithmetic and logical - Load /and /or/out / and Read / Write - Compare / Add / Sub /And /Or – Blocks - Edge / trailing edge instructions - MOVE block application, Timer and Counter Blocks programming – Advanced Instructions – file handling and comment functions – Master control/set/reset function.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3		2	3							2	1	3	
CO2	2	3		2	3							2	1	3	
	3	High				2	Medium					1	Low		

Bloom'sLevel	Summative Assessment (Internal Mode)	
	Assessment1(50Marks)	Assessment2(50Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

23EEA02	MATLAB DESIGN	L	T	P	C
		1	0	0	1
Nature of course	Employability Enhancement Course				
Prerequisites	Fundamentals of Electrical Engineering				

Course Objectives

The course is intended to

1. Observe the fundamentals of MATLAB and SIMULINK.
2. Develop the model by using SIMULINK.

Course Outcomes

On successful completion of the course, students will be able to

CO.No	Course Outcome	Bloom'sLevel
CO1	Contrast the basics concept of MATLAB and SIMULINK	Understand
CO2	Simulate the model by using SIMULINK	Apply

Course Contents

Module-I	**INTRODUCTION OF MATLAB and SIMULINK**	**7**
Introduction to MATLAB - Historical Background Applications - Importance of MATLAB for Engineers-Features-SIMULINK - SIMULINK based circuit designing - Network model for various power systems - Smart and micro grid model - Hybrid filter, Harmonic Compensation - Unit commitment Calculator.		
Module-II	**PRODUCT DESIGN BY USING SIMULINK**	**8**
Inverters and types like Z-Source Inverters, CSI, VSI, multilevel inverters - Converter and types like Luo converter, soft switching converters - Sliding mode controller - Classical controllers - Fuzzy logic controller - Neural network controller - FACTS Devices - MATLAB interfacing with Embedded system (SIMULINK based load control).		

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3		2	3							2			
CO2	2	3		2	3							2			
	3	High				2	Medium					1	Low		

Bloom'sLevel	Summative Assessment (InternalMode)	
	Assessment1(50Marks)	Assessment2(50Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

23EEA03	INDUSTRIAL AUTOMATION	L	T	P	C
		1	0	0	1
Nature of course	One credit course				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Discover the basic concepts of automation industries.
2. Develop the automation applications.

Course Outcomes

On successful completion of the course, students will be able to

CO.No	Course Outcome	Bloom's Level
CO1	Illustrate the fundamentals of industrial automation	Understand
CO2	Compute the applications in industries	Apply

Course Contents

Module-I	**INDUSTRIAL DESIGN**	**7**
Assessing the Need for Industrial Design - The Impact of Industrial Design - The Industrial Design Process - Management of the Industrial Design Process - Assessing the Quality of Industrial Design - investigation of customer needs – conceptualization.		
Module-II	**PROTOTYPE**	**8**
Prototyping Technologies - Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing processes electronically - Planning for Prototypes.		

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1										2	1	1
CO2	2	3										1	2	1
	3	**High**				**2**	**Medium**					**1**	**Low**	

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment1(50Marks)	Assessment2(50Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

23EEA04	QUALITY MANAGEMENT SYSTEMS	L	T	P	C
		1	0	0	1
Nature of course	One credit course				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Teach the need for quality, its evolution and its basic concepts.
2. Discover the quality problems and control.

Course Outcomes

On successful completion of the course, students will be able to

CO.No	Course Outcome	Bloom's Level
CO1	Explain the basic concepts of quality management	Understand
CO2	Identify the issues and problem control in quality management	Understand

Course Contents

Module-I	FUNDAMENTALS OF QUALITY MANAGEMENT	7
Evolution of Quality Management, Concepts of Product and service Quality, Dimensions of Quality-Energy Auditing-Power quality maintenance-Quality management in conveyer automation-Energy Auditing using Micro controller.		
Module-II	**PCB PROTOTYPING AND PRODUCTION**	**8**
Quality problems in distribution system-Quality issues lead to Harmonics mitigation-Power Quality & EMC in Smart Grid-Web based Power Quality Monitoring-Quality control in raw materials-Quality Management procedure in organization structure-Identification of power fluctuations and quality disturbances		

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes(PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2										1	1	2
CO2	1	3										1	1	1
	3	High				2	Medium					1	Low	

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment 1 (50Marks)	Assessment 2 (50Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

23EEA05	PCB DESIGN	L	T	P	C
		1	0	0	1
Nature of course	One credit course				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Enumerate the basic concepts of PCB Design.
2. Outline the basic prototype and production of PCB Design.

Course Outcomes

On successful completion of the course, students will be able to

CO.No	Course Outcome	Bloom's Level
CO1	Describe the types of PCB and standards.	Understand
CO2	Summarize the prototype and productive design.	Apply

Course Contents

Module-I	INTRODUCTION OF PCB DESIGN	7
Types of PCBs, Introduction to KiCad, Schematic entry / drawing, net listing, layering, component foot print library selection & designing, design rules, component placing: Manual & automatic, track routing: automatic & manual, rules: track length, angle, joint & size, Auto router setup. IPC standards for schematic, designing, material and documentation		
Module-II	**PCB PROTOTYPING AND PRODUCTION**	**8**
PCB Prototyping: CNC Machine, Photo-Lithography process, Screen Printing process and chemical etching. PCB Mass Manufacturing Process: Gerber Generation, CAM, penalization, cleaning, drilling, plating, screen printing, etching, automated optical inspection, tinning, solder resist, legend printing, PCB testing.		

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1										2	1	1
CO2	2	3										1	2	1
	3	High				2	Medium					1	Low	

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment1(50Marks)	Assessment2(50Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

23EEA06	ELECTRICAL CAD	L	T	P	C
		1	0	0	1
Nature of course	One credit course				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Explain the basic concepts of components in E-CAD.
2. Develop the prototype of E-CAD.

Course Outcomes

On successful completion of the course, students will be able to

CO.No	Course Outcome	Bloom's Level
CO1	Illustrate the Auto CAD components and its chapters.	Understand
CO2	Construct the panel prototype and applications of E-CAD	Apply

Course Contents

Module-I	**INTRODUCTION OF SCHEMATIC COMPONENTS**	**7**
Introduction to UI of AutoCAD Electrical Unit, Grid and General Setups Design Environment Basic Workflow Basic Drawing tools Basic Editing Tools Layers Dimension Setup; Ladders diagram Wire Type Wire Numbers 3-Phase Circuits Source and Destination Signal Arrows Multi wire 3-Phase Circuits Circuits Diagrams Point-2-Point Connector Schematic Symbol Annotation Swap/Update Blocks Insert a Schematic Component Schematic Reports Schematic Reports Chapter exercise.		
Module-II	**PANEL LAYOUTS AND PROTOTYPE**	**8**
Panel Layouts: Create a Panel Layout from a Schematic List Panel Footprints Terminal Strip Editor Panel Layout Annotation and Reports, Custom Components : Schematic Symbols Icon Menu System, Documentation: Parts Catalogue Database Title Block Update Reference Files Printing and plotting setup Export to PDF and other formats.		

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1										2	1	1
CO2	2	3										1	2	1
	3	High				2	Medium					1	Low	

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment1(50Marks)	Assessment2(50Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		