



REGULATIONS 2024

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

FACULTY OF.....*EEC*.....
BOS/CHAIRMAN.....*[Signature]*.....



JAI SHRIRAM ENGINEERING COLLEGE, TIRUPPUR – 638 660
(An Autonomous Institution)
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Recognized by UGC & Accredited by NAAC and NBA (CSE and ECE)



REGULATIONS 2024
B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER – I

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24UIP001	Induction Program	-	-	-	-	0
THEORY							
2.	24UHS101	Professional English-I	HSM	3	0	0	3
3.	24UMA101	Matrices and Calculus	BS	3	1	0	4
4.	24UPH101	Engineering Physics	BS	3	0	0	3
5.	24UCY101	Engineering Chemistry	BS	3	0	0	3
6.	24UGE101	Problem Solving and Python Programming	ES	3	0	0	3
7.	24UHS102	தமிழர் மரபு / Heritage of Tamils	HSM	1	0	0	1
PRACTICAL							
8.	24UGE111	Problem Solving and Python Programming Laboratory	ES	0	0	4	2
9.	24UBS111	Physics and Chemistry Laboratory	BS	0	0	4	2
10.	24UHS111	English Laboratory	EE	0	0	2	1
Total Credits				16	1	10	22

SEMESTER – II

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UHS201	Professional English-II	HSM	2	0	0	2
2.	24UMA201	Statistics and Numerical Methods	BS	3	1	0	4
3.	24UPH201	Physics for Electrical Engineering	BS	3	0	0	3
4.	24UEE201	Electric Circuits Analysis	PC	3	1	0	4
5.	24UHS202	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSM	1	0	0	1
THEORY CUM PRACTICAL							
6.	24UGEI201	Engineering Graphics and Drafting	ES	3	0	2	4
PRACTICAL							
7.	24UGE211	Engineering Fundamentals Laboratory	ES	0	0	4	2
8.	24UEE211	Electric Circuits Analysis Laboratory	PC	0	0	4	2
9.	24UHS211	Communication Laboratory	EE	0	0	4	2
Total Credits				15	2	14	24

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SEMESTER – III

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UMA301	Transforms and Partial Differential Equations	BS	3	1	0	4
2.	24UEE301	Electromagnetic Theory	PC	3	1	0	4
3.	24UEE302	Electrical Machines I	PC	3	0	0	3
4.	24UEE303	Digital Electronics	PC	3	0	0	3
5.	24UCS321	C Programming and Data Structures	ES	3	0	0	3
THEORY CUM PRACTICAL							
6.	24UEEI301	Electronic Devices and Circuits	PC	3	0	2	4
PRACTICAL							
7.	24UEE311	Electrical Machines I Laboratory	PC	0	0	3	1.5
8.	24UCS322	C Programming and Data Structures Laboratory	ES	0	0	3	1.5
9.	24UEE312	Professional Career Course I	EE				1
Total Credits				18	2	08	25

SEMESTER – IV

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UEE401	Transmission and Distribution	PC	3	1	0	4
2.	24UEE402	Electrical Machines II	PC	3	0	0	3
3.	24UEE403	Linear IC and Applications	PC	3	0	0	3
4.	24UGE401	Environmental Science and Sustainability	BS	2	0	0	2
5.	24UEE404	Measurement and Instrumentation	PC	3	0	0	3
THEORY CUM PRACTICAL							
6.	24UEEI401	Microprocessor and Microcontroller	PC	3	0	2	4
PRACTICAL							
7.	24UEE411	Electrical Machines II Laboratory	PC	0	0	3	1.5
8.	24UEE412	Digital and Linear Circuits Laboratory	PC	0	0	3	1.5
9.	24UEE413	Professional Career Course II	EE				1
Total Credits				17	1	08	23

NH

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SEMESTER – V

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UGE501	Human Values and Ethics	HSM	3	0	0	3
2.	24UEE501	Power System Analysis	PC	3	1	0	4
3.	24UEE502	Control Systems	PC	3	1	0	4
4.	24UEE503	Power Electronics	PC	3	0	0	3
5.		Professional Elective – I	PE	3	0	0	3
6.		Open Elective – I	OE	3	0	0	3
7.		Mandatory Course-I	MC	1	0	0	0
PRACTICAL							
8.	24UEE511	Control Systems Laboratory	PC	0	0	3	1.5
9.	24UEE512	Power Electronics & Drives Laboratory	PC	0	0	3	1.5
10.	24UEE513	Professional Career Course III	EE				1
Total Credits				19	2	6	24

SEMESTER – VI

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UEE601	Power System Operation and Control	PC	3	0	0	3
2.	24UEE602	Protection and Switchgear	PC	3	0	0	3
3.		Professional Elective – II	PE	3	0	0	3
4.		Professional Elective – III	PE	3	0	0	3
5.		Professional Elective – IV	PE	3	0	0	3
6.		Open Elective II	OE	3	0	0	3
7.		Mandatory Course-II	MC	1	0	0	0
PRACTICAL							
8.	24UEE611	Power Systems Laboratory	PC	0	0	3	1.5
9.	24UEE612	Mini Project	EE	0	0	0	1.5
Total Credits				19	0	3	21


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SEMESTER – VII

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UMG701	Principles of Management	HSM	3	0	0	3
2.	24UEE701	Renewable Energy Systems	PC	3	0	0	3
3.		Professional Elective – V	PE	3	0	0	3
4.		Professional Elective – VI	PE	3	0	0	3
5.		Open Elective - III	OE	3	0	0	3
PRACTICAL							
6.	24UEE711	Internship / Industrial Training	EE	0	0	0	2
Total Credits				15	0	0	17

SEMESTER – VIII

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
PRACTICAL							
1.	24UEE811	Project Work	EE	0	0	20	10
Total Credits				0	0	20	10

Total Credits for the entire Programme: 166


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S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
PROFESSIONAL ELECTIVE I							
1.	24UEEP501	PLC Programming	PE	3	0	0	3
2.	24UEEP502	Discrete Signal Processing	PE	3	0	0	3
3.	24UEEP503	Electrical Machine Design	PE	3	0	0	3
4.	24UEEP504	Special Electrical Machines	PE	3	0	0	3
5.	24UEEP505	Power Quality Engineering	PE	3	0	0	3
6.	24UEEP506	Electrical Wiring & Cost Estimation	PE	3	0	0	3
PROFESSIONAL ELECTIVE II							
1.	24UEEP601	Sensor and Transducer	PE	3	0	0	3
2.	24UEEP602	Embedded System Design	PE	3	0	0	3
3.	24UEEP603	Analysis of Electrical Machines	PE	3	0	0	3
4.	24UEEP604	Advanced Control System	PE	3	0	0	3
5.	24UEEP605	Substation Engineering and Automation	PE	3	0	0	3
6.	24UEEP606	Smart Grid Technology	PE	3	0	0	3
PROFESSIONAL ELECTIVE III							
1.	24UEEP607	Hybrid Energy Technology	PE	3	0	0	3
2.	24UEEP608	Embedded C Programming	PE	3	0	0	3
3.	24UEEP609	Solid State Drives	PE	3	0	0	3
4.	24UEEP610	Computer Control of Processor	PE	3	0	0	3
5.	24UEEP611	Custom Power Devices	PE	3	0	0	3
6.	24UEEP612	EV Technology	PE	3	0	0	3
PROFESSIONAL ELECTIVE IV							
1.	24UEEP613	Electrical Energy Storage Systems	PE	3	0	0	3
2.	24UEEP614	Smart System Automation	PE	3	0	0	3
3.	24UEEP615	Switched Mode Power Converters	PE	3	0	0	3
4.	24UEEP616	Industrial IoT and Applications	PE	3	0	0	3
5.	24UEEP617	Power System Transients	PE	3	0	0	3
6.	24UEEP618	Grid Integration of Electric Vehicles	PE	3	0	0	3
PROFESSIONAL ELECTIVE V							
1.	24UEEP701	Wearable Electronics	PE	3	0	0	3
2.	24UEEP702	Embedded Control for Electric Drives	PE	3	0	0	3
3.	24UEEP703	Power Electronics for Renewable Energy Systems	PE	3	0	0	3
4.	24UEEP704	Soft Computing Techniques	PE	3	0	0	3
5.	24UEEP705	Electric Energy Utilization & Conservation	PE	3	0	0	3
6.	24UEEP706	Battery Management System	PE	3	0	0	3
PROFESSIONAL ELECTIVE VI							
1.	24UEEP707	Defense Electronics	PE	3	0	0	3
2.	24UEEP708	VLSI Design	PE	3	0	0	3
3.	24UEEP709	Control of Power Electronics Circuits	PE	3	0	0	3
4.	24UEEP710	AI in Electrical Engineering	PE	3	0	0	3
5.	24UEEP711	Energy Management and Auditing	PE	3	0	0	3
6.	24UEEP712	Electric and Hybrid Vehicle	PE	3	0	0	3



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OPEN ELECTIVE

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24UCEO01	Augmented Reality /Virtual Reality	OE	3	0	0	3
2.	24UCEO02	Remote Sensing Concepts	OE	3	0	0	3
3.	24UCEO03	Geographical Information System	OE	3	0	0	3
4.	24UCEO04	Fire Safety Engineering	OE	3	0	0	3
5.	24UCSO01	Java Programming	OE	3	0	0	3
6.	24UCSO02	UI & UX Design	OE	3	0	0	3
7.	24UCSO03	Cloud Computing	OE	3	0	0	3
8.	24UCSO04	Data Science	OE	3	0	0	3
9.	24UEEO01	Renewable Energy Technologies	OE	3	0	0	3
10.	24UEEO02	Hybrid Electric Vehicles	OE	3	0	0	3
11.	24UEEO03	Introduction to PLC Programming	OE	3	0	0	3
12.	24UEEO04	Energy Conservation & Management	OE	3	0	0	3
13.	24UEEO05	Fundamentals of Electronic Devices	OE	3	0	0	3
14.	24UEEO06	Batteries and Management System	OE	3	0	0	3
15.	24UEEO07	Sensors and Actuators	OE	3	0	0	3
16.	24UEEO08	Electrical, Electronic & Magnetic Materials	OE	3	0	0	3
17.	24UECO01	Basics of Communication Technologies	OE	3	0	0	3
18.	24UECO02	Image Processing	OE	3	0	0	3
19.	24UECO03	Basics of IoT	OE	3	0	0	3
20.	24UECO04	Introduction to PLC Programming	OE	3	0	0	3
21.	24UECO05	Sensors for Engineering Applications	OE	3	0	0	3
22.	24UECO06	Industry 4.0 and Industrial IoT	OE	3	0	0	3
23.	24UFTO01	Basics of Textile Technology	OE	3	0	0	3
24.	24UFTO02	Fundamentals of Fashion Design	OE	3	0	0	3
25.	24UFTO03	Garment Manufacturing Technology	OE	3	0	0	3
26.	24UFTO04	Basics of Textile Finishing	OE	3	0	0	3
27.	24UFTO05	Industrial Engineering for Garment Industry	OE	3	0	0	3
28.	24UFTO06	Basics of Dyeing and Printing	OE	3	0	0	3
29.	24UMEO01	Fundamentals of Robotics	OE	3	0	0	3
30.	24UMEO02	Nano Technology	OE	3	0	0	3
31.	24UMEO03	Reverse Engineering	OE	3	0	0	3
32.	24UMEO04	Industrial Engineering	OE	3	0	0	3
33.	24UMEO05	Introduction to Additive Manufacturing	OE	3	0	0	3
34.	24UMEO06	Energy Conservation in Industries	OE	3	0	0	3
35.	24UITO01	Digital Image Processing and Its Applications	OE	3	0	0	3
36.	24UITO02	Fundamentals of Databases	OE	3	0	0	3
37.	24UITO03	Internet Programming	OE	3	0	0	3
38.	24UITO04	Fundamentals of Internet of Things	OE	3	0	0	3
39.	24UITO05	Fundamentals of Blockchain	OE	3	0	0	3

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PROFESSIONAL CAREER COURSE

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S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
PROFESSIONAL CAREER COURSE I / II / III							
1.	24UEEC01	Design Thinking	EE	1	0	0	1
2.	24UEEC02	Innovation Practice	EE	1	0	0	1
3.	24UEEC03	Quantitative Aptitude	EE	1	0	0	1
4.	24UEEC04	Verbal & Logical Reasoning	EE	1	0	0	1
5.	24UEEC05	PCB System Design	EE	0	0	2	1
6.	24UEEC06	CAD for Electrical System	EE	0	0	2	1
7.	24UEEC07	Control Panel Design	EE	0	0	2	1
8.	24UEEC08	Solar Panel Installation	EE	0	0	2	1

MANDATORY COURSES I

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24UMC801	Introduction to Women and Gender Studies	MC	3	0	0	0
2.	24UMC802	Automotive Safety	MC	3	0	0	0
3.	24UMC803	State, Nation Building and Politics in India	MC	3	0	0	0
4.	24UMC804	Disaster Risk Reduction and Management	MC	3	0	0	0
5.	24UMC805	Film Appreciation	MC	3	0	0	0
6.	24UMC806	Elements of Literature	MC	3	0	0	0
7.	24UMC807	Inclusive Work Culture	MC	3	0	0	0
8.	24UMC808	Quality Systems	MC	3	0	0	0
9.	24UMC809	Industrial Practices and Requirements	MC	3	0	0	0

MANDATORY COURSES II

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24UMC901	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	MC	3	0	0	0
2.	24UMC902	History of Science and Technology in India	MC	3	0	0	0
3.	24UMC903	Political and Economic Thought for a Humane Society	MC	3	0	0	0
4.	24UMC904	Industrial Safety	MC	3	0	0	0
5.	24UMC905	Quantitative and verbal proficiency	MC	3	0	0	0
6.	24UMC906	Industrial Hydraulic Circuits	MC	3	0	0	0
7.	24UMC907	Electrical Safety	MC	3	0	0	0


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CREDITS SUMMARY

S. No	Course Components	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1.	HSM	4	3			3		3		13
2.	BS	12	7	4	2					25
3.	ES	5	6	4.5						15.5
4.	PC		5	15.5	20	14	8.5	3		66
5.	PE					3	9	6		18
6.	OE					3	3	3		9
7.	EE	1	2	1	1	1	1.5	2	10	19.5
8.	MC					√	√			√
Total Credits		22	23	25	23	24	22	17	10	166

COMPARISON OF CREDIT SUMMARY

S. No	Course Components	AICTE Recommendation		Anna University Curriculum R2021		JSREC Autonomous Curriculum R2024	
		Credits	% Credits	Credits	% Credits	Credits	% Credits
1	Humanities, Social Science and Management (HSM)	12	8%	12	7%	13	8%
2	Basic Sciences (BS)	26	16%	25	15%	25	15%
3	Engineering Sciences (ES)	20	13%	14	8%	15.5	9%
4	Professional Core (PC)	53	34%	69	41%	66	40%
5	Professional Electives (PE)	18	11%	21	13%	18	11%
6	Open Electives (OE)	18	11%	12	7%	9	5%
7	Employment Enhancement Course (EE)	11	7%	14	8%	19.5	12%
8	Mandatory (Non-Credit Course (MC)	-	-	-	-	√	√
TOTAL CREDITS		158	100%	167	100%	166	100%

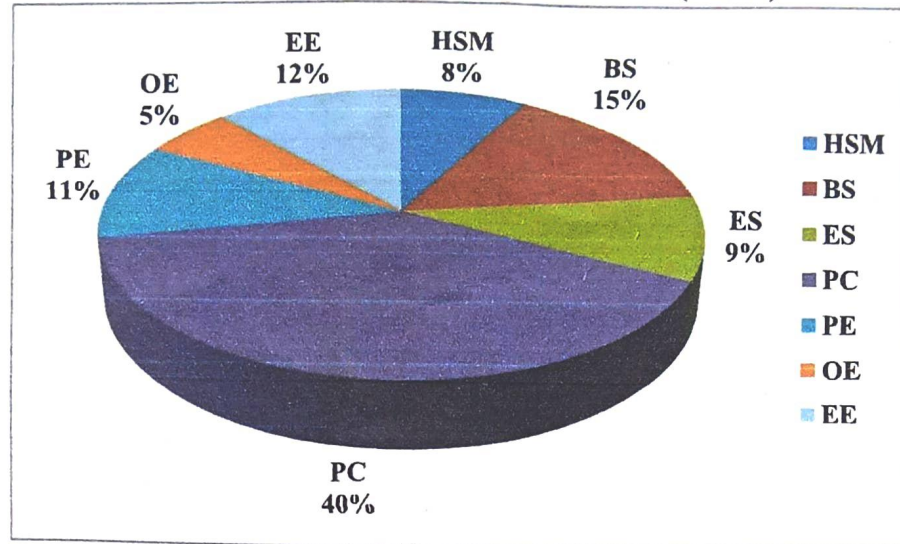
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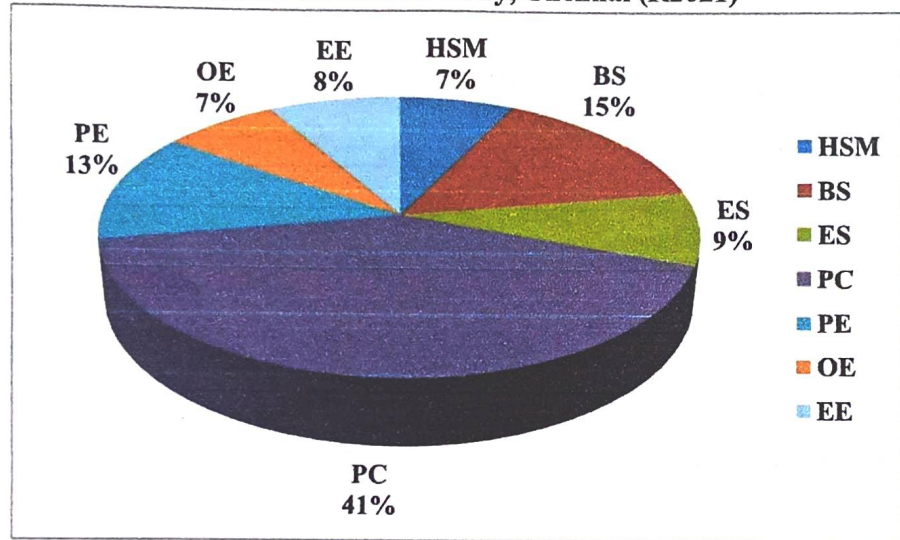
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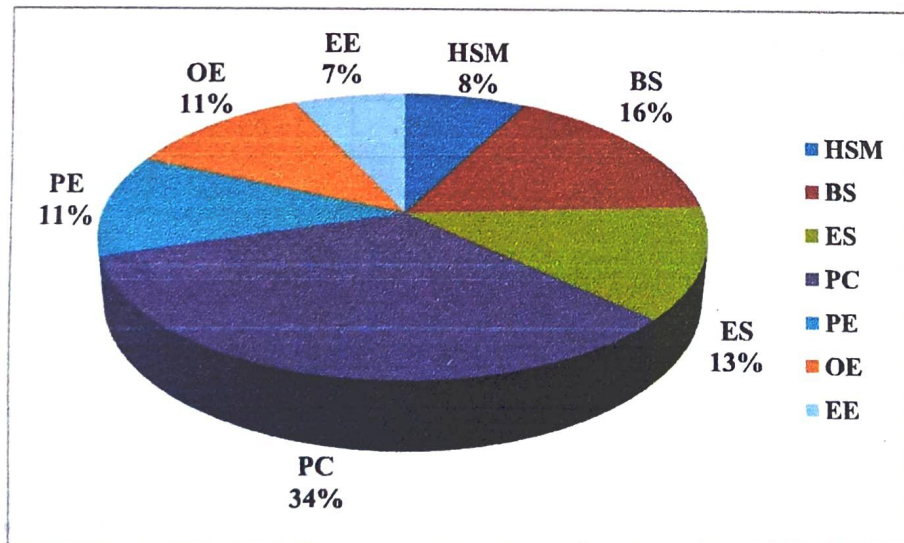
Credits Proposed by JSREC Curriculum (R2024)



Credits - Anna University, Chennai (R2021)



Credits - AICTE



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REGULATIONS 2024

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR I SEMESTER

FACULTY OF.....	ECE
BOS/CHAIRMAN.....	NH

24UHS101	PROFESSIONAL ENGLISH I (Common to all Branches)	L	T	P	C
		3	0	0	3

Prerequisites:

- Basic Knowledge in Language usage

COURSE OBJECTIVES:

- To improve the communicative competence of learners
- To learn to use basic grammatical structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals

UNIT-I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	9
Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).		

UNIT-II	NARRATION AND SUMMATION	9
Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar -Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.		

UNIT-III	DESCRIPTION OF A PROCESS / PRODUCT	9
Reading - Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).		

UNIT-IV	CLASSIFICATION AND RECOMMENDATIONS	9
Reading - Newspaper articles; Journal reports -and Non Verbal Communication (tables, pie charts etc.,). Writing - Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from non verbal (chart, graph etc, to verbal mode) Grammar - Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.		

UNIT-V	EXPRESSION	9
Reading - Reading editorials; and Opinion Blogs; Writing - Essay Writing (Descriptive or narrative). Grammar - Future Tenses, Punctuation; Negation (Statements & Questions); and		


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Simple, 27 Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions - Content vs Function words.

L: 45	T: 00	P: 00	Total : 45 Periods
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TEXT BOOKS

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES

1. Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma. Oxford Univ. Press, 2016, New Delhi.
2. A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.

WEB RESOURCES

- https://www.lisedunetwork.com/the-fundamentals-of-communication/#google_vignette
- <http://hdl.handle.net/10603/58170>
- <https://www.vedantu.com/english/narration>
- <https://asana.com/resources/product-development-process>
- <https://onlinelibrary.wiley.com/doi/10.1155/2019/8043905>

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: To use appropriate words in a professional context
CO2: To gain understanding of basic grammatical structures and use them in right context
CO3: To read and infer the denotative and connotative meanings of technical texts
CO4: To read and interpret information presented in tables, charts and other graphic forms
CO5: To write definitions, descriptions, narrations and essays on various topics


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24UMA101	MATRICES AND CALCULUS (Common to All Branches)	L 3	T 1	P 0	C 4
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Prerequisites:

- Knowledge in Basic Calculus

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT-I	MATRICES	9 + 3
Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley – Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane.		

UNIT-II	DIFFERENTIAL CALCULUS	9 + 3
Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules (sum, product, quotient, chain rules) – Implicit differentiation – Logarithmic differentiation – Applications – Maxima and Minima of functions of one variable.		

UNIT-III	FUNCTIONS OF SEVERAL VARIABLES	9 + 3
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications : Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.		

UNIT-IV	INTEGRAL CALCULUS	9 + 3
Definite and Indefinite integrals – Substitution rule – Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions – Improper integrals – Applications: Hydrostatic force and pressure, moments and centres of mass.		

UNIT-V	MULTIPLE INTEGRALS	9 + 3
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications: Moments and centres of mass, moment of inertia.		

L:45	T: 15	P: 00	Total : 60 Periods
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HEAD OF THE DEPARTMENT
 Dept of Science & Humanities,
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 TIRUPUR -638 660, Tamilnadu.

TEXT BOOKS

1. Kreyszig, E., "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal, B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV = Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 = 7.4 and 7.8]

REFERENCES

1. Anton, H, Bivens, I and Davis, S., "Calculus", Wiley, 10th Edition, 2016.
2. Bali, N., Goyal, M. and Watkins, C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt. Ltd.), New Delhi, 7th Edition, 2009.
3. Jain, R.K. and Iyengar, S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
4. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Ramana, B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Srimantha Pal and Bhunia, S.C., "Engineering Mathematics" Oxford University Press, 2015.
7. Thomas, G. B., Hass, J. and Weir, M.D., "Thomas Calculus", 14th Edition, Pearson India, 2018.

WEB RESOURCES

- <http://explained.ai/matrix-calculus/index.html>
- <https://www.comp.nus.edu.sg/~cs5240/lecture/matrix-differentiation.pdf>
- <https://github.com/Lymn16/Matrix-Calculus>
- <https://nptel.ac.in/>

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Use the matrix algebra methods for solving practical problems.
CO2: Apply differential calculus tools in solving various application problems.
CO3: Able to use differential calculus ideas on several variable functions.
CO4: Apply different methods of integration in solving practical problems.
CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.


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24UPH101	ENGINEERING PHYSICS (Common to All Branches)	L	T	P	C
		3	0	0	3

Prerequisites:

Nil

COURSE OBJECTIVES:

- To make the students effectively achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT-I	MECHANICS	9
Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M.I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.		

UNIT-II	ELECTROMAGNETIC WAVES	9
The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.		

UNIT-III	OSCILLATIONS, OPTICS AND LASERS	9
Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference –Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO ₂ laser, semiconductor laser –Basic applications of lasers in industry.		

UNIT-IV	BASIC QUANTUM MECHANICS	9
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.		

UNIT-V	APPLIED QUANTUM MECHANICS	9
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.		

L:45	T: 00	P: 00	Total : 45 Periods
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TEXT BOOKS
1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017. 2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013. 3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.
REFERENCES
1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009. 2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004. 3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019. 4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015. 5. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-Verlag, 2012.
WEB RESOURCES
• https://www.youtube.com/watch?v=caitynfev64 • https://youtu.be/SqhWxOjBb74 • https://youtu.be/F11MHPDd5D8 • https://youtu.be/NGGSROr3Tlc • https://youtu.be/b-w4TSkhlhE
COURSE OUTCOMES
At the end of the course, students should be able to CO1: Understand the importance of mechanics. CO2: Express their knowledge in electromagnetic waves. CO3: Demonstrate a strong foundational knowledge in oscillations, optics and lasers. CO4: Understand the importance of quantum physics. CO5: Compare and apply quantum mechanical principles towards the formation of energy bands.


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24UCY101	ENGINEERING CHEMISTRY (Common to all Branches)	L	T	P	C
		3	0	0	3

Prerequisites:
Nil

COURSE OBJECTIVES:
- To inculcate sound understanding of water quality parameters and water treatment techniques. - To impart knowledge on the basic principles and preparatory methods of nanomaterials. - To introduce the basic concepts and applications of phase rule and composites - To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics. - To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT-I	WATER AND ITS TREATMENT	9
Water: Sources and impurities, Water quality parameters: Definition and significance of- color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge. Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment (Phosphate, Colloidal, Sodium aluminate and Calgon conditioning) and External treatment—Ion exchange demineralization and Zeolite process.		

UNIT-II	NANO CHEMISTRY	9
Basics: Distinction between molecules, nano materials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nano materials: Definition, properties and uses of – nano particle, nano cluster, nano rod, nano wire and nano tube. Preparation of nano materials: sol-gel, solvo thermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nano materials in medicine, agriculture, energy, electronics and catalysis.		

UNIT-III	PHASE RULE AND COMPOSITES	9
Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.		

UNIT-IV	FUELS AND COMBUSTION	9
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil- cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO ₂ emission and carbon footprint.		

UNIT-V	ENERGY SOURCES AND STORAGE DEVICES	9
Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water		


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nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion- battery; Electric vehicles - working principles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell; Super capacitors: Storage principle, types and examples.

L:45	T: 00	P: 00	Total : 45 Periods
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TEXT BOOKS

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCES

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

WEB RESOURCES

- <https://testbook.com/ias-preparation/water-treatment>
- <https://onlinelibrary.wiley.com/doi/full/10.1002/nano.202300038>
- https://www.pratapsir.com/2023/01/notes-on-phase-rule_21.html
- <https://en.wikipedia.org/wiki/Fuel>

COURSE OUTCOMES

At the end of the course students should be able

- CO1: To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
- CO2: To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- CO3: To apply the knowledge of phase rule and composites for material selection requirements.
- CO4: To recommend suitable fuels for engineering processes and applications.
- CO5: To recognize different forms of energy resources and apply them for suitable applications in energy sectors.


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24UGE101	PROBLEM SOLVING AND PYTHON PROGRAMMING (Common to All Branches)	L	T	P	C
		3	0	0	3

Prerequisites:
Nil

COURSE OBJECTIVES:
• To understand the basics of algorithmic problem solving. • To learn to solve problems using Python conditionals and loops. • To define Python functions and use function calls to solve problems. • To use Python data structures - lists, tuples, dictionaries to represent complex data. • To do input/output with files in Python.

UNIT-I	COMPUTATIONAL THINKING AND PROBLEM SOLVING	9
Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.		

UNIT-II	DATA TYPES, EXPRESSIONS, STATEMENTS	9
Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.		

UNIT-III	CONTROL FLOW, FUNCTIONS, STRINGS	9
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.		

UNIT-IV	LISTS, TUPLES, DICTIONARIES	9
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.		

UNIT-V	FILES, MODULES, PACKAGES	9
Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).		

L:45	T:0	P:0	Total: 45 PERIODS
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TEXT BOOKS
1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016. 2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
REFERENCES
1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1 st Edition, 2021. 2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1 st Edition, Notion Press, 2021. 3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021 4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2 nd Edition, No Starch Press, 2019. 5. Martin C. Brown, "Python: The Complete Reference", 4 th Edition, Mc-Graw Hill, 2018.
WEB RESOURCES
• https://www.python.org/ • https://nptel.ac.in/courses/106106145/
COURSE OUTCOMES
Upon completion of the course, the students will be able to
CO1: Develop algorithmic solutions to simple computational problems and and execute simple Python programs. CO2: Write simple Python programs using conditionals and loops for solving problems. CO3: Decompose a Python program into functions. CO4: Represent compound data using Python lists, tuples, dictionaries etc. CO5: Read and write data from/to files in Python programs.


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24UHS102	HERITAGE OF TAMILS (Common to All Branches)	L	T	P	C
		1	0	0	1

Prerequisites:

Nil

COURSE OBJECTIVES:

- Appreciate Tamil art, culture and literature.
- Learn the history and culture of Tamil language.
- Relate to various art forms and their relevance to development .
- Acknowledge the rich heritage and significant achievements of the Tamilians.
- Appreciate the contribution of Tamilians to nation building.

UNIT I	LANGUAGE AND LITERATURE	3
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Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	3
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Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III	FOLK AND MARTIAL ARTS	3
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Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV	TIINAI CONCEPT OF TAMILS	3
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Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONALEMENT AND INDIAN CULTURE	3
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Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

L:15	T: 00	P: 00	Total : 15 Periods
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TEXT-CUM-REFERENCE BOOKS

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

COURSE OUTCOMES

At the end of the course students should be able

- CO1: Understand the significance of Tamil as a classical language.
CO2: Relate the art and culture in Tamil language.
CO3: Explain the importance of music, dance and martial arts that were derived from Tamil Culture.
CO4: Understand the poetic mode or theme of classical language.
CO5: Relate the contribution of Tamils to Nation building.


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24UHS102	தமிழர் மரபு (Common to All Branches)	L	T	P	C
		1	0	0	1

அலகு I	மொழி மற்றும் இலக்கியம்	3
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை -சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள் ,தமிழகத்தில் சமண, பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம் , ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு		

அலகு II	மரபு- பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை	3
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் , பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.		

அலகு III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள் .		

அலகு IV	தமிழர்களின் திணைக் கோட்பாடுகள்	3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி		

அலகு V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு -இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு .		

L:15	T: 00	P: 00	Total : 15 Periods
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TEXT-CUM-REFERENCE BOOKS

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


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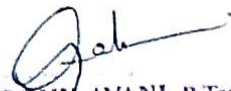
24UGE111	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY (Common to All Branches)	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, and dictionaries to represent complex data.
- To do input/output with files in Python.

S.No.	LIST OF EXERCISES:
1	Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuited.)
2	Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3	Scientific problems using Conditionals and Iterative loops.(Number series, Number Patterns, pyramid pattern)
4	Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/Materials required for construction of a building –operations of list & tuples).
5	Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries).
6	Implementing programs using Functions.(Factorial, largest number in a list, area of shape)
7	Implementing programs using Strings.(reverse,palindrome,charactercount,replacing characters).
8	Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy).
9	Implementing real-time / technical applications using File handling.(copy from one file to another, word count, longest word).
10	Implementing real-time / technical applications using Exception handling.(divide by zero error, voter's age validity, student mark range validation).
11	Exploring Pygame tool.
12	Developing a game activity using Pygame like bouncing ball, carrace etc.

L:00	P:60	T:00	Total: 60 PERIODS
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LIST OF EQUIPMENTS REQUIRED**HARDWARE REQUIREMENTS**

Standard PC

SOFTWARE REQUIREMENTS

1. Windows 7 or higher
2. Python latest version

COURSE OUTCOMES

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

CO1: Develop algorithmic solutions to simple computational problems

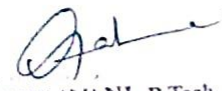
CO2: Develop and execute simple Python programs.

CO3: Implement programs in Python using conditionals and loops for solving problems.

CO4: Deploy functions to decompose a Python program.

CO5: Process compound data using Python data structures.

CO6: Utilize Python packages in developing software applications.



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24UBS111	PHYSICS AND CHEMISTRY LABORATORY (Common to All Branches)	L	T	P	C
		0	0	4	2

PHYSICS EXPERIMENTS (Any Seven Experiments)

Prerequisites:
Nil

COURSE OBJECTIVES:
- To learn the proper use of various kinds of physics laboratory equipment. - To learn how data can be collected, presented and interpreted in a clear and concise manner. - To learn problem solving skills related to physics principles and interpretation of experimental data. - To determine error in experimental measurements and techniques used to minimize such error. - To make the student an active participant in each part of all lab exercises.

- Torsion pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects. - Simple harmonic oscillations of cantilever. - Non-uniform bending - Determination of Young's modulus. - Uniform bending - Determination of Young's modulus. - Laser- Determination of the wave length of the laser using grating. - Air wedge - Determination of thickness of a thin sheet/wire. a) Optical fibre -Determination of Numerical Aperture and acceptance angle. b) Compact disc- Determination of width of the groove using laser. - Acoustic grating- Determination of velocity of ultrasonic waves in liquids. - Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids. - Post office box -Determination of Band gap of a semiconductor. - Photoelectric effect. - Michelson Interferometer. - Melde's string experiment. - Experiment with lattice dynamics kit.
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TEXT BOOKS
- Marko Pinteric, Building Physics, Springer 2017. - D.S.Mathur. Elements of Properties of Matter. S Chand & Company, 2010. - Hugo Hens, Building Physics: Heat, Air and Moisture, Wiley, 2017.

REFERENCES
- W.R.Stevens. Building Physics: Lighting. Pergamon Press, 2013. - Hugo Hens, Applied Building Physics, Wiley, 2016. - K.G.Budinski and M.K.Budinski. Engineering Materials: Properties and Selection. Pearson Education, 2016. - Peter A. Claisse, Civil Engineering Materials, Elsevier, 2016.

COURSE OUTCOMES
Upon completion of the course, the students should be able to


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CO1: Understand the functioning of various physics laboratory equipment.
 CO2: Use graphical models to analyze laboratory data.
 CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.
 CO4: Access, process and analyze scientific information.
 CO5: Solve problems individually and collaboratively.

TOTAL: 30 PERIODS

CHEMISTRY EXPERIMENTS (Any Seven Experiments to be conducted)

Prerequisites:

Nil

COURSE OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles.

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in a water sample. Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using a flame photometer.
13. Preparation of nanoparticles ($\text{TiO}_2/\text{ZnO}/\text{CuO}$) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

L: 00	T: 00	P: 60	Total : 60 Periods
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TEXT BOOKS

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (2009).

WEB RESOURCES

- <https://en.wikipedia.org/wiki/Titration>
- [https://en.wikipedia.org/wiki/Conductivity_\(electrolytic\)](https://en.wikipedia.org/wiki/Conductivity_(electrolytic)).

COURSE OUTCOMES

At the end of the course students should be able

- CO1: To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- CO2: To determine the amount of metal ions through volumetric and spectroscopic techniques
- CO3: To analyse and determine the composition of alloys.
- CO4: To learn simple method of synthesis of nanoparticles.
- CO5: To quantitatively analyse the impurities in solution by electroanalytical Techniques.

TOTAL: 30 PERIODS


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24UHS111	ENGLISH LABORATORY (Common to all Branches)	L	T	P	C
		0	0	2	1

Prerequisites:

- Basic Knowledge in Language usage

COURSE OBJECTIVES:

- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts
- To use language efficiently in expressing their opinions via various media

UNIT-I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	6
Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - 42 politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions(filling out a bank application for example).		

UNIT-II	NARRATION AND SUMMATION	6
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings engaging in small talk- describing requirements and abilities.		

UNIT-III	DESCRIPTION OF A PROCESS / PRODUCT	6
Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking - Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)-talking about precautions.		

UNIT-IV	CLASSIFICATION AND RECOMMENDATIONS	6
Listening - Listening to TED Talks; Listening to lectures - and educational videos. Speaking - Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.		

UNIT-V	EXPRESSION	6
Listening - Listening to debates/ discussions; different viewpoints on an issue; and panel		


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discussions. Speaking -making predictions- talking about a given topic-giving opinions- understanding a website-describing processes

L: 00	T: 00	P: 30	Total : 30 Periods
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WEB RESOURCES

- https://www.lisedunetwork.com/the-fundamentals-of-communication/#google_vignette
- <http://hdl.handle.net/10603/58170>
- <https://www.vedantu.com/english/narration>
- <https://asana.com/resources/product-development-process>
- <https://onlinelibrary.wiley.com/doi/10.1155/2019/8043905>

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: To listen to and comprehend general as well as complex academic information
CO2: To listen to and understand different points of view in a discussion
CO3: To speak fluently and accurately in formal and informal communicative contexts
CO4: To describe products and processes and explain their uses and purposes clearly and accurately
CO5: To express their opinions effectively in both formal and informal discussions


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(An Autonomous Institution)

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

Recognized by UGC & Accredited by NAAC and NBA (CSE and ECE)



REGULATIONS 2024

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR II SEMESTER

FACULTY OF.....EEG.....
BOS/CHAIRMAN.....

24UHS201	PROFESSIONAL ENGLISH II (Common to all Branches)	L	T	P	C
		2	0	0	2

Prerequisites:

- Basic Knowledge in Language usage

COURSE OBJECTIVES:

- To engage learners in meaningful language activities to improve their reading and writing skills
- To learn various reading strategies and apply in comprehending documents in professional context
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT-I	MAKING COMPARISONS	6
Reading – Reading comprehension task :Reading strategies, Methods - skimming, scanning, paraphrasing vs summarizing, Reading advertisements, user manuals, brochures; Proforma invoices Writing – Professional emails, Email etiquette, Creative Writing-Content writing, blog writing , Grammar –Preposition & Prepositional phrases Vocabulary – Words on Engineering materials		

UNIT-II	EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING	6
Reading - Reading longer technical texts, Reading short articles& Journals Writing -Writing responses to complaints, Letters / emails of complaint, writing a travelogue, Agenda with Minutes of meeting(MoM), Cause and Effect Essays, Grammar - If conditional sentences, Active & Passive Voice transformations,		

UNIT-III	PROBLEM SOLVING	6
Reading - Case Studies, excerpts from literary texts, etc. Writing – Letter to the Editor, Sequence of Jumbled paragraph, Checklists, Hints Development - Problem solution essay / Argumentative Essay. Grammar – Error correction; Modals Vocabulary – Idioms and phrases.		

UNIT-IV	REPORTING OF EVENTS AND RESEARCH	6
Reading –Newspaper articles; Writing – Recommendations, Transcoding, Structure of Reports-Accident Report, Survey Report, Project Report Grammar – Reported Speech, Vocabulary – Conjunctions.		

UNIT-V	THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY	6
Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Business communication letters, Grammar – Numerical adjectives, Relative Clauses, Vocabulary – Infinitive and Gerunds.		


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TEXT BOOKS

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021.
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
3. Learning to Communicate – Dr. V. Chellamma. Allied Publishers, New Delhi, 2003.
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata Mc Graw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

WEB RESOURCES

- <https://academicguides.waldenu.edu/writingcenter/grammar/comparisons#:~:text=Adjectives%20and%20adverbs%20can%20be,to%20hedge%20or%20boost%20language.>
- <https://www.linkedin.com/pulse/causality-expressed-natural-language-text-vivek-khetan>
- <https://www.sessionlab.com/blog/problem-solving-techniques/>

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Compare and contrast products and ideas in technical texts
- CO2: Identify cause and effects in events, industrial processes through technical texts
- CO3: Analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format
- CO4: Report events and the processes of technical and industrial nature
- CO5: Present their opinions in a planned and logical manner, and draft effective resumes in context of job search


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24UMA201	STATISTICS AND NUMERICAL METHODS (Common to All Branches)	L	T	P	C
		3	1	0	4

Prerequisites:

- Basic Knowledge in Scientific Calculator usage

COURSE OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems?
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical
- Techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT-I	TESTING OF HYPOTHESIS	9 + 3
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes. Application of chi square test.		

UNIT-II	DESIGN OF EXPERIMENTS	9 + 3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 22 factorial design. Application of Design of experiment SPSS software (Practical oriented).		

UNIT-III	SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	9 + 3
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.		

UNIT-IV	INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION	9 + 3
Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.		

UNIT-V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	9 + 3
Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.		


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TEXT BOOKS

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCES

1. Burden, R.L and Faires, J.D., "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore, J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald, C.F and Wheatley, P.O., "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outlines on Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
6. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

WEB RESOURCES

- <http://www.davidmlane.com/hyperstat/index.html>
- <http://www.robertniles.com/stats/>
- <http://webserv.jcu.edu/math/1SEP1SEP.htm>
- <http://rt.utsi.edu/visualization/analytics/stats/spss-getting-started-windows.php>
- <http://www.ats.ucla.edu/stat/>

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Apply the concept of testing of hypothesis for small and large samples in real life problems.
- CO2: Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- CO3: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- CO4: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.
- CO5: Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.


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24UPH201	PHYSICS FOR ELECTRICAL ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites:

Nil

COURSE OBJECTIVES:

- To make the students to understand the basics of dielectric materials and insulation.
- To understand the electrical properties of materials including free electron theory, applications of quantum mechanics and magnetic materials.
- To instil knowledge on physics of semiconductors, determination of charge carriers and device applications.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano device applications.

UNIT-I	DIELECTRIC MATERIALS AND INSULATION	9
Matter polarization and relative permittivity: definition – dipole moment and polarization vector Polarization mechanisms: electronic, ionic, orientational, interfacial and total polarization – frequency dependence – local field and Clausius-Mossetti equation – dielectric constant and dielectric loss – Gauss's law and boundary conditions – dielectric strength, introduction to insulation breakdown in gases, liquids and solids – capacitor materials – typical capacitor constructions – piezoelectricity, ferroelectricity and pyroelectricity – quartz oscillators and filters – piezo and pyroelectric crystals.		

UNIT-II	ELECTRICAL PROPERTIES OF MATERIALS	9
Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Quantum free electron theory :Tunnelling – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation - Electron effective mass – concept of hole.		

UNIT-III	SEMICONDUCTORS AND TRANSPORT PHYSICS	9
Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.		

UNIT-IV	OPTICAL PROPERTIES OF MATERIALS	9
Classification of optical materials – Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption, loss and gain. Optical processes in quantum wells – Optoelectronic devices: light detectors and solar cells – light emitting diode – laser diode - optical processes in organic semiconductor devices –excitonic state – Electro-optics and nonlinear optics: Modulators and switching devices – plasmonics.		

UNIT-V	NANO DEVICES	9
Density of states for solids - Significance between Fermi energy and volume of the material –		


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Quantum confinement – Quantum structures – Density of states for quantum wells, wires and dots – Band gap of nanomaterials – Tunnelling – Single electron phenomena – Single electron Transistor. Conductivity of metallic nanowires – Ballistic transport – Quantum resistance and conductance – Carbon nanotubes: Properties and applications - Spintronics devices and applications – Optics in quantum structures – quantum well laser.

L:45	T: 00	P: 00	Total : 45 Periods
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TEXT BOOKS

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.
2. R.F.Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.
3. G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition), 2009.

REFERENCES

1. Laszlo Solymar, Walsh, Donald, Syms and Richard R.A., Electrical Properties of Materials, Oxford Univ. Press (Indian Edition) 2015.
2. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw- Hill Education (Indian Edition), 2019.
3. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
4. Mark Fox, Optical Properties of Solids, Oxford Univ.Press, 2001.
5. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.

WEB RESOURCES

- <https://www.youtube.com/watch?v=OZchTd4fxo0>
- <https://www.youtube.com/watch?v=Rv5ngMMK84o>
- <https://www.youtube.com/watch?v=HJoaYEOgbe4>
- <https://www.youtube.com/watch?v=L1c5uZRCyUE>
- <https://www.youtube.com/watch?v=kflmENxGB6U>

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Basics of dielectric materials and insulation.
- CO2: Gain knowledge on the electrical and magnetic properties of materials and their applications.
- CO3: Understand clearly of semiconductor physics and functioning of semiconductor devices.
- CO4: Understand the optical properties of materials and working principles of various optical devices.
- CO5: Appreciate the importance of nanotechnology and nano devices.


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24UEE201	ELECTRIC CIRCUITS ANALYSIS	L	T	P	C
		3	1	0	4

PREREQUISITES

Engineering Physics and Mathematics

COURSE OBJECTIVES

- To introduce electric circuits and its analysis.
- To impart knowledge on solving circuit equations using network theorems.
- To provide key concepts to analyze and understand magnetic circuits.
- To introduce the phenomenon of resonance and transient response of circuits.
- To introduce Phasor diagrams and analysis of three phase circuits.

UNIT-I	BASIC CIRCUITS ANALYSIS	9 + 3
Electrical Circuits: Circuit Elements – Series, Parallel, Series Parallel - Ohm's Laws. Kirchhoff's Laws - Network reduction: voltage and current division, source transformation – star delta conversion. Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor.		

UNIT-II	NETWORK THEOREMS	9 + 3
Mesh Analysis - Nodal analysis - Super position theorem – Thevenin's Theorem - Norton's theorem - Maximum power transfer and reciprocity theorem for DC and AC circuits.		

UNIT-III	MAGNETIC CIRCUITS	9 + 3
Magnetic Circuits-Basic definitions, Faraday's - Laws of Electromagnetic Induction -Concept of Self and Mutual Inductance, Dot Rule - Coefficient of Coupling - Composite Magnetic Circuit - Analysis of Series and Parallel Magnetic Circuits, MMF Calculations. Losses in Magnetic circuits.		

UNIT-IV	RESONANCE AND TRANSIENT RESPONSE ANALYSIS	9 + 3
Series and Parallel Resonance- effect of variation of Q on resonance. Relations between circuit parameters - Q, resonant frequency and bandwidth. Introduction – Laplace transforms and inverse Laplace transforms Transient response of RL, RC and RLC circuits to DC and AC excitation.		

UNIT-V	THREE PHASE CIRCUITS	9 + 3
Advantage of three phase power - Balance and unbalance load - Phasor diagram of three phase star and delta connected load. Analysis of three phase 3 wire and 4 wire circuits with star and delta connected loads, balanced & unbalanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.		

L: 45	T: 15	P: 00	Total: 60 Periods
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TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits

NLP

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Analysis", McGraw Hill publishers, 9 th edition, New Delhi, 2020.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2019.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.
REFERENCES
1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpat Rai& Sons, New Delhi, 2020.
2. Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum's series, McGraw-Hill, First Edition, 2019.
3. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
4. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley Sons, Inc. 2018.
5. Sudhakar A and Shyam Mohan SP, "Circuits and Networks Analysis and Synthesis", McGraHill, 2015.
WEB RESOURCES
1. NPTEL :: Electrical Engineering - NOC:Basic Electric Circuits
2. NPTEL :: Electrical Engineering - NOC:Network Analysis
3. NPTEL :: Electrical Engineering - Circuit Theory
COURSE OUTCOMES
At the end of the course, the students will be able to: CO1: Explain circuit's behaviour using circuit laws. CO2: Apply mesh / nodal analysis / network theorems to determine behaviour of the given DC and AC circuit CO3: Explain the behaviour of magnetically coupled circuits. CO4: Explain the frequency response of series and parallel RLC circuits. CO5: Compute power, line/ phase voltage and currents of the given three phase circuit.

NLP

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24UHS202	TAMILS AND TECHNOLOGY (Common to All Branches)	L	T	P	C
		1	0	0	1

Prerequisites:

Nil

COURSE OBJECTIVES:

- Appreciate weaving and ceramic technology.
- Learn the design and construction technology of ancient times.
- Understand the engineering principles of manufacturing technology.
- Introduce the methods of irrigation and agricultural technology.
- Learn the scientific tamil and tamil computing.

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.		

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	3
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period		

UNIT III	MANUFACTURING TECHNOLOGY	3
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel - Copper and gold Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads - Shell beads/ bone beads - Archeological evidences - Gem stone types described in Silappathikaram.		

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		

UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING	3
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.		

L:15	T: 00	P: 00	Total : 15 Periods
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TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு)
2. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
3. கணினித் தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
4. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5. பொருளை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
6. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
7. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
8. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
9. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.) 55
10. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
11. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
12. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
13. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OUTCOMES

At the end of the course students should be able

- CO1: Explain the principles behind weaving and ceramic technology of ancient tamils.
CO2: Correlate the present and ancient design and construction technology.
CO3: Apply engineering principles to ancient manufacturing technology.
CO4: Apply engineering principles to irrigation and agricultural technology.
CO5: Develop scientific tamil and new techniques in tamil computing.


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24UHS202	தமிழரும் தொழில்நுட்பமும் (Common to All Branches)	L	T	P	C
		1	0	0	1

அலகு I	தெசவு மற்றும் பாணைத்தொழில்நுட்பம்	3
சங்க காலத்தில் நெசவுத்தொழில்- பாணைத்தொழில் நுட்பம் கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.		

அலகு II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் கோவில்களும் மாமல்லபுரச் சிற்பங்களும், சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் நாயக்கர் காலக் கோயில்கள் மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் செட்டிநாட்டு வீடுகள் பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.		

அலகு III	உற்பத்தி தொழில்நுட்பம்	3
கப்பல் கட்டும் கலை உலோகவியல் - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் மணி உருவாக்கும் தொழிற்சாலைகள் மணிகள் துண்டுகள் - கல்மணிகள், கண்ணாடி சுடுமண் மணிகள் சங்கு மணிகள் எலும்புத் தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்		

அலகு IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்	3
அணை, ஏரி, குளங்கள், மதகு - சோழர் காலக் குழுதித் தூம்பின் முக்கியத்துவம் கால்நடை பராமரிப்பு காலநடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் முத்து மற்றும் முத்துக்குளித்தல் -பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.		

அலகு V	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்	3
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்கள் மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத்திட்டம்		

L:15	T: 00	P: 00	Total : 15 Periods
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TEXT-CUM-REFERENCE BOOKS

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


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24UGE1201	ENGINEERING GRAPHICS AND DRAFTING (Common to B.E. Civil, ECE, EEE, Mechanical & B. Tech. FT & IT)	L	T	P	C
		3	0	2	4

Prerequisites:

Nil

COURSE OBJECTIVES:

- Drawing engineering curves.
- Drawing freehand sketch of simple objects.
- Drawing orthographic projection of solids and section of solids.
- Drawing development of solids.
- Drawing isometric and perspective projections of simple solids.

UNIT-I	PLANE CURVES AND FREEHAND SKETCHING	6+12
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects.		

UNIT-II	PROJECTION OF POINTS, LINES AND PLANE SURFACES	6+12
Orthographic projection- principles-Principal planes-First angle projection-projection of points (All Quadrants). Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.		

UNIT-III	PROJECTION OF SOLIDS AND SECTION OF SOLIDS	6+12
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Solids suspended from corner and real time application of projection of solids. Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Practicing three-dimensional modeling of simple objects by CAD Software.		

UNIT-IV	DEVELOPMENT OF SURFACES	6+12
Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones. Development of lateral surfaces of simple solids with square and cylindrical cut-outs — Prisms, pyramids cylinders and cones. Practicing three-dimensional modeling of simple objects by CAD Software.		

UNIT-V	ISOMETRIC AND PERSPECTIVE PROJECTIONS	6+12
Principles of isometric projection — Isometric scale - Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple		



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vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method. Practicing three-dimensional modeling of isometric projection of simple objects by CAD Software. Engineering Applications of isometric, orthographic and perspective projections

L:30	T:0	P:60	Total :90 Periods
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TEXT BOOKS

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015

REFERENCES

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I & II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. Luzzader, Warren. J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition
6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited 2008, 2nd Edition, 2009.

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1 Use BIS conventions and specifications for engineering drawing.

CO2 Construct the conic curves, involutes and cycloid.

CO3 Solve practical problems involving projection of lines.

CO4 Draw the orthographic, isometric and perspective projections of simple solids.

CO5 Draw the development of simple solids.


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24UGE211	Engineering Fundamentals Lab (Common to All branches)	L	T	P	C
		0	0	4	2

Prerequisites:

Nil

COURSE OBJECTIVES:

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
- Wiring various electrical joints in common household electrical wire work.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.
- Understand the component parts of computer systems.
- Understand the master programming constructs, and develop, test, and debug programs.
- Identify and analyze problems, and design and implement solutions.

Part – A (Civil and Mechanical)
(Students will be offered any 10 experiments)

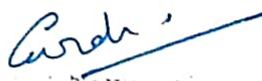
1.	Land documents reading and understanding
2.	Material identification and testing as per BIS & NBC
3.	Basic surveying and land area measurement
4.	Water analysis
5.	Basic vastu
6.	Make a Butt/Lap/Tee joint of MS plate using Arc welding and also make Lap joint using riveting
7.	Prepare T/L/Lap joint from the given wooden workpiece and make a Box /Tray out of plywood using modern power tools
8.	Perform the simple turning, drilling, tapping using lathe
9.	Demonstration of basic foundry operations
10.	Making a square tray using sheet metal
11.	Study of various metals and alloys
12.	Hands on training to use measuring instruments
13.	Study of 3-D printer / Robotics architecture / Mechatronics system

Part – B (Electrical and Electronics)

Students will be offered any 07 experiments

1.	Study of electrical switches, fuses, indicators, circuit breakers, contactors and relays
2.	Wiring circuit for fluorescent lamp and Stair case wiring
3.	Wiring Circuit of ceiling fan
4.	Measurement of Earth Resistance
5.	House wiring with energy meter, RCCB and ELCB


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6.	Study of electronic components resistor, diode, transistors, measuring devices
7.	Soldering and Assembly of Simple Circuits and trouble shooting
8.	Assembly and dismantle of smartphone
Part- C (Computer Technologies)	
1.	Office automation tools - Word processing
2.	Office automation tools -Spread sheets
3.	Office automation tools - Presentation preparation
4.	Network topology configuration
5.	Network crimping & I/O outlet termination
6.	Types of operating systems and installation

L:0	T:0	P:60	Total :60 Periods
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COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1: Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.

CO2: Wire various electrical joints in common household electrical wire work.

CO3: Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.

CO4: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

CO5: Evaluate the performance of different types of CPU scheduling algorithm.

CO6: Use different systems calls for writing application programs.



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24UEE211	ELECTRIC CIRCUITS ANALYSIS LABORATORY	L	T	P	C
		0	0	4	2

PREREQUISITES

Engineering Physics

COURSE OBJECTIVES

- To simulate various electric circuits using Pspice / Matlab / e-Sim / Scilab
- To gain practical experience on electric circuits and verification of theorems

LIST OF EXPERIMENTS

1. Simulation of ohm's laws and kirchoff's laws.
2. Simulation of the mesh and nodal analysis.
3. Simulation of the Thevenin's and Norton's Theorem.
4. Simulation of the superposition Theorem.
5. Simulation of the reciprocity theorem and maximum power transfer theorem.
6. Simulation of transient response of RL/RC/RLC.
7. Experimental verification of ohm's laws and kirchoff's laws.
8. Experimental verification of mesh and nodal analysis.
9. Experimental verification of Thevenin's and Norton's Theorem.
10. Experimental verification of superposition Theorem.
11. Experimental verification of reciprocity theorem and maximum power transfer theorem.
12. Measurement of three phase power.

L: 00	T: 00	P: 60	Total: 60 Periods
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LIST OF EQUIPMENTS REQUIRED

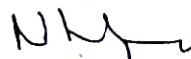
(for batch of 30 students)

1. PC loaded with Pspice/ Matlab/e-Sim / Scilab/ Equivalent Software Package - 10 No's
2. Printer – 1 No's
3. Regulated Power Supply (0-30V) – 15 No's
4. AC/DC – Voltmeters of required rating – 10 No's
5. AC/DC -Ammeters of required rating - 10 No's
6. Multimeters - 10 No's
7. Single Phase Wattmeter of suitable rating - 5 No's
8. Circuit Connection Boards – 20 No's
9. Connecting Wires - Necessary Quantity
10. Three phase star & delta connected load - 3 No's
11. Single phase load bank of suitable rating - 3 No's
12. Necessary Quantities of Resistors, Inductors, Capacitors of various capacities (Quarter Watt to 10 Watt)

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Use simulation methods to verify the electrical laws for the given DC/AC circuit.
CO2: Use experimental methods to verify the electrical laws for the given DC/AC circuit.
CO3: Use simulation and experimental methods to verify the various electrical theorems



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(Superposition, Thevenin, Norton and maximum power transfer)

CO4: Analyze transient behavior of the given RL/RC/RLC circuit using simulation.

CO5: Analyze the performance of the given three-phase circuit by experimental methods.



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24UHS211	COMMUNICATION LABORATORY (Common to all Branches)	L	T	P	C
		0	0	4	2

Prerequisites:

- Basic Knowledge in Language usage

COURSE OBJECTIVES:

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To analyse concepts and problems and make effective presentations explaining them clearly and precisely.
- To be able to communicate effectively through formal and informal writing.
- To be able to use appropriate language structures to write emails, reports and essays
- To give instructions and recommendations that are clear and relevant to the context

UNIT-I	MAKING COMPARISONS	12
Speaking-Role Play Exercises Based on Workplace Contexts, - talking about competition discussing progress toward goals-talking about experiences- talking about events in life-discussing past events-Writing: writing emails (formal & semi-formal).		

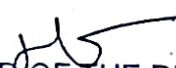
UNIT-II	EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING	12
Speaking: discussing news stories-talking about frequency-talking about travel problems discussing travel procedures- talking about travel problems- making arrangements-describing arrangements-discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails.		

UNIT-III	PROBLEM SOLVING	12
Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios-talking about purchasing-discussing advantages and disadvantages- making comparisons-discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios Writing: short essays and reports-formal/semi-formal letters.		

UNIT-IV	REPORTING OF EVENTS AND RESEARCH	12
Speaking: discussing the natural environment-describing systems-describing position and movement- explaining rules - (example- discussing rental arrangements) - understanding technical instructions-Writing: writing instructions-writing a short article.		

UNIT-V	THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY	12
Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions- Writing: job application (Cover letter + Curriculum vitae)-writing recommendations.		

L: 00	T: 00	P: 60	Total : 60 Periods
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WEB RESOURCES

- <https://academicguides.waldenu.edu/writingcenter/grammar/comparisons#:~:text=Adjectives%20and%20adverbs%20can%20be,to%20hedge%20or%20boost%20language.>
- <https://www.linkedin.com/pulse/causality-expressed-natural-language-text-vivek-khetan>
- <https://www.sessionlab.com/blog/problem-solving-techniques/>

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Speak effectively in group discussions held in formal/semi formal contexts.

CO2: Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions

CO3: Write emails, letters and effective job applications.

CO4: Write critical reports to convey data and information with clarity and precision

CO5: Give appropriate instructions and recommendations for safe execution of tasks


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B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR III SEMESTER

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BOS/CHAIRMAN.....N.H.....

24UMA301	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (Common to B.E. CIVIL, MECH & EEE)	L	T	P	C
		3	1	0	4

PREREQUISITES

Engineering Mathematics

COURSE OBJECTIVES

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis this is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier, transform techniques used in wide variety of situations.
- To introduce the effective mathematical 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 – Solutions of standard types of first order partial differential equations - First orders partial differential equations reducible to standard types - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.		

UNIT-II	FOURIER SERIES	9 + 3
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.		

UNIT-III	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	9 + 3
Classification of PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (Cartesian coordinates only).		

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	9 + 3
Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.		

L: 45	T: 15	P: 00	Total: 60 Periods
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TEXT BOOKS

1. Grewal B.S., "Higher Engineering Mathematics" 44th Edition, Khanna Publishers, New Delhi, 2018.
2. Kreyszig E, "Advanced Engineering Mathematics", 10th Edition, John Wiley, New Delhi, India, 2016.

REFERENCES

1. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2015.
3. James. G., "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, New Delhi, 2016.
4. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
6. Wylie. R.C. and Barrett. L.C. "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

COURSE OUTCOMES

At the end of the course students should be able to:

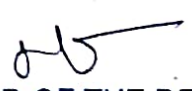
CO1: Solve the given standard partial differential equations.

CO2: Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.

CO3: Identify the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

CO4: Apply the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

CO5: Use the effective mathematical solutions of partial differential equations by using Z transform techniques for discrete time systems.


HEAD OF THE DEPARTMENT

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24UEE301	ELECTROMAGNETIC THEORY	L	T	P	C
		3	1	0	4

PREREQUISITES

Basic Physics and Mathematics

COURSE OBJECTIVES

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To provide knowledge on the concepts of Electrostatic fields, electric potential, energy density and their applications.
- To learn about the Magneto static fields, magnetic flux density, vector potential and its applications.
- To impart knowledge on Different methods of EMF generation and Maxwell's equations
- To study the concepts of Electromagnetic waves and characterizing parameters

UNIT-I	ELECTROSTATICS-I	9 + 3
Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields – Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law - Applications (Domestic).		

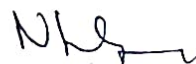
UNIT-II	ELECTROSTATICS-II	9 + 3
Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy density.		

UNIT-III	MAGNETOSTATICS	9 + 3
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) – B in free space, conductor, Magnetization, Magnetic field in multiple media –Boundary conditions, Poisson's Equation, Magnetic force, Torque, Inductance, Energy density, Applications.		

UNIT-IV	ELECTRODYNAMIC FIELDS	9 + 3
Faraday's law – Transformer and motional EMF Displacement current -Maxwell's equations (differential and integral form) Relation between field theory and circuit theory – Applications (Industrial)		

UNIT-V	ELECTROMAGNETIC WAVES	9 + 3
Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector		

L: 45	T: 15	P: 00	Total: 60 Periods
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TEXT BOOKS

- T1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 6th Edition, Oxford University Press Inc. Asian edition, 2015.
- T2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', McGraw Hill Special Indian edition, 2017.
- T3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 2011.

REFERENCES

- R1. V.V.Sarwate, 'Electromagnetic fields and waves', Second Edition, Newage Publishers, 2018.
- R2. J.P.Tewari, 'Engineering Electromagnetics - Theory, Problems and Applications', Second Edition, Khanna Publishers 2013.
- R3. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Fifth Edition (Schaum's Outline Series), McGraw Hill, 2018.
- R4. S.P.Ghosh, Lipika Datta, 'Electromagnetic Field Theory', First Edition, McGraw Hill Education(India) Private Limited, 2017.
- R5. K A Gangadhar, 'Electromagnetic Field Theory', Khanna Publishers; Sixteenth Edition Eighth Reprint: 2015.

COURSE OUTCOMES

- CO1: Apply Gradient, Divergence, and Curl operations on electromagnetic vector fields
- CO2: Compute electrostatic fields, electric potential and energy density along with their applications.
- CO3: Determine magneto static fields, magnetic flux density and vector potential along with their applications.
- CO4: Interpret different methods of EMF generation and Maxwell's equations.
- CO5: Elucidate the concept of electromagnetic waves and characterizing parameters.



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24UEE302	ELECTRICAL MACHINES - I	L	T	P	C
		2	1	0	3

PREREQUISITES
Basic Physics

COURSE OBJECTIVES
- To understand the construction, working principle, and performance of DC generators. - To understand the construction, working principle, and performance of DC motors. - To impart knowledge on characteristics, testing, and efficiency evaluation of DC machines. - To introduce the principle, operation, testing, and analysis of single-phase transformers. - To explain the concept and benefits of autotransformers and three-phase transformer connections.

UNIT-I	DC GENERATORS	9
Principle of operation, constructional details, armature windings and its types, EMF equation, wave shape of induced EMF, armature reaction, demagnetizing and cross magnetizing Ampere turns, compensating winding, commutation, methods of improving commutation, interpoles. Parallel operation of DC Generators, equalizing connections-applications of DC Generators.		

UNIT-II	DC MOTORS	9
Principle of operation, significance of back emf, torque equations and power developed by armature, speed control of DC motors, starting methods of DC motors. Losses and efficiency in DC machine, condition for maximum efficiency. Applications of DC motors.		

UNIT-III	TESTING OF DC MACHINES	9
Testing of DC Machines: Brake test, Field test, Retardation test, Separation of core losses. OCC and load characteristics of different types of DC Generators. Load characteristics of DC motors.		

UNIT-IV	SINGLE PHASE TRANSFORMER	9
Construction and principle of operation, equivalent circuit, phasor diagrams, testing - polarity test, open circuit and short circuit tests, voltage regulation, losses and efficiency, all day efficiency, back-to-back test, separation of core losses, parallel operation of single-phase transformers, applications of single-phase transformer.		

UNIT-V	AUTOTRANSFORMER AND THREE PHASE TRANSFORMER	9
Construction and working of auto transformer, comparison with two winding transformers, applications of autotransformer. Three Phase Transformer- Construction, types of connections and their comparative features, Scott connection, applications of Scott connection.		

L: 30	T: 15	P: 00	Total: 45 Periods
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TEXT BOOKS

1. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017.
2. P. S. Bimbhra, "Electric Machinery", Khanna Publishers, 2nd Edition, 2021.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt. Ltd, 4th Edition 2017.

REFERENCES

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 6th Edition 2017.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2018.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, First Edition 2008.
4. Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018.

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Explain the construction, operation, EMF equation, and characteristics of DC generators, and assess methods to improve commutation and parallel operation.
- CO2: Analyze DC motor operation, torque equations, speed control, starting methods, losses, efficiency, and industrial applications
- CO3: Perform and interpret various tests on DC machines to determine performance, efficiency, and load characteristics.
- CO4: Analyze the performance of single-phase transformers using equivalent circuits, tests, phasor diagrams, and efficiency calculations.
- CO5: Compare auto-transformers and three-phase transformers, their connections, features, and applications including Scott connection.



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24UEE303	DIGITAL ELECTRONICS	L	T	P	C
		2	1	0	3

PREREQUISITES

Basic Mathematics

COURSE OBJECTIVES

- To study various number systems and to simplify the mathematical expressions using Boolean functions word problems.
- To study implementation of combinational circuits using Gates` and MSI Devices.
- To study the design of various synchronous and asynchronous circuits.
- To introduce digital simulation techniques for development of application oriented logic circuit.

UNIT-I	NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES	9
Number system, error detection, corrections & codes conversions, Realization of Logic gates and Universal gates, Boolean algebra: De-Morgan's theorem, switching functions and minimization using K-maps - Digital Logic Families - comparison of RTL, DTL, TTL, ECL and MOS families - operation, characteristics.		

UNIT-II	COMBINATIONAL CIRCUITS	9
Combinational logic - representation of logic functions - SOP and POS forms, K-map representations & minimization - simplification and implementation of combinational logic – multiplexers and demultiplexers - code converters, adders, subtractors, Encoders and Decoders.		

UNIT-III	SYNCHRONOUS SEQUENTIAL CIRCUITS	9
Sequential logic - SR, JK, D and T flip flops – conversion of flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Mealy models- Counters, state diagram; state reduction; state assignment.		

UNIT-IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES	9
Asynchronous sequential logic Circuits-Transition stability, flow stability-race conditions, hazards & errors in digital circuits; analysis of asynchronous sequential logic circuits. Introduction to Programmability Logic Devices: PROM – PLA – PAL, CPLD - FPGA.		

UNIT-V	VHDL	9
RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms – Test bench. (Simulation /Tutorial Examples: adders, counters, flip flops, Multiplexers & De-multiplexers).		

L: 30	T: 15	P: 00	Total: 45 Periods
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TEXT BOOKS

- T1. Morris Mano.M, 'Digital Logic and Computer Design', Prentice Hall of India, 3rd Edition, 2005.
T2. Donald D.Givone, 'Digital Principles and Design', Tata McGraw Hill, 1st Edition, 2003
T3. Thomas L Floyd, 'Digital fundamentals', Pearson Education Limited, 11th Edition, 2018
T4. Samir Palnitkar, "Verilog HDL: Guide to Digital Design and Synthesis", Second Edition, Pearson Education, New Delhi, 2017.

REFERENCES

- R1. Tocci R.J., Neal S. Widmer, 'Digital Systems: Principles and Applications', Pearson Education Asia, 12th Edition, 2017.
R2. Donald P Leach, Albert Paul Malvino, Goutam Sha, 'Digital Principles and Applications', Tata McGraw Hill, 7th Edition, 2010.
R3. Jayaram Bhasker, "A VHDL Primer", PTR Prentice Hall, New Jersey 07632

COURSE OUTCOMES

- CO1: Use various number systems and characteristics of digital logic families.
CO2: Explain the implementation of combinational circuit such as multiplexers and demultiplexers, code converters, adders, subtractors, Encoders and Decoders.
CO3: Model synchronous circuits using Flip Flops.
CO4: Explain asynchronous sequential circuits and programmable logic devices.
CO5: Use VHDL for simulating and testing RTL, combinatorial and sequential circuits.



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24UCS321	C PROGRAMMING AND DATA STRUCTURES	L	T	P	C
		3	0	0	3

PREREQUISITES
Nil

COURSE OBJECTIVES
- To introduce the basics of C programming language - To learn the concepts of advanced features of C. - To understand the concepts of ADTs and linear data structures. - To know the concepts of non-linear data structure and hashing. - To familiarize the concepts of sorting and searching techniques.

UNIT-I	C PROGRAMMING FUNDAMENTALS	9
Data Types – Variables – Operations – Expressions and Statements – Conditional Statements – Functions – Recursive Functions – Arrays – Single and Multi-Dimensional Arrays.		

UNIT-II	C PROGRAMMING - ADVANCED FEATURES	9
Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions – File Handling – Preprocessor Directives		

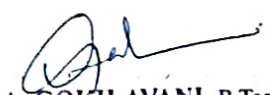
UNIT-III	LINEAR DATA STRUCTURES	9
Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly- Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications: Balancing Symbols – Evaluating arithmetic expressions – Queue ADT – Priority Queues – Queue Implementation – Applications.		

UNIT-IV	NON-LINEAR DATA STRUCTURES	9
Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – Hashing – Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.		

UNIT-V	SORTING AND SEARCHING TECHNIQUES	9
Insertion Sort – Quick Sort – Heap Sort – Merge Sort –Linear Search – Binary Search		

L: 45	T: 00	P: 00	Total: 45 Periods
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TEXT BOOKS
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 1997. 2. ReemaThareja, "Programming in C", Second Edition, Oxford University Press, 2016.


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REFERENCES

1. Brian W. Kernighan, Rob Pike, "The Practice of Programming", Pearson Education, 1999.
2. Paul J. Deitel, Harvey Deitel, "C How to Program", Seventh Edition, Pearson Education, 2013.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Ellis Horowitz, Sartaj Sahni and Susan Anderson, "Fundamentals of Data Structures", Galgotia, 2008

WEB RESOURCES

1. <https://archive.nptel.ac.in/courses/106/105/106105085/>

COURSE OUTCOMES

At the end of the course students should be able to:

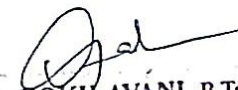
CO1: Develop C programs for any real world/technical application.

CO2: Apply advanced features of C in solving problems.

CO3: Write functions to implement linear and non-linear data structure operations.

CO4: Suggest and use appropriate linear/non-linear data structure operations for solving a given problem and Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

CO5: Appropriately use sort and search algorithms for a given application.


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24UEEI301	ELECTRON DEVICES AND CIRCUITS	L	T	P	C
		3	0	2	4

PREREQUISITES

Basic Physics

COURSE OBJECTIVES

- To understand the structure of basic electronic semiconductor devices.
- To be exposed to active and passive circuit elements.
- To familiarize the operation and applications of transistor like BJT and FET.
- To explore the characteristics of amplifier gain and frequency response.
- To learn the required functionality of positive and negative feedback systems.

UNIT-I	DIODES AND APPLICATIONS	9
PN junction diode – structure, operation and V-I characteristics, diffusion and transition capacitance – Clipping & Clamping circuits - Rectifiers – Half Wave and Full Wave Rectifier – Display devices - LED, Laser diodes, Zener diode characteristics - Zener diode Reverse characteristics – Zener diode as regulator.		

UNIT-II	JUNCTION TRANSISTORS AND AMPLIFIERS	9
BJT - structure, operation, characteristics and Biasing. UJT - Structure and characteristics. BJT small signal model – Analysis of CE, CB, CC amplifiers - Gain and frequency response.		

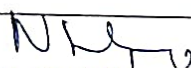
UNIT-III	FET, THYRISTORS AND AMPLIFIERS	9
JFET, MOSFET - structure, operation, characteristics and Biasing. Thyristors and IGBT - Structure and characteristics. MOSFET small signal model – Analysis of CS and Source follower – Gain and frequency response - High frequency analysis.		

UNIT-IV	MULTISTAGE AND DIFFERENTIAL AMPLIFIERS	9
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers – Types (Qualitative analysis).		

UNIT-V	FEEDBACK AMPLIFIERS AND OSCILLATORS	9
Advantages of negative feedback – voltage / current, series, Shunt feedback – Positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.		

LIST OF EXPERIMENTS

1. Characteristics of Semiconductor diode, Zener diode.
2. Characteristics of photo diode and photo transistor.
3. Characteristics of NPN Transistor under common emitter, common collector and common base configurations.
4. Characteristics of JFET and draw the equivalent circuit.
5. Characteristics of UJT and generation of saw tooth waveforms.


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6. Characteristics of light activated relay circuit.
7. Characteristics of Single Phase half-wave and full wave rectifiers with inductive and capacitive filters.
8. Design of Differential amplifiers using FET.
9. Measurement of frequency and phase angle using CRO.
10. Realization of passive filters.

L: 45	T: 00	P: 30	Total: 75 Periods
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TEXT BOOKS

1. David A. Bell , "Electronic devices and circuits", Oxford University, 5th edition 2008.
2. Sedra and smith, "Microelectronic circuits", 7th Edition., Oxford University Press, 2017.

REFERENCES

1. Balbir Kumar, Shail.B.Jain, "Electronic devices and circuits" PHI learning private limited, 2nd edition 2014.
2. Thomas L.Floyd, "Electronic devices" Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad, "Electronic devices and circuit theory", 11th edition, Pearson prentice Hall 2021.
5. Robert B. Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation", CRC Press, Second edition, 2012.

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Describe the structure and operation of PN junction devices and application based circuits.
- CO2: Interpret the structure, characteristics of BJT, UJT and performance of various configurations of BJT based amplifier.
- CO3: Explain the structure, characteristics of FET, MOSFET, Thyristor, IGBT and the performance of various configurations of MOSFET based amplifier.
- CO4: Describe the characteristics of MOS based cascade and differential amplifier.
- CO5: Explain the operation of various feedback amplifiers and oscillators.



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24UEE311	ELECTRICAL MACHINES - I LABORATORY	L	T	P	C
		0	0	3	1.5

PREREQUISITES

Basic Physics and Basic Electrical System

COURSE OBJECTIVES

- To expose the students to determine the characteristics of DC machines and transformers by performing experiments on these machines.
- To provide hands on experience to evaluate the performance parameters of DC machines and transformer by conducting suitable tests.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of DC shunt generator- calculation of critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC series motor.
5. Swinburne's test and speed control of DC shunt motor.
6. Load test on single-phase transformer and three phase transformers.
7. Open circuit and short circuit tests on single phase transformer.
8. Separation of no-load losses in single phase transformer.
9. Speed Control of a DC Motor Using MATLAB/Simulink
10. Dynamic Response of a DC Motor to Load Changes Using MATLAB/Simulink

L: 00	T: 00	P: 45	Total: 45 Periods
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LIST OF EQUIPMENTS REQUIRED

(for batch of 30 students)

1. DC Shunt Generator required rating - 2 No's
2. DC Shunt Motor required rating - 2 No's
3. DC Compound motor required rating - 1 No's
4. DC Series motor required rating - 1 No's
5. AC/DC - Voltmeters of required rating - 10 No's
6. AC/DC -Ammeters of required rating - 10 No's
7. Multimeters - 10 No's
8. Single Phase Wattmeter of suitable rating - 5 No's
9. Connecting Wires - Necessary Quantity
10. Single phase Resistive load - 3 No's
11. Tachometer-3 No's

Nh

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COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Construct the circuit with appropriate connections for the given DC machine/transformer.
- CO2: Experimentally determine the characteristics of different types of DC machines.
- CO3: Demonstrate the speed control techniques for a DC motor for industrial applications.
- CO4: Identify suitable methods for testing of transformer and DC machines.
- CO5: Predetermine the performance parameters of transformers and DC motor



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24UCS322	C PROGRAMMING AND DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	3	1.5

PREREQUISITES
Nil

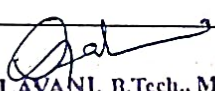
COURSE OBJECTIVES
- To develop applications in C - To implement linear and non-linear data structures - To understand the different operations of search trees - To get familiarized to sorting and searching algorithms

LIST OF EXPERIMENTS
- Practice of C programming using statements, expressions, decision making and iterative statements - Practice of C programming using Functions and Arrays - Implement C programs using Pointers and Structures - Implement C programs using Files - Array implementation of List ADT - Array implementation of Stack and Queue ADTs - Linked list implementation of List, Stack and Queue ADTs - Implementation of Binary Trees and operations of Binary Trees - Implementation of Binary Search Trees - Implementation of searching techniques - Implementation of Sorting algorithms : Insertion Sort, Quick Sort, Merge Sort - Implementation of Hashing – any two collision techniques

L: 00	T: 00	P: 45	Total: 45 Periods
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LIST OF EQUIPMENTS REQUIRED
(for batch of 30 students)
- INTEL based desktop PC, Monitor, Keyboard and mouse - 30 No's - Windows operating system / Linux Ubuntu – 30 No's - Standalone desktops PC – 15 No's

COURSE OUTCOMES
At the end of the course students should be able to:
CO1: Use different constructs of C and develop applications
CO2: Write functions to implement linear and non-linear data structure operations
CO3: Suggest and use the appropriate linear / non-linear data structure operations for a given problem
CO4: Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval
CO5: Implement Sorting and searching algorithms for a given application


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(An Autonomous Institution)

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Recognized by UGC & Accredited by NAAC and NBA (CSE and ECE)



REGULATIONS 2024

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR IV SEMESTER

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BOS/CHAIRMAN.....NLL.....

24UEE401	TRANSMISSION AND DISTRIBUTION	L	T	P	C
		3	1	0	4

PREREQUISITES

Basic Physics and Mathematics

COURSE OBJECTIVES

- To impart knowledge about the configuration of the electrical power systems.
- To study the line parameters and interference with neighboring circuits.
- To comprehend the mechanical design and performance of transmission lines.
- To learn about different insulators and underground cables.
- To examine the distribution system.

UNIT-I	TRANSMISSION LINE PARAMETERS	9 + 3
Structure of electric power system - Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance, and capacitance of solid, stranded, and bundled conductors - Typical configuration, conductor types - Symmetrical and unsymmetrical spacing and transposition – application of self and mutual GMD; skin and proximity effects - Effects of earth on the capacitance of the transmission line - interference with neighboring communication circuits.		

UNIT-II	MODELLING AND PERFORMANCE OF TRANSMISSION LINES	9 + 3
Performance of Transmission lines – short line, medium line and long line – equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance – transmission efficiency and voltage regulation, real and reactive power flow in lines - Ferranti effect – Formation of Corona – Critical Voltages – Effect on line Performance.		

UNIT-III	SAG CALCULATION AND LINE SUPPORTS	9 + 3
Mechanical design of overhead lines – Line Supports –Types of towers – Tension and Sag Calculation for different weather conditions – Methods of grounding - Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.		

UNIT-IV	UNDERGROUND CABLES	9 + 3
Underground cables – Types of cables – Construction of single-core and 3-core belted cables – Insulation Resistance – Potential Gradient – Capacitance of single-core and 3-core belted cables – Grading of cables – Power factor and heating of cables– DC cables.		

UNIT-V	DISTRIBUTION SYSTEMS	9 + 3
Distribution Systems – General Aspects – Kelvin's Law – AC and DC distributions –Techniques of Voltage Control and Power factor improvement – Distribution Loss – Types of Substations – Trends in Transmission and Distribution: EHVAC and HVDC (Qualitative treatment only).		

L: 45	T: 15	P: 00	Total: 60 Periods
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TEXT BOOKS

1. D.P.Kothari, I.J. Nagarith, 'Power System Engineering', Mc Graw-Hill Publishing Companylimited, New Delhi, Third Edition, 2019.
2. C.L.Wadhwa, 'Electrical Power Systems', New Age International Ltd, seventh edition 2022.
3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of IndiaPvt. Ltd, New Delhi, Second Edition, 2008.

REFERENCES

1. B.R.Gupta, 'Power System Analysis and Design' S. Chand, New Delhi, Sixth Edition, 2011.
2. Luces M.Fualken berry, Walter Coffey, 'Electrical Power Distribution and Transmission', PearsonEducation, 2007.
3. Arun Ingole, "Power transmission and distribution" Pearson Education, first edition, 2018
4. J.Brian Hardy and Colin R.Bayliss 'Transmission and Distribution in Electrical Engineering',Newnes; Fourth Edition, 2011.
5. G.Ramamurthy, "Handbook of Electrical power Distribution," Universities Press, 2013.
6. V.K.Mehta, Rohit Mehta, 'Principles of power system', S. Chand & Company Ltd, New Delhi,2013
7. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition,23rd reprint, 2015.
8. R.K.Rajput, 'A Text Book of Power System Engineering' 2nd edition, Laxmi Publications (P) Ltd,New Delhi, 2016.

COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Comprehend the structure of power system, computation of transmission line parameter for different configurations and the impact of skin and proximity effects.

CO2: Model the transmission lines to determine the line performance and the impact of Ferranti effect and corona on line performance.

CO3: Examine the mechanical aspects of transmission lines, grounding and about the insulators in transmission system.

CO4: Assess the performance of underground cables and determine their characteristics.

CO5: Evaluate the performance and explore modern trends in distribution system.



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24UEE402	ELECTRICAL MACHINES - II	L	T	P	C
		2	1	0	3

PREREQUISITES

Electrical Machines

COURSE OBJECTIVES

- To provide knowledge of constructional features and operating principles of synchronous and induction machines.
- To develop analytical skills to determine induced EMF, regulation, and performance characteristics of synchronous generators and motors.
- To enable evaluation of torque, power, and operational behavior of three-phase induction motors.
- To familiarize learners with various starting, speed control, and braking methods used in induction machines.
- To introduce single-phase induction motors, their equivalent circuits, testing methods, and performance analysis.

UNIT-I	SYNCHRONOUS GENERATOR	6 + 3
Constructional details – Types of rotors –winding factors- EMF equation – Synchronous reactance – Armature reaction – Phasor diagrams of non-salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input- Voltage regulation – EMF, MMF and ZPF method.		

UNIT-II	SYNCHRONOUS MOTOR	6 + 3
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 – natural frequency of oscillations – damper windings- synchronous condenser.		

UNIT-III	THREE PHASE INDUCTION MOTOR	6 + 3
Constructional details – Types of rotors – Principle of operation – Slip – cogging and crawling - Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors.		

UNIT-IV	STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR	6 + 3
Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer 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-V	SINGLE PHASE INDUCTION MOTORS	6 + 3
Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor		

L: 30	T: 15	P: 00	Total: 45 Periods
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TEXT BOOKS
1. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, edition 2, 2021. 2. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 5th Edition 2017. 3. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', McGraw Hill publishing Company Ltd, 6th Edition 2017.

REFERENCES
1. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rd Edition, Reprint 2020 2. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.

COURSE OUTCOMES
At the end of the course, the students will be able to: CO1: Identify the constructional features, rotor types, and evaluate induced EMF and voltage regulation methods of synchronous generators. CO2: Analyze the performance of synchronous motors using torque equations, V-curves, and power characteristics under varying excitation. CO3: Develop equivalent circuits and determine torque-slip characteristics, efficiency, and performance of three-phase induction motors through standard tests. CO4: Select and justify appropriate starting, speed control, and braking methods for induction motors in different operating conditions. CO5: Assess the operation and performance of single-phase induction motors using double-field revolving theory and testing methods.

NLP

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24UEE403	LINEAR IC AND APPLICATIONS	L	T	P	C
		3	0	0	3

PREREQUISITES

Electronic Devices and Circuits

COURSE OBJECTIVES

- To impart knowledge on Monolithic IC fabrication procedure.
- Signal analysis using Op-amp based circuits.
- Applications of Op-amp base circuits.
- Functional blocks and applications of special ICs like Timers, PLL circuits.
- Applications of Linear Power Supply and Voltage Regulators.

UNIT-I	IC FABRICATION	9
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IC classification - fundamental of monolithic IC technology: epitaxial growth, masking and etching, diffusion of impurities - Realization of monolithic ICs and packaging - Fabrication of diodes, capacitance, resistance and FETs and PV Cell.

UNIT-II	CHARACTERISTICS OF OP-AMP	9
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Ideal op-amp characteristics – Voltage shunt feedback and Inverting Amplifier - Voltage series feedback and Non-Inverting Amplifier – Voltage Follower - Differential amplifier – CMRR - DC characteristics - AC characteristics – frequency response of OP-AMP.

UNIT-III	APPLICATIONS OF OP-AMP	9
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Basic applications of op-amp - Summer - Differentiator and Integrator - V/I & I/V converters – Instrumentation amplifier - Log and Antilog Amplifiers – S/H circuits - Comparators – Zero crossing detectors - clippers, clampers, peak detector – Waveform generator - Active Filters.

UNIT-IV	CONVERTERS AND SPECIAL ICs	9
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A/D converters - D/A converters - Analog multiplier Ics. IC555 timer – Functional block diagram, Characteristics - Astable and monostable operation - PWM Applications.

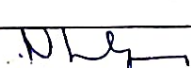
UNIT-V	APPLICATION ICs	9
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IC566 voltage controlled oscillator - IC565 Phase Locked Loop – IC voltage regulators – LM78XX, LM79XX; Fixed voltage regulators - LM317, 723 Variability voltage regulators, switching regulator - SMPS - ICL 8038 function generator.

L: 45	T: 00	P: 00	Total: 45 Periods
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TEXT BOOKS

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, Third Edition, 2011.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', , New Age, Sixth Edition, 2021.
3. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, PHI 2021.


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REFERENCES

1. Fiore, "Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
3. Jacob Millman, Christos C. Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2nd Edition, 2017.
4. Robert F. Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition, 2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', McGraw Hill, 2016 – Fourth Edition.
6. Muhammad H. Rashid, 'Microelectronic Circuits Analysis and Design' Cengage Learning, 2nd Edition, 2012.

COURSE OUTCOMES

At the end of the course, the students will be able to:

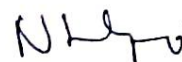
CO1: Explain the monolithic IC in fabrication of diodes, capacitance, resistance, FETs and PV Cell.

CO2: Describe the characteristics and basic applications of Op-Amp.

CO3: Interpret the circuit and applications of op-amp based amplifier, comparator, waveform generators and Converters.

CO4: Illustrate Functional blocks, characteristics and applications of Timer, PLL, analog multiplier ICs.

CO5: Identify the applications of ICs in Instrumentation amplifier, fixed and variable voltage regulator, SMPS and function generator.



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24UGE401	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY (For B.E. CIVIL, ECE, EEE & B.Tech. FT)	L	T	P	C
		2	0	0	2

PREREQUISITES
General Awareness

COURSE OBJECTIVES
- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation. - To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters. - To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them. - To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management. - To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT-I	ENVIRONMENT AND BIODIVERSITY	6
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.		

UNIT-II	ENVIRONMENTAL POLLUTION	6
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.		

UNIT-III	RENEWABLE SOURCES OF ENERGY	6
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.		

UNIT-IV	SUSTAINABILITY AND MANAGEMENT	6
Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability - from un sustainability to sustainability - millennium development goals, and protocols - Sustainable Development Goals-targets, indicators and intervention areas Climate change – Application of AI in climate change - Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry - A case study.		


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UNIT-V	SUSTAINABILITY PRACTICES	6
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio economical and technological change.		

L: 30	T: 00	P: 00	Total: 30 Periods
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TEXT BOOKS
1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018. 2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016. 3. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004. 3. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall. 4. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning. 5. Environment Impact Assessment Guidelines, Notification of Government of India, 2006. 6. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.
REFERENCES
1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38th edition 2010. 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, Third Edition, 2015. 5. ErachBharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

COURSE OUTCOMES
At the end of the course, the students will be able to: CO1: Recognize the functions of environment, ecosystems and biodiversity and their conservation. CO2: Identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society. CO3: Describe the renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations CO4: Select the different goals of sustainable development and apply them for suitable technological advancement and societal development. CO5: Examine the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.


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24UEE404	MEASUREMENT AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

PREREQUISITES

Basic Physics and Mathematics

COURSE OBJECTIVES

- To educate the fundamental concepts and characteristics of measurement and errors
- To impart the knowledge on the functional aspects of measuring instruments
- To infer the importance of various bridge circuits used with measuring instruments.
- To educate the fundamental working of sensors and transducers and their applications
- To summarize the overall measurement and instrumentation with the knowledge on digital instrumentation principles

UNIT-I	CONCEPTS OF MEASUREMENTS	9
Instruments: classification, applications – Elements of a generalized measurement system - Static and dynamic characteristics - Errors in measurement - Statistical evaluation of measurement data.		

UNIT-II	MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS	9
Classification of instruments – moving coil and moving iron meters –Applications, Advantages and Disadvantages- Induction type, dynamometer type watt meters – Energy meter – Megger – Instrument transformers (CT & PT).		

UNIT-III	AC/DC BRIDGES	9
Wheatstone bridge, Kelvin double bridge - Maxwell, Hay, Wien and Schering bridges – Errors and compensation in A.C. bridges		

UNIT-IV	TRANSDUCERS FOR MEASUREMENT OF NON- ELECTRICAL PARAMETERS	9
Classification of transducers – Measurement of pressure, temperature, displacement, flow, angular velocity – Digital transducers – Smart Sensors (Humidity, Motion and Gas Sensors)		

UNIT-V	DIGITAL INSTRUMENTATION	9
A/D converters: types and characteristics – Measurement of voltage, Current, frequency and phase - D/A converters: types and characteristics- DSO- Data Loggers –Instrument standards - Applications		

L: 45	T: 00	P: 00	Total: 45 Periods
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TEXT BOOKS

- T1. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, New Delhi, Edition 2015.
T2. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2017.

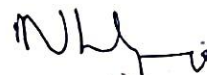
REFERENCES

- R1. M.M.S. Anand, 'Electronics Instruments and Instrumentation Technology', Prentice Hall India, New Delhi, 2009
R2. J.J. Carr, 'Elements of Electronic Instrumentation and Measurement', Pearson Education India, New Delhi, 2011
R3. W. Bolton, 'Programmable Logic Controllers', 6th Edition, Elsevier, 2015.
R4. R.B. Northrop, 'Introduction to Instrumentation and Measurements', Taylor & Francis, New Delhi, 3rd Edition 2014.
R5. E. O. Doebelin and D. N. Manik, "Measurement Systems — Application and Design", Tata McGraw-Hill, New Delhi, 6th Edition 2017.
R6. Rajput, "Electrical and Electronics Measurements and Instrumentation", Chand Pub, 2016

COURSE OUTCOMES

Upon successful completion of the course, the students should have the:

- CO1: Explain the fundamental art of measurement in engineering.
CO2: Outline the structural elements of various electrical instruments.
CO3: Measure the R, L & C in balance conditions and operational limits of DC bridges (Wheatstone, Kelvin Double) and AC bridges (Maxwell, Hay, Wien, Schering)
CO4: Describe the various transducers and their characteristics.
CO5: Interpret the concept of digital instrumentation and virtual instrumentation.



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24UEEI401	MICROPROCESSOR AND MICROCONTROLLER	L	T	P	C
		3	0	2	4

PREREQUISITES

Basic Electronics

COURSE OBJECTIVES

The course is designed to

- Introduce the architecture, memory organization, and operation of 8085 and 8086 microprocessors.
- Develop programming skills using assembly language for arithmetic, logical, and control operations.
- Explain the architecture and interfacing techniques of peripheral devices such as 8259, 8251, 8279, and 8254.
- Familiarize students with the architecture, instruction set, and interfacing capabilities of the 8051 microcontroller.
- Introduce the concepts of RISC architecture and ARM processor programming for embedded applications.

UNIT-I	INTRODUCTION TO MICROPROCESSORS	6
Introduction to 8085 microprocessor – Architecture, Registers, Memory organization, addressing schemes. Bus structure – I/O addressing – Timing diagrams – Interrupts and service routines. Minimum and maximum mode operations – Interfacing concepts for I/O and memory. Introduction to 8086 microprocessor – Architecture overview and comparison with 8085.		

UNIT-II	MICROPROCESSOR PROGRAMMING	6
Instruction format and addressing modes. Assembly language syntax and program development. Data transfer, arithmetic, logical, and control instructions. Loop structures with counting and indexing – Stack operations and subroutines. Simple programs for arithmetic, logical, and code conversion applications.		

UNIT-III	PERIPHERAL INTERFACING AND APPLICATIONS	6
Architecture and programming of: 8259 Programmable Interrupt Controller- 8251 USART (Serial Communication) - 8279 Keyboard and Display Controller- 8254 Programmable Timer/Counter- Application-level interfacing: ADC, DAC, stepper motor, and sensor interface.		

UNIT-IV	INTRODUCTION TO 8051 MICROCONTROLLER	6
8051 Architecture and block diagram – CPU organization, memory structure, I/O ports. Instruction format and addressing modes. Timers and interrupts – Serial communication. Assembly language programming for delay generation, counters, and serial data transfer. Overview of embedded applications using 8051.		



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UNIT-V	INTRODUCTION TO RISC AND ARM PROCESSORS	6
RISC principles and comparison with CISC architecture. Overview of ARM processor family and features. ARMv7 architecture – register organization and modes of operation. ARM instruction set – data processing, branching, and load/store instructions. Basic ARM assembly programming examples. Applications of ARM in embedded and mobile systems.		

LAB COMPONENTS:

1. Hands-on assembly programming using 8085/8086 kits.
2. Interfacing experiments with 8255, 8259, and 8251 ICs.
3. Development of simple projects using 8051 or ARM-based controllers.
4. Simulation of programs using open-source platforms (Keil, Proteus, or TinkerCAD).
5. Mini project on ARM-based embedded application.

L: 30	T: 00	P: 30	Total: 60 Periods
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TEXT BOOKS

1. Ramesh S. Gaonkar, 'Microprocessor Architecture Programming and Application', Pen ram International (P)ltd., Mumbai, 6th Edition, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2018.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The 8051 Micro Controller and Embedded Systems', Pearson Education, Second Edition 2011.
4. Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The PIC Micro Controller and Embedded Systems', 2010

REFERENCES

1. Douglas V. Hall, "Micro-processors & Interfacing", Tata McGraw Hill 3rd Edition, 2017.
2. Krishna Kant, "Micro-processors & Micro-controllers", Prentice Hall of India, 2007.
3. Mike Predko, "8051 Micro-controllers", McGraw Hill, 2009
4. Kenneth Ayala, 'The 8051 Microcontroller', Thomson, 3rd Edition 2004.

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Describe the internal architecture, bus organization, and memory structure of 8085 and 8086 microprocessors.
- CO2: Write and execute assembly language programs for data manipulation, control flow, and arithmetic operations.
- CO3: Explain the architecture and functional operation of peripheral ICs and interface them with microprocessors.
- CO4: Develop simple applications using 8051 microcontroller involving timers, serial communication, and interrupts..
- CO5: Illustrate the basic principles, architecture, and instruction set of RISC and ARM processors for embedded system design.


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24UEE411	ELECTRICAL MACHINES - II LABORATORY	L	T	P	C
		0	0	3	1.5

PREREQUISITES

Electrical Machines

COURSE OBJECTIVES

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS

1. Regulation of three phase alternator by EMF and MMF methods.
2. Regulation of three phase alternator by ZPF 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 three-phase induction motor.
6. No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
7. Separation of No-load losses of three-phase induction motor.
8. Load test on single-phase induction motor.
9. No load and blocked rotor test on single-phase induction motor.
10. Simulation of Three-Phase Induction Motor Starting and Performance using MATLAB/Simulink
11. Speed Control of Synchronous Motor Using Variable Frequency Drive (VFD) MATLAB/Simulink

L: 00	T: 00	P: 45	Total: 45 Periods
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LIST OF EQUIPMENTS REQUIRED

(for batch of 30 students)

1. Three Phase Alternator required rating -3No's
2. Synchronous Motor required rating – 1 No
3. Three Phase Induction Motor required rating – 3 No's
4. Single Phase Induction motor required rating – 2 No's
5. AC/DC – Voltmeters of required rating – 10 No's
6. AC/DC -Ammeters of required rating - 10 No's
7. Multimeters - 10 No's
8. Single Phase Wattmeter of suitable rating - 5 No's
9. Connecting Wires - Necessary Quantity
10. Tachometer-3 No's



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COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Analyze the EMF, MMF and ZPF methods.

CO2: Analyze the characteristics of V and Inverted V curves.

CO3: Acquire hands on experience of conducting various tests on alternators and obtaining performance indices using standard analytical as well as graphical methods to understand the importance of Synchronous machines.

CO4: Acquire hands on experience of conducting various tests on induction motors and obtaining their performance indices using standard analytical as well as graphical methods to understand the importance of single and three phase Induction motors and Ability to acquire knowledge on separation of losses.

CO5: Simulate the starting, operation, and control characteristics of three-phase induction and synchronous motors using MATLAB/Simulink to validate experimental results.



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24UEE412	DIGITAL AND LINEAR CIRCUITS LABORATORY	L	T	P	C
		0	0	3	1.5

PREREQUISITES

Digital and Linear Circuits

COURSE OBJECTIVES

To learn design, testing and characterizing of circuit behavior with combinational logic gate ICs.

- To learn design, testing and characterizing of circuit behavior with register/ counter and sequential logic ICs.
- To learn design, testing and characterizing of circuit behavior with OPAMP ICs.
- To learn design, testing and characterizing of circuit behavior with analog Ics like 555 timer VCO and regulators.
- To learn design, testing and characterizing of circuit behavior with digital Ics like decoders, multiplexers.

LIST OF EXPERIMENTS

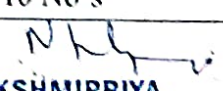
1. Implementation of Boolean Functions.
2. Implementation of Adder and Subtractor circuits.
3. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa.
4. Parity generator and parity checking.
5. Encoders and Decoders.
6. Counters: Design and implementation of 3-bit modulo counters as Synchronous and Asynchronous types using FF IC's and specific counter IC.
7. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitability IC's.
8. Study of multiplexer and de-multiplexer.
9. Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
10. Voltage to frequency characteristics of NE/ SE 566 IC.
11. Variability Voltage Regulator using IC LM317.
12. Timer IC application: Study of NE/SE 555 timer in Astability, Monostability operation.

L: 00	T: 00	P: 45	Total: 45 Periods
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LIST OF EQUIPMENTS REQUIRED

(for batch of 30 students)

1. Dual ,(0-30V) variable Power Supply - 10 No's
2. Digital Multimeter, Potentiometer – 10 No's
3. CRO (30MHz), Function Generator (1 MHz) – 8 No's
4. IC Tester (Analog) – 2 No's
5. Bread board, Digital IC types - 10 No's
6. IC 741/ IC NE555/566/565 - 10 No's
7. LED, LM317, LM723, ICSG3524 / SG3525, Transistor - 2N3391 - 10 No's


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8. Diodes, IN4001, BY126, Zener diodes - 10 No's
9. Step-down transformer 230V/12-0-12V, Capacitor - 10 No's
10. Resistors 1/4 Watt Assorted, Single Strand Wire - 10 No's

COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Develop the Boolean Functions in digital circuits.

CO2: Identify the importance code conversion and develop the code conversion.

CO3: Design and implement circuits with digital ICs like decoders, multiplexers, register.

CO4: Develop the Application of Op-Amp like Adder, comparator, Integrator and Differentiator.

CO5: Design and implement counters using analog ICs like timers, VCOs and digital ICs like Flip-flops and counters.



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REGULATIONS 2024

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR V SEMESTER

FACULTY OF.....	EEE
BOS/CHAIRMAN.....	NK

24UEE501	POWER SYSTEM ANALYSIS	L	T	P	C
		3	1	0	4

PREREQUISITES

Transmission and Distribution

COURSE OBJECTIVES

- Impact knowledge on need for operational studies and to study the power system under steady state operating condition.
- To model iterative techniques for power flow analysis.
- To perform short circuit studies for the power system during symmetrical fault.
- To perform short circuit studies for the power system during unsymmetrical fault.
- The various methods for analyzing power system stability

UNIT-I	POWER SYSTEM	9 + 3
Need for system planning and operational studies - Power scenario in India - Power system components, Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram, Network graph Theory - Bus incidence matrices, Primitive parameters, Formation of bus admittance matrix — Direct inspection method — Singular Transformation method.		

UNIT-II	POWER FLOW ANALYSIS	9 + 3
Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method - Flow charts — Comparison of methods		

UNIT-III	SYMMETRICAL FAULT ANALYSIS	9 + 3
Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level		

UNIT-IV	UNSYMMETRICAL FAULT ANALYSIS	9 + 3
Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system		

UNIT-V	STABILITY ANALYSIS	9 + 3
Classification of power system stability – Rotor angle stability - Power-Angle equation – Steady state stability - Swing equation — Solution of swing equation by step by step method - Swing curve, Equal area criterion - Critical clearing angle and time, Multi-machine stability analysis – modified Euler method.		

L: 45	T: 15	P: 00	Total: 60 Periods
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NLP

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24UEE502	CONTROL SYSTEMS	L	T	P	C
		3	1	0	4

PREREQUISITES
Engineering Mathematics

COURSE OBJECTIVES
The course is designed to • Introduce the basic concepts of open-loop and closed-loop control systems and their mathematical modeling using various representations. • Analyze the time-domain performance of control systems and determine system stability using classical methods. • Examine control system behavior in the frequency domain and interpret Bode, Polar, and Nyquist plots. • Explain the state-space representation of dynamic systems and analyze their controllability and observability. • Design and tune controllers and compensators to meet specific performance criteria in feedback control systems.

UNIT-I	MODELING OF LINEAR TIME INVARIANT SYSTEM (LTIV)	9+3
Control system: Open loop and Closed loop – Feedback control system characteristics – First principle modeling: Mechanical, Electrical and Electromechanical systems – Transfer function representations: Block diagram and Signal flow graph.		

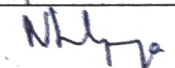
UNIT-II	TIME DOMAIN ANALYSIS	9+3
Standard test inputs – Time response – Time domain specifications – Stability analysis: Concept of stability – Routh Hurwitz stability criterion – Root locus: Construction and Interpretation. Effect of adding poles and zeros		

UNIT-III	FREQUENCY DOMAIN ANALYSIS	9+3
Bode plot, Polar plot and Nyquist plot: – Frequency domain specifications Introduction to closed loop Frequency Response. Effect of adding lag and lead compensators.		

UNIT-IV	STATE VARIABLE ANALYSIS	9+3
State variable formulation – Non uniqueness of state space model – State transition matrix – Eigen values – Eigen vectors – Controllability – Observability		

UNIT-V	DESIGN OF FEED BACK CONTROL SYSTEM	9+3
Design specifications – Lead, Lag and Lag-lead compensators using Root locus and Bode plot techniques –PID controller-PID control in State Feedback form.		

L: 45	T: 15	P: 00	Total: 60 Periods
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24UEE503	POWER ELECTRONICS	L	T	P	C
		3	0	0	3

PREREQUISITES
Electronics Devices

COURSE OBJECTIVES
- To understand the various applications of power electronic devices for conversion, control and conditioning of the electrical power and to get an overview of different types of power semiconductor devices and their dynamic characteristics. - To understand the operation, characteristics and performance parameters of controlled rectifiers - To study the operation, switching techniques and basic topologies of DC-DC switching regulators. - To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods. - To study the operation of AC voltage controller and various configurations of AC voltage controller.

UNIT-I	POWER SWITCHING DEVICES	9
Study of switching devices, SCR, TRIAC, GTO, MOSFET, IGBT, Power Diode – Static and Dynamic characteristics: SCR, MOSFET and IGBT, TRIAC – Introduction to Driver and snubber circuits.		

UNIT-II	CONTROLLED RECTIFIERS	9
Uncontrolled rectifiers: half wave rectifier – mid-point secondary transformer based full wave rectifier - Controlled rectifiers (1 pulse, 2 pulse, 3 pulse, 6 pulse) - performance parameters - displacement factor – ripple and harmonic factor - effect of source inductance		

UNIT-III	DC-DC CONVERTERS	9
Introduction to types of choppers - A, B, C, D and E - Switched mode regulators - Buck, boost, buck-boost converters – Isolated topologies – resonant converters .		

UNIT-IV	INVERTERS	9
IGBT: Static and dynamic behavior - single phase half bridge and full bridge inverters – VSI: (1phase and three phase inverters square wave operation) - Voltage control of inverters single, multi pulse, sinusoidal, space vector modulation techniques – various harmonic elimination techniques – CSI.		

UNIT-V	AC PHASE CONTROLLERS	9
TRIAC triggering concept with positive and negative gate pulse triggering, TRIAC based phase controllers - various configurations for SCR based single and three phase controllers.		

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PREREQUISITES

Engineering Mathematics

COURSE OBJECTIVES

- To make the students familiarize with various representations of systems.
- To enable the students analyze the stability of linear systems in the time domain and frequency domain.
- To guide the students design compensator based on the time and frequency domain Specifications.
- To develop linear models mainly state variable model and transfer function model
- To make the students to design a complete closed loop control system for the physical systems.

LIST OF EXPERIMENTS

1. Numerical Simulation of given nonlinear differential equations.
2. Mathematical modeling and simulation of physical systems in at least two fields.
 - Mechanical
 - Electrical
 - Chemical process
3. Stability analysis using Pole zero maps and Routh Hurwitz Criterion in simulation platform.
4. Root Locus based analysis in simulation platform.
5. Determination of transfer functions of a physical system using frequency response and Bode's asymptotes.
6. Design of Lag, lead compensators and evaluation of closed loop performance.
7. Design of PID controllers and evaluation of closed loop performance.
8. Test of controllability and observability in continuous and discrete domain in simulation platform.
9. State feedback and state observer design and evaluation of closed loop performance.

L: 00	T: 00	P: 45	Total: 45 Periods
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LIST OF EQUIPMENTS REQUIRED

(for batch of 30 students)

1. PC loaded with Pspice/ Matlab/e-Sim / Scilab/ Equivalent Software Package - 10 No's
2. Printer – 1 No's



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24UEE512	POWER ELECTRONICS AND DRIVES LABORATORY	L	T	P	C
		0	0	3	1.5

PREREQUISITES

Power Electronics Devices and Simulation Knowledge

COURSE OBJECTIVES

- To study the VI characteristics of SCR, TRIAC, MOSFET and IGBT.
- To analyze the performance of semi converter, full converter, step-up, step-down choppers by simulation and experimentation.
- To study the behavior of voltage waveforms of PWM inverter applying various modulation techniques.
- To design and analyze the performance of SMPS.
- To study the performance of AC voltage controller by simulation and Experimentation.

LIST OF EXPERIMENTS

1. Characteristic of SCR and TRIAC.
2. Characteristics of MOSFET and IGBT.
3. AC to DC half-controlled converter.
4. AC to DC fully controlled converter.
5. Step down and step up MOSFET based choppers.
6. IGBT based single phase PWM inverter.
7. IGBT based three phase PWM inverter.
8. AC Voltage controller.
9. Switched mode power converter.
10. Simulation of PE circuits (1 Φ & 3 Φ semi converter, 1 Φ & 3 Φ full converter, dc-dc converters, ac voltage controllers).

L: 00	T: 00	P: 45	Total: 45 Periods
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LIST OF EQUIPMENTS REQUIRED

(for batch of 30 students)

1. PC loaded with Pspice/ Matlab/e-Sim / Scilab/ Equivalent Software Package - 10 No's
2. Printer – 1 No's
3. AC Voltage Controller -1
4. Boost Converter – 1
5. Buck Boost converter – 1
6. Buck converter – 1
7. CRO – 10
8. Regulated DC power supply – 10
9. Single phase Full converter – 2
10. Single phase PWM Inverter – 2
11. Single phase Semi converter – 2
12. Step down chopper – 1
13. Step up chopper – 1
14. Three phase PWM Inverter – 2

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COURSE OUTCOMES

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

CO1: Determine the characteristics of SCR, IGBT, TRIAC, MOSFET and IGBT

CO2: Find the transfer characteristics of full converter, semi converter, step up and step down Choppers by simulation experimentation.

CO3: Analyze the voltage waveforms for PWM inverter using various modulation techniques.

CO4: Design and experimentally verify the performance of basic DC/DC converter topologies used for SMPS.

CO5: Understand the performance of AC voltage controllers by simulation and experimentation.



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REGULATIONS 2024

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR CAREER COURSE

24UEEC01	DESIGN THINKING	L	T	P	C
		1	0	0	1

PREREQUISITES

Nil

COURSE OBJECTIVES

- Design Thinking is human-centered problem solving tool which emphasize on empathy, collaboration, co-creation and stakeholder feedback to unlock creativity and innovation, to devise feasible and viable idea/solutions.

UNIT-I	INTRODUCTION TO DESIGN THINKING	5
A brief insight to Design Thinking and Innovation- People Centered Design & Evoking the 'right problem'- Purpose of Design Thinking- Design Thinking Framework.		

UNIT-II	PROCESS IN DESIGN THINKING (EMPATHY, DEFINE)	5
Design Thinking Process – Empathy – Uncovering and Investigating Community Concerns - Define: Examine and Reflect on the problem.		

UNIT-III	CONCEPTING AND BUILDING (IDEA, CREATE)	5
Generating Ideas - Identifying top three ideas - Bundling the Ideas and create concepts - Rapid Prototyping.		

L: 15	T: 00	P: 00	Total: 15 Periods
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TEXT BOOKS

- Robert A Curedale, Design Thinking Process & Methods 4th Edition, December 2017, Design Community College Inc.
- Andrew Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone, First Edition, Nov 2018, Routledge.

REFERENCES

- Idris Mootee, Design Thinking for Strategic Innovation - What They Can't Teach You at Business or Design School, First Edition, 2017, Wiley.
- Yves Pigneur, Greg Bernarda, Alan Smith, Trish Papadacos Alex Osterwalder, Value Proposition Design: How to Create Products and Services Customers Want, 2015, Wiley.
- Brown, Tim, and Barry Katz. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, 2009, Harper Business.

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COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Construct design challenge and reframe the design challenge into design opportunity.

CO2: Identify the feelings of users and the deep user insights and needs.

CO3: Develop ideas and prototypes by brain storming using the ideation tools.

CO4: Organize the user walkthrough experience using ideal user experience journey.

CO5: Develop smart strategies plan that will deliver/achieve the idea/solution.



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24UEEC02	INNOVATION PRACTICE	L	T	P	C
		1	0	0	1

PREREQUISITES

Nil

COURSE OBJECTIVES

- To inspire the students to think innovation concepts and ideas for business model developments.

UNIT-I

INNOVATION IN DESIGN THINKING

5

Innovation and Creativity – Types of innovation – challenges in innovation. Design Thinking – Design Thinking Stages: Empathize – Define – Ideate – Prototype – Test.

UNIT-II

TESTING, REFINING AND PITCHING THE IDEAS

5

Importance & Testing the Design with People - Retest and Redefine Results - Creating a Pitch for the design.

UNIT-III

VALUE PROPOSITION DESIGN

5

Business Vs Startup - Briefing the Problem - Problem Validation and User Discovery - Challenge Brief.

L: 15 T: 00 P: 00 Total: 15 Periods

TEXT BOOKS

- Robert A Curedale, Design Thinking Process & Methods 4th Edition, December 2017, Design Community College Inc.
- Andrew Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone, First Edition, Nov 2018, Routledge.

REFERENCES

- Idris Mootee, Design Thinking for Strategic Innovation - What They Can't Teach You at Business or Design School, First Edition, 2017, Wiley.
- Yves Pigneur, Greg Bernarda, Alan Smith, Trish Papadacos Alex Osterwalder, Value Proposition Design: How to Create Products and Services Customers Want, 2015, Wiley.
- Brown, Tim, and Barry Katz. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, 2009, Harper Business.

COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Select the innovation need and design thinking phases.

CO2: Identify, screen and analyse ideas for new products based on customer needs.

CO3: Develop and analyse the product concepts and presents the overall architecture of product.

CO4: Predict a structured business model.

CO5: Practice the procedures for become an Entrepreneurs.


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24UEEC03	QUANTITATIVE APTITUDE	L	T	P	C
		1	0	0	1

PREREQUISITES

Basic Mathematics

COURSE OBJECTIVES

- To enhance the students to the employability skills and to develop professional career competency.

UNIT-I	QUANTITATIVE ABILITY I	3
Number theory - Shortcuts, Divisibility rule - Unit place deduction - LCM & HCF, Square root and Cube Root, Decimal & Fraction Percentage.		

UNIT-II	QUANTITATIVE ABILITY II	3
Profit, loss and discount, Simple and compound interest, Ratio & Proportions, Mixtures & Allegation, Partnership.		

UNIT-III	QUANTITATIVE ABILITY III	3
Problems on Ages, Average, Clocks, Calendar, Data Interpretation- Bar chart- Pie chart- Line chart-Tables chart.		

UNIT-IV	QUANTITATIVE ABILITY IV	3
Time, speed & distance - Average speed - Relative speed - Train problems - Boats and streams - Races, Chain rule, Time and work - Pipes and cisterns.		

UNIT-V	QUANTITATIVE ABILITY V	3
Permutation & Combination, Probability, Mensuration.		

L: 15	T: 00	P: 00	Total: 15 Periods
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TEXT BOOKS

1. Rajesh Varma, "Fast Track Objective Arithmetic", Arihant Publications.

REFERENCES

1. R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication.
2. R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand& Company Pvt Limited.


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COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Understand the basic number system for solving quantitative aptitude.

CO2: Apply the number system for solving application orientated concepts in quantitative aptitude.

CO3: Apply the financial ability for solving application orientated concepts in quantitative aptitude and in the data interpretation techniques.

CO4: Learn the time and distance for solving application orientated concepts in quantitative aptitude.

CO5: Apply the financial ability for solving application orientated concepts in quantitative aptitude.



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24UEEC04	VERBAL & LOGICAL REASONING	L	T	P	C
		1	0	0	1

PREREQUISITES
Logical Thinking

COURSE OBJECTIVES
To enhance the students to the employability skills and to develop professional career competency.

UNIT-I	VERBAL REASONING I	3
Analytical reasoning – Linear and circular arrangement, Blood relation, Direction Problems, Puzzles. Logical reasoning - Number and Alpha series, Odd man out, Element series and Logical series, Coding and decoding, Analogy, Classification, Logical sequence of words.		

UNIT-II	VERBAL REASONING II	3
Machine Input and Output, Coded Inequalities, syllogisms, Problems on Cubes, Data sufficiency. Critical Reasoning - Statement and Argument, Statement and Assumption, Statement and Conclusion, Cause and effect, Course of action.		

UNIT-III	VERBAL REASONING II	3
Sentence correction and completion, Para-Jumbles, Cloze Passage, Vocabulary, Voices & Forms of Speech, Multidimensional arrangement.		

UNIT-IV	NON- VERBAL REASONING I	3
Figure series, Odd man out, Mirror Image, Water image, Embedded Image, Cubes and Dices, Insert the Missing Characters, Analytical reasoning.		

UNIT-V	NON- VERBAL REASONING II	3
The Embedded figure, Logical Games, Incomplete Pattern, Missing letters, Data arrangement, Mathematical orders, Inferred meaning.		

L: 15	T: 00	P: 00	Total: 15 Periods
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TEXT BOOKS
1. M.K.Panday, "Analytical Reasoning", Magical Series. 2. BS Sijwali- Indu Sijwali, A New Approach to "Reasoning Verbal, Non-Verbal & Analytical", Arihant Publications.

REFERENCES
1. R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication. 2. R.S.Agarwal, "A modern approach to Verbal & Non-verbal reasoning", S.Chand & Company Pvt Limited.


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COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Identify the analytical reasoning and logical reasoning in verbal aptitude applications.
- CO2: Select the verbal reasoning and the critical reasoning in quantitative aptitude.
- CO3: Solve the verbal reasoning and the multidimensional arrangement in quantitative aptitude.
- CO4: Identify the non-verbal reasoning in verbal aptitude applications.
- CO5: Select the non-verbal reasoning in logical games and mathematical orders.



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24UEEC05	PCB SYSTEM DESIGN	L	T	P	C
		0	0	2	1

PREREQUISITES

Basic Electronics Circuits

COURSE OBJECTIVES

- Familiarization of the various types of devices that may be mounted on PCB.

List of Experiments

Analog Electronic Circuits

- Verification of Thevenin theorem
- Voltage - current characteristics of a p-n junction diode
- Simple circuit to glow an LED

Digital Electronic Circuits

- To verify and design AND, OR, NOT and XOR using NAND gates
- Design a adder Circuit
- Design a Subtractor Circuit

L: 00	T: 00	P: 30	Total: 30 Periods
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PCB Design Softwares recommended

- KiCAD (Open Source Electronics Design Automation Suite) <https://www.kicad.org/>
- EasyEDA (Online PCB Design Tool) <https://easyeda.com/>
- PADS - Siemens EDA (PCB Design Software) <https://eda.sw.siemens.com/en-US/pcb/pads/>
- Any other similar PCB designing software

REFERENCES

- Printed Circuit Board – Design & Technology, Walter C. Bosshart, Tata McGraw Hill, 2008.
- Printed Circuit Board –Design, Fabrication, Assembly & Testing, R.S. Khandpur, First Edition, Tata McGraw-Hill Education Pvt. Ltd., 2005.
- Printed Circuit Board Design Using Autocad, Chris Schroeder, Newnes Publisher, 1998.
- Printed Circuits Handbook, Clyde F. Coombs, Jr, Happy T. Holden, Sixth Edition, Publisher: McGraw-Hill Education, 2016.

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Verify the basic circuit concepts in electronic circuits.
CO2: Verify the concepts of semiconductor device performance.
CO3: Design the simple electronic circuit to operate the load.
CO4: Verify the basic operation using digital logic gates.
CO5: Design the digital operations of adder and subtractor.


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24UEEC06	CAD FOR ELECTRICAL SYSTEM	L	T	P	C
		0	0	2	1

PREREQUISITES

Basic Electrical and Electronics Circuits

COURSE OBJECTIVES

- To impart skill of making computer aided electrical drawing.
- To understand the tools in 2D diagrams using Auto CAD.
- Symbols widely used in Electrical and Electronics circuits.
- Winding diagrams of electrical machines.

List of Experiments

Electrical Symbols - Drawing

1. Draw the symbols for components:
Resistor, Capacitor, Inductor, Diode, Transistor, FET, SCR, UJT, TRIAC, DIAC, and Gates AND, OR, NOT, NAND, NOR, EXOR.
2. Draw the symbols used in electrical wiring:
Relays, contactors, fuses, main switch, electric bell, earth, DPST, DPDT, TPST, Neutral link.
3. Draw the symbols for instruments:
Ammeter, Voltmeter, Wattmeter, Energy meter, Frequency meter, Power factor meter, Timer and Buzzers.
4. Draw the symbols for machines:
Armatures, Alternators, Field winding (Shunt, Series and Compound) Transformer and Autotransformer.

Electrical Connection Diagrams - Drawing

1. Draw the control and main circuit of automatic star delta starter.
2. Draw the winding diagram of an electric machine.

L: 00	T: 00	P: 30	Total: 30 Periods
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List of Requirements

1. PC – Pentium Dual Core – 30
2. Electrical CAD or AutoCAD Software multi user - 1

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Identify the skill of making computer aided electrical drawing.
CO2: Select the tools in 2D diagrams using Auto CAD.
CO3: Illustrate the simple drawings in electrical and electronic circuits.
CO4: Design the simple drawings in digital logic gates.
CO5: Design the winding diagrams of electrical machines.


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24UEEC07	CONTROL PANEL DESIGN	L	T	P	C
		0	0	2	1

PREREQUISITES
Basics of Electrical and Electronics Devices

COURSE OBJECTIVES
To enhance the students to the employability skills and to develop professional career competency.

UNIT-I	ELECTRICAL CONTROL DEVICES AND SENSORS	10
Operation details of switch gear devices: Relay, contactors, circuit breakers and its types. Selection of wires and circuits breakers to the load sizing. Electrical symbols and wiring diagram. Sensors and its types		

UNIT-II	CONTROL PANEL DESIGN	10
Control panel Layout-panel design standards-Design of control circuit using relay, contactors and breakers-details wiring of control panel and interfacing with field devices. Earthing and panel cabling – Generation of BOM - Design Approval Process – Design Validation		

UNIT-III	MOTORS AND DRIVES	10
Need for industrial motor drives, different types of drives -VFD and Servo wiring configuration.		

L: 00	T: 00	P: 30	Total: 30 Periods
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COURSE OUTCOMES
At the end of the course, the students will be able to:
CO1: Identify the skill of making control panel design.
CO2: Select the electrical control devices.
CO3: Illustrate the control panel design with the help of sensors.
CO4: Design the control panel with the protection system of control.
CO5: Design the control panel with drive system.



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24UEEC08	SOLAR PANEL INSTALLATION	L	T	P	C
		0	0	2	1

PREREQUISITES

Basics of Electrical Devices and Semiconductor Devices

COURSE OBJECTIVES

- To enhance the students to the employability skills and to develop professional career competency.

UNIT-I	INTRODUCTION TO SOLAR ENERGY AND SYSTEM COMPONENTS	6
Overview of solar energy and its applications, Solar panel types and characteristics, System components: inverters, mounting systems, and wiring		

UNIT-II	SOLAR PANEL INSTALLATION METHODS AND BEST PRACTICES	6
Installation methods: rooftop, ground-mount, and tracking systems, Installation best practices: site assessment, system sizing, and wiring, Safety protocols: fall protection, electrical safety, and personal protective equipment		

UNIT-III	INVERTER TECHNOLOGIES AND CONFIGURATION	6
Inverter types: string, micro, and hybrid, Inverter configuration: sizing, selection, and commissioning, Inverter monitoring and troubleshooting Need for industrial motor drives, different types of drives -VFD and Servo wiring configuration.		

UNIT-IV	SYSTEM DESIGN AND ANALYSIS	6
System design: load calculation, system sizing, and wiring, System analysis: energy production, efficiency, and performance System monitoring and troubleshooting		

UNIT-V	FINAL PROJECT AND COURSE REVIEW	6
Final project: design and present a solar panel installation project		

L: 00	T: 00	P: 30	Total: 30 Periods
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COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Understand the skill of making solar energy system and components.
- CO2: Understand the solar panel installation and their practices.
- CO3: Design the inverter technologies and configurations.
- CO4: Design the system and analysis of solar system.
- CO5: Design the project model under solar energy.

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REGULATIONS 2024

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

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24UEEP501	PLC PROGRAMMING	L	T	P	C
		3	0	0	3

PREREQUISITES

Digital Electronics

COURSE OBJECTIVES

- To know about the basics of PLC and Automation
- To understand the importance of Automation
- To explore various types and manufactures of PLCs.
- To introduce types of programming languages of PLC and some exercise few programs.

UNIT-I	INTRODUCTION	7 + 2
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Programmable Logic Controller (PLC)- Block diagram of PLC- Programming languages of PLC - Basic instruction sets- Design of alarm and interlocks- Networking of PLC- Overview of safety of PLC with case studies- Process Safety Automation: Levels of process safety through use of PLCs- IEC 61131-3 Standard - Application of international standards in process safety control.

UNIT-II	IEC 61131-3	7 + 2
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Rails- Rungs- Relay Logic- Latch switch- Timers- Counters- Boolean logics- Math Instructions - Data manipulation Instructions- Requirement of communication networks for PLC, PLC to PC Communication to computer- FBD equivalent to LL- FBD Programming- IL- SFC-ST.

UNIT-III	SCADA	7 + 2
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Elements of SCADA system- History of SCADA, Remote Terminal Unit- Discrete control- Analog control, Master Terminal Unit- Operator interface.

UNIT-IV	HART and Field Bus	7 + 2
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Introduction- Evolution of signal standards- HART communication protocol- communication modes - HART networks- HART commands- HART and OSI model- Field bus- Architecture- Basic requirements of field Bus standard- Field bus Topology- Interoperability- Interchangeability.

UNIT-V	PLC PROGRAMMING	7 + 2
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Exercise in Programming Languages from IEC 61131-3: Traffic Light Control - Two way - Four way - Water Level Control- Automatic Material Sorting System- Automatic Bottle Filling System, Code Converters- DC motor Control - Alarm Circuit.

SKILL DEVELOPMENT ACTIVITIES (Group Seminar / Mini Project / Assignment / Content Preparation / Quiz / Surprise Test / Solving GATE questions/ etc)

1. Taking Local area to implement simple closed loop system for any system using PLC.
2. Making a complete automated control loop with Supervisory and HMI system.
3. Implementing an Alarm based control scheme and run in a simulated environment.
4. Designing an entire PLC logic for filling and draining water tank automatically.

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TEXT BOOKS

1. Frank D. Petruzella, "Programmable Logic Controllers", 5th Edition, McGraw- Hill, New York, 2019.
2. Stuart Boyer A, "SCADA: Supervisory control and data Acquisition", Fourth Edition, ISA- The Instrumentation, Systems, and Automation Society, 2010.

REFERENCES

1. Bolton. W, "Programmable Logic Controllers", Elsevier Newnes, 6th Edition 2015.

COURSE OUTCOMES

At the end of the course, the students will be able to:

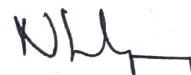
CO1: Understand the basics and need for Automation in industries.

CO2: Explain the logic and flow of any particular programming written for a process.

CO3: Apply the knowledge to design or improve an existing program to increase productivity of any process.

CO4: Categorize SCADA architecture and communication protocols.

CO5: Build and logic in any of the programming languages from IEC- 61131- 3 standards.



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24UEEP502	DISCRETE SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

PREREQUISITES
Engineering Mathematics

COURSE OBJECTIVES
The course is designed to • The fundamental concepts and classifications of signals and systems. • Analyze discrete-time systems using Z-transform and frequency-domain techniques. • Explain and implement Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) algorithms. • Design and realize FIR and IIR digital filters using various techniques. • Familiarize with the architecture and applications of Digital Signal Processors.

UNIT-I	INTRODUCTION	7 + 2
Classification of systems: Continuous, discrete, linear, causal, stability, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.		

UNIT-II	DISCRETE TIME SYSTEM ANALYSIS	7 + 2
Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Discrete Time Fourier transform, magnitude and phase representation.		

UNIT-III	DISCRETE FOURIER TRANSFORM & COMPUTATION	7 + 2
Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF using radix 2 FFT – Butterfly structure.		

UNIT-IV	DESIGN OF DIGITAL FILTERS	7 + 2
FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation Warping, pre warping.		

UNIT-V	DIGITAL SIGNAL PROCESSORS	7 + 2
Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DS Processors.		

SKILL DEVELOPMENT ACTIVITIES (Group Seminar / Mini Project / Assignment / Content Preparation / Quiz / Surprise Test / Solving GATE questions/ etc)
1. Use any DSP processor/MATLAB/open source platform to give hands on training on basic concepts of Digital Signal Processing.


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- a) To determine impulse and step response of two vectors.
- b) To perform convolution between two vectors.
2. Assignment: Implementation of FIR/IIR filters with FPGA.
3. DSP processors based Mini project.

L: 45	T: 00	P: 00	Total: 45 Periods
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TEXT BOOKS

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 4th Edition 2007.
2. Robert J.Schilling & Sandra L.Harris , ' Introduction to Digital Signal Processing using MATLAB', Cengage Learning, 2nd Edition 2013.

REFERENCES

1. Emmanuel C Ifeakor and Barrie W Jervis , "Digital Signal Processing – A Practical approach" Pearson Education, Second edition, 2002.
2. Alan V. Oppenheim, Ronald W. Schaffer and John R. Buck, 'Discrete – Time Signal Processing', Pearson Education, New Delhi, 2nd Edition 2012.
3. SenM.kuo, Woonseng....s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson, 1st Edition 2004.
4. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGraw Hill, New Delhi, 4th Edition 2013.
5. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003, 1st Edition.

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Classify different types of signals and systems and explain their mathematical representation.
- CO2: Analyze discrete-time systems using Z-transform and convolution methods.
- CO3: Compute and interpret DFT and FFT for digital signal analysis.
- CO4: Design FIR and IIR filters to meet specific frequency response characteristics.
- CO5: Explain the architecture, addressing modes, and features of digital signal processors.

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24UEEP503	ELECTRICAL MACHINE DESIGN	L	T	P	C
		3	0	0	3

PREREQUISITES
Electrical Machines

COURSE OBJECTIVES
• To familiarize students with the fundamental principles and factors influencing electrical machine design. • To enable learners to analyze design considerations for transformers, DC machines, induction motors, and synchronous machines. • To develop competence in applying electromagnetic, thermal, and mechanical design aspects to real-world applications. • To introduce modern materials, cooling techniques, and trends in the design of electrical machines. • To equip students to perform design calculations for main dimensions and components of rotating and static machines.

UNIT-I	FUNDAMENTALS OF MACHINE DESIGN	9
Fundamental Aspects of Electrical Machine Design of machines - design factors - limitation in design - modern trends in electrical machine design – types of magnetic, electric and insulating materials – modes of heat dissipation – cooling of rotating machines – methods of cooling.		

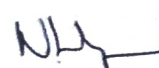
UNIT-II	DESIGN OF TRANSFORMERS	9
Transformer windings – output equation – design of main dimensions— design of core - choice of flux density – determination of number of turns and length of mean term - resistance and leakage reactance – no load current calculation –cooling of transformers- calculation of number of tubes.		

UNIT-III	DESIGN OF DC MACHINES	9
Design of DC Machines Output equation –selection of specific magnetic and electric loadings - separation of D and L – estimation of number of conductors, armature slots and conduct dimensions – choice of number of poles and calculation of length of air gap – design of field systems, interpoles and brushes.		

UNIT-IV	DESIGN OF INDUCTION MOTORS	9
Design of Induction motors output equation -main dimensions – choice of average flux density and ampere conduction for meter — design of stator slots and rotor slots- design of rotor bars end rings– design of wound rotor – design of no-load current.		

UNIT-V	DESIGN OF SYNCHRONOUS MACHINES	9
Types of construction – output equation - main dimensions – short circuit ratio and its effects on the performance – design of rotor –Design of field winding – Design of turbo alternators – Rotor design temperature rise and its effects.		

L: 45	T: 00	P: 00	Total: 45 Periods
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TEXT BOOKS

1. A.K.Sawhney, "A Course in Electrical Machines Design", Dhan path Rai & Co. 6 th edition 2010.

REFERENCES

2. AE Clayton and NN Hancock, "The Performance and Design of Direct Current Machines", CBS Publishers, 3 rd edition, 2004.
3. M.G. Say, "Performance and Design of A.C. Machines", ELBS and Pitman & Sons, 4th edition, 2013.
4. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Company Pvt. Ltd. New Delhi, 2 nd edition, 2006.
5. K. M. Vishnu Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 1 st edition 2008.

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Classify the design factors, materials, and cooling methods used in various electrical machines.
- CO2: Compute output equations and main dimensions for transformers, DC machines, induction motors, and synchronous machines.
- CO3: Determine key design parameters such as flux density, specific loadings, and winding configurations for different machine types.
- CO4: Evaluate the effects of design variables like short circuit ratio, temperature rise, and air gap length on machine performance.
- CO5: Develop optimized designs of electrical machines incorporating modern materials, improved cooling, and efficiency considerations.



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24UEEP504	SPECIAL ELECTRICAL MACHINES	L	T	P	C
		3	0	0	3

PREREQUISITES

Electrical Machines

COURSE OBJECTIVES

- To understand the working of special machines like stepper motor, switched reluctance motor, BLDC motor & PMSM.
- To derive torque equation of special machines.
- To study the characteristics of special machines.
- To identify the controller for different special machines.
- To study the working principle of synchronous reluctance motor, hysteresis motor, AC series motors and Linear motor.

UNIT-I

STEPPER MOTORS

9

Constructional features – Principle of operation – Types – Torque predictions – Linear and Non-linear analysis – Characteristics – Drive circuits – Closed loop control – Applications

UNIT-II

SWITCHED RELUCTANCE MOTORS

9

Constructional features – Principle of operation- Torque prediction – Characteristics - Power controllers – Control of SRM drive - Speed control - current control - design procedures - Sensor less operation of SRM – Current sensing - rotor position measurement and estimation methods- sensor less rotor position estimation - inductance based estimation – applications.

UNIT-III

PERMANENT MAGNET BRUSHLESS DC MOTORS

9

Fundamentals of Permanent Magnets - Types- Principle of operation - Magnetic circuit analysis EMF and Torque equations- Characteristics - Controller design - Transfer function – Machine, Load and Inverter-Current and Speed Controller.

UNIT-IV

PERMANENT MAGNET SYNCHROUNOUS MOTORS

9

Permanent Magnet AC Machines, Machine Configurations, PMSM - Principle of operation – EMF and Torque equations - Phasor diagram - Torque speed characteristics – Evaluation of control characteristics - Design of current and speed controllers.

UNIT-V

STUDY OF OTHER SPECIAL ELECTRICAL MACHINES

9

Constructional features, operating principle and characteristics of synchronous reluctance motor. Principle of operation and characteristics of Hysteresis motor – AC series motors – Linear motor – Applications.

L: 45	T: 00	P: 00	Total: 45 Periods
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TEXT BOOKS

1. Jacek F. Gieras, Dr. Rong-Jie Wang, Professor Maarten J. Kamper - Axial Flux Permanent Magnet Brushless Machines-Springer Netherlands 2008.
2. Bilgin, Berker Emadi, Ali Jiang, James Weisheng - Switched reluctance motor drives: fundamentals to applications-CRC 2019.

REFERENCES

1. Ramu Krishnan - Permanent Magnet Synchronous and Brushless DC Motor Drives -CRC Press, Marcel Applications -CRC Press 2009.
2. T.Kenjo, 'Stepping motors and their microprocessor controls', Oxford University press, New Delhi, 2000 Dekker 2009.
3. T.J.E. Miller, 'Brushless magnet and Reluctance motor drives', Clarendon press, London, 1989.
4. R. Krishnan - Switched Reluctance Motor Drives Modeling, Simulation, Analysis, Design, and Applications -CRC Press 2017.

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Interpret the construction, principle of operation and control methods of various types of stepper motors.
- CO2: Explain the construction, operation and control characteristics of switched reluctance motors.
- CO3: Describe the construction, operation, control method and performance characteristics of permanent magnet brushless DC motors with control scheme.
- CO4: Explain the construction, operation and performance characteristics of permanent magnet synchronous motors.
- CO5: Interpret the construction, operation of other special machines with advantages and limitations for a suitable specific application.

NH

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24UEEP505	POWER QUALITY ENGINEERING	L	T	P	C
		3	0	0	3

PREREQUISITES
Power System

COURSE OBJECTIVES
• To learn the basic definitions in Power Quality. • To study the power quality issues in Single Phase and Three Phase Systems. • To comprehend the principles of Power System Harmonics. • To know the way to use DSTATCOM for Harmonic Mitigation. • To explore the concepts related with Series Compensation.

UNIT-I	INTRODUCTION	7 + 2
Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non-linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.		

UNIT-II	ANALYSIS OF SINGLE PHASE AND THREE PHASE SYSTEM	7 + 2
Single phase linear and non-linear loads – single phase sinusoidal, non-sinusoidal source – supplying linear and nonlinear loads – three phase unbalanced and distorted source supplying non-linear loads – concept of power factor		

UNIT-III	MITIGATION OF POWER SYSTEM HARMONICS	7 + 2
Introduction - Principle of Harmonic Filters – Series-Tuned Filters – Double Band-Pass Filters – damped Filters – Detuned Filters – Active Filters – Power Converters – Harmonic Filter Design – Tuned Filter – Second-Order Damped Filter – Impedance Plots for Filter Banks – Impedance Plots for a Three-Branch 33 kV Filter.		

UNIT-IV	LOAD COMPENSATION USING DSTATCOM	7 + 2
Compensating single – phase loads – Ideal three phase shunt compensator structure – generating reference currents using instantaneous PQ theory – Instantaneous symmetrical components theory – Generating reference currents when the source is unbalanced –Realization and control of DSTATCOM – DSTATCOM in Voltage control mode.		

UNIT-V	SERIES COMPENSATION OF POWER DISTRIBUTION SYSTEM	7 + 2
Rectifier supported DVR – DC Capacitor supported DVR – DVR Structure – Voltage Restoration – Series Active Filter – Unified Power Quality Conditioner.		

L: 45	T: 00	P: 00	Total: 45 Periods
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TEXT BOOKS

1. Arindam Ghosh and Gerard Ledwich "Power Quality Enhancement Using Custom Power Devices", Kluwer Academic Publishers, First Edition, 2002
2. G.T.Heydt, "Electric Power Quality", Stars in a Circle Publications, Second Edition, 2011.
3. George J. Wakileh, "Power System Harmonics – Fundamentals, Analysis and Filter Design", Springer – Verlag Berlin Heidelberg, New York, 2019.

REFERENCES

1. R.C.Duggan "Electric Power Systems Quality", Tata MC Graw Hill Publishers, Third Edition, 2012.
2. Arrillaga "Power System Harmonics", John Wiley and Sons, 2003 2nd Edition.
3. Derek A.Paice "Power Electronic Converter Harmonics" IEEE Press, 1995, Wiley – IEE Press 1999, 18th Edition.

COURSE OUTCOMES

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

- CO1: Use various definitions of power quality for power quality issues
- CO2: Outline the concepts related with single phase / three phase, linear / nonlinear loads and single phase / three phase sinusoidal, non-sinusoidal source
- CO3: Solve problems related with mitigation of Power System Harmonics
- CO4: Employ DSTATCOM for load compensation
- CO5: Demonstrate the role of DVR, SAFs UPQC in power distribution systems.



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24UEEP506	ELECTRICAL WIRING & COST ESTIMATION	L	T	P	C
		3	0	0	3

PREREQUISITES

Basic Electrical Engineering

COURSE OBJECTIVES

- To estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost availability.
- To estimate costing of the products/projects that are part of our everyday usage.
- To basic knowledge on methods and types of estimation and its merits and demerits.
- To prepare the schedule of materials with specifications and estimates for different types of electrical installations.

UNIT-I	DESIGN CONSIDERATIONS	10
Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of Electrical Installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads.		

UNIT-II	ELECTRICAL INSTALLATIONS	11
Systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution Board, guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electrical installations.		

UNIT-III	ELECTRICAL INSTALLATION OF BUILDINGS AND SMALL INDUSTRIES	8
Electrical installations for residential buildings – estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.		

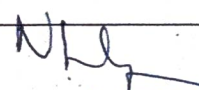
UNIT-IV	SUBSTATIONS	8
Introduction, Types of substations, Outdoor substation – Pole mounted type, Indoor substation, Floor mounted type.		

UNIT-V	DESIGN OF ILLUMINATION SCHEMES	8
Introduction, Terminology in Illumination, laws of illumination, various types of light sources, Practical lighting schemes.		

L: 45	T: 00	P: 00	Total: 45 Periods
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TEXT BOOKS

1. K.B. Raina, S.K. Bhattacharya, Electrical Design Estimating and Costing, New Age International Publisher.


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2. Dr. V.K. Jain, Dr. Amitabh Bajaj, Design of Electrical Installations, University Science Press.
3. Lawrence J. Vogt, P.E., Electricity pricing Engineering Principles and Methodologies, CRC Press.

REFERENCES

1. Guide for Electrical Layout in residential buildings, Indian Standard Institution, IS:4648-1968
2. Electrical Installation buildings Indian Standard Institution, IS:2032.

COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost availability.

CO2: Estimate costing of the products/projects that are part of our everyday usage.

CO3: Basic knowledge on methods and types of estimation and its merits and demerits.

CO4: Prepare the schedule of materials with specifications and estimates for different types of electrical installations.

CO5: Interpret the results obtained from the illumination schemes.



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REGULATIONS 2024

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR OPEN ELECTIVES

FACULTY OF.....EEE.....
BOS/CHAIRMAN.....Nky.....

24UEEO01	RENEWABLE ENERGY TECHNOLOGIES	L	T	P	C
		3	0	0	3

PREREQUISITES
Basic Science

COURSE OBJECTIVES
- To know the Indian and global energy scenario. - To learn the various solar energy technologies and its applications. - To educate the various wind energy technologies. - To explore the various bio-energy technologies. - To study the ocean and geothermal technologies.

UNIT-I	ENERGY SCENARIO	9
Indian energy scenario in various sectors – domestic, industrial, commercial, agriculture, transportation and others – Present conventional energy status – Present renewable energy status-Potential of various renewable energy sources-Global energy status-Per capita energy consumption - Future energy plans		

UNIT-II	SOLAR ENERGY CONVERSION	9
Solar radiation – Measurements of solar radiation and sunshine – Solar spectrum - Solar thermal collectors – Flat plate and concentrating collectors – Solar thermal applications – Solar thermal energy storage – Fundamentals of solar photo voltaic conversion – Solar cells - IV Characteristics and MPPT of Solar PV System – Solar PV Systems – Solar PV applications.		

UNIT-III	WIND ENERGY CONVERSION	9
Wind data and energy estimation – Betz limit - Site selection for wind farms – characteristics – Wind resource assessment - Horizontal axis wind turbine – components - Vertical axis wind turbine, Control of Wind Turbine – Wind turbine generators and its performance – Hybrid systems (Solar – Wind Hybrid System) – Environmental issues - Applications.		

UNIT-IV	BIO-ENERGY CONVERSION	9
Bio resources – Biomass direct combustion – thermochemical conversion – biochemical conversion-mechanical conversion - Biomass gasifier - Types of biomass gasifiers Cogeneration- Carbonisation – Pyrolysis - Biogas plants – Digesters –Biodiesel production – Ethanol production - Applications.		

UNIT-V	OCEAN AND GEOTHERMAL ENERGY CONVERSION	9
Small hydro - Tidal energy – Wave energy – Open and closed OTEC Cycles – Limitations – Geothermal energy – Geothermal energy sources - Types of geothermal power plants – Applications - Environmental impact.		

L: 45	T: 00	P: 00	Total: 45 Periods
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NK

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TEXT BOOKS

1. Kothari, "Renewable Energy Sources and Emerging Technologies", Prentice Hall India Learning Private Limited, 2nd edition (1 January 2011), ISBN-10 : 8120344707.
2. Mehmet Kanoglu, Yunus A. Cengel, John M. Cimbala, "Fundamentals and Applications of Renewable Energy", Indian Edition, Mc Graw Hill, First edition (10 December 2020), ISBN-10 : 9390385636.

REFERENCES

1. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 2012.
2. Rai.G.D., "Non-Conventional Energy Sources", Khanna Publishers, New Delhi, 2014.
3. Sukhatme.S.P., "Solar Energy: Principles of Thermal Collection and Storage", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.
4. Tiwari G.N., "Solar Energy – Fundamentals Design, Modelling and applications", Alpha Science Intl Ltd, 2015.
5. Twidell, J.W. & Weir A., "Renewable Energy Resources", EFNSpon Ltd., UK, 2015.

COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Discuss the Indian and global energy scenario.

CO2: Describe the various solar energy technologies and its applications.

CO3: Elucidate the various wind energy technologies.

CO4: Explore the various bio-energy technologies.

CO5: Outline the ocean and geothermal technologies.

NL

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24UEEO02

HYBRID ELECTRIC VEHICLES

L	T	P	C
3	0	0	3

PREREQUISITES

Engineering Physics

COURSE OBJECTIVES

- The objective of this course is to prepare the students to know about the general aspects of Electric and Hybrid Vehicles (EHV), including architectures, modelling, sizing, and sub system design and hybrid vehicle control.

UNIT-I

DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES

9

Need for Electric vehicle- Comparative study of diesel, petrol, hybrid and electric Vehicles. Advantages and Limitations of hybrid and electric Vehicles. - Design requirement for electric vehicles- Range, maximum velocity, acceleration, power requirement, mass of the vehicle. Various Resistance- Transmission efficiency- Electric vehicle chassis and Body Design, Electric Vehicle Recharging and Refuelling Systems.

UNIT-II

ENERGY SOURCES

9

Battery Parameters - Different types of batteries – Lead Acid- Nickel Metal Hydride - Lithium ion Sodium based- Metal Air. Battery Modelling - Equivalent circuits, Battery charging- Quick Charging devices. Fuel Cell - Fuel cell Characteristics - Fuel cell types - Half reactions of fuel cell. Ultra capacitors. Battery Management System, Introduction to Hybrid Energy Storage Devices.

UNIT-III

MOTORS AND DRIVES

9

Types of Motors - DC motors - AC motors, PMSM motors, BLDC motors, Switched reluctance motors working principle, construction and characteristics – Induction motor for derive applications.

UNIT-IV

POWER CONVERTERS AND CONTROLLERS

9

Solid state Switching elements and characteristics – BJT, MOSFET, IGBT, SCR and TRIAC - Power Converters – rectifiers, inverters and converters for Motor Drives - four quadrant operations.

UNIT-V

HYBRID AND ELECTRIC VEHICLES

9

Main components and working principles of a hybrid and electric vehicles, Different configurations of hybrid and electric vehicles. Power Split devices for Hybrid Vehicles - Operation modes - Control Strategies for Hybrid Vehicle - Economy of hybrid Vehicles - Case study on specification of electric and hybrid vehicles.

L: 45

T: 00

P: 00

Total: 45 Periods



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TEXT BOOKS

1. Iqbal Husain, "Electric and Hybrid Vehicles-Design Fundamentals", CRC Press,2003
2. Mehrdad Ehsani, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles", CRC Press,2005.

REFERENCES

1. James Larminie and John Lowry, "Electric Vehicle Technology Explained " John Wiley & Sons,2003
2. Lino Guzzella, " Vehicle Propulsion System" Springer Publications,2005
3. Ron HodKinson, "Light Weight Electric/ Hybrid Vehicle Design", Butterworth Heinemann Publication,2005.

COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Understand the operation and architecture of electric and hybrid vehicles

CO2: Identify various energy source options like battery and fuel cell

CO3: Select suitable electric motor for applications in hybrid and electric vehicles.

CO4: Explain the role of power electronics in hybrid and electric vehicles

CO5: Infer the configuration, control strategies, and economic aspects of hybrid and electric vehicles with reference to real-world case studies.



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PREREQUISITES

Basic Mathematics

COURSE OBJECTIVES

The Course is designed to:

- Introduce the fundamental concepts, architecture, and operation of Programmable Logic Controllers (PLCs).
- Familiarize students with various PLC programming languages and their syntax as per IEC 61131-3 standards.
- Enable students to develop and test basic PLC programs using ladder logic and function block diagrams for industrial applications.
- Provide knowledge on communication protocols and networking techniques used in PLC and SCADA systems.
- Expose students to real-time industrial case studies to understand the implementation of PLC-based automation systems.

UNIT-I**INTRODUCTION TO PLC****9**

Introduction to PLC: Microprocessor, I/O Ports, Isolation, Filters, Drivers, Microcontrollers/DSP, PLC/DDC- PLC Construction: What is a PLC, PLC Memories, PLC I/O, PLC Special I/O, PLC Types.

UNIT-II**PLC INSTRUCTIONS****9**

PLC Basic Instructions: PLC Ladder Language- Function block Programming- Ladder/Function Block functions- PLC Basic Instructions, Basic Examples (Start Stop Rung, Entry/Reset Rung)- Configuration of Sensors, Switches, Solid State Relays-Interlock examples- Timers, Counters, Examples.

UNIT-III**PLC PROGRAMMING****9**

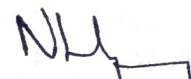
Different types of PLC program, Basic Ladder logic, logic functions, PLC module addressing, registers basics, basic relay instructions, Latching Relays, arithmetic functions, comparison functions, data handling, data move functions, timer-counter instructions, input-output instructions, sequencer instructions

UNIT-IV**COMMUNICATION OF PLC AND SCADA****9**

Communication Protocol – Modbus, HART, Profibus- Communication facilities SCADA: - Hardware and software, Remote terminal units, Master Station and Communication architectures

UNIT-V**CASE STUDIES****9**

Stepper Motor Control - Elevator Control - CNC Machine Control - conveyor control - Interlocking Problems



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SKILL DEVELOPMENT ACTIVITIES (Group Seminar/ Mini Project/ Assignment/ Content Preparation/ Quiz/ Surprise Test/ Solving GATE questions/ etc) 5

1. Market survey of the recent PLCs and comparison of their features.
2. Summarize the PLC standards
3. Familiarization of any one programming language (Ladder diagram/ Sequential Function Chart/ Function Block Diagram/ Equivalent open source software)
4. Market survey of Communication Network Used for PLC/SCADA.
5. Application based basic PLC Programming (Motor control and Protection).

TEXT BOOKS

1. Frank Petruzzola, Programmable Logic Controllers, Tata Mc-Graw Hill Edition
2. John W. Webb, Ronald A. Reis, Programmable Logic Controllers Principles and Applications, PHI publication

REFERENCES

1. Madhuchand Mitra and Samerjit Sengupta, Programmable Logic Controllers Industrial Automation an Introduction, Penram International Publishing Pvt. Ltd.
2. J. R. Hackworth and F. D. Hackworth, Programmable Logic Controllers Principles and Applications, Pearson publication

COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Describe the basic concepts, architecture, and operation of Programmable Logic Controllers.

CO2: Interpret and use different PLC programming languages such as Ladder Logic and Function Block Diagram for simple control applications.

CO3: Develop and simulate PLC programs using timers, counters, and interlocks for industrial automation tasks.

CO4: Illustrate the communication protocols and networking concepts used in PLC and SCADA systems.

CO5: Analyze and design PLC-based automation solutions for real-time case studies such as motor control, conveyor systems, and elevator control.

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24UEEO04

ENERGY CONSERVATION AND MANAGEMENT

L	T	P	C
3	0	0	3

PREREQUISITES

Engineering Physics & Mathematics

COURSE OBJECTIVES

At the end of the course, the student is expected

- To familiarize learners with global and national energy scenarios and the need for energy conservation.
- To develop the ability to conduct energy audits and assess environmental implications of energy use.
- To build competency in analyzing electrical and thermal systems for energy efficiency improvements.
- To enable learners to identify energy conservation opportunities in major industrial utilities.
- To provide knowledge of energy economics and financial evaluation of energy-saving projects.

UNIT-I

INTRODUCTION

9

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT-II

ELECTRICAL SYSTEMS

9

Components of EB billing, Smart Meter / Automated Meter Reading – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT-III

THERMAL SYSTEMS

9

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution & Usage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories.

UNIT-IV

ENERGY CONSERVATION IN MAJOR UTILITIES

9

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets, SDG, Carbon Foot Print, EC Act 2011.

UNIT-V

ECONOMICS

9

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing – ESCO concept, Star Rating, BEE, Energy Efficiency in IM.

L: 45

T: 00

P: 00

Total: 45 Periods

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TEXT BOOKS

1. Energy Manager Training Manual (4 Volumes) available at www.energymanagertraining.com. a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

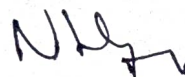
REFERENCES

1. Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981.
3. Dryden. I.G.C., "The Efficient Use of Energy" Butterworths, London, 1982
4. Turner. W.C., "Energy Management Hand book", Wiley, New York, 1982.
5. Murphy. W.R. and G. Mc KAY, "Energy Management", Butterworths, London 1987

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Classify various forms of energy, auditing methodologies, and instruments used in energy management.
- CO2: Analyze electrical systems to determine energy losses and apply suitable methods for power factor correction and harmonic reduction.
- CO3: Evaluate performance parameters of thermal systems such as boilers, furnaces, and steam systems to identify conservation measures.
- CO4: Assess energy-saving opportunities in major utilities including pumps, fans, compressors, and cooling systems.
- CO5: Compute key economic indicators such as payback period, net present value, and internal rate of return for energy conservation projects.
- CO6: Develop an integrated energy management plan incorporating technical, economic, and environmental aspects.



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24UEEO05	FUNDAMENTALS OF ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

PREREQUISITES

Engineering Physics & Mathematics

COURSE OBJECTIVES

- To give a comprehensive exposure to all types of devices and circuits constructed with discrete components. This helps to develop a strong basis for building linear and digital integrated circuits
- To analyze the frequency response of small signal amplifiers
- To design and analyze single stage and multistage amplifier circuits
- To study about feedback amplifiers and oscillators principles
- To understand the analysis and design of multi vibrators

UNIT-I	SEMICONDUCTOR DEVICES	9
PN junction diode, Zener diode, BJT, MOSFET, UJT – structure, operation and V-I characteristics, Rectifiers – Half Wave and Full Wave Rectifier, Zener as regulator		

UNIT-II	AMPLIFIERS	9
Load line, operating point, biasing methods for BJT and MOSFET, BJT small signal model – Analysis of CE, CB, CC amplifiers - Gain and frequency response – Analysis of CS and Source follower – Gain and frequency response - High frequency analysis.		

UNIT-III	MULTISTAGE AND DIFFERENTIAL AMPLIFIER	9
Cascode amplifier, Differential amplifier – Common mode and Difference mode analysis – Tuned amplifiers – Gain and frequency response – Neutralization methods.		

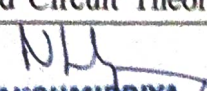
UNIT-IV	FEEDBACK AMPLIFIERS AND OSCILLATORS	9
Advantages of negative feedback – Analysis of Voltage / Current, Series, Shunt feedback Amplifiers – positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.		

UNIT-V	POWER AMPLIFIERS AND DC/DC CONVERTERS	9
Power amplifiers - class A - Class B - Class AB - Class C - Temperature Effect - Class AB Power amplifier using MOSFET – DC/DC convertors – Buck, Boost, Buck-Boost analysis and design, LMPS, SMPS, On-Line UPS & Off-Line UPS.		

L: 45	T: 00	P: 00	Total: 45 Periods
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TEXT BOOKS

1. David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.
2. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th


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Edition, Pearson Education / PHI, 2008.

3. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press, 7th Edition, 2014.

REFERENCES

1. Donald.A. Neamen, "Electronic Circuit Analysis and Design", Tata McGraw Hill, 3rd Edition, 2010.
2. D.Schilling and C.Belove, "Electronic Circuits", McGraw Hill, 3rd Edition, 1989.
3. Muhammad H.Rashid, "Power Electronics", Pearson Education / PHI , 2004.

COURSE OUTCOMES

At the end of the course, the students will be able to:

CO1: Explain the structure and working operation of basic electronic devices.

CO2: Design and analyze amplifiers.

CO3: Analyze frequency response of BJT and MOSFET amplifiers

CO4: Analyze feedback amplifiers and oscillator principles.

CO5: Design power amplifiers and supply circuits.



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PREREQUISITES

Engineering Physics, Engineering Chemistry & Engineering Mathematics

COURSE OBJECTIVES

- The objective of this course is to make the students to understand the working and characteristics of different types of batteries and their management.

UNIT-I**INTRODUCTION OF BATTERIES****9**

Li-ion Batteries - different formats, chemistry, safe operating area, efficiency, aging, Battery Characteristics, Equivalent Circuit of Battery and Battery Safety Standards. Characteristics- SOC, DOD, SOH. Balancing-Passive Balancing Vs Active Balancing. Other Batteries-NCM and NCA Batteries. NCR18650B specifications.

UNIT-II**BATTERY PACK****9**

Battery Pack - design, sizing, calculations, flow chart, real and simulation Model. Types of Battery Charging, Peak power - definition, testing methods - relationships with Power, Temperature and ohmic Internal Resistance. Cloud based and Local Smart charging.

UNIT-III**BATTERY MODELLING****9**

Battery Modelling Methods-Equivalent Circuit Models, Electrochemical Model, Neural Network Model. ECM Comparisons- Rint model, Thevenin model, PNGV model. State space Models- Introduction. Battery Modelling software/simulation frameworks

UNIT-IV**BATTERY STATE ESTIMATION****9**

SOC Estimation- Definition, importance, single cell Vs series batteries SOC. Estimation Methods - Load voltage, Electromotive force, AC impedance, Ah counting, Neural networks, Neuro-fuzzy forecast method, Kalman filter. Estimation Algorithms.

UNIT-V**BMS ARCHITECTURE AND REAL TIME COMPONENTS****9**

Battery Management System- need, operation, classification. BMS ASIC-bq76PL536A-Q1 Battery Monitor IC- CC2662R-Q1 Wireless BMS MCU. Communication Modules- CAN Open-Flex Ray - CANedge1 package.ARBIN Battery Tester. BMS Development with Modeling software and Model - Based Design.

L: 45**T: 00****P: 00****Total: 45 Periods****TEXT BOOKS**

1. Jiuchun Jiang and Caiping Zhang, "Fundamentals and applications of Lithium-Ion batteries in Electric Drive Vehicles" , Wiley, 2015.
2. Davide Andrea , "Battery Management Systems for Large Lithium-Ion Battery Packs" ARTECH House, 2010.

REFERENCES

1. Developing Battery Management Systems with Simulink and Model-Based Design- whitepaper
2. Panasonic NCR18650B- DataSheet, BQ76PL536A-Q1- IC DataSheet, CC2662R-Q1- IC DataSheet

COURSE OUTCOMES

At the end of the course, the students will be able to:

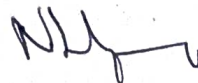
CO1: Acquire knowledge of different Li-ion Batteries performance.

CO2: Design a Battery Pack and make related calculations.

CO3: Demonstrate a Battery Model or Simulation.

CO4: Estimate State-of-Charges in a Battery Pack.

CO5: Approach different BMS architectures during real world usage.



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24UEE007

SENSORS AND ACTUATORS

L	T	P	C
3	0	0	3

PREREQUISITES

Control system theory

COURSE OBJECTIVES

- The objective of this course is to make the students list common types of sensors and actuators used in automotive vehicles.

UNIT-I**INTRODUCTION TO MEASUREMENTS AND SENSORS****9**

Sensors: Functions- Classifications - Main technical requirement and trends - Calibration methods - Classification. Static characteristics- mathematical model of transducers – Zero order transducers.

UNIT-II**VARIABLE RESISTANCE AND INDUTANCE SENSORS****9**

Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer- Variable reluctance transducers: - EI pick up and LVDT

UNIT-III**VARIABLE AND OTHER SPECIAL SENSORS****9**

Variable air gap type, variable area type and variable permittivity type - capacitor microphone Piezoelectric, Magnetostrictive, Hall Effect, semiconductor sensor - digital transducers Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor. Smart Sensor & IOT based Sensor.

UNIT-IV**AUTOMOTIVE ACTUATORS****9**

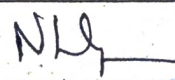
Electromechanical actuators - Fluid-mechanical actuators - Duty-type ratings for electrical machines. Working principles, construction and location of actuators viz. Solenoid, relay, stepper motor etc. Piezo-electric Actuator and Robotic Actuator.

UNIT-V**AUTOMATIC TEMPERATURE CONTROL ACTUATORS****9**

Different types of actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system.

L: 45**T: 00****P: 00****Total: 45 Periods****TEXTBOOKS**

- Doebelin's Measurement Systems: 7th Edition (SIE), Ernest O. Doebelin DhaneshN.Manik McGraw Hill Publishers, 2019.
- Robert Brandy, "Automotive Electronics and Computer System", Prentice Hall, 2001
- William Kimberley, " Bosch Automotive Handbook", 6th Edition, Robert Bosch GmbH, 2004.


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4. Bosch Automotive Electrics and Automotive Electronics Systems and Components,
5. Networking and Hybrid Drive, 5th Edition, 2007, ISBN No: 9783658017835.

REFERENCES

1. James D Halderman, "Automotive Electrical and Electronics", Prentice Hall, USA, 2013
2. Tom Denton, "Automotive Electrical and Electronics Systems," Third Edition, 2004, SAE
3. International.
4. Patranabis.D, "Sensors and Transducers", 2nd Edition, Prentice Hall India Ltd, 2003
5. William Ribbens, "Understanding Automotive Electronics □ An Engineering Perspective," 7th Edition, Elsevier Butterworth □ Heinemann Publishers, 2012.

COURSE OUTCOMES

At the end of the course, the students will be able to:

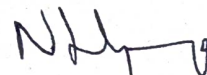
CO1: Classify the sensors and actuators used in vehicles.

CO2: Design measuring equipment for the measurement of pressure force, temperature and flow.

CO3: Understand the operation of the sensors, actuators and electronic control.

CO4: Identify the variable sensors and actuators for automotive applications

CO5: Design temperature control actuators for vehicles.



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24UEEO08	ELECTRICAL, ELECTRONIC & MAGNETIC MATERIALS	L	T	P	C
		3	0	0	3

PREREQUISITES

Engineering Physics

COURSE OBJECTIVES

- Understanding the importance of various materials used in electrical, electronics and magnetic applications.
- Acquiring knowledge on the properties of electrical, electronics and magnetic materials.
- Gaining knowledge on the selection of suitable materials for the given application.
- Knowing the fundamental concepts in Semiconducting materials.
- Getting equipped with the materials used in optical and optoelectronic applications.

UNIT-I	DIELECTRIC MATERIALS	9
Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.		

UNIT-II	MAGNETIC MATERIALS	9
Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and Hysteresis		

UNIT-III	SEMICONDUCTOR MATERIALS	9
Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale Integration techniques. Concept of superconductivity; theories and examples for high temperature superconductivity; discussion on specific superconducting materials; comments on fabrication and engineering applications.		

UNIT-IV	MATERIALS FOR ELECTRICAL APPLICATIONS	9
Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.		

UNIT-V	OPTICAL AND OPTOELECTRONIC MATERIALS	9
Principles of photoconductivity - effect of impurities - principles of luminescence-laser principles -He-Ne, injection lasers, LED materials - binary, ternary photoelectronic materials - LCD materials - photo detectors - applications of optoelectronic materials - optical fibres and materials – electro optic modulators - Kerr effect - Pockels effect.		

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TEXT BOOKS

1. T K Basak, "A course in Electrical Engineering Materials", New Age Science Publications, 2009.
2. S. P. Seth, P. V. Gupta "A course in Electrical Engineering Materials", Dhanpat Rai & Sons, 2011.

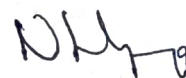
REFERENCES

1. Pradeep Fulay, "Electronic, Magnetic and Optical materials", CRC Press, Taylor and Francis, 2nd illustrated edition, 2017.
2. TTTI Madras, "Electrical Engineering Materials", McGraw Hill Education, 2004.
3. Adrianus J. Dekker, "Electrical Engineering Materials", PHI Publication, 2006.
4. R K Rajput, "A course in Electrical Engineering Materials", Laxmi Publications, 2009.
5. C. Kittel, "Introduction to Solid State Physics", 7th Edition, John Wiley & Sons, Singapore, (2006).

COURSE OUTCOMES

At the end of the course, the students will be able to:

- CO1: Understand various types of dielectric materials, their properties in various conditions.
CO2: Evaluate magnetic materials and their behavior.
CO3: Evaluate semiconductor materials and technologies.
CO4: Select suitable materials for electrical engineering applications
CO5: Identify right material for optical and optoelectronic applications.



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