NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution Affiliated to Anna University Chennai)

K.R.NAGAR, KOVILPATTI

www.nec.edu.in

REGULATIONS – 2023

CURRICULUM & SYLLABUS

B. E. – ELECTRICAL AND ELECTRONICS ENGINEERING

(Outcome Based Education & Choice Based Credit System)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

I. VISION

- Promoting active learning, critical thinking coupled with ethical values to meet the global challenges

II. MISSION

- To instill state-of-the-art technical knowledge and research capability that will prepare our graduates for professionalism and life-long learning.
- To update knowledge to meet industrial and real world challenges
- To inculcate social and ethical values.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 : Excel in industrial or graduate work in Electrical Engineering and allied fields.

PEO 2 : Practice their profession conforming to ethical values and active participation in the affairs of the profession.

PEO 3 : Adapt to evolving technologies and stay current with their profession

IV. PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1 : Apply the basic knowledge of mathematics, science and engineering to identify, formulate, design and investigate complex engineering problems of power electronics and drives, power and energy systems, high voltage engineering, control and instrumentation and applied electronics.

PSO 2 : Apply the modern engineering hardware and software tools in electrical and electronics engineering to adopt in multi disciplinary environments and innovative practices.

V. PROGRAM OUTCOMES (POs)

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

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

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

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

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

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

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

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

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

PO10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO12: **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

REGULATIONS 2023

B.E. – EEE CURRICULUM AND SYLLABUS

SEMESTER – I

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Induction Programme – 2 weeks									**0**
Theory Courses									
1.	23SH11C	தமிழர்மரபு / Heritage of Tamils	HSMC	1	0	0	0	1	1
2.	23SH12C	Mathematical Foundations for Engineers	BSC	3	1	0	0	4	4
3.	23SH13C	Introduction to Engineering	ESC	1	0	0	0	1	1
Integrated Courses									
4.	23SH14C	Technical English	HSMC	1	0	2	0	3	2
5.	23SH15C	Engineering Physics	BSC	2	0	2	0	4	3
6.	23SH16C	Engineering Chemistry	BSC	2	0	2	0	4	3
7.	23ME11C	Engineering Graphics	ESC	2	0	4	0	6	4
Practical Courses									
8.	23EE14C	Engineering Practice	ESC	0	0	4	0	4	2
			TOTAL	**12**	**1**	**14**	**0**	**27**	**20**

SEMESTER - II

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23SH21C	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	1	0	0	0	1	1
2.	23GN05C	Professional Ethics and Human Values	HSMC	2	0	0	0	2	2
3.	23GN01C	Aptitude Essentials	EEC	1	0	0	0	1	1
4.	23EE21C	Fourier Series & Transform, Complex Analysis and Calculus	BSC	3	1	0	0	4	4
5.	23EE22C /23EC22C	Materials Science	ESC	2	0	0	0	2	2
6.	23EE23C	Basic Civil and Mechanical Engineering	ESC	3	0	0	0	3	3
Integrated Courses									
7.	23EE24C	Electric Circuit Analysis	PCC	3	1	2	0	6	5
8.	23SH22C	Professional English	HSMC	1	0	2	0	3	2
9.	23CS11C	Problem Solving Techniques	ESC	3	0	2	0	5	4
Practical Courses									
10.	23GN02C	Innovation through Design Thinking	EEC	0	0	0	4	4	2
			TOTAL	**19**	**2**	**6**	**4**	**31**	**26**

SEMESTER – III

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23GN04C	Aptitude Excellence	EEC	1	0	0	0	1	1
2.	23EE31C	Electromagnetic Theory	ESC	3	1	0	0	4	4
Integrated Courses									
3.	23EE32C	Transforms, Probability and Statistics	BSC	3	0	0	2	5	4
4.	23EE33C	DC Machines and Transformers	PCC	3	0	2	0	5	4
5.	23EE34C	Measurement and Instrumentation	PCC	3	0	2	0	5	4
6.	23EE35C	Electron Devices and Circuits	PCC	3	1	2	0	6	5
Practical Courses									
7.	23GN03C	Intellectual Property Rights Study	EEC	0	0	0	4	4	2
			TOTAL	**16**	**2**	**6**	**6**	**30**	**24**

SEMESTER – IV

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23EE41C	Signals and Systems	PCC	3	0	0	0	3	3
2.	23EE42C	Power System I	PCC	3	1	0	0	4	4
3.	-	Elective Science Stream	BSC	3	0	0	0	3	3
4.	23MC02C	Environmental Science and Engineering	MC	2	0	0	0	2	0
Integrated Courses									
5.	23EE43C	AC Rotating Machines	PCC	3	0	2	0	5	4
6.	23EE44C	Linear Integrated Circuits	PCC	3	1	2	0	6	5
7.	23EE45C	Object Oriented Programming	ESC	3	0	2	0	5	4
Practical Courses									
8.	23EE46C	System Modeling projects	EEC	0	0	2	2	4	2
			TOTAL	**20**	**2**	**8**	**2**	**32**	**25**

SEMESTER – V

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	-	PEC I	PEC	3	0	0	0	3	3
2.	-	OEC I	OEC	3	0	0	0	3	3
3.	23MC01C	Constitution of India	MC	2	0	0	0	2	0
Integrated Courses									
4.	23EE51C	Control Systems	PCC	3	0	2	0	5	4
5.	23EE52C	Power System II	PCC	3	0	2	0	5	4
6.	23EE53C	Digital Electronics	PCC	3	1	2	0	6	5
7.	23EE54C	Power Electronics	PCC	3	0	2	0	5	4
Practical Courses									
8.	23EE55C	Simulation using Modern tool	EEC	0	0	2	2	4	2
			TOTAL	**20**	**1**	**10**	**2**	**33**	**25**

SEMESTER – VI

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	23EE61C	Power System Protection and Switchgear	PCC	3	0	0	0	3	3
2.	23EEXXE	PEC II	PEC	3	0	0	0	3	3
3.	23EEXXE	PEC III	PEC	3	0	0	0	3	3
4.	-	OEC II	OEC	3	0	0	0	3	3
5.	23GN06C	Project Management and Finance	HSMC	2	0	0	0	2	2
Integrated Courses									
6.	23EE62C	High Voltage Engineering	PCC	3	0	2	0	5	4
7.	23EE63C	Microprocessor, Microcontroller and its Applications	PCC	3	0	2	0	5	4
Practical Courses									
8.	23EE64C	Product Development Practice	EEC	0	0	0	4	4	2
			TOTAL	**20**	**0**	**4**	**4**	**28**	**24**

SEMESTER – VII

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Theory Courses									
1.	-	PEC IV	PEC	3	0	0	0	3	3
2.	-	PEC V	PEC	3	0	0	0	3	3
3.	-	PEC VI	PEC	3	0	0	0	3	3
4.	-	OEC III	OEC	3	0	0	0	3	3
Practical Courses									
5.	23EE71C	Mini Project	EEC	0	0	0	6	6	3
6.	23EE72C	Internship (4 Weeks)	EEC	-	-	-	-	-	2
			TOTAL	**12**	**0**	**0**	**6**	**18**	**17**

SEMESTER – VIII

S. No	Course Code	Course Title	Category	Periods Per Week				Total Contact Periods	Credits
				L	T	P	E		
Practical Courses									
1.	23EE81C	Capstone Project / Industry Practice	EEC	0	0	0	12	12	6
			TOTAL	**0**	**0**	**0**	**12**	**12**	**6**

Total Number of credits: 167

DISTRIBUTION OF CREDIT – EEE DEPARTMENT

Category	I Sem.	II Sem.	III Sem.	IV Sem.	V Sem.	VI Sem.	VII Sem.	VIII Sem.	Credits	Percentage of credits
HSMC	3	5	-	-	-	2	-	-	**10**	05.99
BSC	10	4	4	3	-	-	-	-	**21**	12.58
ESC	7	9	4	4	-	-	-	-	**24**	14.38
PCC	-	5	13	16	17	11	-	-	**62**	37.12
PEC	-	-	-	-	3	6	9	-	**18**	10.77
OEC	-	-	-	-	3	3	3	-	**9**	05.38
EEC	-	3	3	2	2	2	5	6	**23**	13.78
Total	**20**	**26**	**24**	**25**	**25**	**24**	**17**	**6**	**167**	**100**

Course Code	**தமிழர் மரபு (HERITAGE OF TAMILS)**	**L**	**T**	**P**	**E**	**C**
23SH11C	(Common to all B.E. / B.Tech. Degree Programmes)	**1**	**0**	**0**	**0**	**1**

COURSE OUTCOMES

இப்பாடம் முடிந்ததும் மாணவர்களிடம் வளரும் திறன்

CO1: தமிழ் மொழியின் இலக்கிய வளம், ஓவிய, சிற்பக் கலையின் பரிணாம வளர்ச்சி நாட்டுப்புறக் கலை மற்றும் வீர விளையாட்டுக்கள் பற்றிய அறிவு மற்றும் விளக்கும் திறன்

CO2: தமிழர்களின் திணை சார் கோட்பாடுகள் மற்றும் இந்திய பண்பாட்டில் தமிழர்களின் பங்கு பற்றிய அறிவு மற்றும் விளக்கும் திறன்

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

Theory Component

CO1: know and explain about Tamil literary resources, Dimensional growth of painting and sculpture arts, folk art and martial arts.

CO2: know and explain about Tamils Thinai concepts, contribution of Tamils in Indian National Movements and Indian Culture

CO1: தமிழ் மொழியின் இலக்கிய வளம், ஓவிய, சிற்பக் கலையின் பரிணாம வளர்ச்சி நாட்டுப்புறக்கலை மற்றும் வீர விளையாட்டுக்கள் பற்றிய அறிவு மற்றும் விளக்கும் திறன் **L:9**

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

CO1: know and explain about Tamil literary resources, Dimensional growth of painting and sculpture arts, folk art and martial arts.

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 - 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 - Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

CO2:தமிழர்களின் திணை சார் கோட்பாடுகள் மற்றும் இந்திய பண்பாட்டில் தமிழர்களின் பங்கு பற்றிய அறிவு மற்றும் விளக்கும் திறன் **L:6**

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 - இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப் படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

CO2: know and explain about Tamils Thinai concepts, contribution of Tamils in Indian National Movements and Indian Culture

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 - 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.

REFERENCES:

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 நாகரீகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

L: 15; TOTAL: 15 PERIODS

Course Code	MATHEMATICAL FOUNDATIONS FOR ENGINEERS	L	T	P	E	C
23SH12C	(Common to all B.E. / B.Tech. Degree Programmes)	**3**	**1**	**0**	**0**	**4**

COURSE OUTCOMES

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

Theory Component

CO1: interpret the nature of quadratic form by orthogonal transformation.
CO2: identify the maxima and minima of functions.
CO3: solve ordinary differential equations.
CO4: find the solution of partial differential equations.
CO5: evaluate integrals of multivariate calculus.

Soft skill Component

CO6 : develop communication, problem solving and interpersonal skills

CO1: interpret the nature of quadratic form by orthogonal transformation. **L:9, T:3**

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors – Diagonalisation of a matrix by orthogonal transformation – Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation and its nature; Cayley – Hamilton theorem (excluding proof) - Application: Stretching of a elastic membrane.

CO2: identify the maxima and minima of functions. **L:9, T:3**

Functions of two variables: Limit, continuity and partial derivatives; Total derivative, Jacobian, Taylor series- Application : Linearization of Non Linear systems using Taylor Series - Maxima and minima - Method of Lagrange multipliers.

CO3: solve ordinary differential equations. **L:9, T:3**

Solutions of first order ordinary differential equations - Equations solvable for ‘p’, equations solvable for ‘y’, equations solvable for ‘x’ - Solutions of higher order linear differential equations with constant coefficients – Cauchy’s and Legendre’s linear equations - Method of variation of parameters – Solution of simultaneous linear differential equation. Application RCL – circuit and Mass Spring System.

CO4: find the solution of partial differential equations. **L:9, T:3**

Formation of partial differential equations – Solutions of standard types of first order partial differential equations - Lagrange’s linear equations - Solutions of homogeneous and Non homogeneous linear partial differential equations of second and higher order with constant coefficient – Application - Shallow wave equations of first order PDE.

CO5 : evaluate integrals of multivariate calculus **L:9, T:3**

Double integration – Cartesian and polar coordinates - Change of order of integration - Change of variables - Cartesian to polar coordinates - Area as double integral - Triple integration - Cartesian and polar coordinates – Change of Variables- Cartesian to spherical and cylindrical coordinates. Application – Moments and centers of mass.

TEXT BOOKS:

1. Grewal.B.S., Higher Engineering Mathematics, Khanna Publications, 44th Edition, 2021.
2. James E. Gentle, Matrix Algebra, Springer International Publishing, 2nd Edition, 2017
3. Shanker Rao.G., Linear Albebra, WileyIndia, 1st Edition , 2017

REFERENCES:

1. Bali.N.P. and Manish Goyal, A Textbook of Engineering Mathematics, Laxmi Publications Private Limited, 10th Edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India, 10th Edition, 2017.
3. Kenneth B. Howell, Ordinary Differential Equations, CRC Press, 2020.
4. James Strewart, Daniel Clegg, Saleem Watson, Essential Calculus Early Trancendentals, Cengage Learning, 9th Edition, 2021.
5. Nanda Kumar A.K, P.S.Datti: Raju .K.George , Ordinary Differential Equations, Cambridge University press, 2017.

L: 45; T: 15; TOTAL: 60 PERIODS

Course Code	INTRODUCTION TO ENGINEERING	L	T	P	E	C
23SH13C	(Common to all B.E. / B.Tech. Degree Programmes)	**1**	**0**	**0**	**0**	**1**

COURSE OUTCOMES

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

Theory Component

CO1: articulate the importance of Engineering and its role in society through OBE framework
CO2: identify and describe academic pathways towards career settlement

CO1: articulate the importance of Engineering and its role in society through OBE framework **L:9**

Engineering – An introduction, Classification of different Engineering Disciplines, Role of Engineers in Society. Graduate Attributes (GA), Program Specific Criteria (PSC)- Program Educational Objectives (PEO), Program Outcomes (PO), Course Outcomes (CO), Choice Based Credit System (CBCS), course categories, teaching and learning process, active and passive learning, project / problem based learning, different assessments process.

CO2: identify and describe academic pathways towards career settlement **L:6**

Curriculum, cafeteria curriculum and self learning big picture of the Program and the significance of each course in the undergraduate Engineering Program, Discuss the different career paths for an engineering graduate. Career objective, competency requirement.

Case study: Each student has to interact with alumni mentors/seniors/faculty members/surf the internet and present a career path that inspires him/her at the end of the course

REFERENCES:

1. Quamrul H. Mazumder Introduction to Engineering, An Assessment and Problem Solving Approach, CRC Press, 1st Edition, 2016.
2. Saeed Moaveni, "Engineering Fundamentals an Introduction to Engineering", Cengage Learning, USA, 4th Edition, 2011.

L: 15; TOTAL: 15 PERIODS

Course Code	TECHNICAL ENGLISH	L	T	P	E	C
23SH14C	(Common to all B.E. / B.Tech. Degree Programmes)	**1**	**0**	**2**	**0**	**2**

COURSE OUTCOMES

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

Theory Component

CO1: apply the fundamental grammar rules in writing

CO2: utilizing phonetic transcription for pronunciation

Practical Component

CO3: apply the basic language skills in various aspects of communication

CO4: utilize technical terms and phrases in specific contexts

CO5: develop the pronunciation skill through various language components

CO6: distinguish different writing forms and interpret text through divergent thinking

CO7: develop effective reports with grammatical and language components

Soft skill Component

CO8: develop communication, team spirit, creativity and time management

CO1: apply the fundamental grammar rules in writing **L:13, P:26**

Parts of Speech - Word Formation using Prefix and Suffix - Sentence formation (Kinds of Sentences) - Tenses (Present, Past & Future tense) – Concord

CO3: apply the basic language skills in various aspects of communication

Diary Writing - Greeting and Self Introduction

CO4: utilize technical terms and phrases in specific contexts

Technical terms and extended definition - Essay Writing (Argumentative Essay and Analytical Essay) - Situational phrases & Conversation - Formal Letter Writing (Permission & Requisition letters)

CO6: distinguish different writing forms and interpret text through divergent thinking

Picture Description, Introduction to Reading Techniques (Skimming, scanning, inferring, predicting, Reading and Reviewing a book (Sci – Fi), E Mail Writing

CO7: develop effective reports with grammatical and language components
Listening and responding to general information (Business context) - Report Writing (Types, Structure, and Stages of report writing) - Checklist

CO2: utilizing phonetic transcription for pronunciation **L:2, P:4**

Phonetics (Vowels & Consonants)

CO5: develop the pronunciation skill through various language components

Word Transformation from one form to another - Letter Writing (Informal) - Listening and responding to general information (General context)

TEXT BOOKS:

1. Paul V. Anderson, Technical Communication: A Reader - Centered Approach, Cengage Learning, 9th Edition, 2017.
2. Ravindra Nath Tiwari, Technical English-II, Shashwat Publication, 1st Edition, 2020.
3. Stephen D. Krashen, Principles and Practice in Second Language Acquisition. Pergamon, 1987.
4. Lester Kaufman and Jane Straus, The Blue Book of Grammar and Punctuation: An Easy-to Use Guide with Clear Rules, Real-World Examples, and Reproducible Quizzes, Wiley, 2021.
5. Wells H. G., The Time Machine, Penguin Classics, 2012.

REFERENCES:

1. Michael McCarthy, English Grammar: The Basics, Taylor & Francis, 2021.
2. Peter Lucantoni and Lydia Kellas, Cambridge IGCSE(TM) English as a Second Language Workbook, Cambridge University Press, 6th Edition, 2022.

L: 15; P: 30; TOTAL: 45 PERIODS

Course Code	ENGINEERING PHYSICS	L	T	P	E	C
23SH15C	(Common to all B.E. / B.Tech. Degree Programmes)	**2**	**0**	**2**	**0**	**3**

COURSE OUTCOMES:

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

Theory Components:

CO1: identify the structural properties of crystalline materials
CO2: comprehend and apply the concepts of centre of mass and elasticity
CO3: explain thermodynamic parameters and fundamental laws and their application in various processes
CO4: illustrate the applications of different lasers and optical fibers
CO5: interpret the quantum concepts, to illustrate the quantization of energy, and computation

Practical Components:

CO6: compare the mechanical properties of the materials due to bending and torsion
CO7: analyze thermal conductivity of different bad conducting materials
CO8: explore the light-matter interaction by the phenomenon of interference and diffraction and photoelectric effect

Soft skill Component:

CO9: develop the team spirit and communication skill through group activities

CO1: identify the structural properties of crystalline materials **L:10**

Crystalline and amorphous materials - unit cell - primitive cell - crystal systems, Bravais lattices - Miller indices – interplanar distance – Characteristics of SC, BCC, FCC, HCP structures - Bragg's law - X-ray diffraction and its applications - Synthesis of crystalline materials

CO2: comprehend and apply the concepts of centre of mass and elasticity **L:6,**
CO6: compare the mechanical properties of the materials due to bending and torsion **P:10**

Multi-particle dynamics - Introduction - Center of mass (CM) – CM of continuous bodies -

Introduction to rigid bodies - translation - rotation – moment of inertia – theorems of moment of inertia – Torsional pendulum.

Elasticity – Stress - strain diagram and its applications - Moduli of elasticity and its relation - bending of beams - Bending moment – cantilever - theory and experiment - Uniform bending - theory and experiment – Non Uniform bending - I-shaped girders

CO3: explain thermodynamic parameters and fundamental laws and their application in various processes **L:6, P:8**

CO7: analyse thermal conductivity of different bad conducting materials.

Laws of thermodynamics – Thermo dynamical processes – Introduction to heat transfer – conduction - convection and radiation – thermal conductivity of good conductor –Radial flow of heat - Spherical shell method and cylindrical shell method – Thermal conductivity of poor conductor- Lee's disc method– Applications - heat exchangers - refrigerators and ovens

CO4: illustrate the applications of different lasers and optical fibers **L:6, P:6**

CO8: explore the light-matter interaction by the phenomenon of Interference and diffraction and photoelectric effect

Lasers: Interaction of light with matter - Einstein coefficients and their relations – characteristics of laser - components of laser – Lasing action – Pumping methods – Types of Laser - Nd-YAG laser -semiconductor laser- Applications

Fiber optics: principle and classification of optical fibers – propagation of light in optical fiber - Numerical aperture and Acceptance angle – losses associated with optical fibers (Qualitative) – Fiber optic communication system - Applications - Displacement and pressure sensors – Endoscopy

CO5: interpret the quantum concepts, to illustrate the quantization of energy, and computation **L:6, P:2**

CO8: explore the light-matter interaction by the phenomenon of interference and diffraction and photoelectric effect

Planck's radiation law - de-Broglie hypothesis – Matter waves - Heisenberg's uncertainty principle – elementary proof – applications – Schrödinger's time-dependent and time-independent wave equation – physical significance of wave function – Introduction to quantum tunneling - applications - particle in a one-dimensional box – tunneling microscope – quantum confinement in 0D, 1D, 2D systems - quantum computation

TEXT BOOKS:

1. Avadhanulu M. N., Kshirsagar P.G and Arun Murthy T.V.S, A Text book of Engineering Physics, S.Chand & Co, 11th Edition, 2018.
2. Kleppner D and Kolenkow R. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
3. Kenneth S Krane, Modern Physics, Wiley, 4th Edition, 2021.

REFERENCES:

1. Wolfson R., Essential University Physics, Volume 1 & 2, Pearson Education, 2nd Indian Edition, 2009.
2. Hitendra K. Malik, A.K.Singh, Engineering Physics, McGraw Hill Education, 2nd Edition, 2017.
3. Kyungwon An, Fundamentals of Laser Physics, World Scientific Publishing Company, 2023
4. Halliday D, Resnick R and Walker J, Principles of Physics, Wiley, 12th Edition, 2021.

L: 30; P: 30; TOTAL: 60 PERIODS

Course Code	**ENGINEERING CHEMISTRY**	**L**	**T**	**P**	**E**	**C**
23SH16C	(Common to all B.E. / B.Tech. Degree Programmes)	**2**	**0**	**2**	**0**	**3**

COURSE OUTCOMES

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

Theory Component

CO1: explain the suitable water treatment technologies for domestic and industrial applications

CO2: apply the knowledge of corrosion to solve the industrial problems

CO3: describe the preparation, properties and their applications of smart materials in various sectors

CO4: describe the basic components and performance analysis of batteries

CO5: predict the mechanical, electrical and electronics properties of materials using various instrumentation techniques

Practical Component

CO6: estimate the amount of Ca^{2+}/ Mg^{2+}, alkalinity and Chloride ion present in the water sample.

CO7: quantify the amount of acid and metal ion in the given samples by different analytical techniques

Soft skill Component

CO8: develop interpersonal, work ethics and communications skills for career settlement

CO1: explain the suitable water treatment technologies for domestic and industrial applications

CO6: estimate the amount of Ca^{2+}/ Mg^{2+}, alkalinity and Chloride ion present in the water sample.

Introduction, sources and impurities in water, potable water specifications (as per WHO and BIS) - hardness-types-estimation of $Ca^{2+}$and Mg^{2+} ion in water by EDTA method. Alkalinity-types-determination of alkalinity of water -chronic daily intake - incremental life time risk - hazard quotient, hazard index, contamination factor - determination of chloride ion in water using Argentometric method-municipal water treatment- physical methods and chemical methods. Disinfection-internal conditioning - calgon and carbonate conditioning. Desalination-types-Reverse Osmosis (RO) process- Forward osmosis (FO) - electro dialysis - demineralization. **L:6, P:12**

CO2: apply the knowledge of corrosion to solve the industrial problems.

CO7: quantify the amount of acid and metal ion in the given samples by different analytical techniques

Corrosion – mechanism of dry and wet corrosion-forms of corrosion– galvanic corrosion and differential aeration corrosion, crevice corrosion, pitting corrosion, microbial corrosion-stress corrosion, intergranular corrosion - determination of rate of corrosion by weight loss method. **L:6, P:6**

Protection: cathodic protection, surface coatings, corrosion inhibitors. Corrosion of industrial components: corrosion and its control in power industries, automotive industries, chemical processing industries and marine industries.

CO3: describe the preparation, properties and their applications of smart materials in various sectors

Polymers: introduction - classification - functional polymers: electroluminescence polymer, biodegradable polymers, fire retardant polymer, thermo responsive polymer - piezo, ferro and pyroelectric polymer - nanocomposites: introduction, synthesis, properties & applications- synthesis of nanocomposites using sol-gel process **L:6**

CO4: describe the basic components and performance analysis of batteries

Introduction - components - operation principle - Lead acid – Nickel metal hydride batteries- Lithium ions batteries: Lithium polymer battery, Lithium sulphur battery - fabrication and performance evaluation- safety issues - battery management system - recycling of lithium batteries. **L:6**

CO5:predict the mechanical, electrical and electronics properties of materials using various instrumentation techniques

CO7: quantify the amount of acid and metal ion in the given samples by different analytical techniques.

Spectroscopy methods: Beer-Lambert's law and its limitations– UV-visible spectroscopy and IR spectroscopy – principle - instrumentation– applications. Estimation of copper. Electro analytical methods: potentiometric titration - Estimation of Fe^{2+} ion by potentiotometric method. Conductometric method- estimation of HCl by conductometric titration- pH metric method-Estimation of HCl by pH metric titration-applications. Thermal analytical methods: Thermal Gravimetric Analysis (TGA) and Differential Thermal Analysis (DTA)- Thermo Mechanical Analysis (TMA) –principle - instrumentation - Thermo gravimetric analysis of $CuSO_4.5H_2O$- applications. **L:6, P:12**

TEXT BOOKS:

1. Jain P.C. and Jain M, Engineering Chemistry, Dhanpat Rai Publishing Company, New Delhi, 17th Edition, 2021.
2. Dara S.S and Umare S.S, A Text Book of Engineering Chemistry, S.Chand & Company Limited, 20th Edition, 2018.
3. Agarwal S, Engineering Chemistry, Cambridge Publishing Company, 2nd Edition, 2019

REFERENCES:

1. Benjamin M. M, Water Chemistry, Waveland Press, 2nd Edition, 2019.
2. Cicek V, Corrosion Engineering, Springer Publishing, 1st Edition, 2021.
3. Shahinpoor. M, Fundamentals of Smart Materials, Publisher: Royal Society of Chemistry, 1st Edition, 2020.
4. Berg H, Bernhardsson S, and Johansson P, Electric Vehicle Batteries: Moving from Research towards Innovation, Publisher: Springer, 1st Edition, 2019.
5. Crouch S, Skoog D, Holler F, Principles of Instrumental Analysis, 2017.

L: 30; P: 30; TOTAL: 60 PERIODS

Course Code	ENGINEERING GRAPHICS	L	T	P	E	C
23ME11C	(Common to MECH, CIVIL, AIDS, EEE, IT)	**2**	**0**	**4**	**0**	**4**

COURSE OUTCOMES:

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

CO1: Construct the Engineering Curves and Perform Freehand Sketching.

CO2: Construct the Orthographic Projections of Points, Straight Lines and Lamina

CO3: Draw the Projections of Simple Solids in Different Positions.

CO4: Visualize the Sectional Views and Surface of Various Solids.

CO5: Draw the Isometric and Perspective Projections of Various Solids.

CO1: Construct the Engineering Curves and Perform Freehand Sketching. **L:6, P:12**

Principles of Engineering Graphics – significance. Usage of Drawing Instruments. Lettering and dimensioning exercise Construction of ellipse, parabola and hyperbola using eccentricity method– Construction of cycloids, Epi and Hypo-cycloids. Orthographic views of simple components by Free hand drawing - Transferring measurement from the given object to the free hand sketches.

CO2: Construct the Orthographic Projections of Points, Straight Lines and Lamina **L:6, P:12**

Principle of orthographic projections – Conventions - First angle and third angle projections. Projections of points placed in all quadrants – projections of straight lines – inclined to both reference planes - determination of true length and inclinations. Projections of regular polygonal surfaces and circular lamina inclined to both reference planes.

CO3: Draw the Projections of Simple Solids in Different Positions. **L:6, P:12**

Projections of simple solids like prisms, pyramids, cylinder and cone - axis inclined to one reference plane - change of position method.

CO4: Visualize the Sectional Views and Surface of Various Solids. **L:6, P:12**

Sectioning of simple solids – Axis perpendicular to horizontal plane- Drawing sectional views with true shape of the section. Development of lateral surfaces of truncated solids – Prisms, pyramids, cylinder and cone.

CO5: Draw the Isometric and Perspective Projections of Various Solids. **L:6, P:12**

Principles of isometric projection – Isometric scale – Isometric projections of simple solids like prism, pyramid, cone and cylinder – Combination of solids. Perspective projections of simple solids by visual-ray method

TEXT BOOKS:

1. Bhatt N.D, "Engineering Drawing", 54th Edition, Charotar Publishing House, 2023.
2. Shah M.B and Rana B.C, "Engineering Drawing", Pearson Education, 2nd Edition, 2009.

REFERENCES:

1. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
2. Agrawal B. & Agrawal C.M., "Engineering Graphics", TMH Publication, 2nd Edition, 2013
3. Narayana K.L. & Kannaiah P, "Text book on Engineering Drawing", Scitech Publishers, 2011.
4. Gopalakrishna K.R, "Engineering Drawing", Subhas Publications, 32nd Edition, 2017.

L: 30; P: 60; TOTAL: 90 PERIODS

Course Code	ENGINEERING PRACTICE LABORATORY	L	T	P	E	C
23EE14C		0	0	4	0	2

PART A - MECHANICAL LABORATORY

COURSE OUTCOMES

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

CO1: prepare a different carpentry joints.

CO2: make a simple component using sheet metal operations.

CO3: make a joints using shield metal arc welding process.
CO4: perform lathe and shaping operations.

LIST OF EXPERIMENTS

1. **CARPENTRY PRACTICES**
   a. Study of carpentry tools
   b. Making T-Joints & Dove tail joints

2. **SHEET METAL PRACTICES**
   a. Study of sheet metal operations
   b. Making of a square tray and conical funnel

3. **METAL JOINING PROCESS PRACTICES**
   a. Study of Shield Metal Arc Welding (SMAW) process
   b. Welding of Butt joints and Lap joints using Shield Metal Arc Welding Process

4. **MACHINING PRACTICES**
   a. Study of lathe machine and shaper machine
   b. Perform lathe and shaping operations

P: 30; TOTAL: 30 PERIODS

TEXT BOOK:

1. Bawa H.S, "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007

REFERENCES:

1. Ramesh Babu V, "Engineering Practices Laboratory Manual", Revised Edition, VRB Publishers Private Limited, Chennai, 2014.
2. Jeyachandran K, Natarajan S. and Balasubramanian S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
3. Jeyapoovan T, Saravanapandian M. and Pranitha S, "Engineering Practices Lab Manual", Vikas Publishing House Private Limited, 2006.
4. Rajendra Prasad A and Sarma PMMS, "Workshop Practice", Sree Sai Publication, 2002
5. Kannaiah P and Narayana K L, "Manual on Workshop Practice", Scitech Publications, 1999.

PART B
ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES LABORATORY

COURSE OUTCOMES

Upon the successful completion of the course, the student will be able to
CO1: demonstrate simple residential wiring circuits
CO2: identify faults in any electrical appliances
CO3: measure energy and resistance to earth of electrical equipment
CO4: demonstrate basic electronic components based on their physical parameters and dimensions
CO5: Measure AC signal parameters using CRO and describe the fundamentals and characteristics of electronic components

LIST OF EXPERIMENTS

ELECTRICAL EXPERIMENTS

1. Residential House Wiring using Switches, MCB
2. Stair Case Wiring Connections
3. Study of wiring in different Lamps, Fan and Iron Box
4. Selection of protective devices
5. Coil Rewinding for Transformer and Fan using Rewinding Machine.
6. Measurement of Energy using Energy Meter for Single Phase System
7. Measurement of Earth Resistance using Electrical Equipment
8. Electrical fault detector.

ELECTRONICS EXPERIMENTS

9. Study and testing of Resistor, capacitor and inductor
10. Measurement of AC signal parameter (Peak-Peak, RMS, Period and Frequency) using CRO and DSO.
11. Study and Operation of Digital Multimeter, Function/Signal Generator and Regulated Power Supply
12. Verification of truth table for logic gates.
13. Characteristics of Diode, Transistor.
14. Soldering Practice

P: 30; TOTAL: 30 PERIODS

REFERENCES:

1. Jeyachandran K, Natarajan S and Balasubramanian S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2. Electrical wiring, estimating and costing", Uppal, S.L. and Laroia, J.M. (1997), 5th Edition. Delhi: Khanna Publishers in Engineering.
3. Jeyapoovan T, Saravanapandian M and Pranitha S, "Engineering Practices Lab Manual", Vikas Publishing House Pvt. Ltd, 2006.
4. Bawa H.S., "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, 2007.
5. Rajendra Prasad A and Sarma P.M.M.S., "Workshop Practice", Sree Sai Publication, 2002.
6. Kannaiah P and Narayana K.L., "Manual on Workshop Practice", Scitech Publications, 1999.

RECOMMENDED ONLINE COURSE(s)

https://nptel.ac.in/courses/108105053
https://onlinecourses.nptel.ac.in/noc22_ee109/preview

Course Code	**தமிழரும் தொழில்நுட்பமும் (TAMILS AND TECHNOLOGY)**	**L**	**T**	**P**	**E**	**C**
23SH21C	(Common to all B.E. / B.Tech. Degree Programmes)	**1**	**0**	**0**	**0**	**1**

COURSE OUTCOMES

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

CO1: தமிழர்களின் நெசவு மற்றும் பானைத் தொழில் நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில் நுட்பம், உற்பத்தித் தொழில்நுட்பம் பற்றிய அறிவு மற்றும் விளக்கும் திறன்.

CO2: தமிழர்களின் வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம், அறிவியல் தமிழ் மற்றும் கணினித் தொழில்நுட்பம் பற்றிய அறிவு மற்றும் விளக்கும் திறன்.

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

CO1: Know and explain about Tamils weaving and Pottery technology, Design and construction Technology and Manufacturing Technology.

CO2: Know and explain about Tamils Agriculture and irrigation technology, Scientific Tamil and Tamil computing

CO1:தமிழர்களின் நெசவு மற்றும் பானைத் தொழில் நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில் நுட்பம் மற்றும் உற்பத்தித் தொழில் நுட்பம் பற்றிய அறிவு மற்றும் விளக்கும் திறன் L:9

சங்ககாலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிகப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்- சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும் கோவில்களும் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக்கலை- கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத்தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்கநாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்குமணிகள் - எலும்புத்துண்டுகள் - தொல்லியல்சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

CO1:KNOW AND EXPLAIN ABOUT WEAVING AND CERAMIC TECHNOLOGY, DESIGN AND CONSTRUCTION TECHNOLOGY, MANUFACTURING TECHNOLOGY

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW)– Graffiti on Potteries- 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- Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold Coins as source of history - Minting of Coins — Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences – Gemstone types described in Silappathikaram.

CO2: தமிழர்களின் வேளாண்மை, நீர்ப்பாசனத் தொழில்நுட்பம், அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் பற்றிய அறிவு மற்றும் விளக்கும் திறன். **L:6**

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக்குமுழித்தூம் பின் முக்கியத்துவம் -கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்- அறிவியல் தமிழின் வளர்ச்சி - கணினித் தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக்கல்விக்கழகம் - தமிழ் மின்நூலகம் - இணையத்தில் தமிழ்அகராதிகள் - சொற்குவைத் திட்டம்.

CO2: KNOW AND EXPLAIN ABOUT AGRICULTURE TECHNOLOGY, IRRIGATION TECHNOLOGY, SCIENTIFIC TAMIL & TAMIL COMPUTING

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- 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.

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 சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை–ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறைவெளியீடு)
5. Social Life of Tamils(Dr.K.K.Pillay)A joint publication of TNTB & ESC and RMRL
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International InstituteofTamilStudies.)
9. 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)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)

L: 15; TOTAL: 15 PERIODS

23GN05C	**PROFESSIONAL ETHICS AND HUMAN VALUES**	**L**	**T**	**P**	**E**	**C**
	(Common to all B.E. / B.Tech. Degree Programmes)	**2**	**0**	**0**	**0**	**2**

COURSE OUTCOMES

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

CO1: Recognize and practice the core human values and theories related to ethical behavior.

CO2: Analyze the engineering ethical breach from past study.
CO3: Distinguish and apply safety, responsibility and rights in workplaces.

CO1: Recognize and practice the core human values and theories related to ethical behavior **L: 10**

Moral dilemmas and moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and controversy –Case studies: Vigil mechanism, Whistle blowing - Protected disclosures - Personal ethics, work ethics and human values - Governing Regulation.

CO2 : Analyze the engineering ethical breach from past study **L: 10**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - Case study: The challenger disaster

CO3 : Distinguish and apply safety, responsibility and rights in workplaces **L: 10**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - Collegiality and loyalty - respect for authority – confidentiality; Collective bargaining, Conflicts of interest - Case study; Occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination. Case studies: The Three mile island and Chernobyl disaster

TEXT BOOK

1. Mike W Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 5th Edition, 2022

REFERENCES

1. BehnamTaebi, "Ethics and Engineering: An Introduction", Cambridge University Press, 2021
2. Ajesh Faizal, Aswathy S U, Roy V I, "Professional Ethics in Engineering: an Industry Perspective", Noor Publishing, 2021
3. R.S.Naagarazan, "A Textbook on Professional Ethics and Human Values", New age International Pvt. Ltd; 3rd Edition, 2022
4. Dr. P. Elamurugan, "Professional Ethics in Engineering", Notion Press, 2021

L:30; TOTAL:30 PERIODS

Course Code	APTITUDE ESSENTIALS	L	T	P	E	C
23GN01C	(Common to all B.E. / B.Tech. Degree Programmes)	1	0	0	0	1

COURSE OUTCOMES:

Upon the completion of the course the students will be able to
CO1: Recall the fundamentals in quantitative techniques and solve Number series problems quickly
CO2: Develop problem solving skills on Numbers and enhance arithmetic ability
CO3: Infer appropriate comparison and distribution methods using ratio and to form equations
CO4: Improve quantitative skills and solve problems on percentages and profit loss
CO5: Calculate data interpretation and data sufficiency in quantitative aptitude

CO1: Recall the fundamentals in quantitative techniques and solve Number series problems quickly **L : 3**

Numeric series – Finding missing numbers – Odd number out series - Letter series – Symbol series - Alphanumeric series

CO2: Develop problem solving skills on Numbers and enhance arithmetic ability **L : 3**

Number Types - HCF & LCM – Square root- Cubic root - divisibility criteria- Unit digit calculation- Prime factors

CO3: Infer appropriate comparison and distribution methods using ratio and to form equations **L : 3**

Ratio & Proportion: Comparison of Ratios - Variations: Direct and indirect proportion Ages: Present Age, Past Age & Future calculation

CO4: Improve quantitative skills and solve problems on percentage and profit loss **L : 3**

Concept of Percentage – Percentage calculation - Calculation of Percentage on Population Results on Depreciation .Profit and Loss –Percentage of Profit and Loss – Discount

CO5: Calculate data interpretation and data sufficiency in quantitative aptitude **L : 3**

Data Interpretation – Pie Chart – Bar Chart – Table Chart .Data Sufficiency in Logical Reasoning : Numbers, Ratio, Ages, Percentage and Profit Loss

REFERENCES:

1. Dr.R.Aggarwal, " Quantitative Aptitude", S Chand Publishing, Revised Edition 2017
2. R.V.Praveen, "Quantitative Aptitude and Reasoning" , 3rd Edition , Eastern Economy Edition, PHI Learning 2016

Video Materials

Profit Loss

https://youtu.be/PpVO7I8dx6U

https://youtu.be/_cW7_BUDYcw

Number series

https://youtu.be/_4ZJFkFE2XU

https://youtu.be/83nJmniFmNk

Numbers

https://youtu.be/81pwuMJ8OIU

https://youtu.be/VT_N9cacgl4

Square root and Cube root

https://youtu.be/nJSqsaT0AgU

https://youtu.be/_HyhwS8P9KY

Problems on Ages

https://youtu.be/6PCTRVmu-ek

https://youtu.be/eAl3BvO_Ipw

Data Interpretation

https://youtu.be/s99rda8e0vc

Course Code	FOURIER SERIES & TRANSFORM, COMPLEX ANALYSIS AND CALCULUS	L	T	P	E	C
23EE21C		3	1	0	0	4

COURSE OUTCOMES

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

Theory Component

CO 1: perform Fourier series expansion of the functions.

CO 2: compute the Fourier transforms of various functions.
CO3: interpret analytic function in transformations.
CO4: evaluate complex integration over contour.
CO5: analyze the concepts related to vector field.

CO 1 : perform Fourier series expansion of the functions

Dirichlet's conditions–General Fourier series –Half range series–Complex form of Fourier series– Parseval's identity–Harmonic analysis- Identification of frequencies. **L:9,T:3**

CO2 : compute the Fourier transforms of various functions

Fourier Integral theorem (without proof)–Fourier transform pair–Fourier Sine and Cosine transforms–Properties–Transforms of simple functions–Convolution theorem –Parseval's theorem. **L:9,T:3**

CO3 : interpret analytic function in transformations

Analytic functions - Necessary and Sufficient conditions (excluding proofs) - Harmonic and orthogonal properties of analytic functions - Harmonic conjugate - Construction of analytic functions- fluid flow problems - Conformal mapping: w= z+c, cz, 1/z and bilinear transformation. **L:9,T:3**

CO 4 : evaluate complex integration over contour

Statement and applications of Cauchy's integral theorem and Cauchy's integral formula (excluding proof) – Taylor's and Laurent's expansions - Singular points - Residues - Cauchy's Residue theorem (excluding proof) - Application of residue theorem to evaluate real integrals - Unit circle and semi - circular contour (excluding poles on boundaries). **L:9,T:3**

CO5: analyze the concepts related to vector calculus

Differentiation of vectors : Gradient, Divergence, Curl and Directional derivatives – Line, Surface and Volume Integrals - Statement of Green's, Gauss divergence and Stokes' theorem - Simple applications involving rectangular parallelepiped and cubes. **L:9,T:3**

TEXT BOOKS:

1. Grewal.B.S, Higher Engineering Mathematics, 44th Edition, Khanna Publications, Delhi, 2021.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India, 2017.

REFERENCES:

1. Bali.N.P. and Manish Goyal, A Textbook of Engineering Mathematics, 9th Edition, Laxmi Publications Private Limited., 2018.
2. Ramana B.V, Higher Engineering Mathematics, Tata Mc-Graw Hill Education, New Delhi, 2017.
3. Jain.R.K. and Iyengar.S.R.K., Advanced Engineering Mathematics, 5th Edition, Narosa Publishing House Private Limited, 2016.
4. Michael D .Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson Education, 2021.

L: 45; T: 15; TOTAL: 60 PERIODS

23EC22C /	**MATERIALS SCIENCE**	**L**	**T**	**P**	**E**	**C**
23EE22C	(Common to ECE & EEE Branches)	**2**	**0**	**0**	**0**	**2**

COURSE OUTCOMES:

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

Theory Components:

CO1: explain the conductivity in metals using free electron theory.
CO2: describe the fundamental properties ofsemiconductors.
CO3: apply the magnetic and dielectric properties for relevant electrical and electronics engineering applications.
CO4: illustrate the optical properties and their applications to optical devices.
CO5: apply the concepts of nanomaterials for nano devices.

CO1: explain the conductivity in metals using free electron theory.

Conduction in metals - Classical free electron theory of metals – Mobility and electrical conductivity - Thermal conductivity of metals - Wiedemann – Franz law – Quantum free electron theory – merits and limitations of free electron theory (FET) - Fermi-Dirac Statistics - Density of States. **L:6**

CO2: describe the fundamental properties of semiconductors.

Energy band diagram - Direct and indirect band gap - Carrier concentration and Fermi level in anintrinsic semiconductor- Carrier concentration and Fermi level in N-type and P-type semiconductors - Carrier transport in Semiconductors: Drift, mobility, diffusion and carrier lifetime - Hall effect **L:6**

CO3: apply the magnetic and dielectric properties for relevant electrical and electronics engineering applications.

Magnetic materials – Classification – Hysteresis – Ferrites - $BaTiO_3$ – Application of Nd-Fe-B magnets. Electric polarization – Different types of polarization – Temperature and frequency dependence – Dielectric loss and dielectric breakdown – dielectric materials applications - capacitors and transformers. **L:6**

CO4: illustrate the optical properties and their applications to optical devices.

Light waves in a homogeneous medium – Refractive index – Dispersion – Classification of Optical materials – Luminescence - Fluorescence– Phosphors – Photoconductivity – Display devices - Principle and working of LED, OLED, LCD - Laser diode – Photodiode (CdS and CdSe)- Optical Amplifiers. **L:6**

CO5: apply the concepts of nanomaterials for nano devices.

Nanomaterials - synthesis - properties - Band gap of nanomaterials – Quantum Tunneling – Quantum cascade lasers -Nano magnets - GMR - Conductivity of metallic nanowires – Carbonnanotubes: Properties and applications - QLED – Spintronics and its device application. **L:6**

TEXTBOOKS:

1. Dr. M. Arumugam, Materials Science, Anuradha Publications, 2018
2. S. M. Sze and M. K. Lee, Semiconductor Physics and Devices, Wiley, 2021.
3. T. Pradeep, Nano: The Essentials: Understanding Nanoscience and Nanotechnology, McGraw-Hill Education, 2017.

4. Hilmi Unlu and Norman J. M. Horing, Progress in Nanoscale and Low-Dimensional Materials and Devices, Springer Link, 2022.

REFERENCES:

1. S.O Pillai, Solid State Physics, 10th edition, NEW AGE International Publishers, 2022
2. W.D.Callitser and D.G. Rethwish. Materials Science and Engineering, John Wiley & Sons, 2014.
3. Juan Martinez-Vega, Dielectric Materials for Electrical Engineering, Wiley, 2013
4. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education, 2009.
5. J. Wilson and J.F.B. Hawkes, Optoelectronics, Pearson Education, 2018.

L : 30; TOTAL : 30 PERIODS

Course Code	**BASIC CIVIL AND MECHANICAL ENGINEERING**	**L**	**T**	**P**	**E**	**C**
23EE23C		**3**	**0**	**0**	**0**	**3**

COURSE OUTCOMES

Upon the completion of this course, the students will be able to
CO1: discuss the materials and measurement techniques used in civil engineering.
CO2: describe the fundamental elements of civil engineering structures.
CO3: explain the basic manufacturing processes
CO4: demonstrate the components and working principle of IC engines and power plants
CO5: describe the working principle of refrigeration and air conditioning system

CO1: discuss the materials and measurement techniques used in civil engineering **L:9**

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas – Contours. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber – modern materials, Thermal and acoustic insulating materials, Decorative panels, water proofing materials, Modern uses of Gypsum, Prefabricated Building component (brief discussion only).

CO2: describe the fundamental elements of civil engineering structure **L:9**

Building Plans – Setting out of a building – Foundations – Types of foundations - Bearing capacity and settlement - Brick masonry – stonemasonry – beams – columns – lintels – roofing – flooring – plastering –- Types of Bridges and Dams - water supply network - Rain water harvesting – Solid waste management- Introduction to Highways and Railways – Introduction to Green Buildings.

CO3: explain the basic manufacturing processes **L:9**

Overview of manufacturing processes - Introduction to metal casting process – Welding Processes- Bulk deformation processes - Powder metallurgy and plastic processing.

CO4: demonstrate the components and working principle of IC engines and power plants **L:9**

Internal combustion engines-Classification – Construction - Working principle- Four stroke and two stroke cycles - Comparison of four stroke and two stroke engines. Power Plants – Classification – Construction and working principle - steam, Gas,

Diesel, Hydroelectric, Nuclear, Wind Energy and Solar Power plants.

CO5: describe the working principle of refrigeration and air conditioning system **L:9**

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression -Window and Split type room Air conditioner.

TEXT BOOKS:

1. Shanmugam G and Palanichamy M.S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2016.
2. Shanmuga Sundaram S and Mylsamy K, "Basic Civil and Mechanical Engineering", Cengage Learning, 2011.
3. Ramamrutham S, 'Basic Civil Engineering', DhanpatRai Publishing Co.(P)Ltd, 2013
4. Venugopal K, Prabhu Raja V and SreeKanjana G "Basic Mechanical Engineering", Anuradha Publications., Chennai, 2014

REFERENCES:

1. Punmia, B.C, Ashok Kumar Jain, Arun Kumar Jain, 'Basic Civil Engineering', Lakshmi Publishers, 2012.
2. Seetharaman S., 'Basic Civil Engineering', Anuradha Agencies, 2005.
3. Rangwala, S.C, 'Building materials', Charotar Publishing House, Pvt. Limited, 27th Edition, 2009.
4. S.K. Garg, "Water Supply Engineering", Khanna publishers, Delhi, 2005
5. Khanna and Justo, "Highway Engineering", New Chand and Bros, Roorkee, 2000
6. Shantha Kumar S R J, "Basic Mechanical Engineering", Hi-tech Publications, 2013.
7. Kalpakjian.S, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2013

L: 45; TOTAL: 45 PERIODS

Course Code	**ELECTRIC CIRCUIT ANALYSIS**	**L**	**T**	**P**	**E**	**C**
23EE24C		**3**	**1**	**2**	**0**	**5**

COURSE OUTCOMES

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

Theory Component

CO1: describe the basic concepts of circuit analysis and basic laws

CO2: apply the network theorems and reduction techniques to estimate the steady state response for a given excitation

CO3: examine the application of series, parallel resonance and coupled circuits

CO4: infer and Evaluate the transient response of electric circuit and characteristics of two port networks.

CO5: analyse three-phase balanced and unbalanced systems in star and delta configurations.

Practical Component

CO6: examine the electric circuits using mesh and nodal analysis

CO7: make use of network theorems to simplify the circuits.

CO8: compute the frequency response of resonant and tuned circuits
CO9: analyze the dynamic behavior of electric circuits using simulation tool.
CO10: infer the behaviors of balanced and unbalanced systems in star and delta configurations using simulation tool.

Soft Skill Component

CO11: Develop effective communication skills, and build team work in analyzing the electric circuits with ethics

CO1: describe the basic concepts of circuit analysis and basic laws **L:9, T:3**
CO6: examine the electric circuits using mesh and nodal analysis **P:6**

Resistive, Inductive and Capacitive elements - Power, Power Factor and Energy - Ohm's Law– Kirchoffs laws and its verification – voltage and current division - source transformation – star delta conversion- Mesh current and node voltage analysis in D.C and A.C. circuits – Experimental verification of mesh and nodal analysis - Phasor diagram - Average and RMS value.

CO2: apply the network theorems and reduction techniques to estimate the steady state response for a given excitation **L:9, T:3**
CO7: make use of network theorems to simplify the circuits **P:6**

Thevenin and Norton Theorems and its Experimental verification – Superposition Theorem and its Experimental verification – Maximum power transfer theorem and its Experimental verification – Reciprocity Theorem and its Experimental verification – Millman's theorem.

CO3: examine the application of series, parallel resonance and coupled circuits **L:9, T:3**
CO8: compute the frequency response of resonant and tuned circuits **P:6**

Series, parallel resonance and its Experimental verification on Frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Single tuned circuits and experimental verification –Measurement of self inductance of a coil

CO4: infer and Evaluate the transient response of electric circuit and characteristics of two port networks. **L:9, T:3**
CO9: analyze the dynamic behavior of electric circuits using simulation tool. **P:6**

Review of Laplace transformation; Laplace transform of network and time domain solution for RL, RC and RLC networks for AC and DC excitations; Transient behaviour of circuit elements under switching conditions and their representations, evaluation of initial and final conditions in RL, RC and RLC circuits with AC and DC excitations- experimental verification of transient response of RL, RC circuits for DC input

CO5: analyse three-phase balanced and unbalanced systems in star and delta configurations **L:9, T:3**
CO10: infer the behaviors of balanced and unbalanced systems in star and delta configurations using simulation tool. **P:6**

Review of balanced system; Unbalanced systems: Delta-connected, three-wire star connected, four-wire star-connected loads; Analysis of unbalanced 3-wire star load: Kirchhoff's law, loop current method, star/delta conversion method using millman's theorem- Simulation of three phase balanced and unbalanced star, delta networks circuits

using Simulation package.

TEXT BOOKS:

1. Charles K Alexander, Matthew Sadiku, Fundamentals of Electric Circuits, 2022, 7th Edition, McGraw Hill Education.
2. William H. HaytJr, Jack E. Kemmerly, and Steven M. Durbin, Engineering Circuits Analysis, McGraw Hill publishers, New Delhi, 2019.

REFERENCES:

1. John Bird, "Electrical Circuit Theory and Technology", 6th Edition, Newnes Publication, 2017.
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw. Hill Education, 5th Edition, New Delhi, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw Hill, New Delhi, 2017.

L: 45; T:15; P: 30; TOTAL: 90 PERIODS

Course Code	**PROFESSIONAL ENGLISH**	**L**	**T**	**P**	**E**	**C**
23SH22C	(Common to all B.E. / B.Tech. Degree Programmes)	**2**	**0**	**2**	**0**	**2**

COURSE OUTCOMES

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

Theory Component

CO1: extend the primary language skills to develop critical thinking

CO2: build the secondary language skillsfor professional competence

Practical Component

CO3: apply the vital sub-functions of listening in particular context

CO4: take part in propagating ideas through effective oral communication

CO5: inferring information using various reading techniques

CO6: construct professional content via distinct methods of writing

Soft skill Component

CO7: develop interpersonal, communicational and behavioral attributes

CO1:extend the primary language skills to develop critical thinking

CO3: apply the vital sub-functions of listening in particular context

L:6,P:16

CO4: take part in propagating ideas through effective oral communication

If Conditionals – Standard Abbreviations –Types of Listening (Comprehensive, Informational, Critical Listening) – One Word Substitution, Components of Speaking

Listening for Specific Information –Listening to Speech (Oxford Union Society) – Listening to Science Talks or Theories

Product Description – Chart Description – Process Description – Group Discussion (Uses – Structure – Strategies – Team Work – Positive & Negative Body Languages – Samples – Demo)

CO2:build the secondary language skills for professional competence **L:5,P:18**
CO5: inferring information using various reading techniques
CO6: construct professional content via distinct methods of writing

Synonyms – Intensive and Extensive Reading –Error Spotting (Based on Concord, Pronoun, Articles & Adverb Placement)– Writing Style (Persuasive, Expository & Descriptive)

Newspaper Reading – Reading Comprehension (Fiction & NonFiction)

Business Letters for Quotations and Clarification, Placing Orders and Making Complaints – Proposal Writing – Job Application Letter & Resume Preparation – Paragraph Writing – Content Writing

TEXT BOOKS

1. Lucantoni, Peter & Lydia Kellas. "English as a Second Language Workbook", 6th Edition, Cambridge University Press, 2022.
2. Twain, Mark. "The Adventures of Tom Sawyer", 1st Edition, Pegasus, 2012.
3. Clear, James. "Atomic Habits", 1st Edition, Dreamliners, 2022.
4. Garcia, Hector & Francesc Miralles. Ikigai: The Japanese Secret to a long and Happy Life. 1st Edition, Tuttle Publishing, 2021.
5. Elbow, Peter, "Writing with Power" 2nd Edition, Oxford University Press, 1998.

REFERENCES

1. Butterfield, Jeff. "Soft Skills for Everyone". 2nd Edition, Cengage, 2020
2. Raman, Meenashi & Sangeetha Sharma. Professional English. 1st Edition, Oxford University Press, 2018

L: 11; P: 34; TOTAL: 45 PERIODS

Course Code	PROBLEM SOLVING TECHNIQUES	L	T	P	E	C
23CS11C	(Common to all B.E. / B.Tech. Degree Programmes)	**3**	**0**	**2**	**0**	**4**

COURSE OUTCOMES

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

Theroy Component

CO1:apply fundamentals of problem solving techniques to develop simple algorithms for arithmetic and logical problems

CO2:apply fundamental, sequential, conditional logic statements and arrays for solving basic problems

CO3: implement modular programming concept using user defined functions

CO4: inscribe programs using pointers and to allocate memory for user defined data types using dynamic memory management functions

CO5: develop file processing application programs

Practical Component

CO6: develop programs for simple algorithms using sequential and Control structures

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

CO8: develop application programs using structures and files concept.

CO1: apply fundamentals of problem solving techniques to develop simple algorithms for arithmetic and logical problems **L:6**

Overview of programming: Problem Solving in Everyday Life, Types of Problem, Computer-based problem solving, Algorithms - Building blocks of algorithms (statements, control flow, functions) - Notation (pseudo code, flow chart) – Problem solving aspect – Top down design – Implementation of algorithms – Program Verification – Efficiency of algorithms – Analysis of algorithm.

CO2: apply fundamental, sequential, conditional logic statements and arrays for solving basic problems **L:12, P:10**

Data Types - Constants – Variables - Keywords – Operators– Problem Solving using fundamental algorithms. Control Statements: Branching and Looping - Algorithms Using Selection and Repetition - Summation of a set of numbers, Reversing Digits of an Integer - Implementation of fundamental algorithms and factoring methods - Array Techniques - Array order reversal, Array Counting, Finding maximum and the minimum value in a set

CO6: develop programs for simple algorithms using sequential and Control structures

Solve problems using control statements (Decision making and Looping)

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

Problem solving based on Array Handling(1D and 2D, Multi-dimensional arrays, traversal, rotation) - Solve problems to handle strings

CO3: implement modular programming concept using user defined functions **L:10, P:8**

Modular Programming approach: Modularization and recursion - Bubble Sort, Selection Sort, Linear Search, Binary Search, Implementation of sorting and searching

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

Solve problems by using modular approach (Functions and Recursion)

CO4: inscribe programs using pointers and to allocate memory for user defined data types using dynamic memory management functions **L:12, P:10**

Pointer Concept – add numbers using call by reference – finding maximum number from list of numbers - permutations of a given string using pointers – Implementation of function returns a pointer;

Structures & Union - finding the largest element of an array using Dynamic Memory Allocation – Implementation of Student database in structure using Dynamic Memory Allocation;

CO7: inscribe programs using arrays, functions and pointers to work with multiple data items.

Build efficient solutions to manage memory efficiently through Pointers.

CO8: develop application programs using structures and files concept.

Develop applications using Structures

CO5: Develop file processing application programs **L:5, P:2**

File Handling: Files - Introduction, Types of file processing: Sequential access, Random access – Implementation of word count, copy file, Voter's age validation, Marks range validation

CO8: Develop application programs using structures and files concept.

Develop appliactions using Files

TEXT BOOKS:

1. Maureen Sprankle and Jim Hubbard, Problem Solving and Programming Concepts, Prentice Hall, 9th Edition, 2012.
2. R.G Dromey, How to solve it by Compute, Pearson education, Delhi, 2nd Edition, 2021.

REFERENCES:

1. Behrouz A. Forouzan, Richard F.Gilberg, P.Golda Jeyasheeli, G.Priyanka, S.T.Veena , Problem solving Using C A Structured Programming Approach, Volume I & II, 1st Edition, Cengage Publication, 2022
2. Karl Beecher, Computational Thinking: A Beginner's Guide to Problem Solving and Programming, BCS Learning & Development Limited, 1st Edition, 2017.
3. Byron S. Gottfried, Jitendar Kumar Chhabra, Programming with C, Tata McGraw Hill Publishing Company, New Delhi, 4th Edition, 2018.
4. Kernighan B.W., Ritchie D.M., C Programming Language (ANSI C), Prentice Hall of India Private Limited., New Delhi, 2nd Edition, 2010.
5. Pradip Dey and Manas Ghosh, Programming in C, Oxford University Press, New Delhi, 2018.
6. Yashavant P. Kanetkar, Let Us C, BPB Publications,16th Edition, 2020
7. H. M.Deitel, P. J. Deitel, C How to Program, Pearson Education., New Delhi, 7th Edition, 2016.

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	**INNOVATION THROUGH DESIGN THINKING**	**L**	**T**	**P**	**E**	**C**
23GN02C	**(Common to all B.E. / B.Tech. Degree Programmes)**	**0**	**0**	**0**	**4**	**2**

COURSE OUTCOMES

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

Experiential Component

CO1: Analyse the impact of design thinking process.

CO2: Practice design thinking process through real world problems.

Soft skill Component

CO3: Present survey conclusions on selected real-world problems.

CO1: Analyse the impact of design thinking process **30**

Design thinking process: history and phases -Ideation tools: brainstorming, mind mapping, scrambler method, six thinking hats -case studies.

CO2: Practice design thinking process through real world problems **30**

Real world problem selection-Practicing the preliminary stages of design thinking process - work presentation.

TEXT BOOKS:

1. Falk Uebernickel, Li Jiang, Walter Brenner, Britta Pukall, Therese Naef, "Design Thinking: The Handbook", WS Professional, 2020
2. PavanSoni, "Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem solving", Penguin Random House, 2020

REFERENCES:

8. Michael Lewrick, "The Design Thinking Playbook", Wiley, 2019
9. Kathryn Christopher, "Design Thinking in Engineering", Kendall Hunt Publishing Company, 2019
10. Robert Curedale, "Design Thinking Process & Methods" Design Community College Inc, 5th Edition, 2019
11. David Lee, "Design Thinking in the Classroom", Ulysses Press, 2018
12. Jimmy Jain, "Design Thinking for Startups", Notion Press, 2018
13. Monika Hestad Silvia Rigoni Anders Grnli, "The Little Booklet on Design Thinking: An Introduction", Zaccheus Entertainment, 2nd Edition, 2017
14. Scott Swan, Michael G.Luchs and Abbie Griffin, "Design Thinking: New Product Development Essentials", Wiley-Blackwell, 2016
15. D.M. Arvind Mallik, "Design Thinking for Educators", Notion Press, 2019

E:60; TOTAL:60 PERIODS

Course Code		**L**	**T**	**P**	**E**	**C**
23GN04C	**APTITUDE EXCELLENCE**	**1**	**0**	**0**	**0**	**1**

COURSE OUTCOMES

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

CO1: Infer appropriate methods to simplify computation
CO2: Develop problem solving skills on Time and Work
CO3: Interpret fundamentals in quantitative techniques and solve problems quickly
CO4: Improve quantitative skills and solve problems on permutation and Combination
CO5: Acquire the knowledge of Cognitive ability and solve puzzles effectively

CO1: Infer appropriate methods to simplify computation

Simplification: BODMAS rule –Simplification algebraic expressions, techniques for mental calculation, approximation methods and quick estimation strategies **3**

CO2: Develop problem solving skills on Time and Work

Time and Work: Chain rule- Units method – efficiency ratio technique-work and wages – pipes and cisterns **3**

CO3: Interpret fundamentals in quantitative techniques and solve problems quickly

Time Speed Distance: Relation between speed and time –Speed ratio-Average speed-Effective speed - Data Sufficiency **3**

CO4: Improve quantitative skills and solve problems on permutation and Combination

Probability Permutation Combination: Fundamental Counting Principle – Computing Permutation – Circular Permutation – Computing Combinations - Data Sufficiency-Percentile **3**

CO5: Acquire the knowledge of Cognitive ability and solve puzzles effectively

Abstract reasoning: Mirror and water image – Figure Matrix –Pattern Completion-Graphing of Data - Logical puzzles – Dot situation - Ranking ordering. **Cognitive ability:** Blood Relation - Direction Sense Test-Data Sufficiency **3**

REFERENCES:

1. R.V.Praveen, "Quantitative Aptitude and Reasoning" , 3rd Edition , Eastern Economy Edition, PHI Learning 2016
2. Arun Sharma, "Quantitative Aptitude for CAT", McGraw Hill Edge, 10th Edition 2022
3. Dr.R.Aggarwal, "Quantitative Aptitude", S Chand Publishing, Revised Edition 2017

L:15; TOTAL : 15 PERIODS

Course Code	ELECTROMAGNETIC FIELDS	L	T	P	E	C
23EE31C		3	1	0	0	4

COURSE OUTCOMES

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

Theory Component

CO1: apply vector calculus on electromagnetic fields in different coordinate system
CO2: analyze the electrostatic field distribution in different medium along with their applications
CO3: evaluate the magneto static field distribution in different medium along with their applications
CO4: illustrate different methods of emf generation and Maxwell's equations
CO5:examine the concept of electromagnetic waves in different spaces and characterizing parameters

CO1: Apply vector calculus on electromagnetic fields in different coordinate system **L:9, T:3**

Sources and effects of electromagnetic fields- review of scalar and vector fields-Coordinate systems (rectangular, cylindrical and spherical) – coordinate transformation-Vector calculus- vector operator del, gradient, divergence and curl- integral theorems of vectors.

CO2: Analyze the electrostatic field distribution in different medium along with their applications **L:9, T:3**

Coulomb's law, Electric field intensity- point charges, Line, Surface and Volume charge distributions - Gauss law and its applications - Electric field in free space, conductors,

dielectrics -Electric potential - different configurations- potential due to electric dipole - Electrostatic Energy and Energy density–Electric Boundary conditions - Capacitance - Electric field in multiple dielectrics and configuration - Laplace, Poisson's equations and solutions

CO3: Evaluate the magnetostatic field distribution in different medium along with their applications **L:9, T:3**

Lorentz force – Biot-Savart's Law – Ampere's Law - magnetic fields by differential current element – Magnetic force due to current carrying conductors - Magnetic flux and magnetic flux density – different configuration - Scalar and Vector Magnetic potentials -- Magnetostatic Energy and Energy density – Magnetic circuits - Magnetization and permeability - Magnetic boundary conditions – Torque - Inductance calculations.

CO4: Explain different methods of emf generation and Maxwell's equations **L:9, T:3**

Faraday's law for Electromagnetic induction - Transformer and motional EMF – Faraday Disc generator - Displacement current - Maxwell's equation (differential & Integral form) - Relation between field theory and circuit theory

CO5: examine the concept of electromagnetic waves in different spaces and characterizing parameters **L:9, T: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 and theorem – Plane wave reflection and refraction.

TEXT BOOKS:

1. Sadiku Matthew N.O., "Principles of Electromagnetics", 6th Edition, Oxford University Press, New Delhi, 2021.
2. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.

REFERENCES:

1. Hayt W.H., Buck J.A and JaleelAkhtar M., "Engineering Electromagnetics" 9th Edition McGraw Hill Education, India, 2020.
2. Henry W.Ott, "Electromagnetic Compatibility Engineering", Wiley-Blackwell; Revised Edition (11 September 2009).
3. J. Edminister and Vishnu Priye, "Electromagnetics", 2nd Edition, Schaum's Series, 2017.
4. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.

L: 45; T: 15; TOTAL: 60 PERIODS

Course Code	TRANSFORMS, PROBABILITY AND STATISTICS	L	T	P	E	C
23EE32C		3	1	0	0	4

COURSE OUTCOMES

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

Theory Component

CO 1: apply Laplace transform to solve ordinary differential equations.

CO 2: solve difference equations using Z-Transform.
CO3: perform basic probability concepts and standard distributions.
CO4: find the correlation and regression of two dimensional random variables.
CO5: calculate the various measures of central tendencies.

CO 1 : apply Laplace transform to solve ordinary differential equations

Definition of Laplace transform and its inverse – Transforms of elementary functions – Properties – Transforms of periodic functions – Initial and final value theorems – Convolution theorem.- solutions of linear ordinary differential equations with constant coefficients - Solutions of simultaneous differential equations of first order with constant coefficients - *Determine the solution of ordinary differential equations in Laplace transform – Activity through software.* **L:9,T:3**

CO2 : solve difference equations using Z-Transform

Z– transform –Elementary properties – Inverse Z–transform – Convolution theorem- Initial and final value theorem – Formation of difference equations –Solutions of difference equations using Z–transform **L:9,T:3**

CO3 : perform basic probability concepts and standard distributions

Discrete and continuous random variables - Moments - Moment generating functions and their properties. Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, and Normal distributions.. **L:9,T:3**

CO 4 : find the correlation and regression of two dimensional random variables

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression - Transformation of random variables – Central Limit Theorem. **L:9,T:3**

CO5: calculate the various measures of dispersion

Central tendencies -Mean, median, mode - Measures of Dispersion –Mean deviation, and Quartile deviation–Moments– Skewness –Kurtosis - Correlation and Regression - *Carry out performance study on measures of central tendencies – Case Study through software***.** **L:9,T:3**

TEXT BOOKS:

1. Grewal.B.S. Higher Engineering Mathematics, 44th Edition, Khanna Publications, Delhi, 2021.
2. Richard A. Johnson, Irwin Miller, John Freund, Miller & Freund's, Probability and Statistics for Engineers, 9th Edition, Pearson Education Limited, Global Edition, 2017.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India, 2017

REFERENCES:

1. Ramana B.V, Higher Engineering Mathematics , Tata Mc-Graw Hill Education, New Delhi, 2017.
2. Jain.R.K. and Iyengar.S.R.K., Advanced Engineering Mathematics, 5th Edition, Narosa Publishing House Private Limited, 2016.
3. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, Probability and Statistics for Engineers and Scientists, Pearson Education, Asia, 9th Edition, 2016

L: 45; T:15; TOTAL: 60 PERIODS

Course Code	DC MACHINES AND TRANSFORMERS	L	T	P	E	C
23EE33C		3	0	2	0	4

COURSE OUTCOMES

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

Theory Component

CO1: illustrate the fundamentals of magnetic circuits and electromechanical energy conversion.

CO2: recognize the different types of transformer and evaluate the performance of transformer.

CO3: identify the DC generator for suitable applications and familiarize the performance of DC generator

CO4: select and draft specifications of DC motors for various applications along with speed control methods.

CO5: analyze the performance parameters/characteristics of the DC machines & transformer under various operating conditions through proper testing

Practical Component

CO6: estimate the magnetic losses in magnetic circuits

CO7: investigate the performance characteristics, efficiency, regulation & significance of various transformer connection

CO8: demonstrate the DC Generator Characteristics for various loading parameters

CO9: demonstrate the DC Motor Characteristics for various loading parameters

CO10: explore the performance of DC Machines and Transformers testing

Soft Skill Component

CO11: Develop effective communication skills, and build team work in characterizing DC machines and transformers with ethics

CO1: describe the fundamentals of Magnetic Circuits and Electromechanical Energy Conversion **L:9, P:6**

CO6: estimate the magnetic losses in magnetic circuits

Magnetic Circuits : MMF, Reluctance & Permeability - Magnetic Materials - B-H Curve, Magnetic Losses - Experimental Verification of Separation of magnetic losses in magnetic circuit – Faraday's law – Energy Stored in the magnetic field – Electromechanical Energy Conversion – Singly Excited System – Multiple Excited System – Rotating Magnetic Field

CO2: Recognize the different types of transformer and evaluate the performance of transformer **L:9, P:6**

CO7: investigate the performance characteristics, efficiency, regulation and significance of various transformer connections.

Construction and Working Principle –EMF Equation- Equivalent circuit Parameters – Phasor Diagram – Auto transformer -Three Phase transformer- Experimental Verification of Load Test on Single and three Phase transformer - Study of Three Phase transformer Connections – Transformer materials, Applications of transformers, Special purpose Instrument transformers (CT and PT), Emerging technologies - Earthing Transformer, Pulse Transformer, High frequency Transformer Solid-State Transformer, Dry-type transformers, Smart transformer, Green transformer

CO3: identify the DC Generator for suitable applications and familiarize the performance of DC Generator **L:9, P:6**

CO8: demonstrate the DC Machines Characteristics for various loading parameters

Construction - Principle of Operation – Lap and Wave windings – EMF Equation – Armature Reaction – Method of Excitation – Commutation – Interpoles and Compensating Winding – Characteristics of DC Generator – Experimental Verification of Open Circuit and Load Characteristics of DC Shunt Generator- Load Characteristics of DC series Generator- Load Characteristics of DC Cumulative and Differential Compound Generator Applications (Qualitative Case Study).

CO4: select and draft specifications of DC motors for various applications along with speed control methods. **L:9, P:6**

CO9: demonstrate the DC Motor Characteristics for various loading parameters

Principle of Operation – Back EMF – Torque Equation – Types of Motors – Experimental verification of Load test on DC Shunt Motor, DC Series Motor- Load Test on Cumulative and Differential DC Compound Motor- Speed Control of DC Shunt Motor - Starters and Speed Control – Speed Torque Characteristics – Braking— selection of motor - Applications (Qualitative Case Study).

CO5: Analyze the performance parameters/characteristics of the DC machines & Transformer under various operating conditions through proper testing **L:9, P:6**

CO10: explore the performance of DC Machines and Transformers testing

DC Machines: Losses & Efficiency – Condition for Maximum Efficiency - Retardation test – Swinburne's Test – Hopkinson's Test, Transformer: Losses & Efficiency, Condition for Maximum Efficiency –Experimental verification of Swinburne's Test- Hopkinson's test- Sumpner's test- Open circuit and Short Circuit Test on Single Phase Transformer All day efficiency and Voltage Regulation – OC & SC Test - Sumpner's test – Polarity Test.

TEXT BOOKS:

1. Nagrath I. J and Kothari D. P. "Electric Machines", 5th Edition, Tata Mc Graw Hill Publishing Company Limited, 2017.
2. S.K.Bhattacharya "Electrical Machines", 4th Edition, McGraw Hill Education, 2017.

REFERENCES:

1. M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning Private Limited, New Delhi, 2011.
2. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, "Electric Machinery", 7th Edition, Tata Mc-Graw Hill Books Company, 2013.
3. P.S. Bimbhra, "Electrical Machinery", Khanna Publishes, 7th Edition, 2011.
4. B.L.Theraja, and A.K.Theraja, A text book of Electrical Technology, Shree Hari Publications, 2021.
5. V.K.Metha and Rohit Metha "Principles of Electrical Machines" S.Chand Publications, 2014.
6. "Transformers", 2nd Edition, BHEL, 2003.
7. IEC60076 -Transformer standards, IEC 60034 rotating machines.

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	MEASUREMENT AND INSTRUMENTATION	L	T	P	E	C
23EE34C		3	0	2	0	4

COURSE OUTCOMES

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

Theory Component

CO1: analyze the performance characteristics of instruments

CO2: describe the construction and operation of various measuring instruments.

CO3: select appropriate AC and DC bridges for the measurement of electrical parameters

CO4: illustrate the operation of transducer suitable for measurement of non electrical quantities

CO5: outline the significance of computer-based data acquisition and digital display devices.

Practical Component

CO6: perform statistical error analysis for instrument data to describe its characteristics.

CO7: calibrate the instruments with standards and design the components for extending its range.

CO8: design the DC and AC bridges for measuring electrical parameters

CO9: build signal conditioning circuit for transducer and analyze its transient and steady state behaviors.

CO10: utilize smart system for parameter measurement and monitoring using digital technology.

Soft Skill Component

CO11: Develop monitoring system with ethics, teamwork and effective communication skills.

CO1: analyze the performance characteristics of instruments **L:8, P:2**

CO6: perform statistical error analysis for instrument data to describe its characteristics.

Methods of Measurement – Fundamental and derived units – Elements of instrument – Static and Dynamic characteristics of instruments – Error types– Propagation of error - Statistical error analysis – Performance measures –Experimental measurement and analysis of Error for a set of data from a batch of resistance – Standard and Calibration

CO2: describe the construction and operation of various measuring instruments. **L:9, P:8**

CO7: calibrate the instruments with standards and design the components for extending its range

Types of analog meters –Principle of Moving coil instruments –Moving iron instruments –Extension of meter range –Design and validate multipliers for extending the range of voltmeter and ammeter- Induction type wattmeter and energy meters – Calibration of three phase energy meter by two wattmeter method and validate using multifunction meter Instrument transformer -Calibrate fixed and variable ratio CT in current measurement- Optical CT-CVT-IVT.

CO3:select appropriate AC and DC bridges for the measurement of electrical parameters **L:10, P:10**

CO8: design the DC and AC bridges for measuring electrical parameters

Balance condition – Source & Detectors – Wheatstone bridge, Kelvin's double bridge – Experimental validation - Maxwell's bridge – Anderson bridge – Experimental design of Maxwell's bridge and Anderson bridge – De-Sauty bridge – Schering bridge – Experimental design of Schering bridge and De-Sauty bridge– Wein bridge – Megger– Earth resistance –Localization of cable fault – Experimental verification of Megger.

CO4: illustrate the operation of transducer suitable for measuring a physical parameter **L:9, P:6**

CO9: build signal conditioning circuit for transducer and analyze its transient and steady state behaviors.

Transducers selection criteria – Types of transducers – Potentiometer – Strain gauge– Encoders – LVDT – Pressure transducer – Calibration experiment for Resistive, inductive and capacitive transducers – Temperature transducers – Build signal conditioning circuit for thermocouple– Transient and steady state analysis for RLC circuit design – Flow meters – Pyrometers–Piezo-electric transducers – hall effect transducer.

CO5: outline the significance of computer-based data acquisition and digital display devices. **L:9, P:4**

CO10: utilize smart system for parameter measurement and monitoring using digital technology

Quantization – Digital voltmeters – Ramp and integrating –Digital multimeter –Digital storage Oscilloscope –Digital printers –Data acquisition system – Display devices: LCD, LED, OLED –Smart monitoring: Multifunction meter, Virtual instrumentation - ELVIS Data acquisition experiment in LabVIEW platform - Introduction to IoT technology - Remote monitoring experiment using IoT technology.

TEXT BOOKS:

1. Ernest O. Doebelin , Dhanesh N. Manik, “Measurement Systems”, 7th Edition, McGraw Hill Education, 2019.
2. Prithwiraj Purkait, Budhaditya Biswasm Santanu Das, Chiranjib Koley, “Electrical and Electronic Measurements and Instrumentation, McGraw Hill Education, 2017.

REFERENCES:

1. Arthur Whitmore Smith, “Principles of Electrical measurements”, Legare Street Press, 2022.
2. A.K.Sawhney, “A Course in Electrical and Electronic Measurements and Instrumentation”, Shree Hari Publications, 2021.
3. Kalsi. H.S, “Electronic Instrumentation”, Tata McGraw Hill, 4th Edition 2019.
4. Alan S.Morris, Reza Langari, “Measurement and Instrumentation Theory and Application”, Elsevier, 2012.
5. Helfrick, Albert. D and Copper. W.D, “Electronics Instrumentation and Measurement Techniques”, Prentice Hall of India Ltd. & Co, New Delhi, 2010.

NPTEL MATERIAL: https://archive.nptel.ac.in/courses/108/105/108105153/#

L: 45; P: 30; TOTAL: 75 PERIODS

Course Code	ELECTRON DEVICES AND CIRCUITS	L	T	P	E	C
23EE35C		3	1	2	0	5

COURSE OUTCOMES

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

Theory Component

CO1: explain the characteristics and applications of PN junction diode.
CO2: describe the working principle of transistor and design of biasing circuits
CO3: summarize the characteristics of amplifier using BJT and MOSFET
CO4: illustrate the operation of differential and feedback amplifiers circuits
CO5: demonstrate the pulse and power supply circuits using IC's

Practical Component

CO6: demonstrate the characteristics and applications of PN junction diode.
CO7: realize the characteristics BJT and MOSFET under various bias
CO8: develop an amplifier circuit using BJT and MOSFET
CO9: construct the differential and feedback amplifiers.
CO10: build and verify the power supply circuits

Soft Skill Component

CO11: Develop communication skills and team work during the design of electronic circuit components

CO1: explain the characteristics and applications of PN junction diode.
CO6: demonstrate the characteristics and applications of PN junction diode.
L:9, T:3, P:6

PN Junction diode – Structure, Operation , Experimental verification of V-I characteristics–Equivalent Circuit – Ideal and Practical Diode – Reverse Recovery Time –Logic Gates using Diode – Rectifiers – Half Wave and Full Wave Rectifier with experimental verification – Filters – Zener diode, characteristics– LED –Schottky diode – Photo Diode – Laser diodes–optocouplers – Analysis of data sheet parameters.

CO2: describe the working principle of transistor and design of biasing circuits
CO7: realize the characteristics BJT and MOSFET under various bias
L:9, T:3, P:6

BJT Structure, - Characteristics of BJT under CB and CE Configuration - Operation – experimental verification of CE, CB, CC Characteristics – Needs of Biasing – Load Line – JFET, MOSFET Structure, - Characteristics of MOSFET and JFET- Operation and Characteristics– Biasing Circuits BJT and MOSFET– experimental verification of Design of Transistor Biasing - Analysis of data sheet parameters – UJT Structure and characteristics.

CO3: summarize the characteristics of amplifier using BJT and MOSFET
CO8: develop an amplifier circuit using BJT and MOSFET
L:9, T:3, P:6

BJT small signal model – Analysis of CE, CC amplifiers – Frequency response analysis – MOSFET Small signal model– Experimental Verification of Frequency Response of Common Emitter Amplifier - Frequency Response of Common Source MOSFET Amplifier - Analysis of CS and Source follower –Power amplifiers, Class A, B, AB – Cascaded Amplifier – Design and implementation of Power amplifiers - Darlington

CO4: illustrate the operation of differential and feedback amplifiers circuits
CO9: construct the differential and feedback amplifiers.
L:9, T:3, P:6

Differential amplifier and its experimental verification – Common mode and Difference mode analysis – Advantages of negative feedback – voltage / current, series, Shunt feedback – Positive feedback – Condition for Oscillations, RC phase shift oscillators and experimental verification – Wien bridge, Hartley, Colpitts and Crystal oscillators.

CO5: demonstrate the pulse and power supply circuits using IC's
CO10: build and verify the power supply circuits

L:9, T:3, P:6

Pulse circuits – RC integrator and differentiator – Diode Clipping & Clamping circuits – Zener Diodes as Regulators – experimental verification of Design of Zener Voltage regulator - IC voltage regulators – LM78XX, 79XX – Variable voltage regulators switching regulators LM317, LM723 – experimental verification of Design of switching regulators - Linear Mode Power Supply – Switched Mode Power Supply

TEXT BOOKS:

1. Donald.A. Neamen, "Electronic Circuit Analysis and Design", 2nd Edition, Tata McGraw Hill, 2009.
2. Millman.J and Halkias.C, "Electronic Devices and Circuits", 4th Edition, McGraw HillEducation, 2017.

REFERENCES:

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 11th Edition, Prentice Hall, 2015.
2. Thomas L. Floyd and David M.Buchla, "Electronics Fundamentals: Circuits, Devices and Applications", 8th Edition, Pearson College Div, 2010.
3. David A. Bell, "Fundamentals of Electronic Devices and Circuits", Oxford University Press, 2009.
3. Schilling and Belove, "Electronic Circuits", TMH, 3rd Edition, 2002.
4. Chenming Hu, "Modern Semiconductor Devices for Integrated Circuits", Prentice Hall, 2009

L: 45; T:15; P: 30; TOTAL: 90 PERIODS

23GN03C	**INTELLECTUAL PROPERTY RIGHTS STUDY**	**L**	**T**	**P**	**E**	**C**
	(Common to all B.E. / B.Tech. Degree Programmes)	**0**	**0**	**0**	**4**	**2**

COURSE OUTCOMES

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

Experiential Component

CO1: Survey and practice the basic elements of existing patents.

CO2: Investigate and present the state of art technologies through effectual IP search.

Soft Skill Component

CO3: Present patent survey conclusions

CO1 Survey and practice basic elements of existing patents **30**

Basic elements of IPR – claims – infringements – Patent examination and Report - Case studies: patent survey.

CO2 Investigate and present the state of art technologies through effectual IP search 30

Importance of IP search-factors to be considered for effective IP search-Hands-on Practice

REFERENCES

1. D.P. Mittal, "Indian Patents Law and Procedure", Taxman Publication, 2002
2. B.L. Wadera, "Patents, trademarks, copyright, Designs and Geographical Judications", 2010
3. P. Narayanan, "Intellectual Property Law", Eastern Law House, 2022
4. N.S. Gopalakrishnan & T.G.Agitha, "Principles of Intellectual Property", Eastern Book Company, Lucknow, 2009.

E:60 TOTAL:60 PERIODS