SRI VENKATESWARA COLLEGE OF ENGINEERING,

(An Autonomous Institution, Affiliated to Anna University, Chennai – 600025)

B.E., Electrical and Electronics Engineering

CURRICULUM AND SYLLABUS

REGULATION – 2022

CHOICE BASED CREDIT SYSTEM

Curriculum Revision No:		Board of Studies recommendation date :	07.10.2022 10.04.2023 19.09.2023	Academic Council Approved date:	08.10.2022 21.04.2023 23.09.2023
Salient Points of the revision	01.	The Program Specific Outcomes is revised which focus on Automation, Design and Development.			
	02.	Two Tamil language courses are introduced in semesters I and II with a total of 3 credits.			
	03.	New theory course “Measurement and Instrumentation” has been introduced.			
	04.	Two new hybrid Theory - Laboratory courses are introduced			
	05.	Professional electives are to be grouped under 6 verticals of different domains.			

SRI VENKATESWARA COLLEGE OF ENGINEERING

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REGULATIONS 2022

B. E ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

I. Graduates will serve as engineering contributors in the emerging fields of Electrical and Electronics Engineering.

II. Graduates will become entrepreneurs through human centered design thinking and innovation.

III. Graduates will be successful in pursuing higher studies in engineering or management.

IV. Graduates will be effective and ethical team player in the field of green energy management and sustainability.

PROGRAM OUTCOMES (POs)

GRADUATE ATTRIBUTES:

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Design, analyse and implement Power Electronics circuit with smart control systems for Industrial drives and Electric Vehicles.

2. Analyse safety, stability, control and protection of vertical and deregulated Smart systems and interconnection of microgrid comprising Renewable, Storage and Nano technologies.

PEO's – PO's & PSO's MAPPING:

POs	PEOs			
	I	II	III	IV
1	✓	✓	✓	
2	✓	✓	✓	
3	✓		✓	
4	✓		✓	
5	✓	✓	✓	
6		✓		✓
7		✓		✓
8		✓		✓
9		✓	✓	✓
10		✓	✓	✓
11		✓	✓	✓
12	✓	✓	✓	
PSOs				
1	✓		✓	✓
2	✓		✓	✓

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REGULATIONS 2022

CHOICE BASED CREDIT SYSTEM

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM AND SYLLABI FOR SEMESTERS I TO IV

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQ-UISITE	POSITION
				L	T	P	C			
1.	IP22151	Induction Program (Common to all branches)	-	-	-	-	-	-	NIL	-
Theory Subjects										
2.	HS22151	Tamil language and Heritage of Ancient Tamil Society (Common to all branches)	HS	1	0	0	1	1	NIL	F
3.	HS22152	Communicative English (Common to all branches)	HS	3	0	0	3	3	NIL	F
4.	MA22151	Applied Mathematics I (Common to all branches except MR)	BS	3	1	0	4	4	NIL	F
5.	PH22151	Applied Physics (Common to AD, CS, EE, EC, IT)	BS	3	0	0	3	3	NIL	F
6.	CY22151	Applied Chemistry (Common to AD, CS, EE, EC, IT)	BS	3	0	0	3	3	NIL	F
7.	CM22151	Basic Civil and Mechanical Engineering	ES	3	0	0	3	3	NIL	F
8.	IT22101	Programming for Problem Solving (Common to IT, AD, CS, EE, EC)	ES	3	0	0	3	3	NIL	F
Practical Subjects										
9.	EE22111	Basic Electrical & Electronics Engineering Laboratory (Common to all branches except EC)	ES	0	0	2	1.0	2	NIL	F
10.	ME22161	Basic Civil & Mechanical Engineering Laboratory (Common to CE, EE, EC)	ES	0	0	2	1.0	2	NIL	F
11.	IT22111	Programming for Problem Solving Laboratory (Common to IT, AD, CS, EE, EC)	ES	0	0	3	1.5	3	NIL	F
			Total	**19**	**1**	**7**	**23.5**	**27**		

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQ-UISITE	POSITION
				L	T	P	C			
Theory Subjects										
1.	HS22251	Science and Technology in Ancient Tamil Society (Common to all branches)	HS	2	0	0	2	2	NIL	F
2.	HS22252	Technical English (Common to all branches)	HS	3	0	0	3	3	NIL	F
3.	MA22251	Applied Mathematics II (Common to all branches except MR)	BS	3	1	0	4	4	NIL	F
4.	PH22252	Physics of Materials (Common to EE and EC)	BS	3	0	0	3	3	NIL	F
5.	ME22252	Fundamentals of Engineering Graphics	ES	2	0	2	3	4	NIL	F
6.	EE22201	Electric Circuit Analysis	PC	3	1	0	4	4	NIL	F
Practical Subjects										
7.	PH22161	Physics Laboratory (Common to all branches except BT)	BS	0	0	2	1	2	NIL	F
8.	CY22161	Chemistry Laboratory (Common to all branches except AD, CS, IT)	BS	0	0	2	1	2	NIL	F
9.	EE22211	Electric Circuits Laboratory	PC	0	0	3	1.5	3	NIL	F
			Total	**16**	**2**	**9**	**22.5**	**26**		

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQ-UISITE	POSITION
				L	T	P	C			
Theory Subjects										
1.	MA22354	Mathematics For Electrical Engineers	BS	3	1	0	4	4	NIL	F
2.	EE22301	Electrical Machines I	PC	3	0	0	3	3	NIL	F
3.	EE22302	Electric Power System	PC	3	0	0	3	3	NIL	F
4.	EE22303	Electromagnetic Theory	PC	3	0	0	3	3	NIL	F
5.	EE22308	Digital Logic Circuits: Theory and Practices	PC	3	0	2	4	5	NIL	F
6.	EE22309	Electron Devices and Circuits: Theory and Practices	PC	3	0	2	4	5	NIL	F
Practical Subjects										
7.	EE22311	Electrical Machines I Laboratory	PC	0	0	3	1.5	3	NIL	F
			Total	**18**	**1**	**7**	**22.5**	**26**		

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL HOURS	PREREQ-UISITE	POSITION
				L	T	P	C			
Theory Subjects										
1.	MA22452	Numerical Methods (Common to EE and CH)	BS	3	1	0	4	4	NIL	F
2.	GE22451	Environmental Sciences and Sustainability (Common to all branches)	BS	3	0	0	3	3	NIL	F
3.	EE22401	Analog Electronics	PC	3	0	0	3	3	NIL	F
4.	EE22402	Control Systems	PC	3	0	0	3	3	NIL	F
5.	EE22403	Electrical Machines II	PC	3	0	0	3	3	NIL	F
6.	EE22404	Measurement and Instrumentation	PC	3	0	0	3	3	NIL	F
Practical Subjects										
7.	EE22411	Analog Electronics Laboratory	PC	0	0	3	1.5	3	NIL	F
8.	EE22412	Control Systems and Instrumentation Laboratory	PC	0	0	3	1.5	3	NIL	F
9.	EE22413	Electrical Machines II Laboratory	PC	0	0	3	1.5	3	NIL	F
			Total	**18**	**1**	**9**	**23.5**	**28**		

SEMESTER I

HS22151	தமிழ்மொழியும்தமிழர்மரபும் Tamil language and Heritage of Ancient Tamil Society	L T P C
	(Common to all branches)	**1 0 0 1**

பாடத்தின்நோக்கங்கள்:

1. தமிழ்மொழியின்தோற்றம்பற்றியும்,
திணைகருத்துக்கள்வாயிலாகவாழ்வியல்முறைகளைபற்றியும்கற்றுக்கொள்வார்கள்.
2. இந்தியதேசியசுதந்திரஇயக்கத்தில்தமிழர்களின்பங்களிப்புமற்றும்தமிழர்களின்மேலாண்மைமுறைகளை பற்றியும்கற்றுக்கொள்வார்கள்.

Course Objectives:

- They will learn about the origin of the Tamil language and the ways of life through five types of lands.
- They will also learn about the contribution of Tamils in the Indian National Freedom Movement and the management methods of Tamils.

அலகு 1	தமிழுக்கும்தொழில்நுட்பக்கல்விக்கும்உள்ளதொடர்பு	3

மொழிமற்றும்பாரம்பரியம்: இந்தியாவில்உள்ளமொழிக்குடும்பங்கள் – திராவிடமொழிகள் – தமிழ்ஒருசெம்மொழி – தமிழில்செம்மொழிஇலக்கியம் - உ.வே.. சாமிநாதய்யர். ஆறுமுகநாவலர் ஆகியோரின் பங்களிப்பு – தொழில்நுட்பக்கல்வியில்தமிழ்மொழியின்முக்கியத்துவம்.

UNIT -1 LANGUAGE AND HERITAGE

Language families in India – Dravidan Languages – Tamil as a Classical language – Classical Literature in Tamil – Contribution of U.Ve.Saminathaiyar. Arumuka Navalar – Importance of Tamil language in technical education.

அலகு2	திணைகருத்துக்கள்	9

திணைகருத்துக்கள்: -ஐந்துவகைநிலங்கள், விலங்குகள், கடவுள்கள், தொழில், வாழ்க்கைமுறைகள், இசை, நடனம், உணவுமுறை, தமிழர்களின்தாவரங்கள்மற்றும்விலங்கினங்கள் – தொல்காப்பியம்மற்றும்சங்கஇலக்கியங்களில்இருந்துஅகம்மற்றும்புரம்கருத்து – தமிழ்பற்றியஅறம்கருத்து – கல்விமற்றும்எழுத்தறிவுசங்ககாலம் – சங்ககாலத்தின்பண்டையநகரங்கள்மற்றும்துறைமுகங்கள் – சங்ககாலத்தில்ஏற்றுமதிமற்றும்இறக்குமதி – சோழர்களின்வெளிநாட்டுவெற்றி.

UNIT -2 THINAI CONCEPTS

Five types of lands, animals, Gods, occupation, life styles, music, dance, food style, Floara and Fauna of Tamils - Agam and puram concept from Tholkappiyam and Sangam Literature – Aram concept of Tamil – Education and Literacy during Sangam Age – Ancient cities and Ports of Sangam Age – Export and Import during Sangam Age - Overseas Conquest of Choloas.

அலகு3	தமிழரின்மரபு	3

இந்தியதேசியசுதந்திரஇயக்கம்மற்றும்இந்தியகலாச்சாரத்திற்குதமிழர்களின்பங்களிப்பு:- சுப்ரமணியபாரதி,

வாஞ்சிநாதன், சுப்பிரமணியசிவா, வீரபாண்டியகட்டபொம்மன், வா..ஊசிதம்பரம்பிள்ளை, தீரன்சின்னமலை, மருதுபாண்டியசகோதரர்கள், பூலிதேவர், திருப்பூர்குமரன், வீரமங்கைவேலுநாச்சியார் -,தமிழர்இலக்கியங்களில்மேலாண்மைகருத்துக்கள் (கி. மு. 500 முதல்கி. பி 200 வரை) – அகநானூறு, புறநானூறு, திருக்குறள்ஆகியவற்றில்மேலாண்மைக்கருத்துகள்.

UNIT -3 HERITAGE OF TAMILS

Contribution of Tamils to Indian National Freedom Movement and Indian Culture: Contributions of Subramanya Bharathi, Vanchinathan, Subramaniya Siva, Veerapandiya Kattabomman, V O Chidambaram Pillai, Dheeran Chinnamalai, The Maruthu Pandiyar, Puli Thevar, Tiruppur Kumaran, Veera Mangai Velunachiyar.

பாடநெறிமுடிவுகள் : படிப்பைவெற்றிகரமாகமுடித்தவுடன் , மாணவர்கள்பின்வருவனவற்றைச்செய்யமுடியும்.

COURSE OUTCOMES: On the successful completion of the course, the student will be able to

பா .வெ . எண் CO No	பாடத்திட்டத்தின்வெளிப்பாடு **Course Outcomes**	**RBT level**
1	மாணவர்கள்தமிழ்மொழித்தோற்றம்பற்றித்தெரிந்துகொள்வார்கள். Students will learn about the origin of the Tamil language.	1
2	தமிழர்களின்வாழ்வியல்முறைகளைத்தெரிந்துகொள்வார்கள். They will know the ways of life of Tamils.	2
3	தமிழர்களின்சுதந்திரபோராட்டவீரர்களைபற்றியும், மேலாண்மைகளைபற்றியும்தெரிந்துகொள்வார்கள். They will know about the freedom fighters of Tamils and the management of Tamils.	2

பாடநூல்கள்:

1.பொன். முத்துகுமாரன்(2002), “தமிழ்மரபு”, காந்தளகம், 68, அண்ணாசாலை, சென்னை 600 002

2.பி. டிஸ்ரீனிவாசஐயங்கார்(தமிழக்கமும்திறனாய்வும்) புலவர்கா. கோவிந்தன் (1988), “தமிழர்வரலாறு (முதல்பகுதி)”, திருநெல்வேலிதென்னிந்தியசைவசித்தாந்தநூற்பதிப்புகழகம் ,154, TTK சாலை, சென்னை 18.

3.டாக்டர். கே. கே. பிள்ளை(2009), “தமிழகவரலாறுமக்களும்பண்பாடும்”, உலகதமிழாராய்ச்சிநிறுவனம், தரமணி , சென்னை 600113

4.முனைவர். ச. இராஜேந்திரன்(2004), “தமிழில்சொல்லாக்கம்”, தஞ்சாவூர்தமிழ்பல்கலைக்கழகம்வெளியீடு

HS22152	COMMUNICATIVE ENGLISH	LT P C
	(COMMON TO ALL BRANCHES)	3 0 0 3

COURSE OBJECTIVES

- Enable learners to interact fluently on everyday social contexts.
- Train learners to engage in conversations in an academic/scholarly setting.
- Instil confidence in learners to overcome public speaking barriers.
- Develop learners' ability to take notes and in the process, improve their listening skills.
- Enhance learners' reading skill through reading text passages for comprehension and contemplation.
- Improve learners' skills to write on topics of general interest and drafting correspondences for general purposes.

UNIT I		9

Listening - short video clips - conversational scenes form movies, celebrities' speeches /interviews. Speaking - several ways of introducing oneself at several situations, introducing others at several situations, inviting people for several occasions, describing people and their places. Reading - short comprehension passages - making inferences, critical analysis. Writing - completing the incomplete sentences - developing hints from the given information. Grammar - Wh-Questions and Yes or No questions - Parts of speech. Vocabulary development - prefixes - suffixes - articles - countable / uncountable nouns.

UNIT II		9

Listening - customer care voice files, short narratives - identifying problems and developing telephone etiquettes. Speaking - speaking over skype/ whatsapp, making business calls, making self-recorded informative videos, inquiring about a concept/activity, describing a concept/activity. Reading - reading the headlines on news magazines - slogans and taglines from advertisements. Writing - free writing - writing - headlines, slogans and taglines individual inspirations. Grammar- conjunctions, idioms, phrases, quotes. Vocabulary development - guessing the meanings of words in different contexts.

UNIT III		9

Listening - courtroom scenes from movies, debates and talks from news channels, notes taking. Speaking- language and tone for arguments, discussion, deliberation, contemplation, expressing opinions, reacting to different situations in an alien country. Reading - language used in instruction manuals of household appliances, cookery and other basic instructions. Writing- understanding the structure of texts - use of reference words, discourse markers- coherence, rearranging the jumbled sentences. Grammar - adjectives - degrees of comparison, framing direct and indirect questions. Vocabulary development - concise approach, single word substitution.

UNIT IV		9

Listening - Sports commentaries, advertisements with users' criticisms; Speaking - for social causes, for promoting a concept, negotiating and bargaining; Reading - review of a product, movie, movement or a system; Writing - writing for advertisements, selling a product; Grammar – Tenses - Simple Past, Present and Future, Continuous - Past, Present and Future; Vocabulary Development - synonyms, antonyms and phrasal verbs.

UNIT V		9

Listening - video lectures, video demonstration of a concept; Speaking – presenting papers/concepts, delivering short speeches, discourses on health, suggesting natural home remedies, cleanliness, civic sense and responsibilities; Reading - columns and articles on home science; Writing - correspondences of requests, basic enquiry/observation and basic complaints; Grammar - modal verbs, perfect tenses - Vocabulary development - collocations.

TOTAL PERIODS: 45

REFERENCE BOOKS	
1.	Department of English, Anna University, Mindscapes: English for Technologists and Engineers. Orient Black Swan, Chennai, 2017.
2.	Downes and Colm, & quot; Cambridge English for Job-hunting & quot;, Cambridge University Press, New Delhi, 2008.
3.	Murphy and Raymond, & quot; Intermediate English Grammar with Answers & quot; Cambridge University
4.	Press, 2000. Thomson, A.J., & quot; Practical English Grammar 1 & 2" Oxford, 1986.
WEBSITES	
1.	http://www.usingenglish.com
2.	http://www.uefap.com3
3.	https://owl.english.purdue.edu/owl/
4.	www.learnenglishfeelgood.com/esl-printables-worksheets.html
SOFTWARES	
1.	Face 2 Face Advance – Cambridge University Press, 2014.
2.	English Advance Vocabulary- Cambridge University Press.
3.	IELTS test preparation – Cambridge University Press 2017
4.	Official Guide to the TOEFL Test with CD-ROM, 4th Edition.
5.	Cambridge Preparation for the TOEFL TEST- Cambridge University Press, 2017.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Acquire adequate vocabulary for effective communication.	3
2	Listen to formal and informal communication and read articles and infer meanings from specific contexts from magazines and newspapers.	3
3	Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.	4
4	Comprehend conversations and short talks delivered in English.	6
5	Write short write-ups and personal letters and emails in English.	6

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1										3				
2										3				
3										3				
4										3			2	2
5										3			2	2

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

3 means 'a strong correlation' as the students will use all the four skills (Listening, Speaking, Reading and Writing) with appropriate body language in formal and informal environment.

MA22151	APPLIED MATHEMATICS I	LT P C
	(COMMON TO ALL BRANCHES EXCEPT MR)	3 1 0 4

COURSE OBJECTIVES

- Compute eigen values and eigen vectors and use in diagonalization and in classifying real quadratic forms.
- Study differential calculus and its applications to relevant Engineering problems.
- Compute derivatives using the chain rule or total differentials.
- Understand the rotation of two-dimensional geometry using definite integrals.
- Acquaint with the Mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I	MATRICES	9+3

Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors – Statement and Applications of Cayley-Hamilton Theorem –Diagonalization of matrices– Reduction of a quadratic form into canonical form by orthogonal transformation-Nature of quadratic forms.

UNIT II	APPLICATION OF DIFFERENTIAL CALCULUS	9+3

Curvature and radius of Curvature– Centre curvature – Circle of curvature –Evolutes– Envelopes- Evolute as Envelope of Normals.

UNIT III	DIFFERENTIAL CALCULUS FOR SEVERAL VARIABLES	9+3

Limits and Continuity - Partial derivatives – Total derivatives – Differentiation of implicit functions – Jacobians and properties– Taylor's series for functions of two variables – Maxima and Minima of functions of two variables –Lagrange's method of undetermined multipliers.

UNIT IV	APPLICATION OF DEFINTE INTEGRALS	9+3

Integration by Parts-Bernoulli's formula for integration- Definite integrals and its Properties- Solids of Revolution- Disk Method- Washer Method- Rotation about both x and y axis and Shell method.

UNIT V	MULTIPLE INTEGRALS	9+3

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves - Change of variables in double integrals – Triple integrals – Volume of solids.

TOTAL (L:45+T:15) PERIODS: 60

TEXT BOOKS

1.	Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics",10thEdition, John Wiley, (2015)
2.	Grewal B.S, Grewal J.S, "Higher Engineering Mathematics",43rdEdition, Khanna Publications, Delhi, (2015).

REFERENCE BOOKS

1.	Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Nineth Edition, Laxmi Publications Pvt. Ltd., (2014).
2.	Glyn James, "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, (2016).
3.	Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).

WEBLINKS	
1.	https://home.iitk.ac.in/~peeyush/102A/Lecture-notes.pdf
2.	https://www.sydney.edu.au/content/dam/students/documents/mathematics-learning-entre/integration-definite-integral.pdf

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Solve the Eigen value problems in matrices.	3
2	Apply the basic notion of calculus in Engineering problems and to tackle for different geometries.	3
3	Perform calculus for more than one variable and its applications in Engineering problems.	3
4	Apply definite integrals for design of three dimensional components.	3
5	Evaluate multiple integral in Cartesian and polar coordinates.	3

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	3								3	3	3
2	3	3										3	2	2
3	3	3	3	3								3	2	2
4	3	3										3	2	2
5	3	3	2	2								3	2	2

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

PH22151	APPLIED PHYSICS	L T P C
	(COMMON TO AD, CS, EE, EC, IT)	3 0 0 3

COURSE OBJECTIVE

- To enhance the fundamental knowledge in Physics and its applications relevant to various Streams of Engineering and Technology.

UNIT I	LASERS AND FIBER OPTICS	9

Lasers: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Nd-YAG laser – CO_2 Laser – Exceimer Laser – Applications. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, and mode) – losses associated with optical fibers–Fiber optic communication - fibre optic sensors: pressure and displacement - Endoscope.

UNIT II	QUANTUM PHYSICS	9

Black body radiation – Planck's theory (derivation)- deduction of Wien's and Rayleigh Jean's law – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent wave equations – particle in a one-dimensional - three dimensional potential box– Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT III	CRYSTAL PHYSICS	9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – interplanar distances- coordination number and packing factor for SC, BCC, FCC, HCP and Diamond structure (qualitative) - crystal imperfections: point defects, line defects – Burger vectors, stacking faults.

UNIT IV	WAVES AND OSCILLATIONS	9

Travelling waves, Wave equation for string, Energy and momentum, Resonance Superposition & Reflection, Standing waves, Harmonic oscillations, Damped harmonic motion- Forced oscillations, amplitude resonance - Expression for Resonant frequency, Electrical analogy of mechanical oscillations, Quality factor and sharpness of resonance, Electrical analogy of mechanical oscillators.

UNIT V	ELECTROMAGNETIC WAVES	9

Maxwell's Equations. Vector and Scalar Potentials. Plane waves in Dielectric media. Poynting Theorem and Poynting Vector- Electromagnetic (EM) Energy Density. Physical Concept of Electromagnetic Field Energy Density, EM Wave Propagation in Unbounded Media, Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant.

TOTAL PERIODS: 45

TEXT BOOKS

1.	Gaur R.K., Gupta S.L, "Engineering Physics", Dhanput Publications, 2015.
2.	Shatendra Sharma, Jyotsna Sharma, "Engineering Physics", Pearson, 2006.
3.	Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
4.	Arumugam M, "Materials Science", Anuradha Publications, 2015.

REFERENCE BOOKS	
1.	David Halliday, Robert Resnick, Jearl Walker, "Principles of Physics", 10th Edition, Wiley, 2015.
2.	Peter Atkins, Julio De Paula, "Physical Chemistry", 10th Edition., Oxford University Press, 2014.
3.	Arthur Beiser, Shobhit Mahajan, Rai Choudhury S, "Concepts of Modern Physics", 7th Edition, McGraw Hill Education, 2017.
4.	Raghavan V, "Materials Science and Engineering", PHI Learning Pvt. Ltd., 2010.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Develop an understanding about photonics and Fiber Optic communication system.	2
2	Acquire the knowledge of Quantum mechanics.	3
3	Classify and demonstrate the fundamentals of crystals and their defects.	3
4	Gain knowledge in waves and oscillations.	2
5	Enable to explore the theory of electromagnetic waves and its propagation.	3

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3				2	2				1			2	2
2	3	3	2	2	2	2				1		2	2	3
3	3									1			2	2
4	3		2							1			3	3
5	3	3	2	2	2					1		2	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

CY22151	APPLIED CHEMISTRY	L T P C
	(COMMON TO AD, CS, EE, EC, IT)	3 0 0 3

COURSE OBJECTIVES

- To make the students conversant with basic electrochemistry and batteries.
- To develop an understanding of the laws of photochemistry and basics.
- To acquaint the students with the basics of nanomaterials, their properties and uses.
- To acquire the basic knowledge on sensors which are essential for the software engineers for develop new devices.
- To enable the students to understand the types of instruments for material analysis and their working principle.

UNIT I	ELECTROCHEMISTRY	9

Electrodes and electrochemical cells – electrode potential, standard electrode potential, single electrode potential and its determination, types of electrodes – calomel, quinhydrone and glass electrode. Nernst equation - Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries – Primary (dry cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery) and next generation batteries.

UNIT II	PHOTOCHEMISTRY	9

Laws of photochemistry – Grotthuss-Draper law, Stark–Einstein law and Lambert Beer Law – determination iron by spectrophotometer. Quantum efficiency – Photo processes - internal conversion, inter-system crossing, fluorescence, phosphorescence and photo-sensitization-quenching of fluorescence and its kinetics, Stern-Volmer relationship. Applications of photochemistry.

UNIT III	NANOCHEMISTRY	9

Basics and scale of nanotechnology, different classes of nanomaterials, Distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Synthesis of nanomaterials, fabrication (lithography) and its applications – Basics of nanophotonics and quantum confined materials (surface plasmon resonance).

UNIT IV	CHEMICAL SENSOR	9

Sensors, sensor science and technology, types of sensors. Chemical Sensors – characteristics and elements. Electrochemical sensors – voltammetry, potentiometric sensors, amperometric sensors, polarization techniques.

UNIT V	INSTRUMENTATION TECHNIQUES	9

Treatment of analytical data, including error analysis. Classification of analytical methods and the types of instrumental method - Electromagnetic radiation-UV-visible and IR spectroscopy: principles, instrumentation (Block diagram only) and applications. Separation techniques chromatography: Gas chromatography, liquid chromatography - importance of column technology (packing, capillaries), separation based on increasing number of factor (volatility, solubility, interactions with stationary phase, size).

TOTAL PERIODS: 45

TEXT BOOKS

1.	Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010.
2.	Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010.
3.	B.K.Sharma, "Instrumental Methods of Chemical Analysis", 28th Edition, Goel Publishing

	House, 2012.
4.	Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed.
REFERENCE BOOKS	
1.	Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
2.	B.R. Puri, L.R. Sharma, M.S. Pathania., "Principles of Physical Chemistry" Vishal Publishing Company, 2008.
3.	John Vetelino, Aravind Reghu, Introduction to Sensors, Taylor & Francis Group, CRC Press, 1st edition, 2010.
4.	Peter Gründler, Chemical Sensors, An Introduction for Scientists and Engineers, Springer-Verlag Berlin Heidelberg 2007.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Identify electrochemical cells, corrosion and fundamental aspects of batteries	2
2	Interpret the photochemical reactions and make use of spectroscopic techniques	2
3	Realize the structures, properties and applications of nanoparticles.	2
4	Acquire the basic knowledge on chemical sensors to develop an interdisciplinary approach among the students which are essential for the software engineers.	2
5	Develop a theoretical principles of UV-visible and IR spectroscopy and separation techniques.	3

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	2								3	3	3
2	3	3				3	3					3	2	2
3	3	3	3			3	3	1				3	3	3
4	3	3	3		1	3	3					3	2	2
5	3	3		2		3	3					3	2	2

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

CM22151	BASIC CIVIL AND MECHANICAL ENGINEERING	L T P C
		3 0 0 3

COURSE OBJECTIVES

- To provide the students an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.
- To help students acquire knowledge in the basics of surveying and the materials used for construction.
- To provide an insight to the essentials of components of a building and the infrastructure facilities.
- To explain the component of power plant units and detailed explanation to IC engines their working principles.
- To explain the Refrigeration & Air-conditioning system.

UNIT I	PART A: OVERVIEW OF CIVIL ENGINEERING	5

Civil Engineering contributions to the welfare of Society - Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering – National building code – terminologists: Plinth area, Carpet area, Floor area, Buildup area, Floor space index - Types of buildings: Residential buildings, Industrial buildings.

UNIT I	PART B: OVERVIEW OF MECHANICAL ENGINEERING	4

Overview of Mechanical Engineering - Mechanical Engineering Contributions to the welfare of Society – Specialized sub disciplines in Mechanical Engineering – Manufacturing, Automation, Automobile and Energy Engineering - Interdisciplinary concepts in Mechanical Engineering.

UNIT II	SURVEYING AND CIVIL ENGINEERING MATERIALS	9

Surveying: Objects – Classification – Principles – Measurements of Distances and angles – Leveling – Determination of areas– Contours.

Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel - Timber – Modern Materials, Thermal and Acoustic Insulating Materials, Decorative Panels, Water Proofing Materials. Modern uses of Gypsum, Pre-fabricated Building component (brief discussion only)

UNIT III	BUILDING COMPONENTS AND INFRASTRUCTURE	9

Building plans – Setting out of a Building - Foundations: Types of foundations – Bearing capacity and settlement – Brick masonry – Stone Masonry – Beams – Columns – Lintels – Roofing Flooring – Plastering. Types of Bridges and Dams – Water Supply Network - Rain Water Harvesting – Solid Waste Management - Introduction to Highways and Railways - Introduction to Green Buildings.

UNIT IV	INTERNAL COMBUSTION ENGINES AND POWER PLANTS	9

Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines. Working principle of Boilers-Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices.

UNIT V	REFRIGERATION AND AIR CONDITIONING SYSTEM	9

Principles of Refrigeration and Air Conditioning. Vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Tonnage calculations for refrigerator and air conditioning systems.

TOTAL PERIODS: 45

TEXT BOOKS	
1.	G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018.
2.	P.Selvaraj, M. Periyasamy, S. Selvakumar, Basic Civil and Mechanical Engineering, Scitech Publications Pvt. Ltd., 2013.
REFERENCE BOOKS	
1.	Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2018.
2.	Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd, 2013.
3.	Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, 2005.
4.	Shantha Kumar SRJ., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, 2000.
5.	Nag P.K, "Power Plant Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2014.
6.	Ganesan V, "Internal Combustion Engines", 4th edition, Tata McGraw Hill Publishing Co., New Delhi, 2012.
7.	Arora C.P, "Refrigeration and Air Conditioning", Tata McGraw Hill Publishing Co, New Delhi, 2009.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Summarise the importance of Civil and Mechanical engineering towards the welfare of society.	2
2	Apply the principles and the different methods of surveying and discuss the properties and uses of various construction materials.	3
3	Describe about the building components and common infrastructures.	2
4	Explain about the various power plants and the working principles of internal combustion engines used in automotive vehicles.	2
5	Elaborate the working of domestic refrigerator and air conditioners.	2

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3					3		3					2	2
2	3					3		3					2	2
3	3					3		3					2	2
4	3					3		3					2	3
5	3					3		3					2	2

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

IT22101	PROGRAMMING FOR PROBLEM SOLVING	L T P C
	(COMMON TO IT, AD, CS, EE, EC)	3 0 0 3

COURSE OBJECTIVES

- Learn the organization of a digital computer.
- Learn to think logically and write algorithms or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I	INTRODUCTION TO PROBLEM SOLVING	6

Simple model of a Computer – Hardware – Software – Data Representation, Introduction to Computer Networks and Internet, Problem Solving Techniques – Bottom up design and top down design - applications, Introduction to Algorithms and Flow Chart.

Suggested Activities:

Case study – Understanding the analysis and design of the Student Management System (SMS).

UNIT II	C PROGRAMMING BASICS	12

Introduction to 'C' programming – structure of a 'C' program – Conversion of simple algorithm to program. Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

Suggested Activities:

Case study: Dataset creation and Grade calculation in SMS.

UNIT III	ARRAYS AND STRINGS	9

Array: declaration, initialization. Multi dimensional arrays. Strings: Strings vs Character arrays, string operations.

Suggested Activities: Grade sheet generation in SMS.

UNIT IV	FUNCTIONS AND STRUCTURES	9

Need for Modular programming, Functions: definition, call, arguments, call by value. Call by reference, Recursion. structures and unions: Need, declaration, Accessing Structure elements, Arrays of structures

Suggested Activities: Redesigning SMS in terms of modules.

UNIT V	POINTERS AND FILE HANDLING IN C	9

Pointers: Introduction, pointers to primitive datatypes, pointers to user defined datatypes: arrays and structures, array of pointers, Dynamic Memory Allocation. Files: Read/Write of binary and text files. Preprocessor directives.

Suggested Activities: Mange I/O in SMS using Files.

TOTAL PERIODS: 45

TEXT BOOKS

1.	Pradip Dey, Manas Ghosh, "Programming in C", First Edition, Oxford University Press, 2018.
2.	R G Dromey, "How to Solve it using Computer", Pearson,2006.

REFERENCE BOOKS

1.	Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.
2.	Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.
3.	Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, Tata

	McGraw Hill, 2010.
4.	Reema Thareja, "Programming in C", 2nd ed., Oxford University Press, 2016.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Identify input and output from the real word problem scenarios.	3
2	Represent the design flow using Flow-charts and application logic using pseudo code.	3
3	Apply appropriate programming constructs to implement a given design using C.	3
4	Debug and customize an existing software developed in C.	5
5	Develop a modularised software application In C for the given user requirements	6

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	1	3						2	3			2	3	3
2	1	3						2	3			2	3	3
3	1		3	2	1			2	3			2	3	3
4	1		3	2	1			2	3			2	3	3
5	1		3	2	1			2	3			2	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22111	BASIC ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY	L T P C
	(COMMON TO ALL BRANCHES EXCEPT EC)	0 0 2 1

COURSE OBJECTIVES

- To provide exposure to the students with hands on experience in basic of Electrical and Electronics wiring connection and measurements.
- To introduce the students to Electrical Machines and basic laws of Electrical Circuits.

LIST OF EXPERIMENTS

1.	Wiring – Residential house wiring and Stair case wiring.
2.	(a) AC Analysis- Measurement of electrical quantities–voltage, current, power, and power factor using RLC. (b) Study of three phase system.
3.	Energy conservation - Measurement and comparison of energy for incandescent lamp and LED lamp.
4.	(a) Identification of circuit components (Resistor, Capacitor, Diode and BJT) and soldering practice. (b) Signal Measurement- Measurement of peak to peak, RMS, average, period, frequency of signals using CRO.
5.	(a) VI Characteristics of Solar photovoltaic panel. (b) Design of Solar PV Array and Battery sizing for Residential solar PV system.
6.	Design a 5V/12V Regulated Power Supply using FWR and IC7805 / IC7812.
7.	DC Analysis- Verification of Ohm's Law and Kirchhoff's Laws.
8.	Study of Transformer and motor characteristics.

TOTAL PERIODS:30

REFERENCE BOOKS

1.	Mittle V.N, Arvind Mittal, "Basic Electrical Engineering", Tata Mc Graw Hill (India), Second Edition, 2013.
2.	Sedha R.S., "A Text Book of Applied Electronics", S.Chand & Co., 2014.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Wiring of basic electrical system and measurement of electrical parameters.	4
2	Verify the basic laws of Electric circuits and select various Electrical Machines.	4
3	Construct electronic circuits and design solar photovoltaic system.	4
4	Apply the concept of three-phase system.	4
5	Construct a fixed voltage regulated power supply.	4

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	3					2			2	3	3
2	3	3	3	3					2			2	3	3
3	3	3	3	3					2			2	3	3
4	3	3	3	3					2			2	3	3
5	3	3	3	3					2			2	3	3
3- High Mapping; 2-Moderate Mapping; 1-Low Mapping														

ME22161	BASIC CIVIL AND MECHANICAL ENGINEERING LABORATORY	L T P C
	(COMMON TO CE, EE, EC)	0 0 2 1

COURSE OBJECTIVES

- To provide an exposure and hands on experience to the students on various civil and mechanical engineering processes.

LIST OF EXPERIMENTS

1.	Carpentry – Preparation of Cross half lap joint and Tee joint using power tools.
2.	Plumbing – Basic pipe line connection used in houses with PVC pipes, valves, taps, couplings, unions, reducers, elbows.
3.	Welding - Butt joint and lap joint using Electric Arc welding.
4.	Machining – Turning and facing using Centre Lathe.
5.	Sheet metal work – Making of a cylinder using GI sheet and finishing using rivets.
6.	Fitting – Preparation of metal pieces by grinding and filing to maintain flat sides at right angles.
7.	Drilling and Tapping – Drilling of holes precisely and making internal threads by Tapping for various sizes.
8.	Casting – Mould preparation using simple solid pattern and casting.
9.	Automation – Basic pneumatic circuit using single and double acting cylinder.
10	3D printing –Demonstration of printing of simple solids using Additive Manufacturing/3D printing.

TOTAL PERIODS:30

TEXT BOOKS

1.	Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2.	Jeyapoovan T., Saravanapandian M. & Pranitha S., "Engineering Practices Lab Manual", Vikas Publishing House Pvt.Ltd, 2006.
3.	Bawa H.S., "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007.
4.	Ian Gibson, David W Rosen, Brent Stucker., “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 2010.
5.	Anthony Esposito, Fluid Power with Applications, Pearson Education, 7th edition, 2009.
6.	Civil & Mechanical Engineering Practices Lab Manual, SVCE, 2022.

COURSE OUTCOMES Upon the successful completion of the course, the students will be able to		
CO's	**STATEMENTS**	**RBT LEVEL**
1	Prepare various joints used for assembling wooden parts	3
2	Make required pipeline connection by selecting the suitable components	3
3	Fabricate components by various manufacturing processes	3
4	Understand the principles of low-cost automation using pneumatic circuits	2
5	Understand the principle of additive manufacturing/3D printing	2

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	2												2	2
2	2												2	2
3	2												2	2
4	1				2								2	2
5	1				2								2	2

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

IT22111	PROGRAMMING FOR PROBLEM SOLVING LABORATORY	L T P C
	(COMMON TO IT, AD, CS, EE, EC)	0 0 3 1.5

COURSE OBJECTIVES

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

	LIST OF EXPERIMENTS
1.	Usage of Basic Linux commands.
2.	C Programming using Simple statements and expressions.
3.	Scientific problem solving using decision making and looping.
4.	Simple programming for one dimensional and two dimensional arrays.
5.	Solving problems using Strings.
6.	C Programming using Pointers.
7.	C Programming using user defined functions (Pass by value and Pass by reference).
8.	C Programming using Recursion.
9.	C Programming using structures and union.
10.	C Programming using enumerated data types.
11.	C Programming using macros and storage classes.
12.	C Programming using Files.
13.	Develop modularized application for any one of the following scenarios.
	Scenarios: o Student Management System o Stock Management System o Banking Application o Ticket Reservation System
	TOTAL PERIODS:45

TEXT BOOKS

1.	Pradip Dey, Manas Ghosh, "Programming in C", First Edition, Oxford University Press, 2018.
2.	Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, Tata McGrawHill, 2010.

COURSE OUTCOMES		
Upon the successful completion of the course, the students will be able to		
CO's	**STATEMENTS**	**RBT LEVEL**
1	Apply appropriate programming constructs to solve problems	3
2	Design, implement, test and debug programs that use the basic features of C	5
3	Design modularized applications in C to solve real world problems	6
4	Use C pointers and dynamically allocated memory to solve complex problems	4
5	Apply file operations to develop solutions for real-world problems	3
Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6		

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	1	3						2	3			2	3	3
2	1	3						2	3			2	3	3
3	1		3	2	1			2	3			2	3	3
4	1		3	2	1			2	3			2	3	3
5	1		3	2	1			2	3			2	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

SEMESTER II

HS22251அறிவியல் மற்றும் தொழில் நுட்பத்தில் தமிழ் L T P C

Science and Technology in Ancient Tamil Society **2 0 0 2**

(*COMMON TO ALL BRANCHES*)

பாடத்தின்நோக்கங்கள் :

- அறிவியலில் தமிழின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள்.
- தொழில்நுட்பத்தில்தமிழ் பாரம்பரியத்தின் தாக்கம் பற்றிஅறிந்துகொள்வார்கள்.

Course Objectives:

- They will know about the use of Tamil in science.
- Learn about the impact of Tamil heritage on technology.

அலகு 1 அறிவியல் தமிழ் : 3

கருவி உருவாக்கம் - ஆராய்ச்சி மேம்பாடு - கல்வி வளர்ச்சி - அறிவியல் தமிழ் சொற்கள் உருவாக்கம்.

UNIT I Scientific Tamil

Tool Development - Research Development - Educational Development - Scientific Tamil words Creation.

அலகு 2 தொழில் நுட்பத்தில் தமிழ் 12

வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பம் :சங்க காலத்தில் கட்டுமானப் பொருட்கள் - சோழர்களின் பெரிய கோவில்கள் மற்றும் பிற வழிபாட்டு தலங்கள் - பல்லவர்களின் சிற்பங்கள் மற்றும் கோவில்கள் (மாமல்லபுரம்) - நாயக்கன் கால கோவில்கள் (மதுரை மீனாட்சி அம்மன் கோவில்), திருமலை நாயக்கர் மஹால், செட்டி நாட்டு வீடுகள்.

UNIT II Tamil in Technology

Design and Construction Technology: Building materials in Sangam age – Great temples of Cholas and other workship places – Sculptures and Temples of Pallavas (**Mamallapuram**) – Temples of Nayakas period (**Madurai Meenakshi amman temple**), Thirumalai Nayakar Mahal, Chetti Nadu Houses.

உற்பத்தி தொழில்நுட்பம் :கப்பல் கட்டும் கலை, உலோகவியல் ஆய்வுகள், தங்கம், தாமிரம், இரும்பு பற்றிய அறிவு - தொல்பொருள் சான்றுகள் - சுட்டக்களிமண் மணிகள், சங்கு மணிகள், எலும்பு மணிகள்.

Manufacturing Technology: Art of Ship building, Metallurgical studies, Knowledge about Gold, Copper, Iron – Archeological evidences – Terracotta beads, Shell beads, Bone beads.

விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பம் : அணைகள், ஏரிகள், குளங்கள், மதகுகள், சோழர் கால குமுழி தூம்பு ஆகியவற்றின் முக்கியத்துவம் - கால்நடை பராமரிப்பு, கால்நடைகளின்

பயன்பாட்டிற்காக வடிவமைக்கப்பட்ட கிணறுகள். விவசாயம் மற்றும் வேளாண் செயலாக்கம் - கடல் பற்றிய அறிவு - மீன்பிடித்தல், முத்து குளித்தல், சங்கு சேகரித்தல்.

Agriculture and Irrigation Technology: Dams, Tank, ponds, sluice, Significance of Kumuzhi Thoompu of Cholas period- Animal Husbandry, Wells designed for cattle use. Agriculture and Agro processing, - Knowledge about Sea – Fisheries, Pearl, Conche diving.

தமிழ் கணினி: அறிவியல் தமிழ் வளர்ச்சி - தமிழ் கணினி, தமிழ் புத்தகங்களின் டிஜிட்டல் மயமாக்கல், தமிழ் டிஜிட்டல் நூலகம், தமிழ் மென்பொருள் உருவாக்கம் - தமிழ் மெய்நிகர் அகாடமி - சொற்குவை திட்டம்.

Tamil Computing: Development of Scientific Tamil – Tamil Computing, Digitization of Tamil books, Tamil Digital Library, Development of Tamil Softwares – Tamil virtual Academy – Sorkuvai project.

தமிழின் எதிர்காலமும் தகவல் தொழில்நுட்பமும்- உலகமயமாக்கலும் தகவல் தொழில்நுட்பமும்-கணினிக்கு தமிழ் கற்று கொடுத்தல்-தமிழ் மொழித் தொழில்நுட்பத்தில் வளங்கள்.

Future of Tamil and Information Technology- Globalization and Information Technology-Teaching Tamil for Computer-Resources in Tamil Language Technology.

பாடநெறி முடிவுகள் :

பா. வெ. எண்	பாடத்திட்டத்தின் வெளிப்பாடு	RBT level
CO 1	அறிவியலில் தமிழ் மொழியின் பயன்பாடு பற்றி தெரிந்து கொள்வார்கள்	2
CO 2	பல்வேறு தொழில்நுட்பத்தில் தமிழ் மொழியின் தாக்கம் பற்றி அறிந்து கொள்வார்கள்	3

பாட நூல்கள்:

1.**டாக்டர், வா.செ .குழந்தைசாமி (1985),**"அறிவியல் தமிழ் ", பாரதி பதிப்பகம், 126/108, உஸ்மான் சாலை, தியாகராய நகர் , சென்னை 600017

2.**சுப. திண்ணப்பன், (1995),** "கணினியும் தமிழ் கற்பித்தலும்", புலமை வெளியீடு, 38-B மண்ணத்நதோட்டத் தெரு, ஆழ்வார்பேட், சென்னை 600018

3.**மு. பொன்னவைக்கோ, (2003),** "வளர் தமிழில் அறிவியல் - இணையத்தமிழ்", அனைத்திந்திய அறிவியல்தமிழ்க்கழகம், தஞ்சாவூர் 615 005.

4.**துரை. மணிகண்டன், (2008),** "இணையமும் தமிழும்", நல் நிலம் பதிப்பகம், 7-3, சிமேட்லி சாலை, தியாகராய நகர், சென்னை 600 017.

HS22252	TECHNICAL ENGLISH	L T P C
	(COMMON TO ALL BRANCHES)	3 0 0 3

COURSE OBJECTIVES

- Enable learners to define and understand technical communication and scientific writing
- Expose learners to the technicalities of seminar presentation, group discussion, and public speaking
- Develop learners' writing skills for scientific and documenting purposes
- Improve learners' ability to draft correspondences for business purposes
- Cultivate learners' ability to holistically understand the nuances of job interviews and recruiting process.

UNIT I		9

Listening - AV files pertaining to manufacturing processes of products, scientific documentaries; Speaking - syllable division and word stress, intonation, sharing opinions; Reading - news articles related to science and technology; Writing - definitions, instruction, recommendation, data interpretation, resume; Grammar - tenses and their aspects, sentence connectors – discourse markers, sequential words, active and passive voice, subject-verb agreement.

UNIT II		9

Listening - AV pertaining to marketing strategies, peer reading and pronunciation; Speaking- turn taking, sharing opinions; conducting and attending a meeting, understanding the nuances of spoken communication among internal audience and external audience; Reading - analytical documents, descriptive documents; Writing - fliers, brochures, resume - letter of application, checklists; Grammar - modal verbs, clauses - types and uses, conditional clauses, articles.

UNIT III		9

Listening - AV related to how to use components, scientific description, Speaking - speaking for motivation and initiation, speaking at a seminar presentation; Reading - scientific journals, papers; Writing - Technical descriptions - process description, purpose and function, PowerPoint, Google forms, user manuals; Grammar - phrasal verbs, prepositions, technical and scientific affixes.

UNIT IV		9

Listening - scientific debates, crisis management; Speaking - handling conflicts, speaking about the loss of benefits, progress or decline of business, identifying the connotative meanings, Reading- documented evidences of uses and functions of a product, review of a product, Writing - memos, follow-up letters, reports - proposal, project, progress reports, sales reports, reports on industrial visits, executive summary. Grammar - reported speech and tag questions, sentence structure - comparative, imperative, cause and effect, infinitive of result.

UNIT V		9

Listening - AV of Group discussions, panel discussions, face to face interviews for recruitment purposes; Speaking- speaking at group discussions, interviewing a personality, answering at the interviews; Reading - WebPages of top notch engineering companies, Writing - blogging, e-mails, letter of complaint, minutes of the meeting; Grammar - one word substitution, collocations, better word/sentence substitution (rephrasing the content/improvising ideas).

TOTAL PERIODS: 45

REFERENCE BOOKS	
1.	Department of English, Anna University. Mindscapes: English for Technologists and Engineers. Orient Blackswan, Chennai. 2012.
2.	Downes, Colm, Cambridge English for Job-hunting, Cambridge University Press, New Delhi. 2008.
3.	Murphy, Raymond, Intermediate English Grammar with Answers, Cambridge University Press 2000.
4.	Thomson, A.J., Practical English Grammar 1 & 2, Oxford, 1986.
5.	Herbert A J, The Structure of Technical English, Longman, 1965.
WEBSITES	
1.	http://www.usingenglish.com
2.	http://www.uefap.com3
3.	https://owl.english.purdue.edu/owl/
4.	www.learnenglishfeelgood.com/esl-printables-worksheets.html
SOFTWARES	
1.	Face 2 Face Advance – Cambridge University Press, 2014.
2.	English Advance Vocabulary- Cambridge University Press.
3.	IELTS test preparation – Cambridge University Press 2017.
4.	Official Guide to the TOEFL Test with CD-ROM, 4th Edition.
5.	Cambridge Preparation for the TOEFL TEST- Cambridge University Press, 2017.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Understand the nuances of technical communication and scientific writing	3
2	Present papers and give seminars	3
3	Discuss in groups and brainstorm	6
4	Draft business correspondences and write for documenting purposes	6
5	Face job interviews with confidence	6

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1										3			2	2
2										3				
3										3			2	2
4										3			2	2
5										3			2	2

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

3 denotes 'a strong correlation' as the students will use all the four skills (Listening, Speaking, Reading and Writing) with appropriate body language in technical and professional situations.

MA22251	APPLIED MATHEMATICS II	L T P C
	(COMMON TO ALL BRANCHES EXCEPT MR)	3 1 0 4

COURSE OBJECTIVES

- Acquire the concepts of vector calculus needed for problems in all engineering disciplines and compute different types of integrals using Green's, Stokes' and Divergence theorems.
- Skilled at the techniques of solving ordinary differential equations that model engineering problems.
- Extend their ability of using Laplace transforms to create a new domain in which it is easier to handle the problem that is being investigated.
- Explain geometry of a complex plane and state properties of analytic functions.
- Understand the standard techniques of complex variable theory so as to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.

UNIT I	VECTOR CALCULUS	9+3

Gradient, divergence and curl - Directional derivative - Vector identities – Irrotational and solenoidal vector fields - Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem in a plane, Gauss divergence theorem and Stokes'theorem (excluding proofs) – Verification and application in evaluating line, surface and volume integrals.

UNIT II	ORDINARY DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS	9+3

Differential equations of first order – Equations of the first order and first degree – Linear equations – Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients – Applications of Linear differential equations – Oscillatory electrical circuit – Deflection of beams.

UNIT III	LAPLACE TRANSFORM	9+3

Conditions for existence - Transform of elementary functions - Transforms of unit step function and impulse functions – Basic properties – Shifting theorems - Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Initial and final value theorems - Transform of periodic functions. Inverse Laplace transforms - Convolution theorem – Application to solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT IV	ANALYTIC FUNCTIONS	9+3

Analytic functions - Necessary and sufficient conditions (Cauchy-Riemann equations) - Properties of analytic function - Harmonic conjugates - Construction of analytic functions - Conformal mapping – Mapping by functions W = Z + C, CZ, 1/Z, Z2 – Joukowski's transformation- Bilinear transformation.

UNIT V	COMPLEX INTEGRATION	9+3

Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series expansions - Singular points - Residues - Cauchy's Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semi-circular contour.

TOTAL (L:45+T:15) PERIODS: 60

TEXT BOOKS

1.	Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics",10thEdition, John Wiley, (2015).
2.	Grewal B.S, Grewal J.S, "Higher Engineering Mathematics",43rdEdition, Khanna

	Publications, Delhi, (2015).
REFERENCE BOOKS	
1.	Dass, H.K., and Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd., 2011.
2.	Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).
3.	Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", 9th edition, Laxmi Publications(p) Ltd., 2014.
WEB LINKS	
1.	https://nptel.ac.in/courses/111/105/111105134/
2.	https://nptel.ac.in/courses/111/105/111105121/

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Interpret the fundamentals of vector calculus and execute evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems	3
2	Solve first order linear, homogeneous differential equations and use series solution method to solve second order differential equations	3
3	Determine the methods to solve differential equations using Laplace transforms and Inverse Laplace transforms	3
4	Explain Analytic functions and Categorize transformations	3
5	Perform Complex integration to evaluate real definite integrals using Cauchy integral theorem and Cauchy's residue theorem	3

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	2	2								3	3	3
2	3	3	3	3								3	3	3
3	3	3	3	3								3	3	3
4	3	3										3	3	3
5	3	3										3	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

PH22252	PHYSICS OF MATERIALS	L T P C
	(COMMON TO EE and EC)	3 0 0 3

COURSE OBJECTIVES

- To understand the physical properties of materials like electrical and thermal conductivity.
- To understand various types of semiconducting materials, their applications in the field of Engineering and understand the concept of Fermi energy.
- To understand the different types of dielectric materials and their applications in Engineering fields.
- To understand the phenomena of superconductor, properties and their applications and the different types of magnetic materials.
- Ability to understand different types of Transistors and its characteristics and to construct Basic Logic Gates and simplification of circuits using K-map.

UNIT I	CONDUCTING MATERIALS	9

Introduction – Classification of materials based on the electrical resistivity - Classical Free electron theory – Electrical and thermal conductivity of metal (derivation) – Wiedemann – Franz law – Lorentz number – Drawbacks of Classical Free electron theory – Quantum Free electron theory – Fermi distribution function – Effect of temperature of Fermi function – Density of energy states (derivation) – Carrier concentration in metals – Emission of electrons from metals – Thermionic emission – Photoelectric emission – Field emission.

UNIT II	SEMICONDUCTING MATERIALS	9

Introduction – Classification of materials based on band theory (metals, semiconductors and insulators) – Intrinsic and extrinsic semiconductors – Carrier concentration in intrinsic semiconductor (derivation) - Effect of temperature on Fermi level - Compound semiconductors – Variation of electrical conductivity in intrinsic semiconductors with temperature - Band gap determination of intrinsic semiconductor (derivation and Experiment to determine Band Gap) – Hall effect (derivation and experiment).Tunnel diode, Schottky diode.

UNIT III	DIELECTRIC PROPERTIES OF MATERIALS	9

Introduction to dielectric materials - Dielectric constant - Polarization of dielectric materials - Types of Polarization (Polarisability) - Equation of internal fields in solid (One- Dimensional) (Derivation) - Clausius – Mossotti Relation for elemental dielectric materials - Dielectric Breakdown - Frequency dependence of dielectric constant, Dielectric Losses - Important applications of dielectric material - Ferro and Piezo electricity (Qualitative).

UNIT IV	MATERIALS AT LOW TEMPERATURE AND MAGNETIC PROPERTIES	10

Temperature dependence of resistivity in superconducting materials - Meissner effect – Properties of superconductors - Type I and Type II superconductors - BCS theory (Qualitative) – Low Tc and High Tc (alloy) superconductors – Ceramic superconductors (oxide superconductors) - LaBaCuO, YBaCuO, BiSrCaCuO - Josephson's effect (AC and DC) – - Applications of Superconductors-SQUIDS – CRYOTRON – MAG LEV.

Dia, Para and Ferro magnetic material – Domain theory for Ferro magnetic materials - Phenomena of Hysteresis and its applications –Magnetic Semiconductor- Ferrites and its structures.

UNIT V	FUNDAMENTALS OF ELECTRONIC SCIENCE	8

JFET-Drain and Transfer Characteristics- Electronic Transistor (SET), Spintronics-Electronic devices vs Spintronic Devices-Design of Basic Logic gates using transistor, Karnaugh map SoP and PoS forms.

	TOTAL PERIODS: 45
TEXT BOOKS	
1.	Arumugam M, "Materials Science", Anuradha Publications, 2015.
2.	Rajendran V, "Engineering Physics", Tata McGraw Hill, 2015.
3.	Suresh R, Jayakumar V, "Materials Science", Lakshmi Publications 2003.
4.	Palanisamy P.K, "Materials Science", SciTech publications, 2015.
5.	V.K. Mehta, Rohit Mehta, Principles of Electronics", 2020
6.	M. Morris Mano, "Digital Design", 3rd edition, Pearson Education, 2014.
REFERENCE BOOKS	
1.	Gaur R.K, Gupta S.L, "Engineering Physics", Dhanpat Publications, 2015.
2.	Avadhnaulu M.N, Kshirsagar P.G, "A Textbook of Engineering Physics", S. Chand, 2006.
3.	Kittel C, "Introduction to Solid State Physics", 7th Edition, Wiley Eastern Ltd, 2004.
4.	Azaroff L.V, Brophy J.J., "Electronic Processes in Materials", McGraw Hill.,1963.
5.	A.B. Gupta, Nurul Islam, "Solid State Physics and Electronics", 2017.
6.	John F. Wakerley, "Digital Design-Principle & practice", 3rd edition, Pearson, 2008.

COURSE OUTCOMES

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

CO's	**STATEMENTS**	**RBT LEVEL**
1	Comprehend the behavior of electrons in solids	2
2	Demonstrate an understanding of various properties of Semiconducting materials and their internal structure	3
3	Analyse the properties of dielectric materials and apply them in various fields	3
4	Summarize basics of magnetism and superconductivity. Explore a few of their technological applications	2
5	Develop an understanding the Fundamentals of Electronic Science and its applications	3

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3			1						1		2	3	3
2	3									1		2	3	3
3	3									1		2	3	3
4	3	2	2	1	2				2	1		2	3	3
5	3	2	2	1		2			2	1		2	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

ME22252	FUNDAMENTALS OF ENGINEERING GRAPHICS	L T P C
		2 0 2 3

COURSE OBJECTIVES

- This course will introduce students to build their ability to read drawings and interpret the position and form of simple geometries.
- This course will familiarize the students in drafting drawings with CAD software.

UNIT 0	CONCEPTS AND CONVENTIONS (NOT FOR EXAM)	2

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

UNIT I	CONICS, CYCLOIDAL CURVES, AND INVOLUTES	7

Geometric construction - Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Drawing of tangents and normal to the above curves - Construction of cycloid, epicycloid and hypocycloid - Drawing of tangents and normal to the above curves. Construction of involutes of square, pentagon and circle - Drawing of tangents and normal to the above involutes.

UNIT II	PROJECTION OF POINTS, LINES AND PLANE SURFACES	9

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 one of the principal planes and perpendicular to other by rotating object method.

UNIT III	PROJECTION OF SOLIDS	9

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Projections of hollow prism and hollow cylinder with centrally drilled hole or square through its ends by rotating line method - axis is inclined to one of the principal planes and parallel to the other.

UNIT IV	BLOCK FLOW DIAGRAM USING CAD	9

Introduction to Computer Aided Drafting hardware - Overview of application software -2D drafting commands (AutoCAD) for simple shapes – Schematic components in electrical systems – Connectors, Point to Pint Wiring diagrams – Terminals – Dimensioning and Plotting.

UNIT V	ORTHOGRAPHIC AND ISOMETRIC VIEWS USING CAD	9

Annotation in CAD - Isometric views - Orthographic views - 3D Modelling basics - 3D to 2D conversion.

TOTAL (30L+30P) PERIODS: 60

TEXT BOOKS

1.	Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2019.
2.	Dhananjay M. Kulkarni, A.P. Rastogi, Ashoke K. Sarkar, “Engineering Graphics with AutoCAD”, PHI Learning Private Ltd., 2009.
3.	Venugopal K. and Prabhu Raja V., “Engineering Drawing + AutoCAD", New Age International (P) Limited, 6th edition, 2022.

REFERENCE BOOKS	
1.	Dhananjay A Jolhe, “Engineering Drawing with an Introduction to AutoCAD”, Tata McGraw-Hill Publishing Company Limited., 2008.
2.	Parthasarathy N. S. and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
3.	Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson Education India, 2nd Edition, 2009.
4.	Natrajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2018.
5.	Sham Tickoo, AutoCAD Electrical 2019 for Electrical Control Designers, Cadcim Technologies, 2019.
WEB LINKS	
1.	AutoCAD tutorials - https://www.thesourcecad.com/autocad-tutorials/
2.	https://nptel.ac.in/courses/112105294
3.	https://nptel.ac.in/courses/112103019

COURSE OUTCOMES

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

CO’s	STATEMENTS	RBT LEVEL
1	Construct conic sections and as per drawing standards	2
2	Obtain orthographic projections of lines and plane surfaces and simple solids in various positions	3
3	Obtain projections of simple and hollow solids	3
4	Employ the CAD software for drafting and modelling of simple components	2
5	Construct 2D views from 3D models using CAD software	3

Bloom’s Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO’s	PO’s												PSO’s	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1										1			2	2
2										2			2	2
3										2			2	2
4					2				1	3			2	2
5					2				1	3			2	2

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22201	ELECTRIC CIRCUIT ANALYSIS	L T P C
		3 1 0 4

COURSE OBJECTIVES

- To familiarize the principles of passive circuit elements and analyze circuit parameters.
- To solve complex circuits using network theorems and reduction methods.
- To impart knowledge on analysis of 3 phase circuits and its phasor diagrams.
- To analyze the transient response of circuits with DC and AC input.
- To introduce the phenomenon of resonance in coupled circuits.

UNIT I	BASIC CIRCUITS ANALYSIS	12

Ohm's Law – Kirchoff's laws – DC and AC Circuits – Resistors, Inductances and Capacitances in series and parallel – Mesh, Super mesh, Node and Super node method of analysis for DC and AC circuits - Dependent voltage and current sources.

UNIT II	NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS	12

Network reduction: Voltage and Current division, Source transformation – Star delta conversion, Thevenin's and Norton's Theorems – Superposition Theorem – Maximum power transfer theorem – Millman's theorem – Reciprocity Theorem.

UNIT III	THREE PHASE CIRCUITS	12

Phasor Diagram – Power, Power factor and Energy–Three phase balanced / unbalanced voltage sources – Analysis of three phase 3-wire and 4-wire circuits with star and delta connected, balanced & unbalanced loads – Power and power factor measurements in three phase circuits.

UNIT IV	TRANSIENT RESPONSE FOR DC, AC CIRCUITS	12

Transient response of RL, RC and RLC Circuits for DC input and AC sinusoidal input – Characterization of two-port networks in terms of Z, Y, h and transmission parameters.

UNIT V	RESONANCE AND COUPLED CIRCUITS	12

Series and parallel resonance – Frequency response – Quality factor and Bandwidth –Low and High pass filters –Self and mutual inductance – Coefficient of coupling – Singly tuned circuits.

TOTAL PERIODS: 60

TEXT BOOKS

1.	William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill Education, 8th edition, New Delhi, 2013.
2.	Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", 5th edition, McGraw Hill Education, 2013.
3.	Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, 5th edition, McGraw Hill Education, New Delhi, 2017.

REFERENCE BOOKS

1.	Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", 5th edition, McGraw Hill Education, 2017.
2.	Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.

COURSE OUTCOMES		
Upon the successful completion of the course, the students will be able to		
CO's	**STATEMENTS**	**RBT LEVEL**
1	Apply circuit laws to analyze steady-state parameters of given electrical circuits	4
2	Simplify DC and AC electrical circuits by applying suitable reduction methods and network theorems	3
3	Analyze three phase balanced and unbalanced circuits to determine power and power factor	4
4	Analyze transients of electrical circuits and parameters of two-port networks	4
5	Realize resonance phenomenon and the effect of magnetic coupling in real time applications	5
Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6		

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	2	2				1			2	3	3
2	3	3	3	2	2				1			2	3	3
3	3	3	3	2	2				1			2	3	3
4	3	3	3	2	2				1			2	3	3
5	3	3	3	2	2				1			2	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

PH 22161	PHYSICS LABORATORY	L T P C
	(COMMON TO ALL BRANCHES EXCEPT BT)	0 0 2 1

COURSE OBJECTIVES

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS (Any EIGHT Experiments)	
1.	a) Determination of Wavelength, and particle size using Laser. b) Determination of acceptance angle in an optical fiber.
2.	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
3.	Determination of wavelength of mercury spectrum – spectrometer grating.
4.	Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5.	Determination of Young's modulus by Non uniform bending method.
6.	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
7.	Determination of Rigidity modulus of a given wire -Torsional Pendulum.
8.	Energy band gap of a Semiconductor.
9.	Determine the Hysteresis loss of a given Specimen.
10.	Calibration of Voltmeter & Ammeter using potentiometer.
	TOTAL PERIODS:30
REFERNCE BOOKS	
1.	"Physics Laboratory practical manual", 1st Revised Edition by Faculty members, 2018.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Analyze the physical principle involved in the various instruments; also relate the principle to new application	4
2	Comprehend the Experiments in the areas of optics, mechanics and thermal physics to nurture the concepts in all branches of Engineering	3
3	Apply the basic concepts of Physical Science to think innovatively and also improve the creative skills that are essential for engineering	3
4	Evaluate the process and outcomes of an experiment quantitatively and qualitatively	3
5	Extend the scope of an investigation whether or not results come out as expected	3

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	2	3	2				3	1		2		2
2	3	3		3		2			3	1		2		2
3	3	3	2	3	2	2			3	1		2		
4	3	3		3					3	1		2		
5	3	3		3	2				3	1		2	2	2
3- High Mapping; 2-Moderate Mapping; 1-Low Mapping														

CY22161	CHEMISTRY LABORATORY	L T P C
	(COMMON TO ALL BRANCHES EXCEPT AD, CS, IT)	0 0 2 1

COURSE OBJECTIVE

The objective of the Chemistry Laboratory is to acquaint the students with the basic phenomenon/concepts of chemistry, the student face during course of their study in the industry and Engineering field.

- To appreciate the need and importance of water quality parameters for industrial and domestic use.
- To gain the knowledge on electrochemical instrumentation techniques like potential and current measuring used in electrochemistry applications
- To impart knowledge on separation of components using paper chromatography.
- To enhance the thinking capability about polymer and properties like molecular weight.

LIST OF EXPERIMENTS (Minimum EIGHT Experiments)

1.	Determination of DO content of water sample by Winkler's method.
2.	Determination of strength of given hydrochloric acid using pH meter.
3.	Determination of strength of acids in a mixture using conductivity meter.
4.	Estimation of iron content of the water sample using spectrophotometer (phenanthroline / thiocyanate method).
5.	Determination of total, temporary & permanent hardness of water by EDTA Method.
6.	Estimation of iron content of the given solution using potentiometer.
7.	Determination of alkalinity in water sample.
8.	Determination of Single electrode potential.
9.	Separation of components from a mixture of red and blue inks using Paper chromatography.
10.	Determination of molecular weight of polymer by using Ostwald's/Ubbelohde viscometer

TOTAL PERIODS:30

REFERENCE BOOKS

1.	Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New York 2001.
2.	Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel‟s Textbook of practical organic chemistry", LBS Singapore 1994.
3.	Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980
4.	Jeffery G.H., Bassett J., Mendham J.and Denny vogel‟s R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.

COURSE OUTCOMES		
Upon the successful completion of the course, the students will be able to		
CO's	**STATEMENTS**	**RBT LEVEL**
1	Distinguish hard and soft water, solve the related numerical problems on water, purification and its significance in industry and daily life	3
2	Interpret the knowledge of instruments to measure potential and current related parameters	2
3	Demonstrate the basic principle for separation of components using paper chromatography	3
4	Evaluate the molecular weight of polymer using Ostwald's/Ubbelohde viscometer	3
5	Distinguish hard and soft water, solve the related numerical problems on water, purification and its significance in industry and daily life	3
Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6		

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	2				3	3	3	1		1	2		
2	3	2	1			3	3	3					**2**	**2**
3	3					3	3					2		
4	3			1		3	3	3						
5														

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22211	ELECTRIC CIRCUITS LABORATORY	L T P C
		0 0 3 1.5

COURSE OBJECTIVES

- To provide practical exposure in constructing and solving electrical circuits
- To simulate various electrical circuits using simulation software.

LIST OF EXPERIMENTS	
1.	Simulation and experimental verification of electric circuits by mesh and nodal analysis.
2.	Simulation and experimental verification of Thevenin's and Norton's theorems.
3.	Simulation and experimental verification of Maximum power transfer theorem.
4.	Simulation and experimental verification of Superposition and Millman's theorems.
5.	Simulation of three phase, balanced and unbalanced, star and delta networks.
6.	Simulation and experimental verification of DC transient analysis of electric circuits.
7.	Simulation of AC transient analysis (RL, RLC) of electric circuits.
8.	Determination of Z & Y two-port network parameters.
9.	Design, simulation and experimental verification of series resonant circuit.
10.	Design, simulation and experimental verification of parallel resonant circuit.
11.	Design, Simulation and experimental verification of low pass and high pass filters.
12.	Design and develop a PCB layout of given electrical circuit using software package. (Mini-Project
	TOTAL PERIODS:45

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Apply circuit laws and theorems to analyze steady-state parameters of given electrical circuits	4
2	Simulate and compute power and power factor in balanced and unbalanced three-phase circuits	3
3	Analyze the transient parameters of the given DC and AC electrical circuits	4
4	Model and evaluate two-port network parameters	5
5	Design and estimate parameters of resonant and filter circuits and verify through experiments and simulation	5

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	2	2	3				3	2		2	3	3
2	3	3	2	2	3				3	2		2	3	3
3	3	3	2	2	3				3	2		2	3	3
4	3	3	2	2	3				3	2		2	3	3
5	3	3	2	2	3				3	2		2	3	3
3- High Mapping; 2-Moderate Mapping; 1-Low Mapping														

SEMESTER III

MA22354	MATHEMATICS FOR ELECTRICAL ENGINEERS	L T P C
		3 1 0 4

COURSE OBJECTIVES

- Introduce the Fourier series analysis.
- Introduce the basic concepts of the Fourier transform techniques and its application in engineering.
- Introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I	PARTIAL DIFFERENTIAL EQUATIONS	9+3

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation – Linear homogeneous partial differential equations of second and higher order with constant coefficients.

UNIT II	FOURIER SERIES	9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series –Half range cosine series –Parseval's identity – Harmonic analysis

UNIT III	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	9+3

Classification of PDE – Method of separation of variables - Solution of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

UNIT IV	FOURIER TRANSFORMS	9+3

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity

UNIT V	Z - TRANSFORMS AND DIFFERENCE EQUATIONS	9+3

Z- transform - Elementary properties – Inverse Z - transform (using partial fraction, long division method and residue technique) –Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL PERIODS (L:45+T:15): 60

TEXT BOOKS

1.	Erwin Kreyszig, "Advanced Engineering Mathematics", 10 th Edition, Wiley India, 2011.
2.	Grewal. B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, Delhi 2017.
3.	Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt. Ltd. 1998.

REFERENCE BOOKS

1.	Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7thEdition, Laxmi Publications Pvt Ltd , 2007.
2.	Glyn James, "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, 2011.
3.	Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2012.
4.	Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill

	Education Pvt Ltd, New Delhi, 2012.
5.	Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt. Ltd. 7th Edition, New Delhi, 2012.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Express proficiency in handling higher order Partial differential equations	4
2	Acquire the skill in examining a signal in another domain rather in the original domain by handling Full and Half Range Fourier Series	4
3	Develop skills in classification, formulation, solution, and interpretation of PDE models	4
4	Develop the skill of conversion between time domain to frequency domain using the concept of Fourier Transforms	5
5	Apply the systematic method for finding the impulse response of LTI systems described by difference equations: partial fraction expansion	5

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3									3	3	3
2	3	3	3									3	3	3
3	3	3	3									3	3	3
4	3	3	3	3								3	3	3
5	3	3	3									3	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22301	ELECTRICAL MACHINES I	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Introduce techniques of Magnetic-circuit analysis and introduce Magnetic materials.
- Impart the principle of Operation, Construction, Testing of Single Phase Transformers and Three Phase Transformer Connections.
- Illustrate the theory of Electromechanical energy conversion and the concept of Co-energy.
- Familiarize the working principle of different types of DC machines and analyze the losses in DC machines to improve the efficiency by conducting various tests.
- Study the characteristics and speed control methods of DC machines.

UNIT I	MAGNETIC CIRCUITS AND MAGNETIC MATERIALS	9

Magnetic circuits – Laws governing magnetic circuits –Flux linkage, Inductance and energy – Statically & Dynamically induced EMF – Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses – AC excitation, Introduction to permanent magnets.

UNIT II	TRANSFORMERS	9

Construction –Principle of operation on no load and load – Equivalent circuit – Phasor diagram – Losses – Testing – Efficiency and Voltage regulation – All day efficiency – Sumpner test, Per unit representation – Three phase transformers – Connections and their comparative features, Scott Connection – Parallel operation of transformers – Auto transformer – tap changing transformers.

UNIT III	ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES	9

Energy in magnetic system – Field energy and co-energy – Force and torque equations – Singly and multiply excited magnetic field systems – Generated EMF – MMF of distributed windings – Magnetic fields in rotating machines – Rotating MMF waves – Magnetic saturation and leakage fluxes – Torque in round rotor machine.

UNIT IV	DC GENERATORS	9

Construction & Components of DC Machines – Cooling, Mounting, Standards & Specifications, Principle of operation – Lap and wave windings – EMF equations– Circuit model – Armature reaction – Methods of excitation – Commutation – Compensating winding – Losses, Efficiency and Power stages in DC Generator – Characteristics of DC generators – Parallel operation of shunt generator – Applications.

UNIT V	DC MOTORS	9

Principle of operation – Types of DC Motors – Back EMF and Torque equations – Speed Torque Characteristics – Starting – Types of Starters – Speed control – Testing and efficiency – Swinburne's test and Hopkinson's test –Testing standards– IEC, NEMA – Applications.

TOTAL PERIODS: 45

TEXT BOOKS

1.	Nagrath I. J and Kothari D. P. "Electric Machines", Tata McGraw Hill Publishing Company Ltd, 2017, 5th Edition.
2.	P.S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2021.

REFERENCE BOOKS

1.	M.N.Bandyopadhyay, "Electrical Machines Theory and Practice", PHI Learning Pvt Ltd., New Delhi, 2009.
2.	P. C. Sen, "Principles of Electrical Machines and Power Electronics", John Wiley & Sons,

	1997.
3.	Deshpande M. V, "Electrical Machines", PHI Learning Pvt. Ltd., New Delhi, 2011.
4.	Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, "Electric Machinery", Tata McGraw Hill Books Company, 2003, 6th Edition.
5.	S.Sarma & K.Pathak, "Electric Machines", Cengage Learning India (P) Ltd., Delhi, 2011.
6.	Richard C Dorf, "Electrical Power Engineering hand book", CRC Press, 1998.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Analyze magnetic circuits and determine the performance parameters	4
2	Compute the performance parameters of single phase and three phase transformers	3
3	Derive torque of rotating machines and analyze the machine performance	3
4	Estimate the electro-mechanical performance of DC Generators	4
5	Apply different methods of starting & speed control and determine the performance of DC Motors	4

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	2	2	3			2					3	3	3
2	3	2	2	3								3	3	3
3	3	2	2	3			2					3	3	3
4	3	2	2	3			2					3	3	3
5	3	2	2	3		3	2					3	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22302	ELECTRIC POWER SYSTEM	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Learn about various components of Power systems.
- Calculate the transmission line parameters for various conductor configurations.
- Predict the performance of Transmission lines.
- Understand about different Insulators and Underground cables.
- Familiarize the basic concepts related to Substation and Distribution system.

UNIT I	STRUCTURE OF POWER SYSTEM	9

Structure of Electric Power System– Conventional, Deregulated Structure, Micro-grid and Smart Grid Structure – Methods of electric power generations – Conventional (Thermal and Hydro Power Plants) – Renewable Energy based generation – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS – Indian Electricity (IE) Rules and Acts – Tariff – Types – Electrical Safety.

UNIT II	TRANSMISSION SYSTEM PARAMETERS	9

Resistance, Inductance and Capacitance calculations -solid, stranded, and bundled conductors- Single-phase and three phase lines – single and double circuit lines - Typical configuration, conductor types - Symmetrical and unsymmetrical spacing and transposition – application of self and mutual GMD - skin and proximity effects– effect of earth on transmission line capacitance-Distribution line model

UNIT III	MODELLING AND PERFORMANCE OF TRANSMISSION LINES	9

Classification of lines- Performance of Transmission lines – short line, medium line and long line – ABCD constants - equivalent circuits, phasor diagram – real and reactive power flow in lines – Power Circle diagrams – Ferranti effect- shunt and series compensation- surge-impedance loading, loadability limits based on thermal loading – Formation of Corona – Critical Voltages – Effect on line Performance.

UNIT IV	INSULATORS, CABLES AND SAG CALCULATION	9

Insulators: Types – voltage distribution in insulator string – improvement of string efficiency – testing of insulators, Underground cables: Underground cables – Types of cables – insulation resistance –potential gradient – capacitance of single-core and three-core cables- Grading of cables – DC cables, Mechanical designs of transmission line: sag and tension calculations for different weather conditions – Tower spotting & Types of towers.

UNIT V	SUBSTATION, GROUNDING SYSTEM AND DISTRIBUTION SYSTEM	9

Classification, major components of substations - Bus-bar arrangements - Importance of earthing in a substation - Qualitative treatment to neutral grounding and earthing practices in substations - Distribution Systems – Kelvin's Law – AC and DC distributions –Concentrated and Distributed loading- Techniques of Voltage Control and Power factor improvement – Distribution Loss- Anti-theft measures – Demand side management (Qualitative)

TOTAL PERIODS: 45

TEXT BOOKS

1.	Gupta B.R, 'Power System Analysis & Design', S.Chand and Company Ltd, 2014, 7th Edition.
2.	Metha.V.K, and Rohit Metha., 'Principles of Power System', S.Chand and Company Ltd., 2020.

REFERENCE BOOKS

1.	Hadi Saadat, 'Power System Analysis,' PSA Publishing; Third Edition, 2011

2.	Wadwa. C.L., 'Electric Power Systems, New Age International (P) Ltd', New Delhi, 2022, 8th Edition.
3.	John J. Grainger and Stevenson Jr. W. D, 'Power System Analysis', McGraw Hill International edition, 2016.
4.	S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.
5.	D.P.Kothari and I.J. Nagrath, 'Power System Engineering', Tata McGraw–Hill, 2019, 3rd Edition.
6.	Central Electricity Authority (CEA), "Guidelines for Transmission System Planning", New Delhi.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Understand the major components of power system and its practical significance	4
2	Determine transmission line parameters for various conductor configurations	5
3	Model the transmission lines to determine the line performance and analyze the impact of Ferranti and corona effects	4
4	Calculate electrical parameters of overhead and underground cables and perform sag calculations	4
5	Analyze substation, grounding and distribution systems	4

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	2	2		2						3	3	
2	3	3	2	2								3	3	2
3	3	3	2	2								3	3	2
4	3	3	2	2								3	3	2
5	3	3	2	2								3	3	

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22303	ELECTROMAGNETIC THEORY	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Introduce the basic mathematical concepts related to Electromagnetic vector fields.
- Impart the concepts of Electrostatics, Electrical potential and boundary conditions.
- Inculcate the concepts of Magnetostatics, Magnetic flux density, scalar and vector potential and its applications.
- Investigate the equations of Electrodynamic field and EM wave.

UNIT I	BASICS OF ELECTROMAGNETIC VECTOR FILEDS	9

Sources and effects of Electromagnetic fields – Vector algebra - Scalars, Vectors, Dot product, Cross product - Coordinate Systems – Cartesian, Cylindrical and Spherical Coordinate system – Coordinate transformations – Line, Surface and Volume integrals – Gradient, Divergence, Curl – Theorems and Applications.

UNIT II	ELECTROSTATICS – I	9

Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and Applications. Electric potential due to discrete and continuous charges – Electric field and equipotential plots, Electric dipole - Uniform and Non-Uniform field, Utilization factor.

UNIT III	ELECTROSTATICS – II	9

Electric field in free space, conductors, dielectrics – Dielectric polarization – Dielectric strength – Electric field in multiple dielectrics – Boundary conditions - Poisson's and Laplace's equations, Uniqueness Theorem, General procedure for solving Poisson's and Laplace's equations–Capacitors and Capacitance of Parallel, Coaxial, Spherical conductors– Energy density–Case study on real time applications.

UNIT IV	MAGNETOSTATICS	9

Lorentz force, 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) – Magnetic materials– Magnetization, Magnetic field in multiple media Magnetic force, Torque, Self and mutual inductance – Inductance of a solenoid, Energy density, Applications.

UNIT V	ELECTRODYNAMIC FIELDS AND WAVES	9

Magnetic Circuits – Faraday's Law– Transformer and motional EMF – Displacement current – Maxwell's equations (differential and integral form) – Applications – Time harmonic fields – Electromagnetic waves – Properties of EM waves in Lossy medium.

TOTAL PERIODS: 45

TEXT BOOKS

1.	Mathew N. O. Sadiku, S.V.Kulkarni 'Principles of Electromagnetics', Oxford University Press Inc,Asian edition,2015, 6th Edition.
2.	K.A. Gangadhar, P.M. Ramanthan 'Electromagnetic Field Theory (Including Antennae's and wave propagation', Khanna Publications, 2013, 16th Edition.

REFERENCE BOOKS

1.	William H. Hayt and John A. Buck, 'Engineering Electromagnetics', Tata McGraw Hill Special Indian edition, 2014.
2.	Karl E Lonngren,Sava V Savov, Randy J Jost, ' Fundamentals of Electromagnetic with MATLAB', Prentice Hall of India, 2012.

COURSE OUTCOMES		
Upon the successful completion of the course, the students will be able to		
CO's	**STATEMENTS**	**RBT LEVEL**
1	Apply basic mathematical concepts to solve electromagnetic vectors in orthogonal coordinate system	4
2	Interpret and solve the problems related to electrostatics	4
3	Apply the electrostatic principles to compute the boundary value problems and analyze Electric field in material space	4
4	Analyze and solve the problems related to magneto-statics	4
5	Solve time-varying fields using Maxwell's equation and Electromagnetic wave equation	4
Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6		

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	2					2			3	2	3
2	3	3	3	2					2			3	2	3
3	3	3	3	2					2			3	2	3
4	3	3	3	2					2			3	2	3
5	3	3	3	2					2			3	2	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22308	DIGITAL LOGIC CIRCUITS: THEORY AND PRACTICES	L T P C
		3 0 2 4

COURSE OBJECTIVES

- To impart knowledge on concepts of binary representation, logic gates, and Boolean algebra.
- To design and analyze digital circuits using combinational and sequential logic.
- To develop skills in HDL coding and simulate digital circuits.

UNIT I	NUMBER SYSTEMS, CODES AND BOOLEAN REDUCTION	9+6

Review of number systems, Signed binary numbers – Binary Arithmetic – Fixed and floating point representation – Boolean Algebra - laws and theorems – Simplification of Boolean expressions – Sum of Products (SOP) and Product of Sums (POS) forms – Logic Minimization using K-map – Binary codes – BCD code, Gray code, Error detection and Error correction codes.

Experiments:

1. Reduction and Implementation of Boolean Expression using logic gates (K-map).
2. Implementation of Code Converters (Binary to Gray, and Gray to Binary) using logic gates.

UNIT II	COMBINATIONAL CIRCUITS	9+6

Combinational logic – Adders, Ripple carry adder, Carry lookahead adder, Subtractor, Multiplexer, Demultiplexer, Encoder, Decoder, Parity generator and checker – Introduction to VHDL coding.

Experiments:

1. Implementation of Adder and Multiplexer.
2. Design and simulation of Adder/ Subtractor circuits.
3. Design and simulation of Multiplexer and Demultiplexer.

UNIT III	SEQUENTIAL CIRCUITS	9+6

Sequential logic – SR, JK, D and T flip flops –Synchronous counter – Ripple Counter – Modulo-n counter –Sequence generator – Design of synchronous sequential circuits – Moore and Mealy models – state diagram, state reduction, state assignment.

Experiments:

1. Implementation and simulation of Shift registers.
2. Design, implementation and simulation of Synchronous counter.

UNIT IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	9+6

Design of Asynchronous sequential circuits – Transition table, flow table – race conditions, hazards and errors in digital circuits; Analysis of asynchronous sequential logic circuits – Design of asynchronous controller for vending machine.

Experiments:

1. Design, implementation and simulation of Asynchronous counter.

UNIT V	MEMORY DEVICES AND DIGITAL LOGICAL FAMILIES	9+6

Implementation of combinational logic circuits using PROM, PLA, PAL – Introduction to FPGA – Digital Logic Families: Logic gates using TTL, ECL and MOS families – operation and characteristics of digital logical family.

Experiments:

1. Implementation and verification of two input NOR and NAND gates using TTL/CMOS

TOTAL PERIODS: 45+30

TEXT BOOKS	
1.	M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 2013.
2.	John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2012.
REFERENCE BOOKS	
1.	Salivahanan, Arivazhagan, 'Digital Circuits & Design', Vikas Publishing House, 2012.
2.	William Kleitz, 'Digital Electronics-A Practical Approach with VHDL', Pearson, 2014.
3.	Floyd and Jain, 'Digital Fundamentals', 8th edition, Pearson Education, 2013.
4.	Anand Kumar, 'Fundamentals of Digital Circuits', PHI,2013.
5.	Gaganpreet Kaur, 'VHDL Basics to Programming', Pearson, 2013.
6.	Mandal, 'Digital Electronics Principles & Application', McGraw Hill Education, 2014.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Apply the concepts of Boolean algebra and reduction techniques to minimize logic expressions	3
2	Analyze and design various combinational logic circuits	4
3	Investigate and design synchronous and asynchronous sequential circuits	4
4	Comprehend the operation, characteristics of memory devices, digital logic families and construct digital circuits with memory devices	3
5	Design, debug and verify simple digital circuits and systems with the aid of HDL codes, schematic capture tools and simulation tools	4

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3							3	3			3	
2	3	3	2	2	3				3	3		2	3	2
3	3	3	2	2	3	2			3	3		3	3	2
4	3	3	2	2	3	2			3	3		3	3	
5	3	3	2	2	3	2			3	3		3	3	

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS		
SL.NO	**DESCRIPTION OF EQUIPMENTS**	**QUANTITY REQUIRED**
1.	IC Trainer kit	10
2.	IC Tester	4
3.	Bread board	10
4.	ICs - Logic gates, Flip-flops	Each 10
5.	Connecting wires	As required

EE22309	ELECTRON DEVICES AND CIRCUITS: THEORY AND PRACTICES	L T P C
		3 0 2 4

COURSE OBJECTIVES

- To understand the structure, operation, characteristics and applications of basic electronic devices.
- To gain knowledge about biasing circuits.
- To learn the required functionality of positive and negative feedback systems.
- To study about Optoelectronic devices.
- To construct various electronic circuits and understand the theoretical concepts by practices.

UNIT I	PN JUNCTION DEVICES AND APPLICATIONS	9+6

Construction and operation of PN junction diode, Current equations, Transition capacitance and Diffusion capacitance, Reverse recovery time, Temperature Effects-Construction and operation of Zener diode, Varactor diode.

Experiments:

1. V-I characteristics of PN Junction diodes and Zener diode
2. Clippers and Clampers using Diodes
3. Simulation study of Rectifiers with and without filters
4. Zener diode as voltage regulators

UNIT II	BIPOLAR JUNCTION TRANSISTORS	9+6

Construction and operation of Transistor, Modes of operation, Different types of configurations, Thermal runaway and Stabilization, AC and DC load lines, Need for biasing a Transistor and various biasing techniques-BJT small signal model–Analysis of CE, CB, CC amplifiers–Determination of h parameters.

Experiments:

1. Input and Output characteristics of Common Emitter.
2. Frequency analysis of Common Emitter.

UNIT III	FIELD EFFECT TRANSISTORS	9+6

Construction and Principle of operation of JFET and MOSFET, Biasing circuits for MOSFET-Fixed bias, Self bias, Voltage divider bias-Small signal model of FET/MOSFET - Analysis of CS, CG and Source Follower-Construction and Principle of operation of UJT.

Experiments:

1. Characteristics of MOSFET, UJT.

UNIT IV	MULTISTAGE AND FEEDBACK AMPLIFIERS	9+6

Two stage RC coupled amplifier –Analysis of Differential amplifier, Single tuned amplifiers–Gain and Frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis). Advantages of negative feedback – Analysis of Voltage/ Current, Series, Shunt feedback Amplifiers using Transistor.

Experiments:

1. Transfer Characteristics of Differential amplifier

UNIT V	OSCILLATORS AND OPTOELECTRONIC DEVICES	9+6

Positive feedback, Condition for oscillations, Phase shift – Wien bridge-Hartley-Colpitts and Crystal Oscillators- Construction and Operation of Optoelectronic devices: LED, LCD, Photo Diode, Photo Transistor, Opto-Coupler and Solar Cell.

Experiments:

1. Design and testing of RC phase shift and LC oscillators.
2. Characteristics of LED.

3. Experimental study of Opto-isolator (IC 4N28).	
TOTAL PERIODS: 45+30	
TEXT BOOKS	
1.	Boylestead L R and Nashelsky L, "Electronic Devices and Circuit theory", Pearson Prentice Hall, New Delhi, 2018, 11th edition.
2.	Salivahanan, Suresh kumar, "Electronic Devices and Circuits", Tata McGraw Hill 2013, 3rd edition.
REFERENCE BOOKS	
1.	Thomas L Floyd, "Electronic Devices", Prentice Hall of India, New Delhi, 2013, 7th edition.
2.	Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill 2007, 3rd edition.
3.	G.K.Mithal, "Electronic devices and circuits", Khanna Publishers, New Delhi, 2010, 23rd edition.
4.	Millman J, Christos C Halkias, SatyabatraJit, "Electronic devices and circuits", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2012, 3rd edition.
5.	Theodore F Bogart Jr, Jefffrey S Beasley, Guillermo Rico' "Electronic devices and circuits", Prentice Hall of India, New Delhi, 2004, 6th edition.
6.	For datasheets: https://www.alldatasheet.com/

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Apply the concepts of PN junction devices and analyse its various electronic circuits	4
2	Analyse the various configurations of bipolar junction transistors and amplifiers	4
3	Analyse the various configurations of field effect transistors and amplifiers	4
4	Analyse the performance of multistage and feedback amplifier circuits	4
5	Understand the operation of oscillators and Optoelectronic devices and analyse its behaviour using practices	4

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	2	3				3	3		2	3	
2	3	3	3	2	3				3	3		2	3	
3	3	3	3	2	3				3	3		2	3	
4	3	3	3	2	3				3	3		2	3	
5	3	3	3	2	3				3	3		2	3	
3- High Mapping; 2-Moderate Mapping; 1-Low Mapping														

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS		
SL.NO	**DESCRIPTION OF EQUIPMENTS**	**QUANTITY REQUIRED**
1.	Regulated Power supply	15
2.	CRO 30MHz	6
3.	DSO	2
4.	Function Generator	6
5.	Digital Multimeter	6
6.	Bread board	10
7.	Diode, Zener diode, BJT, UJT, JFET, MOSFET, UJT, LED, Photodiode, Phototransistor and Opto-coupler IC	Each 10
8.	Ammeter in various milli and micro ampere ranges	15
9.	Voltmeter in various ranges between 0-30V	15
10.	Resistors of various ranges	50
11.	Capacitors of various ranges	25
12.	Connecting wires	As required

EE22311	ELECTRICAL MACHINES I LABORATORY	L T P C
		0 0 3 1.5

COURSE OBJECTIVES

- Evaluate the Load characteristics of DC machines and transformers.
- Examine the performance characteristics of DC machines and Transformers using Direct and Indirect tests.
- Investigate different Speed control methods of DC Shunt Motor.
- Understand the need for starters.
- Obtain the Load test plots for Three Phase Transformers.

LIST OF EXPERIMENTS

	DC Machines
1.	Open circuit and Load characteristics of DC Separately Excited and Self Excited Shunt Generator
2.	Load characteristics of DC Compound Generator with differential and cumulative connections
3.	Load test on DC Shunt, Series and Compound motor
4.	Swinburne's test
5.	Hopkinson's test on DC Motor – Generator set
6.	Study of Starters, Regenerative and Dynamic braking for DC motors
7.	Speed control of DC shunt Motor and its 4 Quadrant operation
	Transformers
8.	Load test on Single-Phase Transformer and Three Phase Transformers
9.	Open circuit and Short circuit tests on Single Phase Transformer
10.	Polarity Test and Sumpner's test on Single Phase Transformers
11.	Separation of no-load losses in Single Phase Transformer
	TOTAL PERIODS:45

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Determine the performance characteristics of a DC machine operating as a Generator or Motor	3
2	Estimate the performance of a DC machine by Indirect methods	4
3	Identify and apply suitable method of starting, speed control and braking of a DC motor	3
4	Determine the performance characteristics of Single and Three Phase Transformers	4
5	Pre-determine the performance of Single phase Transformer	4

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	2	2	2		2	3	2		2	3	
2	3	3	3	2		2		2	3	2		2	3	
3	3	3	3	2	2	2		2	3	2		2	3	
4	3	3	3	2	2	2		2	3	2		2	3	2
5	3	3	3	2		2		2	3	2		2	3	2
3- High Mapping; 2-Moderate Mapping; 1-Low Mapping														

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS		
SL.NO	**DESCRIPTION OF EQUIPMENTS**	**QUANTITY REQUIRED**
1.	DC Separately excited generator coupled with DC Shunt Motor	1
2.	DC Shunt generator Coupled with DC Shunt Motor	1
3.	DC Shunt Motor Coupled with DC Compound Generator	1
4.	DC Shunt Motor with loading Arrangement	1
5.	DC Series Motor with loading Arrangement	1
6.	DC Compound motor with loading Arrangement	1
7.	DC drive for 4 quadrant operation of dc motor	1
8.	Dynamic braking panel for dc motor	1
9.	Single Phase Transformer	6
10.	Three phase Transformer	2
11.	Single Phase Resistive Loading Bank	2
12.	Three Phase Resistive Loading Bank	2
13.	Tachometer -Digital/Analog	8
14.	Single Phase Auto Transformer	5
15.	Three Phase Auto Transformer	1
16.	SPST switch	3
17.	Wattmeter	10
18.	Lamp loading arrangement	3
19.	Ammeters	20
20.	Voltmeters	20
21.	Rheostats	15

SEMESTER-IV

MA22452	NUMERICAL METHODS	L T P C
	(Common to B.E. EEE & B.Tech. CH)	3 1 0 4

COURSE OBJECTIVES

- Learn the solution of algebraic, transcendental equations, system of linear equations
- Understand the concept of Interpolation and approximation.
- Learn how to apply numerical differentiation and Integration
- Familiarize in solving IVP
- Understand how to solve BVP in ODE and PDE

UNIT I	SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	12

Introduction to computation software for numerical methods solution of algebraic and transcendental equations – Newton Raphson method- Solution of linear system of equations – Gauss elimination method – Pivoting - Gauss Jordan method, Solution of Tri-diagonal system of equations – Gauss Seidel iterative method – Matrix Inversion by Gauss Jordan method – Eigen values of a matrix by Power method and Jacobi Method for symmetric matrix. Solving equations and Eigen value problems using computational tools.

UNIT II	INTERPOLATION AND APPROXIMATION	12

Finite difference operators and its relations – Interpolation with equal intervals – Newton's forward and backward difference formulae – Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation–Interpolation and Approximation using computational tools.

UNIT III	NUMERICAL DIFFERENTIATION AND INTEGRATION	12

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule, Romberg's Method – Two point and three-point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules–Application of computational tools for numerical differentiation and integration.

UNIT IV	INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS	12

Single Step methods – Taylor's series method, Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations, second order equations and simultaneous first order equations – Multi step methods – Milne's and Adams- Bash forth predictor corrector methods for solving first order equations – Solving Initial value problems using computational tools.

UNIT V	BOUNDARY VALUE PROBLEMS	12

Finite difference solution of ODE. Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method–Solving Boundary value problems using computational tools.

TOTAL PERIODS:60

TEXT BOOKS

1.	Grewal. B.S., Numerical Methods in Engineering & Science with Programs in C, C++ &MATLAB, Khanna Publishers, 11th Edition, New Delhi, 2013.
2.	Jain M.K., Iyengar. S.R.K., and Jain. R.K, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, New Delhi, 2015.
3.	Chapra. S.C., and Canale.R.P., Numerical Methods for Engineers, Tata McGraw Hill,7th Edition, New Delhi, 2015.

REFERENCE BOOKS	
1.	Sankara Rao. K., Numerical methods for Scientists and Engineers, Prentice Hall of India, 3rd Edition, New Delhi, 2007.
2.	Gerald. C. F., and Wheatley. P. O., Applied Numerical Analysis, Pearson Education, Asia, New Delhi, 2009.
3.	Venkataraman. M.K. Numerical Methods in Science and Engineering, National Publishers, 2001.
4.	Kandasamy. K., Thilagavathy. K., and Gunavathi. K., Numerical Methods, S. Chand &Company Ltd., New Delhi, 2008.
5.	Sastry, S.S., "Introductory Methods of Numerical Analysis", Prentice Hall of India, 2010.
	WEBLINKS
1.	https://nptel.ac.in/courses/111/107/111107105/
2.	https://nptel.ac.in/courses/111/107/111107063/

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Have the fundamental knowledge of solving an algebraic or transcendental equation, linear system of equations	3
2	Appreciate the numerical techniques of interpolation in various intervals	4
3	Apply the numerical techniques of differentiation and integration for engineering problems	3
4	Solve Initial value problems using an appropriate numerical technique	5
5	Solve Boundary value problems using finite difference method	5

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	2									2	3	3
2	3	3	2									2	3	3
3	3	3	2										3	3
4	3	3	2	2									3	3
5	3	3	2	2									3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

GE22451	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	L T P C
	(COMMON TO ALL BRANCHES)	3 0 0 3

COURSE OBJECTIVES

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution.
- To study and understand the various types of renewable sources of energy and their applications.
- To familiarize the concept of sustainable development goals, economic and social aspects of sustainability, recognize and analyze climate changes, and environmental management challenges.
- To inculcate and embrace sustainability practices, develop a broader understanding of green materials and energy cycles, and analyze the role of sustainable urbanization.

UNIT I	ENVIRONMENT AND BIODIVERSITY	9

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– food chains, food webs and ecological pyramids, ecological succession. Biodiversity– types–genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: fragmentation and habitat loss, poaching of wildlife, human-wildlife conflicts – endangered and endemic species of India –conservation of biodiversity: In-situ and ex-situ.

UNIT II	ENVIRONMENTAL POLLUTION	9

Definition, causes, effects and preventive measures of air, water and soil pollution. Marine and thermal pollution – causes, effects and control measures. Light and noise pollution–effect on flora and fauna. Nuclear pollution– Sources, effects and control measures. Disposal of radioactive wastes (Nuclear hazards). Pollution case studies. Role of an individual in the prevention of pollution. Solid, hazardous and E-waste management. Occupational health and safety management system (OHASMS). Environmental protection, Environmental protection acts, categorization of spices according to IUCN.

UNIT III	RENEWABLE SOURCES OF ENERGY	9

Energy resources: Growing energy needs, Non renewable resources – types, uses. Energy management and conservation – New energy sources, Need of new sources – geo suitability of establishing renewable energy sources, different types new energy sources. Applications of hydrogen energy, ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy. Role of an individual in conservation of energy.

UNIT IV	SUSTAINABILITY AND MANAGEMENT	9

Development, GDP, Sustainability– concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols, Sustainable Development Goals-targets, indicators and intervention areas –Principles of green chemistry, Climate change- Global, Regional and local environmental issues and possible solutions-case studies – Role of non-governmental organization, Concept of carbon credit, carbon footprint – Environmental management in industry–A case study.

UNIT V	SUSTAINABILITY PRACTICES	9

Zero waste and R concept, circular economy, ISO 18000 series, material life cycle assessment, environmental impact assessment. Wasteland reclamation, Sustainable habitat: green buildings, green materials, energy efficiency and energy audit, sustainable transports. Energy cycles, carbon cycle, emission and sequestration, Green engineering: sustainable urbanization- socio-economical and technological change.

Rain water harvesting, watershed management environmental ethics: Issues and possible solutions.	
	TOTAL PERIODS: 45
TEXT BOOKS	
1.	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", NewAge International Publishers, 7th Edition, 2022.
2.	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3.	Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', Pearson Education2nd edition, 2004.
4.	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5.	Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design anddevelopment, Cengage learning.
6.	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7.	Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.
REFERENCE BOOKS	
1.	R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2.	Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3.	Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4.	Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 3rdedition, 2015.
5.	Erach Bharucha "Text book of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd, 3rd edition, 2021.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Recognize the fundamental role of ecosystems and suggest an appropriate method for the conservation of biodiversity	3
2	Describe the different types of pollution, their effects and strategies to control pollution	3
3	Identify the various renewable energy resources and use the appropriate one thereby conserving non-renewable resources for future generation	3
4	Explain the various goals of sustainable development applicable to suitable technological advancement and societal development	2
5	Summarize the various sustainability practices, green materials, energy cycles, and the role of green engineering in sustainable urbanization	2

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3					3	3	2		2		1	2	2
2	3					3	3	2		2		2	2	2
3	3		1			3	3	1		2		1	2	2
4	3					3	3	3		2		2	2	2
5	3					3	3	3		2		2	2	2
3- High Mapping; 2-Moderate Mapping; 1-Low Mapping														

EE22401	ANALOG ELECTRONICS	L T P C
		3 0 0 3

COURSE OBJECTIVES

- To understand the Monolithic IC Fabrication process.
- To perform mathematical operations using Op-amp.
- To learn about various applications of Op-amp.
- To understand the functioning of ICs -Voltage regulators and amplifiers

UNIT I	IC FABRICATION	9

Monolithic IC technology–Basic planar processes–Fabrication of Monolithic transistors, FET, Monolithic diodes, Integrated resistors, Integrated capacitors, and PV cell, Thin and Thick film technology.

UNIT II	LINEAR IC – OPERATIONAL AMPLIFIER	9

Basic of Op-Amp, Internal Block Diagram and Ideal characteristics, DC characteristics, AC characteristics – Basic Applications: Inverting Amplifier, Inverter, Scale changer, Inverting summer – Non Inverting Amplifier, Voltage follower, Non Inverting summer, Differential Amplifier, Subtractor, Instrumentation amplifier, Differentiator, Integrator.

UNIT III	APPLICATIONS OF OPERATIONAL AMPLIFIER	9

Instrumentation amplifier V to I, I to V Converters, Comparator, Clipper, Clamper, Peak Detector, Multivibrators, Waveform Generation: Triangular, Saw tooth, Sinusoidal, Schmitt Trigger – I order and II order active filters – A/D converters (Dual Slope, Successive Approximation and Flash), D/A converters (R-2R ladder and weighted resistor) – Precision Rectifiers –Sample and Hold circuit.

UNIT IV	SPECIAL ICs	9

555 Timer-Functional Block Diagram, Characteristics, Monostable and Astable modes of operation– 565 Phase Locked Loops (PLL) - Block Diagram, operation – 566 Voltage controlled Oscillator, PLL, Applications –Analog multiplier and Divider, AD633-Analog multiplier ICs.

UNIT V	APPLICATION ICs	9

IC voltage regulators, LM78XX, 79XX– Fixed and adjustable three terminal regulators, LM723 General purpose voltage regulator, Block diagram, Circuit configurations, Current limiting schemes, Output current boosting, Switching regulators–SMPS–LM324 Single Supply Quad Operational amplifiers—LM380 Power amplifier–AD623 Instrumentation amplifier and its application.

TOTAL PERIODS: 45

TEXT BOOKS

1.	D.Roy Choudhary, Shail B.Jain, ‘Linear Integrated Circuits’, New Age, 2017, 4th Edition.
2.	Ramakant A.Gayakward, ‘Operational amplifiers and Linear Integrated Circuits’, Pearson Education, PHI. 2015, 4th Edition.

REFERENCE BOOKS

1.	David A.Bell, ‘Operational amplifiers and Linear ICs’, Oxford, 2013, 3rd Edition.
2.	Robert F.Coughlin, Fredrick F. Driscoll, ‘Operational amplifier and linear integrated circuits”, Prentice Hall of India 2014, 6th Edition.
3.	Sergio Franco, ‘Design with Operational Amplifiers and Analog Integrated Circuits’, McGraw Hill, 2017, 4th Edition.

COURSE OUTCOMES		
Upon the successful completion of the course, the students will be able to		
CO's	**STATEMENTS**	**RBT LEVEL**
1	Comprehend the fundamental techniques for fabrications of Monolithic elements and devices.	4
2	Demonstrate the basic applications of Op-amp.	4
3	Construct waveform generation circuits of Op-amp and converters.	4
4	Examine the internal schematic layout and operation of Special ICs.	4
5	Practice with different applications based on Application IC's.	4
Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6		

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	2	2			2	2	2		2	2	
2	3	3	3	2	2			2	2	2		2	2	2
3	3	3	3	2	2			2	2	2		2	2	2
4	3	3	3	2	2			2	2	2		2	2	2
5	3	3	3	2	2			2	2	2		2	2	2

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22402	CONTROL SYSTEMS	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Understand the use of transfer function models for analysis of physical systems and introduce the control system components.
- Impart adequate knowledge on the time response of various systems and steady state error analysis.
- Accord basic knowledge in obtaining the open loop and closed loop frequency responses of systems and stability analysis.
- State the need of controller in closed loop system and design the compensators.
- Learn state variable representation of physical systems and study the effect of state feedback.

UNIT I	SYSTEMS AND THEIR REPRESENTATION	9

Basic elements in control systems – Open and closed loop systems – Transfer function –Modelling of mechanical and electrical systems – Analogy – Synchros – AC and DC servomotors – overall system gain – Block diagram reduction techniques – Signal flow graphs – Thermal and pneumatic system.

UNIT II	TIME RESPONSE	9

Type and order of the system – Types of test input – Time response of first and second order system – Time domain specifications static and dynamic Error coefficients – Steady state error – Root locus technique.

UNIT III	FREQUENCY RESPONSE	9

Frequency response – Frequency domain specifications – Correlation between frequency domain and time domain specifications – Determination of closed loop response from open loop response – Stability analysis – Bode plot –Polar Plot- Routh Hurwitz criterion – Nyquist stability criterion.

UNIT IV	CONTROLLERS AND COMPENSATORS DESIGN	9

Needs of Controller–Implementation of P,PD,PI and PID controller using OPAMP, Effects of controller in feedback system, Effect of adding poles and zeros – Lag, lead and lag-lead networks – Lag, lead and lag-lead compensators design using Bode plot – Design of state feedback controller.

UNIT V	STATE VARIABLE ANALYSIS	9

Concept of state variables – State models for linear and time invariant Systems – Different forms of state model – Solution of state equation - State transition Matrix and properties – Controllability and Observability – State model for Discrete time system.

TOTAL PERIODS: 45

TEXT BOOKS

1.	Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers, 2017, 6th edition.
2.	Norman S Nise, "Control Systems Engineering", 7th Edition, Wiley, 2015.

REFERENCE BOOKS

1.	M. Gopal, "Control Systems, Principles and Design", 4th Edition, Tata McGraw Hill, New Delhi, 2012.
2.	S.K.Bhattacharya, Control System Engineering, 3rd Edition, Pearson, 2013.
3.	Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Prentice Hall, 2012.
4.	K. Ogata, "Modern Control Engineering", PHI, 2012, 5th edition
5.	S.Palani, AnoopK.Jairath, "Automatic Control Systems including MATLAB", ANE Books, 2013.

6.	Benjamin C. Kuo, "Automatic Control systems", Wiley, 2014.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Derive transfer functions for electrical and mechanical systems	4
2	Analyze the root locus for a transfer function and interpret time response	4
3	Sketch Bode and Polar plots for a transfer function and verify the stability of a system by Routh-Hurwitz and Nyquist criteria	4
4	Implement a Controller and Design a Compensator using Bode plots	4
5	Solve a physical system with state variables	4

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	3					2			3	3	3
2	3	3	3	3					2			3	3	3
3	3	3	3	3					2			3	3	3
4	3	3	3	3					2			3	3	3
5	3	3	3	3					2			3	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22403	ELECTRICAL MACHINES II	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.
- Construction and performance of salient and non – salient type synchronous generators.
- Principle of operation and performance of synchronous motor.

UNIT I	THREE PHASE INDUCTION MOTOR	9

Constructional details – Types of rotors - Principle of operation – Slip – Equivalent circuit – Torque-Slip characteristics – Condition for maximum torque – Three phase windings – Cogging and crawling – Losses and efficiency – No load and blocked rotor tests – Circle diagram –Double cage induction motors– Induction Generator.

UNIT II	STARTING, BRAKING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR	9

Need for starting – Types of starters – DOL, Rotor resistance, Auto transformer and Star-delta starters – Speed control – Voltage control, Frequency control and Pole changing – Cascaded connection – V/F control – Slip power recovery scheme – Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT III	SINGLE PHASE INDUCTION MOTORS	9

Constructional details – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods – Capacitor- start & run Induction motor – Shaded pole induction motor– AC series motor – Hysteresis motor – Synchronous reluctance motor – Stepper motor.

UNIT IV	SYNCHRONOUS GENERATOR	9

Constructional details – Types of rotors Winding factors – EMF equation – Synchronous reactance – Armature reaction – Phasor diagram – Voltage regulation – EMF, MMF, ZPF and A.S.A methods – Synchronization – Synchronizing torque – Change of excitation and mechanical input - Parallel operation –- The Conditions Required for Paralleling - The General Procedure for Paralleling Generators– Two reaction theory – Slip test – Transient reactance.

UNIT V	SYNCHRONOUS MOTOR	9

Principle of operation – Torque equation – Operation on infinite bus bars – V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed – Hunting – frequency of oscillation – damper windings - Synchronous condenser.

TOTAL PERIODS: 45

TEXT BOOKS

1.	A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', McGraw Hill publishing Company Ltd, 6th Education 2017.
2.	Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
3.	Stephen J. Chapman, 'Electric Machinery Fundamentals', McGraw Hill Education Pvt. Ltd, 4th Edition 2017.

REFERENCE BOOKS

1.	D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 5th Edition 2017.
2.	P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2nd Edition, 2021.
3.	M.N. Bandyopadhyay, 'Electrical Machines Theory and Practice, PHI Learning PVT LTD', New Delhi, 2009.
4.	B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2015.
5.	Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002.

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Determine the performance parameters of a Three phase Induction Motor by suitable tests	3
2	Evaluate different types of Starters and classify the Speed control schemes of Three phase Induction Motors	3
3	Characterize different types of Single phase Induction Motors and special machines	3
4	Predict the Regulation of an Alternator by different methods	3
5	Describe the Operation and Characteristics of Synchronous Motors	3

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	3					2			3	3	3
2	3	3	3	3					2			3	3	3
3	3	3	3	3					2			3	3	3
4	3	3	3	3					2			3	3	3
5	3	3	3	3					2			3	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22404	MEASUREMENT AND INSTRUMENTATION	L T P C
		3 0 0 3

COURSE OBJECTIVES

- Educate the fundamental concepts and characteristics of measurement and errors.
- Impart the knowledge on the functional aspects of measuring instruments.
- Infer the importance of various bridge circuits used with measuring instruments.
- Educate the fundamental working of sensors and transducers and their applications.
- Understand the structure of overall measurement and instrumentation with the knowledge of digital Instrumentation principles.

UNIT I	INTRODUCTION TO MEASUREMENTS	9

Measurements – types–Classification and applications of instruments – Elements of a generalized measurement system – Static and Dynamic characteristics – Errors in measurement –Statistical evaluation of measurement data- Instrument standards.

UNIT II	ANALOG INSTRUMENTS	9

Classification of instruments – Moving Coil and Moving Iron meters – Induction type, Dynamometer type Wattmeters – Energy meter – Megger – Instrument transformers (CT & PT), Instrumentation Amplifier.

UNIT III	COMPARATIVE METHODS OF MEASUREMENTS	9

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) & A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops – Electrostatic and electromagnetic Interference – Grounding techniques.

UNIT IV	DIGITAL INSTRUMENTS, STORAGE AND DISPLAY DEVICES	9

Digital Multimeter, Energy meter, frequency meter, Phase meter, SD Card and tape – Recorders, digital plotters and printers, digital CRO, LED, LCD & Dot matrix display – Data Loggers.

UNIT V	TRANSDUCERS AND DATA ACQUISITION SYSTEMS	9

Classification and selection of Transducers – Resistive, Inductive and Capacitive transducer, Ultrasonic sensor, Piezoelectric, Hall effect and Optical Transducer – Smart Sensors. DSO – Introduction to PLC, SCADA, IOT and Introduction to Virtual Instrumentation using Lab view.

TOTAL PERIODS: 45

TEXT BOOKS

1.	A.K. Sawhney, PuneetSawhney ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, New Delhi, Edition 2015.
2.	H.S. Kalsi, ‘Electronic Instrumentation’, Tata McGraw-Hill, New Delhi, 2017.

REFERENCE BOOKS

1.	M.M.S. Anand, ‘Electronics Instruments and Instrumentation Technology’, Prentice Hall India, New Delhi, 2013.
2.	W.Bolton, Programmable Logic Controllers, Elseiver, 2010, 5th Edition.
3.	R.B. Northrop, ‘Introduction to Instrumentation and Measurements’, Taylor & Francis, New Delhi, 2008.
4.	E. O. Doebelin and D. N. Manik, “Measurement Systems – Application and Design”, Tata McGraw-Hill, New Delhi, 2007.
5.	R. K. Rajput, “Electrical and Electronics Measurements and Instrumentation”, Chand Pub, 2016.

COURSE OUTCOMES Upon the successful completion of the course, the students will be able to		
CO's	**STATEMENTS**	**RBT LEVEL**
1	Explain the Measurements in Engineering	5
2	Examine the structural elements of various Instruments	4
3	Estimate the unknown resistance, Inductance and Capacitance by using Bridges	5
4	Categorize the concept of Digital Instrumentation and Virtual Instrumentation	3
5	Apply the concepts of Sensors/Transducers	4
Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6		

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	2	2	3			2	3	2		3	2	3
2	3	3	2	2	3			2	3	2		3	2	3
3	3	3	2	2	3			2	3	2		3	2	3
4	3	3	2	2	3			2	3	2		3	2	3
5	3	3	3	2	3			2	3	2		3	2	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

EE22411	ANALOG ELECTRONICS LABORATORY	L T P C
		0 0 3 1.5

COURSE OBJECTIVES

- To verify the basic principles, operations and applications of op-amp and Special IC's.
- To understand the fabrication process.

LIST OF EXPERIMENTS

Linear applications of Op-amp	
1.	Inverting Amplifier, Non-Inverting Amplifier and Differential Amplifier
2.	Instrumentation Amplifier
3.	Differentiator and Integrator
Non-Linear applications of Op-amp	
4.	Comparator
5.	Clipper and Clamper
6.	Precision rectifier
7.	Multivibrators and Triangular wave generator
Data converters	
8.	Analog to digital converter
9.	Digital to analog converter
Active Filters	
10.	Low pass filter
11.	High pass filter
Special ICs Applications	
12.	Astable and Monostable Multivibrators using NE/SE 555 Timer IC
13.	Frequency multiplication using NE/SE 565 PLL IC
Application ICs	
14.	Design and Implementation of High and Low Voltage Regulator using IC723

TOTAL PERIODS:45

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Apply the fabrication technique for Monolithic device.	4
2	Validate the basic applications of Op-amp.	4
3	Construct waveform generation circuits of Op-amp.	4
4	Examine the operation of Special ICs (NE/SE 555 and NE/SE 565).	4
5	Experiment with different applications based on IC723.	4

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	2	3			2	2	2		2	2	
2	3	3	3	2	3			2	2	2		2	2	2
3	3	3	3	2	3			2	2	2		2	2	2
4	3	3	3	2	3			2	2	2		2	2	2
5	3	3	3	2	3			2	2	2		2	2	2
3- High Mapping; 2-Moderate Mapping; 1-Low Mapping														

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS		
SL.NO	**DESCRIPTION OF EQUIPMENTS**	**QUANTITY REQUIRED**
1.	Regulated Power supply	15
2.	CRO 30MHz	6
3.	DSO	4
4.	Function Generator	5
5.	Digital Multimeter	10
6.	Bread board	10
7.	Various IC	Each 10
8.	Resistors of various ranges	10
9.	Capacitors of various ranges	10
10.	Connecting wires	As required

EE22412	CONTROL SYSTEMS AND INSTRUMENTATION LABORATORY	L T P C
		0 0 3 1.5

COURSE OBJECTIVES

- Identify the transfer function parameter and state space equation of the system and to assess the system dynamic response.
- Assess the system performance using frequency and time domain analysis and methods for improving it.
- Design various controllers and compensators to improve system performance.
- Measure unknown passive parameters using bridges and understand ladder program
- Assess the dynamic characteristics of sensors and understand the calibration of measuring instruments.

LIST OF EXPERIMENTS

Control systems:	
1.	Determination of Transfer function parameters of DC shunt Motor and DC Generator
2.	a)Determination of speed – torque characteristics of AC Servomotor and to obtain its transfer function parameters b)Study of Synchro transmitter and receiver
3.	Time response analysis of first and second order system for various standard input and stability analysis of linear time invariant system using MATLAB software.
4.	Design of Lag and Lead compensator
5.	Simulation and Experimental Verification to study the effect of P, PI, PD and PID controller on the step response of a feedback control system
6.	Controllability and Observability tests for continuous time domain systems using MATLAB software.
Instrumentation:	
7.	Measurement of the unknown Resistance (Wheat stone's and Kelvin's Bridge)
8.	Measurement of the unknown inductance and capacitance (Anderson's and Schering Bridge)
9.	Calibration of Measuring Instruments and current transformer
10.	Dynamic characteristics of Sensors/Transducers (a)Temperature (b) Pressure (c) Displacement (d) Optical (e) Strain (f) Flow
11.	Study and development of the Ladder program for Logic gates using Programmable Logic Controller
	TOTAL PERIODS:45

REFERNCE BOOKS

1.	K. Ogata, 'Modern Control Engineering', 5th edition, Pearson Education India publisher, 2015
2.	A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, New Delhi, Edition 2015.

COURSE OUTCOMES		
Upon the successful completion of the course, the students will be able to		
CO's	**STATEMENTS**	**RBT LEVEL**
1	Predict the transfer function parameter of the DC Motor and Generator	3
2	Apply various the time and frequency domain techniques to assess the stability	3
3	Test the system controllability and observability using state space representation and applications of state space representation to various systems.	3
4	Use AC/DC bridge for accurate measurements of R, L and C values.	3
5	Calibrate various measuring instruments and draw the dynamic characteristics of sensors/transducers.	3
Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6		

COURSE ARTICULATION MATRIX

CO's	PO's												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	2	3	3		3	2			2	3	3
2	3	3	3	2	3	3		3	2			2	3	3
3	3	3	3	2	3	3		3	2			2	3	3
4	3	3	3	2	3	3		3	2			2	3	3
5	3	3	3	2	3	3		3	2			2	3	3

3- High Mapping; 2-Moderate Mapping; 1-Low Mapping

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS		
SL.NO	**DESCRIPTION OF EQUIPMENTS**	**QUANTITY REQUIRED**
1.	Design of PID controller kit	1
2.	DC Shunt motor	1
3.	DC Generator	1
4.	AC Servo motor with load and speed sensor kit	1
5.	Synchro -Transmitter and Receiver with voltmeter kit	1
6.	MC/MI Voltmeter	6
7.	MC/MI Ammeter	6
8.	Lag-Lead compensator design kit	1
9.	Digital storage Oscilloscope	4
10.	2MHz Function Generator	2
11.	Lamp Load	1
12.	Personal computers with MATLAB software	10
13.	Rheostats	6
14.	CRO Probe	2
15.	Bread board	3

16.	Connecting wires/Patch cords	As required
17.	Kelvin Double bridge kit	1
18.	Wheat stone Bridge kit	1
19.	Anderson Bridge kit	1
20.	Schering Bridge kit	1
21.	LVDT Kit	1
22.	Kit assembly of Pressure Sensor/Temperature sensor/ Level sensor/Optical sensor	1
23.	PLC with Process control kit	1
24.	Current Transformer	1
25.	Energy meter	1
26.	Multimeter	6
27.	Various range of Unknown Resistance/Inductance/Capacitance	Each 10
28.	Wattmeter	2
29.	Galvanometer	1
30.	Stopwatch	1
32.	Autotransformer	1
33.	Regulated Power Supply	3
34.	CRO/DSO	2
35.	WPL software 2.47	-

EE22413	ELECTRICAL MACHINES II LABORATORY	L T P C
		0 0 3 1.5

COURSE OBJECTIVES

- Familiarize the students with the operation of synchronous machines and induction machines and equip them with experimental skills.

LIST OF EXPERIMENTS	
1.	Regulation of Three Phase Alternator by EMF and MMF methods
2.	Regulation of Three Phase Alternator by ZPF and ASA methods
3.	Regulation of Three Phase salient pole Alternator by slip test
4.	V and Inverted V curves of Three Phase Synchronous Motor
5.	Load test on Single Phase and Three Phase Induction Motor (Cage & Slip ring)
6.	Equivalent circuit parameters of Three Phase Induction Motor by no load and blocked rotor tests
7.	Equivalent circuit parameters of Single Phase Induction Motor by no load and blocked rotor tests
8.	Study of braking methods of Three Phase Induction Motor
9.	Speed control of Induction motor by different methods
10.	Synchronization of Alternator with Infinite Bus-bar
11.	Load Test on Three Phase Alternator
12.	Study of Induction Generator (Stand-alone and Grid-connected)
	TOTAL PERIODS:45

COURSE OUTCOMES

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

CO's	STATEMENTS	RBT LEVEL
1	Understand and analyze EMF and MMF methods	5
2	Analyze the characteristics of V and Inverted V curves	4
3	Hands-on experience of conducting various tests on alternators and obtain their performance indices using standard analytical as well as graphical methods	3
4	Hands-on experience of conducting various tests on induction motors and obtaining their performance indices using standard analytical as well as graphical methods	5
5	Calculate different types of losses	5

Bloom's Taxonomy (RBT) Level: Remember-1; Understand-2; Apply-3; Analyze-4; Evaluate-5; Create-6

COURSE ARTICULATION MATRIX														
CO's	**PO's**												**PSO's**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	3	3	3	3	2	2		2	3	3		3	3	3
2	3	3	3	3	2	2		2	3	3		3	3	3
3	3	3	3	3	2	2		2	3	3		3	3	3
4	3	3	3	3	2	2		2	3	3		3	3	3
5	3	3	3	3	2	2		2	3	3		3	3	3
3- High Mapping; 2-Moderate Mapping; 1-Low Mapping														

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS		
SL.NO	**DESCRIPTION OF EQUIPMENTS**	**QUANTITY REQUIRED**
1.	DC Shunt Motor Coupled with Three phase cylindrical rotor alternator	2
2.	DC Shunt Motor Coupled with Three phase salient-pole alternator	1
3.	DC Shunt Motor Coupled with Three phase cage induction motor	1
4.	Synchronous Induction motor	1
5.	Single Phase Induction Motor with Loading Arrangement	2
6.	Three Phase cage Induction Motor with loading Arrangement	4
7.	Three phase slip ring induction motor with loading arrangement	2
8.	Rotor resistance panel for slip ring induction motor	1
9.	AC drive for speed control of induction motor	1
10.	Static Kramer drive	1
11.	Dynamic braking panel	1
12.	Tachometer -Digital/Analog	12
13.	Single Phase Auto Transformer	2
14.	Three Phase Auto Transformer	5
15.	Single Phase Resistive Loading Bank	2
16.	Three Phase Resistive Loading Bank	3
17.	Three phase Capacitor Bank	2
18.	Three phase Inductive load	1
19.	TPDT switch	2
20.	Wattmeter	12
21.	Rheostats	15
22.	Ammeters	20
23.	Voltmeters	20