Dr. MAHALINGAM
COLLEGE OF ENGINEERING AND TECHNOLOGY
Udumalai Road, Pollachi, Coimbatore District - 642003
Established in 1998 ♦ Approved by AICTE ♦ Affiliated to Anna University
(A DIVISION OF NIA EDUCATIONAL INSTITUTIONS)
An Autonomous Institution
Since 2011
NAAC A++ GRADE
Cycle 3 (2023-2030)
The Highest Grade

Curriculum and Syllabi

Semesters I to VI

Regulations 2023

(2023 Batch only)

Dr. Mahalingam College of Engineering and Technology, Pollachi 642003.

(An autonomous institution approved by AICTE and affiliated to Anna University)

Department of Electronics and Communication Engineering

Vision

To strive for excellence in Electronics and Communication Engineering education, research and technological services imparting quality training to students, to make them competent and motivated engineers.

Mission

- Impart high quality technical education in Electronics and Communication Engineering through effective teaching- learning process and updated curriculum.
- Equip the students with professionalism and technical expertise to provide appropriate solutions to societal and industrial needs.
- Provide stimulating environment for continuously updated facilities to pursue research through creative thinking and team work.

Programme Educational Objectives (PEOs) – Regulations 2023

B.E. Electronics and Communication Engineering graduates will:

PEO1. Actively apply knowledge and technical skills in engineering practices towards the progress of the organization in competitive and dynamic environment.

PEO2. Own their professional and personal development by continuous learning and apply the learning at work to create new knowledge.

PEO3. Conduct themselves in a responsible and ethical manner supporting sustainable economic development which enhances the quality of life.

Programme Outcomes (POs) - Regulations 2023

On successful completion of B.E. Electronics and Communication Engineering programme, graduating students/graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Lifelong 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.

Programme Specific Outcomes (PSOs) - Regulations 2023

On successful completion of B.E. Electronics and Communication Engineering programme, graduating students/graduates will be able to:

PSO1: Technology deployment: Apply technologies of electronics, embedded systems, signal processing, communication and networking in the field of Industrial Automotive, Consumer, Medical and Defense Electronics industries

PSO2: IC design: Apply the design flow of Very Large Scale Integrated circuits to design and test Integrated Circuits in semiconductor industries

Dr.Mahalingam College of Engineering and Technology,Pollachi

2023 Regulations - Course Code Generation Procedure for UG Courses

Regulation

Mode of Assessment	
Character Type – Number	
T	Theory
I	Theory with Practical
L	Practical
	Practical with Theory
E	Elective
O	Open Elective
P	Project
S	Skill Development Course/Internship
C	Customized

Semester Number	
Character Type – Number	
1 to 8	Semester
0	Floating

Sequence Number
Character Type – Number
01, 02, 03, . . . , 99

1	2	3	4	5	6	7	8
2	3	A	U	X	X	0	1

Board/Department/Programme/Course Type			
Character Type – Alphabet			
AD	Artificial Intelligence & Data Science	ME	Mechanical
AM	CSE (Artificial Intelligence & Machine Learning)	SC	CSE (Cyber Security)
AU	Automobile	PH	Physics
CE	Civil	CH	Chemistry
CS	Computer Science	EN	English
EA	Advanced Communication Technology	MA	Mathematics
EC	Electronics and Communication	ES	Employability Skills
EE	Electrical and Electronics	VA	Value Added Course
EV	VLSI Design & Technology	SA	Studio Activities
IT	Information Technology		

Programme: B.E. Electronics and Communication Engineering
2023 Regulations
Curriculum for Semester I to VI
(2023 Batch only)

Course Category	Course Code	Course Title	Duration	Credits	Marks
VAC	23VAL101	Induction Program	3 Weeks	-	100

Semester I

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI101	Communication Skills I	2	0	2	3	100	All
Minor	23MAI102	Matrices and Calculus	3	0	2	4	100	AU,EA,EC, EE,EV&ME
Minor	23CHI101	Chemistry for Electrical Sciences	3	0	2	4	100	EC,EE&EV
Major	23ECT101	Electron Devices	3	0	0	3	100	EA,EC&EV
Multi-disciplinary	23ADT001	C Programming	3	0	0	3	100	CE,EA,EC &EV
Multi-disciplinary	23ADL001	C Programming Laboratory	0	0	3	1.5	100	CE,EA,EC&EV
VAC	23VAL102	Wellness for Students	0	0	2	1	100	All
VAC	23VAT101	தமிழர்மரபு /Heritage of Tamils	1	0	0	1	100	All
AEC	23SAL101	Studio Activities	0	0	2	-	-	All
		Total	**15**	**0**	**13**	**20.5**	**800**	

Semester II

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
AEC	23ENI201/ 23FLT201/23FLT202	Communication Skills II/ Foreign Language –Japanese/ Foreign Language - German	2	0	2	3	100	All
			3	0	0			
			3	0	0			
Minor	23MAI202	Complex Variables and Transforms	3	0	2	4	100	AU,EC,EE, EV&ME
Minor	23PHI201	Physics for Electrical Sciences	3	0	2	4	100	EA,EC,EE&EV
Major	23ECT001	Circuit Theory	3	0	0	3	100	EA,EC&EV
Multi-disciplinary	23ITT202	Problem Solving and Python Programming	3	0	0	3	100	EA,EC&EV
Multi-disciplinary	23MEL001	Engineering Drawing	1	0	3	2.5	100	AD,AM,AU,CS, EA,EC,EE,EV,IT, ME & SC
Major	23ECL001	Electric Circuits and Electron Devices Laboratory	0	0	3	1.5	100	EA,EC&EV
SEC	23ESL201	Professional Skills 1:Problem solving skills & Logical Thinking 1	0	0	2	1	100	All
VAC	23VAT201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	100	All
Multi-disciplinary	23CHT202	Environmental Sciences	1	0	0	-	100	All
AEC	23SAL201	Studio Activities	0	0	2	-	-	All
		Total	**17**	**0**	**16**	**23**	**1000**	

Semester III

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAT303	Numerical Methods and Linear Algebra	3	1	0	4	100	EC & EE
Major	23ECT301	Analog Circuits I	3	0	0	3	100	--
Major	23ECT302	Signals and Systems	3	1	0	4	100	--
Major	23ECT303	Digital System Design	3	0	0	3	100	--
Major	23ECL301	Analog Circuits I Laboratory	0	0	3	1.5	100	--
Major	23ECL302	Digital System Design Laboratory	0	0	3	1.5	100	--
SEC	23ESL301	Professional Skills 2: Problem solving skills & Logical Thinking 2	0	0	2	1	100	All
VAC	23VAT301	Universal Human Values 2 :Understanding Harmony	2	1	0	3	100	All
AEC	23SAL301	Studio Activities	0	0	2	-	-	All
		Total	**14**	**3**	**10**	**21**	**800**	

Semester IV

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAT401	Probability and Statistics	3	1	0	4	100	AM, AU, CS, EC, EE,ME, SC& IT
Major	23ECT401	Analog Circuits II	3	0	0	3	100	--
Major	23ECT402	Analog and Digital Communication	3	0	0	3	100	--
Major	23ECT002	Transmission Lines and Waveguides	3	0	0	3	100	EA & EC
Multi-disciplinary	23ITI001	Data Structures using C	3	0	2	4	100	EA & EC
Major	23ECL401	Analog Circuits II Laboratory	0	0	3	1.5	100	--
Major	23ECL402	Analog and Digital Communication Laboratory	0	0	3	1.5	100	--
SEC	23ESL401	Professional Skills 3: Professional Development and Etiquette	0	0	2	1	100	All
AEC	23SAL401	Studio Activities	0	0	2	-	-	All
		Total	**15**	**1**	**12**	**21**	**800**	

Course Category	Course Code	Course Title	Duration	Credits	Marks
SEC	23XXXXXX	Internship - 1/Community Internship /Skill Development	2 Weeks	**1**	**100**

Semester V

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23ECT501	Control Systems	3	0	0	3	100	--
Major	23ECI501	Digital Signal Processing	3	0	2	4	100	--
Major	23ECT502	Embedded Microcontrollers	3	0	0	3	100	--
Major	23XXXXXX	Professional Elective - I	3	0	0	3	100	--
Major	23XXXXXX	Professional Elective - II	3	0	0	3	100	--
Major	23ECL501	Embedded Microcontroller Laboratory	0	0	3	1.5	100	--
SEC	23ESL501	Professional Skills 4: Communication Skills and Interview Essentials	0	0	2	1	100	All
Project	23ECP501	Reverse Engineering Project	0	0	6	3	100	--
AEC	23SAL501	Studio Activities	0	0	2	-	-	All
		Total	**15**	**0**	**15**	**21.5**	**800**	

Semester VI

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23ECT601	VLSI System Design	3	0	0	3	100	--
Major	23ECI601	Computer Communication Networks	3	0	2	4	100	--
Major	23ECT602	Antenna and Wave Propagation	3	0	0	3	100	--
Major	23XXXXXX	Professional Elective - III	3	0	0	3	100	--
Major	23XXXXXX	Professional Elective - IV	3	0	0	3	100	--
Minor	23XXXXXX	Open Elective - I	3	0	0	3	100	--
Major	23ECL601	VLSI System Design Laboratory	0	0	3	1.5	100	--
SEC	23ESL601	Professional Skills 5: Campus to Corporate	0	0	2	1	100	All
AEC	23SAL601	Studio Activities	0	0	2	-	-	All
		Total	**18**	**0**	**9**	**21.5**	**800**	

Course Category	Course Code	Course Title	Duration	Credits	Marks
SEC	23XXXXXX	Internship - 2/ Research Internship/ Skill Development	2 Weeks – 4 Weeks	**1**	**100**

Tentative Curriculum for Semester VII to VIII

Semester VII

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	Microwave Engineering	3	0	0	3	100	--
Major	23XXXXXX	Artificial Intelligence and Machine Learning	3	0	0	3	100	--
Major	23XXXXXX	Professional Elective - V	3	0	0	3	100	--
Major	23XXXXXX	Professional Elective - VI	3	0	0	3	100	--
Minor	23XXXXXX	Open Elective - II	3	0	0	3	100	--
SEC	23XXXXXX	RF and Microwave Laboratory	0	0	3	1.5	100	--
Project	23XXXXXX	Project Phase - I	0	0	8	4	100	--
		Total	**15**	**0**	**11**	**20.5**	**700**	

Semester VIII

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Project	23XXXXXX	Project Phase - II	0	0	12	6	200	--
SEC	23XXXXXX	Internship - 3/ Skill Development	8 Weeks			4	100	--
		Total	**0**	**0**	**12**	**10**	**300**	

Total Credits: 161

SEMESTER I

Course Code:23VAL101		Course Title: Induction Program (Common to all B.E/B.Tech Programmes)
Course Category: VAC		Course Level: Introductory
Duration: 3 weeks	Mandatory Non-Credit Course	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Explain various sources available to meet the needs of self, such as personal items and learning resources
2. Explain various career opportunities, opportunity for growth of self and avenues available in the campus
3. Explain the opportunity available for professional development
4. Build universal human values and bonding amongst all the inmates of the campus and the society.

List of Activities:

1. History of Institution and Management: Overview on NIA Educational Institutions – Growth of MCET – Examination Process –OBE Practices –Code of Conduct – Centre of Excellence.
2. Lectures, interaction sessions and Motivational Talks by Eminent people, Alumni, Employer and Industry Experts
3. Familiarisation of Department / Branch:HoD's & Senior Interaction- Department Associatio
4. Universal Human Value Modules : Aspirations and concerns, Self Management, Relations Social and Natural Environment.
5. Orientation on Professional Skills Courses
6. Proficiency Modules : Mathematics, English, Physics and Chemistry
7. Introduction to various Chapters, Cells, Clubs and its events
8. Creative Arts : Painting, Music and Dance
9. Physical Activity :Games, Sports and Yoga
10. Group Visits: Visit to local area and Campus Tour

Course Outcomes	Cognitive Leve
At the end of this course, students will be able to:	
CO1 : Explain various sources available to meet the needs of self, such as personal items and learning resources through visit to local areas and campus	Understand
CO2: Explain various career opportunities and avenues available in the campus through orientation sessions	Understand
CO3: Explain the opportunity available for professional development through professional skills, curricular, co-curricular and extracurricular activities	Understand
CO4: Build universal human values and bonding amongst all the inmates of the campus and society for having a better life	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1(	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO2	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO3	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO4	2	-	-	-	-	-	-	2	1	2	-	-	-	-

High : 3, Medium :2, Low: 1

Text Book(s):

T1. Reading material, Workbook prepared by PS team of the college

Reference Book(s):

R1. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster Uk, 2004.

R2. Vethathiri Maharishi Institute For Spiritual and Intuitional Education, aliyar, “value educat harmonious life (Manavalakalai Yoga)”, Vethathri Publications, Erode, 2010.

R3. Dr.R.Nagarathna, Dr.H.R. Nagendra, “ Integrated approach of yoga therapy for positive Swami Vivekananada Yoga Prakashana Bangalore,2008 Ed.

Web References:

1. https://youtube.com/playlist?list=PLYwzG2fd7hzc4HerTNkc3pS_IvcCfKznV
2. https://www.youtube.com/watch?v=P4vjfEVk&list=PLWDeKF97v9SO0frdgmpaghDMjkom1
3. https://fdp-si.aicte-india.org/download/AboutSIP/About%20SIP.pdf

Course Code: 23ENI101	Course Title: Communication Skills I (Common to all B.E/B.Tech Programmes)		
Course Category: AEC		Course Level: Introductory	
L:T:P(Hours/Week) 2:0:2	Credits: 3	Total Contact Hours:60	Max Marks:100

Course Objectives

The course is intended to impart formal and informal language effectively and accurately in various real-life contexts on par with B1 level of CEFR Scale.

Module I **20 Hours**

Grammar: Synonyms & Antonyms -Tense forms - Modals - Passives – Reported Speech – Comparatives and Descriptive adjectives.

Listening: Listening for gist and specific information - Listening to past events, experiences and job preferences - Listening to descriptions of monuments - Listening for excuses - Listening to description: transportation systems and public places.

Speaking: Introducing oneself - Exchanging personal information – Effective Conversations: Role Play Situations (Describing personality traits - Describing landmarks, monuments and festivals - Making polite requests and excuses - Discussing facts - Asking for and giving information – Expressing wishes - Talking about lifestyle changes - Talking about transportation and its problems - Describing positive and negative features of things and places - Making comparisons)

Reading: Skimming and Scanning - Reading Comprehension - Reading and comprehending online posts and emails – Case Studies

Writing: Letter writing (Permission letters - Online cover letter for job applications) - Instructions - Recommendations - Write a blog (General) - Report Writing (Industrial Visit Report and Event Reports) - formal and informal emails.

Module II **20 Hours**

Grammar: Sequence adverbs - Phrasal verbs - Relative clauses – Imperatives - Infinitives - Conditionals.

Listening: Listening to review of food items - Listening to results of surveys- Listening to motivational talks & podcasts

Speaking: Expressing likes and dislikes - Describing a favourite snack - Giving advices and suggestions - Speculating about past and future Events – Group Discussion

Reading: Reading different expository texts - Reading to factual texts - Print and online media- Reading Comprehension

Writing: Process Descriptions – Email Writing (Requesting for information) - Reviewing Movie – Social media feeds/posts (Any Social Media)

List of Experiments: **20 Hours**

1. Mini Presentation and Picture Prompt Discussion
2. Debate Tournament
3. Listening, Mind Mapping & Summarization
4. Listening to Stories and Providing the Innovative Climax
5. Reading Comprehension
6. Writing - Interpretation of Visuals

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1 : Utilize the basic English grammar and vocabulary to acquire professional communication skills.	Apply
CO 2 : Develop listening and speaking skills through classroom activities based on listening comprehension, recapitulation, interpretation and debate on the same	Apply
CO 3 : Read and write social media posts and comments	Apply
CO 4 : Perform as a member of a team and engage in individual presentation	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	-	-	-

High-3; Medium-2;Low-1

Textbooks:

T1. Jack C. Richards, Jonathan Hull, and Susan Proctor, “Interchange - Student’s book 2”, 5th Edition, Cambridge University Press, South Asia Edition, 2022.

T2. Jack C. Richards, Jonathan Hull, and Susan Proctor, “Interchange - Student’s Book 1”, 5th Edition, Cambridge University Press, South Asia Edition, 2022.

Reference Book(s):

R1. David Bohlke, Jack C. Richards, “Four Corners”, 2nd Edition, Cambridge University Press,2018.

R2. Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones, Graham Burton,Empower B1 – Student’s Book, Cambridge University Press, 2020.

R3. Raymond Murphy, “Intermediate English Grammar” 30th Edition, Cambridge University Press,2022.

Web References:

1. https://speakandimprove.com/
2. https://writeandimprove.com/
3. https://www.cambridgeenglish.org/exams-and-tests/linguaskill/

Course Code: 23MAI102		Course Title: Matrices and Calculus (Common to AU, EA, EC, EE, EV & ME)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) 3:0 :2	Credits: 4	Total Contact Hours:75	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on the use of matrix algebra techniques for practical applications, familiarize with differential calculus and acquire knowledge of mathematical tools to evaluate multiple integrals.

Module I **23 Hours**

Matrices

Definitions and examples of symmetric, skew symmetric and orthogonal matrices - Eigenvalues and Eigenvectors – Properties of Eigenvalues and Eigenvectors-Diagonalization of matrices through orthogonal transformation - Cayley-Hamilton Theorem (without proof) – verification problems and properties - Transformation of quadratic forms to canonical forms through orthogonal transformation.

Differential and Integral Calculus

Curvature – Radius of curvature –Centre of curvature- Circle of curvature - Evolutes and Involutes - Evaluation of definite and improper integrals - Beta and Gamma functions – Properties and applications.

Multivariable Differentiation I

Limit – continuity - Mean value theorems and partial derivatives - Taylor's series and Maclaurin's series – Jacobian of functions of several variables.

Module II **22 Hours**

Multivariable Differentiation II

Maxima, Minima and saddle points of functions of several variables - Method of Lagrange's multipliers.

Multiple Integral

Multiple Integration: Double integrals - Change of order of integration in double integrals - Change of variables (Cartesian to polar, Cartesian to spherical and Cartesian to cylindrical) - Triple integrals - Applications: Finding areas and volumes.

Ordinary Differential Equations Of Second and Higher Orders

Second and higher order linear differential equations with constant coefficients – Second order linear differential equations with variable coefficients (Cauchy - Euler equation, Legendre's equation) – Method of variation of parameters – Solution of first order simultaneous linear ordinary differential equations

List of Experiments: **30 Hours**

1. Introduction to MATLAB.
2. Rank of matrix and solution of system of linear algebraic equations.
3. Finding Eigen values and Eigen vectors of a matrix.
4. Solving ordinary differential equation.
5. Gram Schmidt Procedure.
6. Finding Maxima, Minima of a function.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Determine the canonical form of a quadratic form using orthogonal transformation.	Apply
CO2: Identify the evolute of a curve and solve the improper integrals using beta gamma functions.	Apply
CO3: Examine the extreme value of multivariate functions.	Apply
CO4: Evaluate the area and volume using multiple integrals and solve the higher order differential equations.	Apply
CO5: Demonstrate the understanding of calculus concepts through modern tools.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Erwinkreyzig, Advanced Engineering Mathematics, 9th edition, John Wiley& Sons, 2006.

T2. Veerarajan T., Engineering Mathematics for first year, 3rd edition, Tata McGraw-Hill,

Reference Book(s):

R1. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, 9th edition, Pearson, Reprint, 2002.

R2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

R3. P. Sivaramakrishna Das , C. Vijayakumari , Engineering Mathematics, Pearson India, 2017.

Web References:

1. https://nptel.ac.in/courses/111107112
2. https://nptel.ac.in/courses/111104031

Course Code: 23CHI101	Course Title: Chemistry for Electrical Sciences (Common to EC, EE & EV)		
Type of Course: Minor	Course Level: Introductory		
L:T:P (Hours/Week) 3: 0:2	Credits:4	Total Contact Hours:75	Max Marks:100

Course Objectives

The course is intended to impart the knowledge of chemistry involved in Electrochemistry, Corrosion and its control, Spectroscopic technique, Fuels and Nanomaterials.

Module: I **23 Hours**

Electrochemistry and Batteries:

Electrochemistry - Basic terminologies - Potentiometric titration – Nernst equation – Batteries – Types and Characteristics, Construction, working and applications - Lead –Acid battery, Lithium-ion battery – Fuel cells - Construction, working and applications – Hydrogen Oxygen fuel cell.

Corrosion and its Control:

Corrosion – Dry and Wet corrosion – Mechanism of electrochemical corrosion – Galvanic corrosion and Concentration cell corrosion, Factors influencing corrosion. Corrosion Control methods – Cathodic protection methods, Metallic coating – Galvanizing, Tinning – Chrome plating and Electroless plating of Nickel

Spectroscopic Techniques:

Spectroscopy- Electromagnetic spectrum, Absorption and Emission spectroscopy – Relationship between absorbance and concentration – Derivation of Beer-Lambert's law (problems).

Module: II **22 Hours**

Spectroscopic Techniques:

UV - Visible Spectroscopy, Atomic Absorption Spectroscopy, Flame photometry - Principle, Instrumentation, and applications.

Biofuels and Lubricants:

Biomass - Biogas - Constituents, manufacture and uses. General outline of fermentation process - manufacture of ethyl alcohol by fermentation process. Combustion - Calorific values - Gross and Net calorific value - Problems based on calorific value. Lubricants - Classification of lubricants - Properties of liquid lubricants and their significance - Greases - Common grease types and properties. Components of grease – Base oil, additives and thickener.

Synthesis and Applications of Nano Materials:

Introduction - Difference between bulk and Nano materials - size dependent properties. Nano scale materials - Particles, clusters, rods, and tubes. Synthesis of Nanomaterials: Sol-Gel process, Electro deposition, Hydrothermal methods. Applications of Nano materials in Electronics, Energy science and Medicines. Risk and future perspectives of nano materials.

LIST OF EXPERIMENTS: (Any 6 experiments) **30 Hours**

1. Estimation of Fe^{2+} by potentiometric titration.
2. Determination of corrosion rate by weight loss method.
3. Estimation of iron in water by spectrophotometry
4. Determination of Cloud and Pour Point.
5. Green Synthesis of Silver Nanoparticles by Neem leaf.
6. Conductometric titration of strong acid against strong base.
7. Determination of strength of acid by pH metry.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Understand and explain the chemistry involved in Electrochemistry, Corrosion, Spectroscopic techniques, Fuels and Nanomaterials.	Understand
CO2: Apply the acquired knowledge of chemistry to solve the Engineering problems.	Apply
CO3: Analyze the Engineering problems through the concept of Electro chemistry, Spectroscopic techniques, Fuels, and Nanomaterials.	Apply
CO4: Apply the knowledge of chemistry to investigate Engineering materials by volumetric and instrumental methods and analyze, interpret the data to assess and address the issues of Environmental Pollution	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-	-	-

Text book(s):

T1. Jain and Jain, Engineering Chemistry, 17th Edition, Dhanpat Rai Publishing Company, New Delhi, 2018.

T2. Wiley Engineering Chemistry, 2nd Edition, Wiley India Pvt Ltd, New Delhi, 2011.

Reference Book(s):

R1. Dara S. S and Umare S. S., A textbook of Engineering Chemistry, 12th Edition, S. Chand & Co Ltd, New Delhi , 2014.
R2. V. R. Gowariker, N. V. Viswanathan and Jayadev Sreedhar, Polymer Science,4th Edition New Age International(P) Ltd, Chennai ,2021.
R3. Jeffery G. H., Bassett. J., Mendham J and Denny R. C., Vogel's Textbook of Quantitative Chemical Analysis, 5th Edition Oxford, ELBS, London, 2012.

Web References:

1. http://nptel.ac.in/courses/122101001/downloads/lec.23.pdf
2. https://nptel.ac.in/courses/104106075/Week1/MODULE%201.pdf
3. https://nptel.ac.in/courses/103102015/

Course Code: 23ECT101		Course Title: Electron Devices (Common to EA ,EC & EV)	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objective:

The course is intended to impart knowledge of basic electronic devices such as diodes, Bipolar junction Transistors and Field effect transistors.

Module I **23 Hours**

Semiconductor Diode: PN junction - forward and reverse bias conditions. V-I Characteristics and its Temperature dependence – Diode specifications - Diode Resistance – Diode junction Capacitance – Transition and Diffusion capacitances - Rectifiers - Clipper - Clamper

Special Diodes: Zener diode - Characteristics of Zener diode - Avalanche and Zener breakdown - Application of Zener diode :Voltage regulator - Varactor diode, Tunnel diode, Light emitting diodes – Photo diodes

Bipolar Junction Transistors: Bipolar Junction Transistor and its types: NPN and PNP Transistor - Transistor operation - Configurations of BJT : Input and output characteristics of CE, CB and CC configurations - Transistor as a Switch and Amplifier.

Module II **22 Hours**

Field Effect Transistors: JFET and its types, construction and operation of n- channel and p-channel JFETs – characteristics curves – FET applications – Comparison of BJT and JFET

MOSFETS and Power Devices: MOSFETs: Depletion MOSFETs and Enhancement MOSFETs – construction and operation - Drain and Transfer characteristics - Differences between JFETs and MOSFETs – Precaution in handling MOSFETs - MOSFET as a switch.

Construction, operation and characteristics of SCR, DIAC, TRIAC, Power transistor and IGBT

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Understand and explain the construction and characteristics of PN junction diode, special diodes, BJTs, FETs and Power devices.	Understand
CO 2: Identify a suitable electronic device and develop appropriate circuit for the given application.	Analyze
CO 3: Engage in independent study as a member of a team and make an effective oral presentation on the applications of various Electron devices.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	2	2	-	1	1	-

High-3; Medium-2; Low-1

Text Book:

T1. Millman J. , Halkias C. C. "Electronic Devices and Circuits ", Tata McGraw Hill, New Delhi, 2011.

Reference Book(s):

R1. Salivahanan.S, Suresh kumar.N and Vallavaraj.A, “Electronic Devices and Circuits”, Second Edition, TMH, New Delhi, 2008.

R2. Robert Boylestad and Louis Nashelsky, “Electron Devices and Circuit Theory”, Pearson Prentice Hall, Tenth Edition, 2008.

R3. Streetman Ben G. and Banerjee Sanjay, “Solid State Electronic devices”, PHI, Sixth Edition, 2006

R4. David A. Bell, “Electronic Devices and Circuits”, Oxford University Press, Fifth Edition, 2008

Web References:

1. http://nptel.ac.in/video.php?subjectId=117103063
2. http://nptel.ac.in/video.php?subjectId=117106091
3. www.youtube.com/watch?v=Wf19II0ts84

Course Code: 23ADT001		Course Title: C Programming (Common to CE,EA,EC &EV)	
Course Category: Multi-disciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course helps to understand the structured and procedural programming skills. The major objective is to provide students with understanding of code organization and functional hierarchical decomposition using complex data types.

Module I **22 Hours**

Basics Of Computer Organization: Generation and Classification of Computers – Basic Organization of a Computer **—** Softwaredevelopment life cycle – Problem Solving Techniques, Algorithm, Pseudo code and Flow Chart.

Introduction To C Programming: Introduction – Structure of a C program – Keywords – Identifiers – Constants – Variables – Data Types – Operators and Expressions – Formatted & Unformatted I/O functions – Decision statements – Loop control statements.

Arrays: Characteristics – Declaration- One-dimensional array, Two-dimensional arrays

Module II **23 Hours**

Functions: Declaration & Definition of function – Built in function – User defined function -Types of functions – Call by value & reference.

Strings and Pointers: Formatting strings – String handling functions. Pointers: Features and Types of pointers – Arithmetic operations with pointers–Pointers and Arrays- Array of Pointers-Pointers and Strings

Structures and Union: Structures: Features – Operations on Structures – Array of structures – Pointers to Structures -Unions-Union of Structures.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Correlate the fundamental concepts of computer organization such as architectures of the processors and project management for real time application	Apply
CO2: Infer the fundamental concepts of programming, such as variables, data types and control structures for real time problems	Analyze
CO3: Apply programs solving skills and knowledge of C programming constructs to solve the given one dimensional and two dimensional datasets	Apply
CO4: Build a modules to solve the given application using functions	Apply
CO5: Develop a program by accessing the address of the variable using pointers and manipulation of characters using string handling functions	Apply
CO6: Test the performance of the students by group assignments and projects on real time problems	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	2	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	1	-	-	-	-	-	-	-	-	-
CO5	3	-	-	1	-	-	-	-	-	-	-	-
CO6	-	1	-	3	2	-	-	-	2	-	-	2

High-3; Medium-2; Low-1

Text Book(s):

T1. Ashok N.Kamthane, Amit.N.Kamthane, "Programming in C", 3rd Edition,Pearson Education, 2015.

T2. Deitel H M and Deitel P J, "C How to Program", Prentice Hall, 2013.

Reference Book(s):

R1. Ajay Mittal, "Programming in C-A Practical Approach", 3rd Edition, Pearson Education, 2010.

R2. Yashavant P.Kanetkar," Let Us C" , 16th Edition, BPB Publications, 2018.

R3. Herbert Schildt, "C The Complete Reference", Tata McGraw Hill, 2010.

R4. S Gottfried Byron, "Programming With C", Tata McGraw Hill, 2011.

Web References:

1. NPTEL course content on Introduction To Programming In https://onlinecourses.nptel.ac.in/noc22_cs40
2. Complete guide on Learn C programming: http://www.cprogramming.com/
3. Complete reference manual on C programming: http://www.c4learn.com/

Course Code:23ADL001	Course Title: C Programming Laboratory (Common to CE,EA,EC & EV)		
Course Category: Multi-disciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Course Objectives

The course introduces students to the practical knowledge of programming using C programming language as an implementation tool. It aims at providing students with understanding of programming essentials used within the framework of imperative and structural programming paradigms.

List of Experiments:

1. Implement basic C programs using data types
2. Implement programs using Operators and Expressions
3. Develop Programs using Branching statements
4. Implement Programs using Control Structures
5. Develop programs using Arrays
6. Implement programs using Functions
7. Implement programs using String Operations
8. Develop programs using Pointers
9. Implement programs using Structures
10. Develop programs using Union

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Write programs using appropriate programming constructs.	Apply
CO2: Apply programs solving skills and knowledge of C programming constructs to solve the given one dimensional and two dimensional dataset	Apply
CO3: Develop a program by accessing the address of the variable using pointers and manipulation of characters using string handling functions	Analyze
CO4: Evaluate modular programming techniques to break down complex programs into smaller and manageable modules	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	3	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-
CO3	-	2	-	-	3	-	-	-	-	-	-	-
CO4	-	-	-	3	3	-	-	-	-	-	-	1

High-3; Medium-2; Low-1

Text Book(s):

T1. Ashok N.Kamthane,Amit.N.Kamthane, “Programming in C”, 3rd Edition, Pearson education, 2015.

T2. Deitel H M and Deitel P J, “C How to Program”, Prentice Hall, 2013.

Reference Book(s):

R1. Ajay Mittal, “Programming in C-A Practical Approach”, 3rd Edition, Pearson Education, 2010.

R2. Yashavant P.Kanetkar, “Let Us C”, 16th Edition, BPB Publications, 2018.

R3. Herbert Schildt, “C The Complete Reference", Tata McGraw Hill, 2010.

Web References:

1. C programming resources: https://electronicsforu.com/resources/15-free-c-programming-ebooks
2. C programming tutorials: https://www.fromdev.com/2013/10/c-programming-tutorials.html
3. C Manual: https://books.goalkicker.com/CBook

Course Code: 23VAL102		Course Title: Wellness for Students (Common to all B.E/B.Tech Programmes)	
Course Category: VAC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0 :2	Credits:1	Total Contact Hours:30	Max Marks:100

Course Objectives:
The course is intended to impart knowledge on setting SMART goals for academic, career and life, applying time management techniques, articulating the importance of wellness for success in life and understanding the dimensions of wellbeing and relevant practices.

Module I **15 Hours**

GOAL SETTING Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people. Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume. Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment.

TIME MANAGEMENT - TOOLS AND TECHNIQUES Importance of planning and working to time. Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination.

CONCEPT OF WELLNESS – impact of absence of wellness - Wellness as important component to achieve success. Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods

Module II **15 Hours**

Simplified Physical Exercises. Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Joint movements, Warm up exercises, simple asanas, WCSC simplified exercises.

PRACTICES FOR MENTAL WELLNESS

Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.
Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas.

PUTTING INTO PRACTICE
Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Set well-articulated goals for academics, career, and personal aspirations	Apply
CO 2: Apply time management techniques to complete planned tasks on time	Apply
CO 3: Explain the concept of wellness and its importance to be successful in career and life	Apply
CO 4: Explain the dimensions of wellness and practices that can promote wellness	Apply
CO 5: Demonstrate the practices that can promote wellness	Valuing

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	1	1	-	1
CO2	-	-	-	-	-	-	-	-	1	-	1	1
CO3	-	-	-	-	-	-	-	-	1	-	-	1
CO4	-	-	-	-	-	-	-	-	1	-	-	1
CO5	-	-	-	-	-	1	1	-	1	-	-	1

High-3; Medium-2;Low-1

Text Book(s):

T1. Reading material, workbook and journal prepared by PS team of the college

Reference Book(s):

R1. Stephen R Covey, “First things first”, Simon & Schuster UK, Aug 1997

R2. Sean Covey, “Seven habits of highly effective teenagers”, Simon & Schuster UK, 2004.

R3. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, “Value education for harmonious life (Manavalakalai Yoga)”, Vethathiri Publications, Erode, I Ed. (2010).

R4. Dr. R. Nagarathna, Dr. H.R. Nagendra, “Integrated approach of yoga therapy for positive health”, Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.

R5. Tony Buzan, Harper Collins, “The Power of Physical Intelligence English”

Course Code: 23VAT101	Course Title: HERITAGE OF TAMILS (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்ள இயலும்.

CO.2இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்ள இயலும்.

தமிழர் மரபு

அலகு 1 – மொழி மற்றும் இலக்கியம் 3

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

அலகு 2 – மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3

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

அலகு 3 – நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் 3

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

அலகு 4 – தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக் கோட்பாடு – சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு 5 – இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறபகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுய மரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப் படிகள்– தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
மாணவர்கள் இப்பாடத்தை கற்றபின்	
CO.1 மொழி மற்றும் இலக்கியம், பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை , நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் , திணைக் கோட்பாடுகள் மூலம் தமிழர் மரபை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பை அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: 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.

Course Code: 23VAT101	Course Title: HERITAGE OF TAMILS (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.
2. Understand the Contribution of Tamils to Indian National Movement and Indian Culture.

HERITAGE OF TAMILS

UNIT I LANGUAGE AND LITERATURE 3

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

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

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

UNIT III FOLK AND MARTIAL ARTS **3**

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

UNIT IV THINAI CONCEPT OF TAMILS **3**

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

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

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

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand the Heritage of Tamils in terms of Language and Literature, Rock Art Paintings to Modern Art – Sculpture, Folk and Martial Arts, Thinai Concept.	Understand
CO.2 Understand the Contribution of Tamils to Indian National Movement and Indian Culture.	Understand

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: 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.

SEMESTER II

Course Code: 23ENI201		Course Title: Communication Skills II (Common to all B.E/B.Tech Programmes)	
Course Category: AEC		Course Level: Introductory	
L:T:P(Hours/Week) 2:0:2	Credits: 3	Total ContactHours:60	Max Marks:100

Course Objectives

The course is intended to impart effective and accurate language in business correspondence on par with B2 level of CEFR Scale.

20 Hours

Module I

Grammar: Linking Words - Collocations –Sentence Completion - Articles –Adverbs– Indefinite Pronoun

Listening: Listening to short conversations - Listening for gist and summarizing - Listening for detail - Responding to straightforward questions.

Speaking: Making statements of facts - Agreeing and disagreeing to opinions - Respond to queries - Group Discussion.

Reading: Read and select (phrasal verbs & relative clause)- Cloze Test - Gapped sentences - Multiple- choice gap-fill

Writing: Paragraph Writing: Descriptive, narrative, persuasive and argumentative - Emails: Giving information - Making enquiries - Responding to enquiries - Power Point Presentation

Module II **20 Hours**

Grammar: Expressions of cause and result – Concord - Error Spotting (Parts of Speech & Indian English) - Prepositions

Listening: Listening for identifying main points - Responding to a range of questions about different topics - Listening to identify relevant information

Speaking: Empathetic Enunciation – Situation handling – Visual Interpretation - - Short presentations

Reading: Intensive Reading: Comprehending business articles, reports and proposals and company websites-- Open gap-fill - Extended reading

Writing: – Report Writing - Memo – Complaint letter - Business Letters (Seeking permission & Providing Information)

List of Experiments: **20 Hours**

1. Listening to Monologue and Extended Listening Activity I
2. Listening to Monologue and Extended Listening Activity II
3. Expressing Opinions and Situational based speaking
4. Mini Presentation and Visual Interpretation
5. Reading Comprehension
6. Writing letter, email and report

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Identify the common errors in written and spoken correspondence.	Apply
CO2: Develop listening, reading and speaking skills through task based activities in listening, reading comprehension, recapitulation, interpretation and discussion.	Apply
CO3: Read business correspondences like memo, Email, letter, proposals and write reports and website entries and product launches.	Apply
CO4: Perform as an individual and member of a team and engage effectively in group discussion and individual presentation.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	-	-	-

High-3; Medium-2;Low-1

Textbooks:

T1. Guy Brook- Hart, "Business Benchmark Upper Intermediate", 2nd Edition, South Asian, Cambridge University Press, 2020.

T2. Norman Whitby, "Business Benchmark pre-intermediate to Intermediate", 2nd Edition, South Asian, Cambridge University Press, 2014.

Reference Book(s):

R1. Hewings Martin - Advanced Grammar in use Upper-intermediate Proficiency, CUP,3rd Edition,2013.

R2. Clark David – Essential BULATS (Business Language Testing Service), CUP, 2006.

R3. Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis-Jones, Rachel Godfrey,Gareth Davies, Empower B1+ – Student's Book, Cambridge University Press,2015.

Web References:

1. https://speakandimprove.com/
2. https://writeandimprove.com/
3. https://www.cambridgeenglish.org/exams-and-tests/linguaskill/

Course Code:23FLT201		Course Title: FOREIGN LANGUAGE -JAPANESE (Common to all B.E/B.Tech Programmes)	
Course Category: AEC		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Course Objectives:

The course objectives intended to:

1. Express a basic exposure on Japanese language and culture
2. Express thoughts and communicate in the beginner level of Japanese with native Japanese speaker
3. Identify the kanji etymology as well as use it in basic vocabulary required for the JLPT/NAT 5 examination level
4. Read and write 100 kanji of the official JLPT N5
5. Choose the appropriate verb forms for learning and practicing the Japanese language

UNIT I Introduction to Japan and greetings 9 Hours

Japan : Land and culture - Introduction to Japanese language – Greetings – Seasons - Days of the week - Months of the year – Dates of the month - Self introduction – Numbers (Upto 99,999) – Expressing time – Conversation audio and video.

Listening: Listening to Greetings - Listening for Specific Information: Numbers, Time. Speaking: Self-Introduction

UNIT II Building vocabulary 9 Hours

Family relationships - Colours - Parts of body - Profession - Directions - Time expressions (today, tomorrow, yesterday, day before, day after) - Japanese housing and living style - Food and transport (vocabulary) - Stationery, fruits and vegetables

Listening: Listening for Specific Information: Directions, Family Members, Parts of body Speaking: Introducing one's family.

UNIT III Writing systems 9 Hours

Hiragana Chart 1 - vowels and consonants and related vocabulary – Hiragana Charts 2&3, double consonants, vowel elongation and related vocabulary – Introduction to Kanji – Basic Vocabulary – Basic Conversational Phrases.

Listening: Listening to Japanese Alphabet Pronunciation, Simple Conversation.

Speaking: Pair Activity (Day to day situational conversation)

UNIT IV Kanji and preposition 9 Hours

Katakana script and related vocabulary – Basic kanjis: naka, ue, shita, kawa , yama , numbers (1- 10, 100, 1000, 10,000 and yen) , person, man, woman, child, tree , book , hidari, migi, kuchi , 4 directions - Usage of particles wa, no, mo and ka and exercises - Usage of kore, sore, are, kono, sono, ano, arimasu and imasu - Particles – ni (location) and ga , donata and dare - Particles ni (time), kara, made , ne , koko, soko, asoko and doko - Directions : kochira, sochira, achira and dochira , associated vocabulary (mae, ushiro, ue, shita, tonari, soba, etc.)

Listening: Listening to conversation with related particles

UNIT V Verb forms 9 Hours

Introduction to Verbs - Verbs –Past tense, negative - i-ending and na-ending adjectives introduction - ~masen ka, mashou - Usage of particles de, e , o, to, ga(but) and exercises - Adjectives (present/past – affirmative and negative) – Counters - ~te form

Listening: Listening to different counters, simple conversations with verbs and adjectives.

Speaking: Pair Activity (Explaining one's daily routine by using appropriate particles and verbs)

Course Outcomes		**Cognitive Level**
At the end of this course, students will be able to:		
CO1:	Recognize and write Japanese alphabet	Understand
CO2:	Comprehend the conversation and give correct meaning	Understand
CO3:	Apply appropriate vocabulary needed for simple conversation in Japanese language	Apply
CO4:	Apply appropriate grammar to write and speak in Japanese language	Apply
CO5:	Speak using words of the Japanese language	Apply

Text Book:

T1. Genki 1 Textbook: An Integrated Course in Elementary Japanese by Eri Banno, Yoko Ikeda, Yutaka Ohno, Yoko Sakane, Chikako Shinagawa, Kyoko Tokashiki published by The Japan Times

T2. Genki 1 Workbook: An Integrated Course in Elementary Japanese by Eri Banno published by The Japan Times

Reference:

1. *Japanese for Everyone: Elementary Main Textbook1-1*, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007
2. *Japanese for Everyone: Elementary Main Textbook1-2*, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007
3. www.japaneselifestyle.com
4. www.learn-japanese.info/

5. www.learn.hiragana-katakana.com/typing-hiragana-characters/
6. www.kanjisite.com/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	1	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	1	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	1	--	-

High-3; Medium-2; Low-1

Course Code:23FLT202	Course Title: FOREIGN LANGUAGE - GERMAN (Common to all B.E/B.Tech Programmes)		
Course Category: AEC		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Course Objectives:

The course is intended to:

1. Listen and understand numbers, names and dialogues of a native speaker on par with A1 level.
2. Speak and introduce self in simple sentences to convey their opinion and ideas on par with A1 level.
3. Read simple passages and given text on par with A1 level.
4. Write letter and simple sentences on par with A1 level.

UNIT I BASIC INTRODUCTION TO GERMAN SCRIPTS 9

Theme and Text (Introduction to German - German script, Deutsche Namen, Daily Greetings and Expressions) – Grammar ('wh' questions, das Alphabet)– Speak Action (Buchstabieren, sich und andere vorstellen nach Namen und Herkunft fragen, internationale Wörter auf Deutsch verstehen, jemanden begrüßen)– pronunciation (Buchstabieren J,V,W,Y, - Long vowels A,E,I,O,U - Pronunciation of Ä,Ü,Ö) – To learn (internationale Wörter in Texten finden, Wörter sortieren)

Theme and Text (Gespräche im caf'e, Getränkekarte, Telefon-buch, Namen, Rechnungen) – Grammar (Frägesatze mit wie, woher, wo, was Verben in präsens Singular und Plural, das Verb Sein, Personalpronomen und Verben)– Speak Action (eine Gespräch beginnen sich und andere vorstellen zählen, etwas bestellen und bezhalen Telefonnummern und verstehen)– pronunciation (Wortakzent in Verben und in Zahlen) – To learn (Grammatiktabelle ergänzen, mit einem Redemittelkasten arbeiten)

UNIT II NUMBERS AND NOMINATIVE CASE 9

Theme and Text (Numbers – 1 to 12 (Eins bis Zwolf) – 20, 30, 40, 90 (zwanzig-Neunzig) – All Numbers (1-10000) – German Currency (Euro) – Basic Mathematics (plus, Minus, Malen, Geteilt durch)) – Grammar (Introduction of verbs –Have Verb – To Come, To Speak, To Read, To Drive, To Fly, To write, To Eat, To sleep, To take etc.,)

Theme and Text (Communication in course) – Grammar (Singular and Plural, Artikel: der,das,die/ ein,eine, verneinung: kein, keine, Komposita: das Kursbuch) – Speak Action (Gegenständen

fragen/ Gegenstände benennen im kurs:) – pronunciation (word accent Marking, Umlaute ö ä ü hören und sprechen) – To learn (Lernkarten schreiben, Memotipps, eine Regel selbst finden)

Theme and Text (City, Town, Language: Nachbar, Sprachen, Sehenswürdigkeiten in Europa) – Grammar (Past tense for Sein, W-Frage, Aussagesatz und Satzfrage) – Speak Action (about city and siteseeing) – pronunciation (Satzakzent in Frage- und Aussagesätzen) – To learn (eine Regel ergänzen, eine Grammatiktabelle erarbeiten, Notizen machen)

UNIT III AKKUSATIVE CASE AND PREPOSITIONS 9

Theme and Text (Menschen und Hauser, Furniture catalogue, E-Mail, House information) – Grammar (possesivartikel im Nominativ, Artikel im Akkusativ, Adjektive im satz, Graduierung mit zu)– Speak Action (Whonung bescreiben about perons and things)– pronunciation (consonant - ch) – To learn (wortschatz systematisch)

Theme and Text (Termine - Appointment and punctuality in Germany) – Grammar (questions with wann?, Preposition (am, um, von... bis), verneinung mit nicht, trennbare verben, präteritum von haben) – Speak Action (Daily plan making, time commitment, excuse for late coming) – pronunciation (consonants- p,b,t,d / k,g) – To learn (Rollenkarten arbeiten)

Theme and Text (orientation in working area, go for work, floor plan city plan, office and computer) – Grammar (preposition: in,neben, unter, auf, vor, hinter, an, zwischen, bei und mit + Datic)– Speak Action (work place, work, giving appointments)– pronunciation (consonants: f,w und v) – To learn (Making notice in calender)

UNIT IV DATIV CASE AND PREPOSITIONS 9

Theme and Text (Holiday and Party, holiday plan, party plan in Germany) – Grammar (regular and iregular verbs) – Speak Action (holiday speak, accident, Ich-Text schreiben) – pronunciation (lange und kurze vokale markieren) – To learn (Text Order)

Theme and Text (organising an Excursion to Berlin through city orientation, Bus plan, City plan, post card, Excursion programme) – Grammar (preposition: in, durch, über + Akkusativ: zu, an... vorbei + Dativ, Modalverb wollen) – Speak Action (Tourism, culture, postcard preparation, travel description) – pronunciation (r and l)– To learn (plaket making)Theme and Text (Beruf und all Tag, Visiten karten, wörterbuch) – Grammar – Speak Action (profession, statistic speaking) – pronunciation (n,ng and nk)– To learn (wörterbuch , text information in tabel)

UNIT V ADJECTIVES AND PRONUNCIATION 9

Theme and Text (Haushaltstipp, kochrezept, maße und gewichte, Mahlzeiten und Gerichte) – Grammar (jeden Tag, manchmal, nie, Question - welche, Comparison – viel, gut, gern) – Speak Action (about eat, drink question and answers) – pronunciation (e,en,el,er) – To learn (Text auswerten und zusammenfassen)

Theme and Text (Clothing , colour, weather) – Grammar (Adjecktive im Akkusativ, unbestimmer Artikel) – Speak Action (weather, dress and colour understanding) – pronunciation (e-o- ö and ie-u- ü) – To learn (wetter and Farben interkulturelle)

Theme and Text (in super market,purchase, House Maintainence, Emotion, Sports, Body parts) – Grammar (Modal Verb) – Speak Action (Body parts) – To learn (Rollenkarten arbeiten)

Total:45 Hours

Course Outcomes		**Cognitive Level**
At the end of this course, students will be able to:		
CO1	Recognize and write German alphabet, numbers.	Understand
C02	. Comprehend the conversation and give correct meaning	Understand
CO3	Apply appropriate grammar and vocabulary to write and speak.	Apply
CO4	Apply appropriate cases and texts to listen, write and speak.	Apply
CO5	Speak and read using words of the German language	Apply

TEXT BOOK

T1. Netzwerk, “Deutsch als Fremdsprache” by Stefanie Dengler, Paul Rusch, Helen Schmitz published

T2. Funk, Kuhn, Demme, “Studio D A1 Deutsch als Fremdsprache” published by Goyal Publishers & Distributors Pvt Ltd;

REFERENCES

R1. Hueber, “Fit for Goethe- Zertifikat A1 (Start Deutsch 1)” by GOYAL PUBLISHERS AND DISTRIBUTORS; 2016

Course Articulation Matrix

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CO3	-	-	-	-	-	-	-	-	-	3	-	1	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	1	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	1	--	-

High-3; Medium-2;Low-1

Course Code: 23MAI202		Course Title: Complex Variables and Transforms (Common to AU, EC, EE, EV & ME)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) 3:0 :2	Credits: 4	Total Contact Hours:75	Max Marks:100

Course Objectives:

This course is intended to enable the student to acquire the knowledge on the calculus of functions of complex variables and continuous, discrete transforms.

Module I **23 Hours**

Vector Calculus

Gradient – Divergence – Curl – Line integrals – Surface integrals – Volume integrals – Theorems of Green, Gauss and Stokes (without proof) and their applications.

Complex Variables (Differentiation)

Cauchy-Riemann equations – Analytic functions – Properties – Harmonic functions – Finding harmonic conjugate – Conformal mapping (w=z+a, w= az, w=1/z,) – Mobius transformation and their properties.

Complex Variables I (Integration)

Cauchy Integral formula – Cauchy Integral theorem – Taylor's series – Singularities of analytic functions – Laurent's series.

Module II **22 Hours**

Complex Variables II (Integration)

Residues – Cauchy Residue theorem – Contour integrals – Evaluation of real definite integrals around unit circle and semi-circle (Excluding poles on the real axis).

Laplace Transform

Laplace Transform – Properties of Laplace Transform – Laplace transform of derivatives and integrals – Laplace transform of periodic functions -Inverse Laplace transforms - Convolution theorem – Solution of ordinary differential equations by Laplace Transform method.

Fourier Series

Dirichlet's condition -Fourier series – Even and odd functions- Half range sine and cosine series - Parseval's identity--Harmonic Analysis.

List of Experiments(Using Python):	30 Hours

1. Find gradient of a given scalar function, divergence and curl of a vector function.
2. Verify Green's theorem in a plane.
3. Graphically plot time and frequency domain of standard functions and compute Laplace transform of In- built functions.
4. Find the Fourier series of a periodic function.
5. Compute Inverse Laplace transform of In- built functions.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the concepts of Vector Differentiation and Integration.	Apply
CO2: Using the concept of complex variables to construct analytical functions and evaluate definite integrals.	Apply
CO3: Apply Laplace transform techniques to solve ordinary differential equations.	Apply
CO4: Compute the Fourier series expansion for given periodic functions.	Apply
CO5: Develop programs using Complex Variables and Transforms concepts through modern tool.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Erwinkreyzig, Advanced Engineering Mathematics, 10th edition, John Wiley& Sons, 2011.

T2. Veerarajan T., Engineering Mathematics for first year, 3rd edition, Tata McGraw-Hill, New Delhi, 2019.

Reference Book(s):

R1. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, 9th edition, Pearson, Reprint, 2002.

R2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

R3. P. Sivaramakrishna Das , C. Vijayakumari , Engineering Mathematics, Pearson India, 2017.

Web References:

1. https://nptel.ac.in/courses/111107112
2. https://nptel.ac.in/courses/111104031

Course Code: 23PHI201		Course Title: Physics for Electrical Sciences (Common to EA, EC, EE & EV)	
Course Category: Minor		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits: 4	Total Contact Hours:75	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on the fundamental laws and relations in electricity, magnetism, electromagnetism and electromagnetic waves.

Module I **22 Hours**

Electrostatics: Definition of electric charge-Coulomb's Law – Electric field intensity – Field intensity due to point and line charges – Electric flux density -Gauss's law- Application of Gauss's law: Determine the field due to a line charge and a plane sheet of charge – Electric potential-Equipotential surfaces-Potential gradient.

Magnetostatics: Definition of magnetic flux- magnetic field intensity-Lorentz Law of force- Biot – Savart law, Ampere's Law- Application of Ampere's Law: Magnetic induction due to a long linear conductor and solenoid - Magnetic field due to straight conductors-circular loop – Magnetic flux density (B) - Magnetic potential.

Electric Fields in Materials: Dielectrics: An atomic view - Dielectric Polarization-Dielectrics and Gauss's law- Dielectric Strength- Energy stored in a dielectric medium - Capacity of a condenser - Capacitance - coaxial, Spherical capacitor- Poisson and Laplace Equation.

Module II **23 Hours**

Magnetic Fields in Materials: Magnetic susceptibility and permeability- properties of dia, para and ferro magnetic materials-hysteresis loop.

Electromagnetic Induction: Faraday's law – Lenz's law – Time varying magnetic field - self Inductance - self Inductance of a solenoid- Mutual inductance- Mutual inductance of two solenoids. Charge conservation law - continuity equation- displacement current-Maxwell's equations.

Electromagnetic Waves: Electromagnetic waves in free space - Poynting vector - Propagation of electromagnetic waves in dielectrics – Phase velocity- Propagation of electromagnetic waves through conducting media- penetration or skin depth.

List of Experiments (Any six) **30 Hours**

1. Verification of Ohms' law.
2. Test the Faraday's hypothesis of magnetic field induction.
3. Determination of specific resistance of the given material using Carey foster's bridge.
4. Measurement of capacitance using Schering Bridge.
5. Measurement of inductance using Maxwell Bridge.
6. Determination of wavelength of the given light source using spectrometer.
7. Determination of Dielectric constant of a given Material.

Course Outcomes	**Cognitive Level**
At the end of the course students will able to	
CO1: **Apply** the concepts of static electric and magnetic fields to obtain the electric and magnetic characteristics of the materials.	Apply
CO2: **Interpret** the behavior of materials in electric and magnetic fields.	Apply
CO3: **Apply** the concept of time-varying electric and magnetic fields to obtain the propagation characteristics of electromagnetic waves in different media.	Apply
CO4: **Conduct, analyze and interpret** the data and results from the physics laboratory experiments.	Evaluate

Course Articulation Matrix

CO Vs PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	3	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Textbooks:

T1. R.K.Gaur and S.L.Gupta, “Engineering Physics”, Dhanpat Rai publications, New Delhi, 8th Edition, 2011.

T2. W. H. Hayt and John A. Buck, “Engineering Electromagnetics”, Tata McGraw Hill, New Delhi, 6th Edition, 2014.

Reference Book(s):

R1. David Griffiths, “Introduction to Electrodynamics”, Pearson Education, 4th Edition, 2013

R2. K. A. Gangadhar and P. M. Ramanathan, “ Electromagnetic Field Theory”, Khanna Publishers, New Delhi, 5th Edition, 2013.

R3. Mathew. N. O. Sadiku, “Elements of Electromagnetics”, Oxford University Press, 4th Edition, 2009.

Web References:

1. http://nptel.iitm.ac.in
2. http://openems.de/start/index.php
3. https://bop-iitk.vlabs.ac.in/List%20of%20experiments.html

Course Code: 23ECT001		Course Title: Circuit Theory (Common to EA ,EC&EV)	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) 3:0:0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objective:

The course is intended to impart knowledge of the fundamentals of Electric circuits and its analysis.

Module I **23 Hours**

Fundamentals of Electric Circuits: Ohm's law - Kirchoff's Laws –Series resistive circuit- Voltage division rule- Parallel resistive circuit – Current division rule– Source transformation – Star to delta and delta to star transformation

Time period, Frequency, Angular frequency, Average value, Root mean square value, Form factor and Peak factor of sinusoidal.

Analysis of DC and AC Circuits: Mesh and node method of analysis - Networks theorem: Superposition Theorem , Thevenin's Theorem, Norton's theorem and Maximum power transfer theorem.

Module II **22 Hours**

Resonance and Coupled Circuits: Series resonance-Voltage and Current in a series resonance, Impedance and phase angle. Parallel resonance-Resonant frequency - Variation of Impedance with frequency Coupled circuits- mutual inductance, Coefficient of coupling.

Transient Response of Networks: Steady state and Transient response - Response of an R-L, R-C and R-L-C circuits under DC excitation.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Define, understand, and explain the various laws for analyzing Electric circuits.	Understand
CO2: Apply the knowledge of network laws and theorems to the given electric circuit to obtain the required parameters.	Apply
CO3: Analyze the resonance and transient behaviour of the given electric circuit using appropriate mathematical tools.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	1	1	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1. Sudhakar A, Shyammohan S. Pillai "Circuits and Networks -Analysis and Synthesis", McGraw Hill., New Delhi, 2015

Reference Book(s):

R1. William H. Hayt and Jack E. Kemmerly, “Engineering Circuit Analysis ", McGraw Hill International Edition, 2006

R2. Singh "Network Analysis and Synthesis", McGraw-Hill Education., New Delhi, 2013

R3. M. Arumugham and N.Prem kumar, “Electric Circuit Theory”, Khanna publishers, 2010

R4. Alexander C, Sadiku M. N. O "Fundamentals of Electric Circuits", Tata McGraw Hill., New Delhi, 2013

Web References:

1. http://nptel.ac.in/video.php?subjectId=108102042
2. http://nptel.ac.in/courses/108102042/
3. http://nptel.ac.in/courses/108105053/
4. http://freevideolectures.com/Course/2336/Circuit-Theory/

Course Code: 23ITT202		Course Title: Problem solving and Python Programming (Common to EA, EC & EV)	
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The objective of the course is to introduce learners to the fundamentals of programming using the Python language. The course aims to equip participants with the necessary skills and knowledge to write efficient, readable, and maintainable Python code.

Module I **23 Hours**

Basics of Python: Features - Variables and Data Types - Expressions and Statements - Operators.

Control Flow: Conditional Statements – Looping and Iterative Statements

Functions and File Handling: Introduction to Functions - Recursive Functions - Introduction to Files and File Handling

Data Structures in Python: Lists: Functions and Methods - Tuples: Operations and Built-in Functions - Sets: Functions and Methods - Dictionaries: Functions and Methods - Strings: Operators and Built-In String Functions

OOP Concepts: Classes and Objects: Modifiers in Classes - Method Invocation in Classes - Inheritance and Polymorphism.

Module II **22 Hours**

Exception Handling: Errors and Exceptions

GUI Programming with TKinter: GUI Basics - Working with the TKinter Library

Widgets and Events: Adding Widgets and Binding Events - Message and Entry Widgets - Checkboxes and Radio Buttons - Menus and Lists - Canvas for Drawing

Data Visualization with Matplotlib: Introduction to Matplotlib Library - Line and Bar Plots - Scatter Plots - Pie Charts - Working with Multiple Figures - 3D Plots - Plotting Using Files.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply Python programming constructs and data structure techniques to solve practical problems and build functional applications.	Apply
CO2: Categorize the OOPs concepts to create modular and extensible Python programs.	Analyze

CO3: Infer the errors and exceptions in Python programs using exception handling techniques to ensure robust and fault-tolerant code	Analyze
CO4: Build graphical user interfaces (GUIs) using TKinter, effectively incorporating various widgets and event binding to create interactive and visually appealing applications	Apply
CO5:. Employ the Matplotlib library for data visualization to present data and insights in a visually impactful method	Apply
CO6: Combine the Python language features and libraries to provide solutions collaboratively with Ethical values to the practical problems	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	3	2	2	-	-	3	3	3	3	3

High-3; Medium-2; Low-1

Text Book(s):

T1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey, and Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python”,3rd Edition, O’Reilly, 2020.

T2. Mark Lutz, “Powerful Object-Oriented Programming Python”, 4th Edition, O’Reilly, 2013.

Reference Book(s):

R1. Mark Lutz, “Learning Python, Powerful OOPs”, 5th Edition, O’Reilly, 2013.

R2. Zelle, John M, “Python Programming: An Introduction to Computer Science”, Franklin Beedle& Associates, 2003.

Web References

1. https://docs.python.org/3/tutorial/
2. https://www.learnpython.org/
3. https://www.pyschools.com/
4. https://archive.nptel.ac.in/courses/106/106/106106182/

Course Code: 23MEL001		Course Title: ENGINEERING DRAWING (Common to AD,AM,AU,CS,EA ,EC,EE,EV,IT,ME, SC)	
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours: 60	Max Marks:100

Course Objectives:

The course is intended to

- To impart knowledge on basic dimensioning. 2D and 3 D drawings such as points, lines, planes and solids on first quadrant.

Module I **8 Hours**

Basics of Engineering Drawing: Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Basic Geometrical constructions –Orthographic projection- Free hand Sketching.

Projection of Points, Lines: First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces by rotating object method.

Projection of Solids: Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination).

Module II **7 Hours**

Sectioned Solids: Sectioning of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by cutting planes inclined to one reference plane and perpendicular to the other – Orthographic views of sections of simple solids.

Development of Surfaces: Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders using straight line and radial line method.

Isometric Projection: Principles of isometric projection – Isometric scale –Isometric projections of simple solids and truncated solids. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination).

List of Experiments **45 Hours**

1. Lettering & Dimensioning
2. Projection of Points & Lines
3. Orthographic projections
4. Projection of Simple Solids
5. Projection of Section of Simple Solids
6. Development of Surfaces
7. Isometric Projections

Course Outcomes:

CO 1: Apply the concepts related to free hand sketching, orthographic and Isometric projection in first quadrant.	Understand
CO2: Apply the concepts and draw projections of points in four different quadrants and lines located first quadrant.	Apply
CO3: Apply the concepts and draw projections and sections of simple solids using rotatingobject method.	Apply
CO4: Apply the concepts and draw lateral surface of simple solids using straight line andradial line development methods.	Apply
CO5: Apply the concepts and draw isometric view of simple solids and truncated solids using principles of isometric projection.	Apply
CO6: Conduct experiments to demonstrate concepts, implement and analyze the drawing concepts using engineering tool : Using AutoCAD.	Analyze

Textbook:

T1. Cencil Jensen, Jay D.Helsel and Dennis R. Short, " Engineering Drawing and Design", Tata McGraw Hill India, New Delhi, 3rd edition, 2019.

Reference Book(s):

R1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill India, New Delhi, 2nd edition, 2014.

R2. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw India, New Delhi, 3rd edition, 2010.

R3. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, Gujarat, 54rd edition, 2023.

PUBLICATIONS OF BUREAU OF INDIAN STANDARDS

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

Web References:

1 http://nptel.ac.in/courses/112103019/

2 https://www.coursera.org/specializations/autodesk-cad-cam-cae-mechanical-engineering

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	3	-	-	3	-	-	-	1	1	-	1	-	-

High-3; Medium-2; Low-1

Course Code: 23ECL001	Course Title: Electric Circuits and Electron Devices Laboratory (Common to EA, EC & EV)		
Course Category: Major		Course Level: Introductory	
L:T:P (Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Course Objective:

The course is intended to verify the electric circuit, network theorems and characteristics of the basic electronic devices.

List of Experiments:

1. PN Junction Diode and Zener diode Characteristics
2. Half wave and Full wave Rectifier circuits
3. Regulator using Zener diode
4. Wave shaping circuits: Clippers and clampers
5. Characteristics of Common Emitter configuration
6. Characteristics of Common Base configuration
7. FET characteristics and its application as a switch
8. Verification of Kirchhoff's Voltage and Current laws
9. Verification of Super Position Theorem
10. Verification of Thevenin's and Norton's theorems
11. Verification of Maximum Power transfer theorem
12. Determination of Resonance frequency of Series & Parallel RLC Circuits

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Conduct experiments to verify the characteristics of devices and theorems for Electric circuits.	Evaluate
CO2: Compare the experimental results obtained during verification of network theorems with simulation results.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	3	-	-	-	-	1	1	-	-	-	-
CO2	-	3	-	-	3	-	-	-	-	-	-	1	1	-

High-3; Medium-2; Low-1

Reference:

1. Laboratory Manual Prepared by Faculty of Electronics and Communication Engineering, Dr. Mahalingam College of Engineering and Technology.

Course Code: 23ESL201		Course Title: Professional Skills 1: Problem solving skills & Logical Thinking 1 (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours:30	Max Marks:100

Course Objectives:

To enhance the students' numerical, analytical and logical reasoning ability.

To make them prepare for various public and private sector exams and placement drives.

Module I Quantitative Ability 20 Hours

Number System and LCM & HCF- Percentage- Ratio and Proportion - Average- Progressions- Ages-Partnership- Mixture & Allegation - Profit and loss- Interest calculation- Data interpretation.

Module II Reasoning Ability 10 Hours

Seating Arrangement- Linear, circular and Complex – Direction Problems- Blood Relation- Puzzles- Crypt arithmetic- Venn diagrams- Statement and conclusion- Statement and argument- Causes and effects- Self-Learning.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Build the competence in numerical, analytical and logical Reasoning ability	**Apply**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-

High-3; Medium-2; Low-1

Textbook(s):

T1: Dr. R. S. Aggarwal. “Quantitative Aptitude for Competitive Examinations” Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

T2: Dr. R. S. Aggarwal. “A Modern Approach to Logical Reasoning”, Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018

Reference Book(s):

R1: R. V. Praveen. “Quantitative Aptitude and Reasoning” 2nd Revised Edition, Prentice-Hall of India Pvt.Ltd, 2013

R2: Arun Sharma. “Quantitative Aptitude for Common Aptitude Test”, McGraw Hill Publications, 5th Edition, 2020

R3: Arun Sharma. “Logical Reasoning for Common Aptitude Test”, McGraw Hill Publications, 6th Edition, 2021.

Web References:

1 https://www.indiabix.com/aptitude/questions-and-answers/

2 https://www.geeksforgeeks.org/aptitude-questions-and-answers/

Course Code: 23VAT201	Course Title: TAMILS AND TECHNOLOGY (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

மாணவர்கள் இப்பாடத்தை கற்றலின் மூலம்

CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்ள இயலும்.

CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்ள இயலும்.

தமிழரும் தொழில்நுட்பமும்

அலகு 1 – நெசவு மற்றும் பானைத் தொழில்நுட்பம் 3

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்

அலகு 2 – வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

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

அலகு 3 – உற்பத்தித் தொழில்நுட்பம் 3

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத் துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன் வளம் – முத்து மற்றும் முத்துக் குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு 5 – அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி – கணினித் தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென் பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

Course Outcomes மாணவர்கள் இப்பாடத்தை கற்றபின்	**Cognitive Level**
CO.1 நெசவு மற்றும் பானைத் தொழில்நுட்பம், வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம், உற்பத்தித் தொழில்நுட்பம், வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் ஆகியன குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)
CO.2 அறிவியல் தமிழ் மற்றும் கணினித் தமிழ் குறித்து அறிந்து கொள்வார்கள்.	அறிதல் (Understand)

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: 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.

Course Code: 23VAT201	Course Title: TAMILS AND TECHNOLOGY (Common to all B.E/B.Tech Programmes)		
Course Category: VAC		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0 :0	Credit: 1	Total Contact Hours: 15	Max Marks:100

Pre–requisites

- NIL

Course Objectives

The course is intended to:

1. Understand Weaving and Ceramic Technology, Design and Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.
2. Understand the Scientific Tamil & Tamil Computing.

TAMILS AND TECHNOLOGY

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

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

UNIT III MANUFACTURING TECHNOLOGY 3

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

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

TOTAL : 15 PERIODS

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO.1 Understand Weaving and Ceramic Technology, Design and Construction Technology, Manufacturing Technology, Agriculture and Irrigation Technology.	Understand
CO.2 Understand the Scientific Tamil & Tamil Computing.	Understand

Course Articulation Matrix

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	1	-	-

High–3; Medium–2; Low–1

TEXT - CUM REFERENCE BOOKS

1 தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே.பிள்ளை
(வெளியீடு. தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)

3. கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: 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.

Course Code: 23CHT202		Course Title: Environmental Sciences (Common to all B.E/B.Tech Programmes)	
Course Category: Multidisciplinary		Course Level: Introductory	
L:T:P(Hours/Week) 1: 0: 0	Credits: Mandatory Non-Credit Course	Total Contact Hours: 15	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on sustainable utilization of natural resources, prevention of pollution, disaster management and environmental issues & public awareness on ecosystem.

Module I **8 Hours**

Natural Resources

Role of individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

Environmental Pollution and Disaster Management

Role of an individual in prevention of pollution; Disaster management : floods, earthquake, cyclone and landslides.

Environmental Ethics and Legislations

Environmental ethics : Environment Protection Act; Air Act; Water Act ; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation.

Module II **7 Hours**

Environmental Issues and Public Awareness

Public awareness - Environment and human health.

Environmental Activities

(a) Awareness Activities:

i. Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste.
ii. Slogan making event.
iii. Poster making event.

(b) Actual Activities:

i. Plantation.
ii. Cleanliness drive.
iii. Drive for segregation of waste.
iv. To know about the different varieties of plants.
v. Shutting down the fans and ACs of the campus for an hour or so.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Explain the use of natural resources for a sustainable life as an individual in prevention of pollution.	Understand
CO 2: Apply the environmental ethics and legislations for various environmental issues.	Apply
CO 3: Create the public awareness on environment and human health as an individual or team through various activity based learning.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	3	3	-	-	-	-
CO3	3	-	-	-	-	3	3	-	3	3	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Benny Joseph, "Environmental Studies", Tata McGraw Hill, New Delhi, 2006.

T2. Mackenzie Davis and Susan Masten, "Principles of environmental engineering and science", Mc-Graw Hill, 3rd Edition, 2014.

Reference Book(s):

R1. Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, Enviro Media.

R2. Cunningham, W.P.Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.

Web References:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview.
2. https://en.wikipedia.org/wiki/Environmental_science.

SEMESTER III

Course Code: 23MAT303		Course Title: NUMERICAL METHODS AND LINEAR ALGEBRA (Common to EC, EE & EV)	
Course Category: Minor		Course Level : Intermediate	
L:T:P(Hours/Week) 3:1:0	Credits: 4	Total Contact Hours:60	Max Marks:100

Course Objectives: This course is designed to give an overview of numerical methods and linear algebra to provide knowledge and skills needed to apply in solving decision making problems in various fields of science and engineering.

Module I **22+8 Hours**

Solution of System of Linear Equations and Eigenvalue : Solution of system of linear equations– Direct methods: Gaussian elimination method – Indirect methods: Gauss Jacobi method, Gauss-Seidel method– sufficient conditions for convergence –Solution of nonlinear equations: Newton Raphson method –Power method to find the dominant Eigen value and the corresponding Eigen vector. Application of Eigen value and the corresponding Eigen vector.

Interpolation, Numerical Differentiation and Integration: Interpolation – Newton's forward, backward interpolation – Lagrange's interpolation. Numerical Differentiation and Integration – Trapezoidal rule – Simpson's 1/3 rule – Double integration using Trapezoidal rule.

Numerical Solution of Ordinary Differential Equation: Numerical solution of first order ordinary differential equation-Single step method: Taylor's series- Euler's method – Runge-Kutta method of fourth order – Multi step method: Milne's predictor corrector methods for solving first order differential equations.

Module II **22+7 Hours**

Vector Spaces: Vector spaces- Subspace of a vector space- basis and dimension of vector space – linear combination and spanning sets of vectors – linear independence and linear dependence of vectors – Row space, Column space and Null space – Rank and nullity of subspaces.

Orthogonality and Inner Product Spaces: Inner product of vectors: length of a vector, distance between two vectors, and orthogonality of vectors – Orthogonal projection of a vector – Gram-Schmidt process to produce orthogonal and orthonormal basis – Inner product spaces.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply the knowledge and skills of numerical methods to solve algebraic and trascedental equations.	Apply
CO2: Apply the basic knowledge of various numerical methods in solving interpolation with equal and unequal interval problems, numerical differentiation and integration.	Apply
CO3: Solve first order ordinary differential equation by single step and multi step methods.	Apply
CO4: Apply the concept of vector spaces and Inner product spaces to produce orthogonal and orthonormal basis.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	1	-	1	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	1	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Grewal, B.S. and Grewal, J. S., “Numerical Methods in Engineering and Science”, Eleventh Edition, Khanna Publishers, New Delhi, 2013.

T2. Curtis F. Gerald, Patric.O. *W*heatley, “Applied Numerical Analysis”, Seventh Edition, Pearson Education, Asia, New Delhi, 2009.

Reference Book(s):

R1. Steven Chopra, Raymond.P. Canale, “Numerical Methods for Engineers”, Seventh Edition, 2015.

R2. Jain M.K, Iyengar.S.R. K and Jain.R. K, “Numerical Methods for Scientific and Engineering Computation”, Sixth Edition, New Age Publishers, 2012.

R3. Gilbert Strang, “Linear algebra and its Applications”, Fourth Edition, Cengage Learning (RS), 2012.

Web References:

1 http://nptel.ac.in/courses/122104018/node2.html
2 http://nptel.ac.in/courses/111105038

Course Code: 23ECT301		Course Title: Analog Circuits I	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week)3: 0 : 0	Credits:3	Total Contact Hours: 45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on fundamental concepts of electronic circuits and its design procedure. This course also enables the students to design simple analog circuits.

Module I **23 Hours**

BJT and FET amplifiers: Biasing schemes for BJT and FET**:** DC and AC load lines, operating point, Fixed bias and Voltage divider bias. Bias Compensation techniques. Analysis of BJT and FET amplifiers: Analysis of CE and CS Amplifiers - Estimation of voltage gain, Current gain, input resistance and output resistance. Hybrid π - model of CE and CS amplifiers – Cascade and Cascode amplifiers - Large Signal Amplifiers: Class A, Class B, Class AB and Class C Power amplifiers – calculation of power efficiency.

Module II **22 Hours**

Feedback amplifiers and Oscillators: Feedback topologies-Voltage series, current series, voltage shunt, current shunt - effect of feedback on gain, bandwidth - Concept of tuned amplifiers - Single tuned amplifier and Neutralization techniques. Oscillators: Barkhausen criterion, RC oscillators (Phase shift, Wien bridge), LC oscillators (Hartley, Colpitts), crystal oscillator. Introduction to SMT and SMD.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Define and Explain the concept of various electronic circuits	Understand
CO2: Apply the concept of network theorems to analyze the input and output parameters of electronic circuits.	Apply
CO3: Analyze the given amplifier circuits using appropriate models at low and high frequencies.	Analyze
CO4: Design various analog circuits using discrete electronic Components for the given specifications.	Apply
CO5: Develop a simple mini-project using suitable analog circuits and demonstrate as a team or individual. (for internal assessment only)	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	1	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	1	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	1	-
CO5	-	-	-	3	-	-	-	-	1	1	-	1	1	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Anil K.Maini and Varsha Agarwal, “Electronic Devices and Circuits”, Wiley India Private Ltd, New Delhi, 2009.

T2. Sedra/ Smith, “Micro Electronic Circuits” Oxford University Press, 2004.

Reference Book(s):

R1.S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, “Electronic Devices and Circuits”, Second Edition, Tata McGraw-Hill, New Delhi, 2007.

R2.Robert L. Boyelstad and Louis Nasheresky, “Electronics Devices and Circuit Theory”, Ninth Edition, Pearson Education/ PHI, New Delhi 2002.

R3. A.V.N. Tilak, Design of Analog Circuits, Khanna Publishing House, 2022.

Web References:

1. https://www.ee.iitm.ac.in/videolectures/doku.php?id=ec201
2. https://nptel.ac.in/courses/117101106
3. https://archive.nptel.ac.in/courses/108/102/108102112/

Course Code: 23ECT302		Course Title: Signals and Systems	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 3:1:0	Credits: 4	Total Contact Hours: 60	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on basic signals and systems, its operation, apply mathematical tools like Fourier transform and Fourier series for analysis, analyze system properties and to obtain system response for continuous time and discrete-time systems and to analyze the relationship between continuous-time and discrete-time signals.

Module I **32 Hours**

Signals: An introduction to signals – formalizing signals – energy and power signals, signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential signal; continuous and discrete time signals, continuous and discrete amplitude signals. Basic operations on Signals: Operations performed on the Independent and Dependent variable – shifting, scaling and folding (using MATLAB)

Systems: An introduction to systems – formalizing systems – system properties: linearity: additivity and homogeneity, shift-invariance, causality, stability. Continuous time and discrete time Linear shift-invariant (LSI) systems - Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

Application of Fourier representation for continuous time signals: Fourier series representation of continuous time periodic signals, properties of Continuous Time Fourier Series. The Fourier Transform - properties of Continuous Time Fourier Transform - magnitude and phase response.

Module II **28 Hours**

Analysis of Continuous Time Systems: System modeling: Differential equation – impulse response – convolution integral - The Laplace Transform for continuous time signals and systems – region of convergence, poles and zeros of system functions, Laplace domain analysis, solution of differential equations and system behavior.

Sampling and Reconstruction: Sampling Theorem and its implications – Spectra of sampled signals. Signal reconstruction: ideal interpolator, zero-order hold. Aliasing and its effects.

Analysis of Discrete Time Signals and Systems: Discrete Time Fourier Series, Properties of DTFS - Discrete Time Fourier Transform - Properties of DTFT - Frequency response of LTI Systems - convolution sum - Relation between continuous and discrete time systems.

Course Outcomes: At the end of this course, students will be able to:	**Cognitive Level**
CO 1: Apply the mathematical concepts to classify the given signal/system based on its properties.	Apply
CO 2: Analyze the given signal/system behavior using time domain and frequency domain techniques	Analyze
CO 3: Analyze various methods to categorize the signals and systems and identify solutions for mathematical representations of systems	Analyze
CO 4: Simulate and conduct experiments in teams involving various operations on signals and response of systems using MATLAB (for internal assessment only)	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	3	-
CO4	-	-	-	-	3	-	-	-	3	-	-	-	3	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Allan V.Oppenheim, S. Wilsky and S.H.Nawab, “Signals and Systems”, Pearson Education, 2007

T2. Simon Haykins and Barry Van Veen, “Signals and Systems”, John Wiley & Sons, 2004.

Reference Book(s):

R1. H P Hsu, Rakesh Ranjan, “Signals and Systems”, Schaum’s Outlines, Tata McGraw Hill, Indian Reprint, 2007

R2. Ganesh Rao D, Satish Tunga, “Signals and Systems”, Sanguine, 2005

R3. Edward W Kamen, Bennic S Heck, “Fundamentals of Signals and Systems using the Web and MATLAB”, Pearson Education, 2011

Web References:

1. https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/
2. https://nptel.ac.in/courses/117104074
3. https://nptel.ac.in/courses/117101055

Course Code: 23ECT303		Course Title: Digital System Design	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge to Understand digital arithmetic operations, basic operations of TTL and CMOS gates and design synchronous and asynchronous sequential logic circuits.

Module I **23 Hours**

Digital Arithmetic & Logic Families: Binary Codes, Digital Arithmetic and Simplification of Boolean functions, Error detecting and correcting codes, Hamming Code, Arithmetic Number representation, Hexadecimal arithmetic, BCD arithmetic simplification,Karnaugh map simplification and Quine McCluskey Method. Logic Families:- TTL,Totem-pole TTL, open-collector and tristate TTL, Schottky TTL, standard TTL characteristics, NMOS, PMOS, CMOS logic circuits, Characteristics of MOS logic, Fan-out, Propagation Delay, Power dissipation, Noise margin, Supply Voltage levels, Operational Voltage levels.

Combinational Systems : Design of half adder, full adder and subtractor using logic gates, n-bit parallel adder and subtractor, Multiplexer, Demultiplexer, Encoder, Decoder, Code converters, Magnitude comparators, Parity generators.

Module II **22 Hours**

Sequential Systems: SR latch, JK flip-flop,T flip-flop, D flip-flop, Master-slave RS flip-flop, Master-slave JK flip-flop, Shift registers (SISO, SIPO,PISO,PIPO), Universal shift register.

Ripple Counters, Synchronous Counters, Modulus-n counter, Ring counter, Mealy and Moore model, Design of synchronous sequential circuits, state reduction, state assignment, Design and analysis of asynchronous sequential circuits, race free state assignment, Hazards.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Construct boolean expressions and different arithmetic operations with binary numbers.	Apply
CO 2: Examine logic gates using TTL, CMOS technologies and operational characteristics of digital ICs.	Analyze
CO 3: Develop combinational circuits for a given specification.	Apply
CO 4: Design synchronous and hazard free asynchronous sequential circuits using flip-flops.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-		-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-		-	-	-	-	-	-	3	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Morris Mano.M, Michael D.Ciletti, Digital Design with an Introduction to the Verilog HDL, Fifth edition, Pearson Education 2014.

T2.Thomas L Floyd, Digital Fundamentals, Tenth edition, Pearson Education, 2013.

T3. Charles H Roth, Larry L.Kinley, Fundamentals of Logic Design, Fifth edition, 2010.

Reference Book(s):

R1. Donald D Givone , Digital Design with an Introduction to the Verilog HDL , TMH 2003

R2. Salivahanan s and Arivazhgan s.” Digital Circuits and Design “ Fourth Edition, Vikas Publishing House Pvt Limited. New Delhi 2012

R3. R.P.Jain Modern Digital Electronics, Tata Mc Graw Hill, 3rd Edition 2007

R4. Samuel Lee C, Digital Circuits and Logic Design, Prentice Hall, First Edition, 1976.

Web References:

1. learnabout-electronics.org/Digital/dig1
2. https://www.youtube.com/playlist?list=PLwjK_iyK4LLBC_so3odA64E2MLgIRKafl
3. https://nptel.ac.in/courses/108105132

Course Code: 23ECL301		Course Title: Analog Circuits I Laboratory	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours:45	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge of the design of various electronic circuits using discrete electronic components and also enables the students to design and verify the circuit using simulation software.

List of Experiments:

1. Frequency Response of CE& CC amplifiers.
2. Frequency Response of RC coupled amplifier
3. Frequency response of CS amplifier.
4. Frequency response of Differential amplifier.
5. Class-A power amplifier.
6. Complementary symmetry Class-B and Class-AB amplifiers.
7. Feedback amplifiers using BJT.
8. Class C tuned amplifier.
9. LC oscillators using BJT.
10. RC oscillators using BJT.
11. Multivibrators using BJT.
12. Simulation of above experiments using Multisim software.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Conduct experiments to obtain the frequency response of various electronic circuits for a given specifications.	Evaluate
CO2: Compare experimental results of electronic circuits using discrete components with simulation results.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	3	-	-	-	-	1	1	-	-	-	-
CO2	-	3	-	-	3	-	-	-	-	-	-	1	1	-

High-3; Medium-2;Low-1

Reference Book(s):

R1. Laboratory Manual Prepared by Faculty of Electronics and Communication Engineering, Dr. Mahalingam College of Engineering and Technology.

R2. A.V.N. Tilak, Design of Analog Circuits, Khanna Publishing House, 2022.

Course Code: 23ECL302		Course Title: Digital System Design Laboratory	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week)0:0:3	Credits: 1.5	Total Contact Hours: 45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on verifying the functionality of logic circuits, analyze operation of integrated circuits, counters, shift registers and understand software tools for design and implementation of digital circuits.

List of Experiments

1. Design and implement adder and subtractor using logic gates.
2. Design and implement 2-bit magnitude comparator using logic gates.
3. Design and implement encoder and decoder using logic gates.
4. Design and implement code converters using logic gates.
5. Verify characteristic tables of flip-flops.
6. Construct and verify 4-bit ripple counter and synchronous counters.
7. Construct and verify shift registers.
8. Introduction to Hardware Description Language.
9. Gate-level/Dataflow modelling: Half adder, Full adder and multiplexer.
10. Structural modelling: Ripple Carry Adder and Asynchronous Counters.
11. Behavioral modelling: JK and D flip-flops.
12. Behavioral modelling: Synchronous Counters

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Experiment with the characteristics of basic logic gates.	Apply
CO2: Design and implement combinational logic circuits and sequential logic circuits.	Create
CO3: Analyze HDL programming for functional verification of digital circuits using EDA tools.	Analyze
CO4: Evaluate digital circuits with suitable Verilog HDL modelling using EDA tools.	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2		-	2	-	-	-	-	-	2	-	-	-	2	-
CO3	-	-	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	2	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2; Low-1

References:

R1. Sameer Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Second edition, Pearson, 2003.

R2. Stephan Brown and Zvonk Vranesic, Fundamentals of Digital Logic with Verilog Design, Second edition, Mc-Graw Hill, 2008.

R3. Laboratory manual prepared by the department of ECE, Dr.MCET.

Web References:

1. https://de-iitr.vlabs.ac.in/List%20of%20experiments.html
2. https://onlinecourses.nptel.ac.in/noc22_ee55/preview
3. https://www.vlab.co.in/broad-area-electronics-and-communications

Course Code: 23ESL301		Course Title:Professional Skills 2: Problem solving skills & Logical Thinking 2 (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Intermediate	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours:30	Max Marks:100

Course Objectives:

The course is intended to enhance the students' numerical, analytical and logical reasoning ability. Also course focus to make learners prepare for various public and private sector exams and placement drives.

Module I **20 Hours**

Quantitative Ability

Time and work –Pipes and cisterns- - Time Speed Distance-Problems on Trains-Boats and Streams- Permutation and Combination-Probability, Mensuration- Heights and distance- Logarithms- Clocks and Calendars – Data Sufficiency

Module II **10 Hours**

Reasoning Ability

Number & Alpha series- Odd man out-Coding and Decoding-Syllogisms- -Problems on Cubes and Dices- Logical Venn diagram -Visual Reasoning- Element & logical series-Analogies

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Enhance their problem solving skills & Logical thinking Skills	**Apply**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-

High-3; Medium-2; Low-1

Textbook(s):

T1: Dr. R. S. Aggarwal. "Quantitative Aptitude for Competitive Examinations" Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018.

T2: Dr. R. S. Aggarwal. "A Modern Approach to Logical Reasoning", Sultan Chand & Sons Pvt. Ltd, New Delhi, 2018

Reference Book(s):

R1: R. V. Praveen. “Quantitative Aptitude and Reasoning” 2nd Revised Edition, Prentice-Hall of India Pvt.Ltd, 2013

R2: Arun Sharma. “Quantitative Aptitude for Common Aptitude Test”, McGraw Hill Publications, 5th Edition, 2020

R3: Arun Sharma. “Logical Reasoning for Common Aptitude Test”, McGraw Hill Publications, 6th Edition, 2021.

Web References:

1 https://www.indiabix.com/aptitude/questions-and-answers/

2 https://www.geeksforgeeks.org/aptitude-questions-and-answers/

Course Code: 23VAT301		Course Title: Universal Human Values 2: Understanding Harmony	
Course Category: VAC		Course Level: Intermediate	
L:T:P (Hours/Week) 2:1: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

- Induction Program

Course Objectives

The course is intended to:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Strengthening of self-reflection
3. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
4. Development of commitment and courage to act
5. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

Unit I Introduction to Value Education 9 Hours

Need for the Value Education; Self -exploration as the process for value education; Continuous Happiness and Prosperity: A look at basic Human Aspirations; Right understanding: Relationship and Physical Facilities; Happiness and Prosperity: current scenario; Method to fulfill the Basic human aspirations

Unit II Harmony in Human Being 9 Hours

Human being as a co-existence of self ('I') and the material 'Body'; needs of Self ('I') and 'Body'; The Body as an instrument of 'I'; Harmony in the self ('I'); Harmony of the self ('I') with body; Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III Harmony in the Family and Society 9 Hours

Harmony in the Family the basic unit of human interaction; Values in human to human relationship; Trust as the foundational values of relationship; Respect as the right evaluation ;Understanding harmony in the society (society being an extension of family); Vision for the universal human order.

Unit IV Harmony in the Nature 9 Hours

Understanding the harmony in the Nature Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature; Existence as Co-existence at all levels; Holistic perception of harmony in existence.

Unit V Harmony on Professional Ethics 9 Hours

Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics; Case study: holistic technologies, management models and production systems; Strategy for transition towards value-based life and profession

Course Outcomes		Cognitive Level
At the end of this course, students will be able to:		
CO.1	Reflect on values, aspiration, relationships and hence identify strengths and weaknesses.	Responding
CO.2	Appraise physical, mental and social wellbeing of self and practice techniques to promote wellbeing.	Responding
CO.3	Value human relationships in family and society and maintain harmonious relationships.	Valuing
CO.4	Respect nature and its existence for survival and sustainable of all life forms and hence practice conservation of nature	Valuing
CO.5	Appreciate ethical behaviour as a result of value system in personal and professional situations	Receiving

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	1	2	2	-	-	2	-	-
CO2	-	-	-	-	-	1	2	2	2	1	-	2	-	-
CO3	-	-	-	-	-	2	2	2	2	1	-	2	-	-
CO4	-	-	-	-	-	2	2	2	2	-	-	2	-	-
CO5	-	-	-	-	-	1	2	2	2	-	-	2	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Book(s):

R1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3. The story of stuff, Annie Leonard, Free Press, New York 2010.

Web References:

1. https://aktu.ac.in/hvpe/ResourceVideo.aspx
2. http://hvpenotes.blogspot.com/
3. https://nptel.ac.in/courses/109/104/109104068/

SEMESTER IV

Course Code: 23MAT401		Course Title: Probability and Statistics (Common to EC, EE, ME, AU, CS, AM, SC, IT & EV)	
Course Category: Minor		Course Level: Intermediate	
L: T: P (Hours/Week) 3:1:0	Credits: 4	Total Contact Hours:60	Max Marks:100

Course Objectives:

This course aims at helping the students to gain knowledge on random variables, probability distributions and hypothesis testing for data.

Module I **22+8 Hours**

Probability and Random Variables: Axioms of Probability- Conditional Probability- Total Probability -Baye's Theorem- Random Variables-One Dimensional Randon variables- Probability Mass Function- Probability Density Functions- Properties - Moments- Moment generating functions and their properties- Two Dimensional Random Variables - Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression using least square method – Transformation of random variables.

Standard Distributions: Discrete Distributions - Binomial- Poisson- Properties, Moment generating functions -Continuous Distributions - Uniform –Exponential- Normal Distributions and their properties.

Module II **23+7 Hours**

Testing of Hypotheses: Sampling distributions, Estimation of parameters, Statistical hypothesis, Large sample test based on Normal distribution for single mean and difference of means, Tests based on t-test, Chi-square distributions and F distributions for mean, variance and proportion, Contingency table (test for independent), Goodness of fit.

Design of Experiments: Analysis of Variance (ANOVA) - One-way Classification – Completely Randomized Design (CRD) – Two-way Classification – Randomized Block Design (RBD) – Latin square**.**

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate the concepts of probability theory to engineering problems.	Understand
CO2: Calculate the expected values, variances and correlation coefficient of random variables	Apply
CO3: Use the theoretical discrete and continuous probability distributions in the relevant application areas.	Apply
CO4: Apply the concepts of testing the hypothesis and design of experiments to solve real life problems.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	1	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Veerajan T, “Probability, Statistics and Random process”, 3rd Edition, Tata McGraw-Hill, New Delhi, 2017.

T2. Dr.J.Ravichandran, “Probability and Statistics for Engineers”, 1stEdition, Wiley India Pvt. Ltd., 2010.

Reference Book(s):

R1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, “Probability and Statistics for Engineers and Scientists”, 9th Edition Pearson Education, Asia, 2013.

R2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, “Schaum's Outlines Probability and Statistics”, 4th Edition Tata McGraw Hill edition, 2012.

R3. Morris DeGroot, Mark Schervish, “Probability and Statistics”, Pearson Educational Ltd,4th Edition, 2014, India.

Web References:

1 https://archive.nptel.ac.in/courses/111/105/111105090/

2. https://archive.nptel.ac.in/courses/111/105/111105041/

Course Code: 23ECT401		Course Title: Analog Circuits II	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objective:
The course is intended to impart the skills to design the Electronic circuits using op-amps and linear ICs.

Module I **23 Hours**

OPERATIONAL AMPLIFIER AND ITS APPLICATIONS

Block Diagram of Op-amp, IC741 – Ideal Op-amp characteristics - Inverting and non-inverting amplifiers – DC characteristics - AC characteristics – Concept of frequency compensation-methods of improving slew rate. Application of operational amplifiers: Adder, Subtractor, Instrumentation amplifier, Integrator, Differentiator. Square wave and triangular waveform generators. Comparators, Schmitt Trigger. Digital to Analog converters - Binary weighted and R-2R Ladder types - Analog to digital converters - Sample and Hold circuit - Counter type, Successive approximation, dual slope types - Over-sampling A/D Converters.

Module II **22 Hours**

SPECIAL FUNCTION ICS AND ITS APPLICATIONS

Timer IC 555 – Block diagram – Applications: Monostable multivibrator – Astable multivibrator – Phase lock loop: Block diagram - Principle of operation – Phase detector - Voltage Controlled Oscillator (IC566) - Monolithic PLL IC 565. Lock range and Capture range. Application of PLL: Frequency multiplier and Frequency translation. Voltage Regulators: Fixed voltage regulators (IC 78XX and 79XX) - Adjustable voltage regulators (IC 723) - Buck & Boost regulators - Switching regulators.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Define and Explain various terms and characteristics of op-amp	Understand
CO2: Design Electronic Circuits using op-amp to perform mathematical operations.	Apply
CO3: Identify and Analyze Electronic Circuits for the given specifications	Analyze

CO4: Design Electronic circuits using appropriate ICs for the given application.	Apply
CO5: Involve as a team to develop a mini project using Analog Integrated circuits and engage in lifelong learning (for internal assessment only)	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	2	-	2	1	1	-

High-3; Medium-2; Low-1

Text Book:

T1. Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4th Edition, Prentice Hall / Pearson Education, 2015

T2. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., Fifth Edition, 201

Reference Book(s):

R1. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 4th Edition, Tata Mc Graw-Hill, 2016

R2. Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2014.

R3. S.Salivahanan & V.S. Kanchana Bhaskaran, “Linear Integrated Circuits”, TMH,2nd Edition, 4th Reprint, 2016.

Web References:

1. https://www.ee.iitm.ac.in/videolectures/doku.php?id=ec201
2. https://archive.nptel.ac.in/courses/108/108/108108111/
3. https://onlinecourses.nptel.ac.in/noc24_ee73/preview

Course Code: 23ECT402		Course Title: Analog and Digital Communication	
Course Category: Major		Course Level: Intermediate	
L:T:P (Hours/Week) 3:0:0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on analog and digital communication systems and to analyze various error control techniques

Module I **23 Hours**

Analog Modulation **:** Introduction to Analog modulation systems. AM system: AM Power distribution - Various generation methods of AM waves - Detection of AM waves: Superheterodyne receiver. SSB Modulation and Demodulation, VSB modulation and demodulation. Angle Modulation system: Generation of FM waves: Direct and Indirect methods -Types of FM: Narrow band and wideband FM - Detection of FM waves, Phase Modulation - Simulation of AM using MATLAB

Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation –Drawbacks of Analog Modulation

Module II **22 Hours**

Pulse Modulation : Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM.

Baseband transmission system: Line codes and its properties – ISI – Nyquist criteria for distortion less transmission line – Correlative coding – Eye pattern –Simulation using MATLAB– Principle of equalization

Passband transmission system: Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying- Simulation using MATLAB

Error Control Coding: Introduction to error control codes: Types of Error correction and detection codes. Channel Coding Theorem – Linear Block Codes –CRC Codes- Hamming codes – Convolutional codes – Trellis coding - Viterbi decoding

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Analyze the power, bandwidth and spectrum of analog and digital modulation systems using suitable mathematical tools.	Apply

CO 2: Contrast baseband with passband transmission system and estimate the bit error rate of BFSK, BPSK and QAM.	Analyze
CO 3: Analyze the error detection and correction capabilities of several error control codes	Analyze
CO 4: Design a framework that correlates analog modulation signal waveforms with the BER assessment of various digital modulation systems.	Apply
CO 5: Engage in an independent study in '5G-Advanced' techniques and present an effective oral presentation as a team. (for internal assessment only)	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	1	-	-	-	-	-	-	-	2	-
CO2	-	3	-	-	1	-	-	-	-	-	-	-	2	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	2	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	2	2	-	1	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1.Simon Haykin, "Communication systems", John Wiley and Sons, Inc, Fourth edition, 2010.
T2. Taub H. and Schilling D.L., "Principles of Communication Systems",Tata McGraw Hill, 2001.
T3. Proakis J.G., ``Digital Communications'', 4th Edition, McGraw Hill, 2000

Reference Book(s):

R1. Wayane Tomasi, "Electronic Communication Systems: Fundamendals Through Advanced", Pearson Education , Fifth edition, 2009.
R2. Proakis J.G and Salehi M, "Communication Systems Engineering", Pearson Education , 2002.
R3. Bernard Sklar, Pabitra Kumar Roy, "Digital Communication : Fundamentals and Applications", Pearson Education, Second Edition ,2009.

Web References:

1. https://nptel.ac.in/courses/117/105/117105143
2. https://nptel.ac.in/courses/117/101/1171011051/

Course Code: 23ECT002		Course Title: Transmission Lines and Waveguides (common to EA and EC)	
Course Category : Major		Course Level: Intermediate	
L:T:P (Hours/Week): 3:0:0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

Empower students with essential skills in transmission line networks, power measurement, impedance matching, and expertise in waveguide propagation modes and cavity resonators for RF and Microwave applications.

Module I **22 Hours**

Basics of Transmission Lines: Concept and definition, Different kinds of transmission lines, Applications, Equivalent circuit, Primary and Secondary constants –General transmission line equations- Transmission line Parameters -The lossless transmission line, The infinite long transmission line, The distortion less transmission line and condition for distortion less and minimum attenuation

High Frequency Transmission Lines: Approximations at high frequencies - Line of zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short-circuited lines - Power and impedance measurement on lines

Impedance matching: Quarter wave transmission line, Single stub matching, Construction of smith chart, Smith chart as impedance chart, smith chart as admittance chart, single stub matching Problems using smith chart - Impedance matching network design using smith chart utility in ADS software.

Module II **23 Hours**

Waveguides: Introduction, Wave propagation in parallel plane waveguide, Rectangular Waveguides-Transverse Electric (TE) and Transverse Magnetic (TM) mode analysis – Field expressions, Characteristic equation, Cut-off frequency, Phase velocity, Group velocity, Wavelength and Impedance, Dominant and degenerate modes

Cavities and Planar transmission lines: Rectangular Cavity Resonators-Dominant modes and Resonant Frequencies, Q factor, Unloaded Q for TE_{101} mode, Types of coupling and Coupling coefficients.

Losses in transmission lines - Strip Lines, Micro strip Lines, Slot lines, Coplanar lines

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Apply the analytical and graphical tool such as smith chart for the transmission line problems and impedance calculations	Apply
CO 2: Analyze the transmission line characteristics at microwave frequency range under various load conditions.	Analyze
CO 3:Design waveguides and microstrip lines for a given specification	Apply
CO4: Integrate through independent or team learning and employ modern tools for the design of transmission lines and impedance matching networks (for internal assessments only)	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	2	-
CO4	-	3	-	-	3	-	-	-	3	3	-	-	3	-

High-3; Medium-2;Low-1

Text Book(s):

T1. John D Ryder, “Networks, Lines and Fields”, PHI, 2nd Edition New Delhi, 1999.
T2. Jordan. E.C. and Balmain.K.G, “Electromagnetic Waves and Radiating Systems”, 2nd Editon, PHI, New Delhi, 1995.

Reference Book(s):

R1. R.K. Shevgaonkar, “Electromagnetic Waves”, Tata McGraw Hill India, 2005
R2. Umesh Sinha, “Transmission Lines and Networks”, Satya Prakashan (Tech. India Publications, New Delhi), 2001
R3. David M. Pozar, “Microwave Engineering”, 3rd Edition, John Wiley, 2009.

Web References:

1. https://nptel.ac.in/courses/117101057
2. https://www.microwaves101.com/encyclopedias/transmission-lines
3. http://www.amanogawa.com/archive/transmissionB.html

Course Code: 23ITI001		Course Title: Data Structures using C (Common to EA,EC)	
Course Category: Multidisciplinary		Course Level: Intermediate	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Course Objectives:

The objective of this course is to impart knowledge of fundamental data structures and its implementation. Additionally, learn the application of data structures for solving various problems.

Module I **23 Hours**

Linked List: Introduction- Types of Data Structures - Abstract Data type, List ADT: Array Implementation of list - Linked List Implementation of list – Doubly Linked List – Circularly Linked List-Applications: Radix sort, Stack ADT: Stack Model – Array and Linked List Implementation of Stack Applications: Balancing Symbols - Postfix Expressions- Infix to Postfix Conversion, Queue ADT: Queue Model – Array and Linked List Implementation of Queue-Double ended Queue- Applications of Queue

Module II **22 Hours**

Trees: Implementation of Trees - Tree Traversals ,Binary Trees: Implementation – Expression Trees – Binary Search Tree: Implementation, AVL Trees: Single Rotation – Double Rotation – Implementation, Graphs: Definitions – Representation of Graphs – Graph Traversals: Breadth First Search –Depth First Search -Topological Sort ,Weighted and Unweighted Shortest Path Algorithms: Dijkstra's Algorithm - Breadth-First Search Algorithm, All Pairs Shortest Path: Floyds Algorithm, Minimum Spanning Tree: Prim's Algorithm – Krushkal's Algorithm ,Internal Sorting: Insertion Sort-Merge Sort-Quick Sort-Bucket Sort.

List of Exercises: **30 Hours**

1. Implementation of List ADT using array and Linked list
2. Implementation of Stack ADT and Queue ADT in array
3. Implementation of Stack ADT and Queue ADT in Linked list
4. Implement the Binary Search Tree Algorithm
5. Implement Graph traversals
6. Implement Sorting Algorithms

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop various applications using arrays and linked list	Apply
CO2: Examine the performance of tree operations and compare their time complexities.	Analyze
CO3: Correlate different graph algorithms and different sorting algorithms to determine the most appropriate one for a given context.	Analyze
CO4: Design and integrate multiple data structures and algorithms to create a consistent and innovative solution for a problem.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	-	-	-	-	-	-	-	-	2	-	-

High-3; Medium-2; Low-1

Text Book(s):

T1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education Asia, New Delhi, 2015.

Reference Book(s):

R1. Sahni Horowitz , “Fundamentals of Data Structures in C”, 2nd Edition Tata McGraw-Hill, New Delhi, 2008.

R2. Seymour Lipschutz, “Data Structures with C”, McGraw Hill, 2014.

R3. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, “Introduction to Algorithms” 3rd Edition, The MIT Press Cambridge, 2014

Web References:

1. https://www.coursera.org/specializations/data-structures-algorithms
2. http://www.csse.monash.edu.au/~lloyd/tildeAlgDS
3. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

Course Code: 23ECL401		Course Title: Analog Circuits II Laboratory	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours:45	Max Marks: 100

Course Objectives:
The course is intended to impart knowledge of the design of various electronic circuits using Op-amps and linear ICs. It also enables the students to design and verify the circuit using simulation software.

List of Experiments:

1. Arithmetic and Calculus operations using op-amp.
2. Comparator circuits using op-amp
3. Instrumentation amplifier
4. Filter circuits using op-amp
5. RC oscillator using op-amp
6. DAC converter
7. Applications of 555 IC
8. Applications of 565 IC
9. Regenerative comparator
10. Fixed voltage regulators
11. Variable voltage regulators
12. Simulation of above experiments using Multisim software.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Conduct experiments to verify the output of various electronic circuits using op-amps and linear ICs for a given specifications.	Evaluate
CO2: Compare the experimental results of electronic circuits using op-amps and ICs with simulation results.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	3	-	-	-	-	1	1	-	-	-	-
CO2	-	3	-	-	3	-	-	-	-	-	-	1	1	-

High-3; Medium-2;Low-1

Reference Book(s):

R1. Laboratory Manual Prepared by Faculty of Electronics and Communication Engineering, Dr. Mahalingam College of Engineering and Technology.

R2. A.V.N. Tilak, Design of Analog Circuits, Khanna Publishing House, 2022.

Course Code: 23ECL402		Course Title: Analog and Digital Communication Laboratory	
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours: 45 hours	Max Marks:100 Marks

Course Objectives:

The course is intended to impart knowledge on various analog, digital, Pulse modulation techniques, Error control coding using hardware and MATLAB Software.

List of Experiments:

1. Simulate and Perform Amplitude modulation/Demodulation
2. Simulate and perform Frequency modulation /Demodulation
3. Verify sampling theorem in the hardware and simulate
4. Perform Pulse Amplitude Modulation
5. Perform Pulse Position Modulation and Pulse Width Modulation
6. Perform PCM encoding/decoding operation
7. Simulate and Perform Delta Modulation/Demodulation
8. Simulate and Perform ASK and FSK
9. Simulate and perform Binary Phase Shift Keying
10. Simulate and perform Quadrature Phase Shift Keying
11. Simulate Convolutional Encoding, Decoding and carry out in the hardware.
12. Carry out Pre-emphasis and De-emphasis operation

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Interpret different modulation and demodulation techniques based on its characteristics.	Apply
CO 2: Engage as an individual and team member to discriminate different modulation techniques	Evaluate
CO 3: Use a simulation tool to verify the different modulation techniques, encoding and decoding techniques.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	3	-	-	-	-	2	2	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-	-	3	2	-

High-3; Medium-2; Low-1

References:

R1.“Laboratory manual”, prepared by the ECE department

R2. John.Prokias, Masoud Salehi and Gerhard Bauch,”Contemporary Communication Systems using MATLAB”,3rd Edition,Cengage learning,2012.

R3. Kwonhue Choi,Huaping Liu,”Problem-Based Learning in Communication Systems using MATLAB and Simulink”,Wiley IEEE Press,2016.

Course Code: 23ESL401		Course Title Professional Skills 3 : Professional Development and Etiquette (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Intermediate	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours:30	Max Marks:100

Course Objectives:

The course is intended to cultivate students' appropriate etiquette across various personal and professional contexts, fostering professionalism and effective communication.

Module I **15 Hours**

Emotional Intelligence

Intrapersonal Skill: Goal Setting- Self-management- Emotional Intelligence: Understanding & Developing EI for Effective Communication and Relationships – Enhancing Social Skills

Professional Development

Introduction to Professional Development - Career State Assessment - Set Career Goals- Stay on Industry Trends - Self & Lifelong learning – Creativity - Problem Solving Skills - Strong Fundamentals – Using/ Creating Opportunities – Work & Life Balancing - Revisiting Goals

Teamness and Interpersonal skills

Paraphrasing: Techniques for Active Listening -Paraphrasing as a Tool for Effective Understanding and Communication – Collaboration and Team Building: Building Trust and Rapport - Self-paced learning.

Module II **15 Hours**

Effective Communication

Effective Verbal Communication - Assertive Communication - Elements of Effective Communication - Barriers to Effective Communication - Persuasion Skills - Effective Presentation: Oral and visual presentation – Drafting formal reports.

Professional Etiquette

Introduction - Types of professional Etiquette- Personal Grooming: Importance of Personal Grooming in Professional Settings- Dress Codes and Professional Appearance Guidelines- Body language - Social – Email – Telephonic – Dining – Classroom - Business.

Activities:

- Emotional Intelligence: Scenario based role play, Debate
- Paraphrasing: Listening, Reading
- Effective Presentation:
    - Oral Presentation: Self-Introduction, JAM , Extempore speech
    - Visual presentation: Email Writing, Power Point Presentation, Vlog
- Professional Etiquette: Demonstrate required Professional Etiquette in all the above activities.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Communicate effectively and exhibit Professional etiquettes in various social forums.	**Apply**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	2	3	-	1	-	-

High-3; Medium-2; Low-1

Textbook(s):

T1. Sabina Pillai, Agna Fernandez, “Soft Skills & Employability Skills”, Cambridge University Press 2018

T2. Peggy Post &Peter Post, “The Etiquette Advantage in Business: Personal Skills for Professional Success”, 2nd edition (May 3, 2005), William Morrow.

Reference Book(s):

R1. Ashraf Rizvi, "Effective Technical Communication" 2nd Edition, McGraw-Hill India, 2018

R2. Maithry Shinde, Jyotsna Sreenath, “Life Skills & Personality Development”, Cambridge University Press 2022

Web References:

1. https://www.indeed.com/career-advice/career-development/etiquette-at-work
2. https://www.skillsyouneed.com/interpersonal-skills.html

SEMESTER V

Course Code: 23ECT501		Course Title: Control Systems	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 3:0:0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to provide a fundamental understanding of the concept of transfer functions and their application in determining system responses. It also equips students with the ability to analyze the stability and performance of dynamic systems.

Module I Analysis and Modeling of Control Systems 22 Hours

Control System Modelling: Basic elements of control systems – Open and Closed loop systems- Transfer function – mathematical modelling of electrical and mechanical systems- Analogies between electrical and mechanical systems- Block diagram reduction techniques – Signal flow graph.

Time Domain Analysis: Impulse and step response of first and second order systems- Time domain specifications- steady state error and error constants.

Frequency domain analysis: Frequency response- Frequency domains specifications – correlation between time and frequency domain specifications- Bode plot – Polar plot.

Module II Advanced Control System Analysis and Design 23 Hours

Stability analysis: Stability – characteristics equation – location of roots in s-plane – Routh Hurwitz stability criterion- Concept of root locus –construction of root locus – effect of pole zero additions on the root loci.

Design of compensators & Controllers: Lead compensator, lag compensator, lead-lag/lag-lead compensators – Design of PD, PI and PID Controllers. Case study on Gear Transmisison.

State space analysis: concept of state –state variable – state model – state space model for electrical and mechanical systems- canonical model, obtaining transfer function from state model- state transition matrix and its properties – solution of state equations – Concept of Controllability and Observability.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Define and explain the concept related to control system.	Understand

CO 2: Apply the concepts of control systems and signal processing to obtain required parameters of the system.	Apply
CO 3: Analyze the given linear control system and derive an appropriate conclusion.	Analyze
CO 4: Design various controllers for the given specifications.	Create
CO 5: Develop a simple simulation based mini-project using suitable components and demonstrate as a team or individual(for internal assessment only)	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	1	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	1	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	1	-
CO5	-	-	-	3	1	-	-	-	1	1	1	1	1	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Nagrath.J and Gopal. M, “Control System Engineering”, New Age International Publishers, 5th Edition, 2007.

T2. Benjamin.C. Kuo, “Automatic Control Systems”, PHI, New Delhi, 7th Edition, 2009.

Reference Book(s):

R1.Gopal.M, “Control System Principles and Design”, TMH, New Delhi, 3rd Edition, 2010.

R2.S.Palani, “Control Systems Engineering”, TMH, New Delhi, 2nd Edition, 2020.

R3. Norman.S.Nise, “Control Systems Engineering”, Wiley, 4th Edition, 2003.

Web References:

1. https://archive.nptel.ac.in/courses/107/106/107106081/
2. https://archive.nptel.ac.in/courses/108/106/108106098/
3. https://www.electrical4u.com/electrical-engineering-articles/control-system/

Course Code: 23ECI501		Course Title: Digital Signal Processing	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 3:0 :2	Credits:4	Total Contact Hours:75	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on knowledge on analyzing discrete-time systems and their applications in signal processing. It covers computing the Discrete Fourier Transform (DFT) and its inverse (IDFT), designing Linear Phase Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters, and addressing finite word length effects in digital implementations.

Module I Discrete-Time Signal Processing 22 Hours

Introduction: Review of Basic discrete-time signals and Fourier transforms. **Z-Transform and Its Applications:** Definition- properties- significance in discrete-time systems- Inverse Z-transform techniques- Poles, zeros, and system stability analysis- System characterization- Impulse response and difference equations. Role of Pole-zero location in system function: Design of Notch filters and Comb filters. **Frequency Domain Analysis Using FFT:** Discrete Fourier Transform (DFT): Definition- properties- IDFT- applications. **FFT algorithms:** Radix-2 FFT (DIT and DIF methods).

Module II Digital Filter Design and Multirate Signal Processing 23 Hours

Digital Filter Design: Finite Impulse Response (FIR) Filters- Characteristics of linear phase FIR filters- Design using windowing techniques- Infinite Impulse Response (IIR) Filters: Design of analog Butterworth and Chebyshev filters- Analog-to-digital transformation techniques (BLT and IIT). **Real-Time DSP Applications:** Fixed-point and floating-point number representations- Effects of finite word length on filter implementation.

Introduction to Multirate Signal Processing: Need for sampling rate Conversion-Reducing the sampling rate(Decimation) – Increasing the sample rate(Interpolation)

List of Experiments: 30 Hours

1. Generate and analyze discrete-time signals (e.g., unit impulse, step, and sinusoidal) using MATLAB.
2. Implement FFT to analyze the frequency spectrum of discrete-time signals using Python.
3. Design and implement low-pass and high-pass FIR and IIR (Butterworth and Chebyshev) filters using MATLAB.

4. Design filters based on pole-zero placements using Scilab.
5. Study the impact of coefficient quantization and fixed-point representation on filter responses using Scilab.
6. Implementation of Decimation and Interpolation filters using python.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Analyze discrete-time signals and systems to assess their behavior and properties using mathematical tools.	Analyze
CO2: Apply techniques for efficient computation and frequency domain analysis of discrete-time signals and systems.	Apply
CO3: Design and develop digital filters to meet specific performance criteria and implement them effectively.	Create
CO4: Evaluate the effects of finite word length and practical constraints on digital system stability and performance.	Evaluate
CO5: Apply multirate signal processing techniques to achieve efficient sampling rate conversion	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	3	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-	3	-
CO5	-	-	-	-	2	-	-	-	-	-	-	-	3	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Allan V.Oppenheim and Ronald W.Schafer,;Discrete Time Signal processing", Pearson,Third Edition,2010

T2. John G. Proakis and Dimitris G.Manolakis,'Digital Signal Processing: Principles, Algorithms and Applications",Third Edition,Pearson Educational/,2007

Reference Book(s):

R1. Lonnie C.Ludeman, "Fundementals of Digital Signal Processing", John Wiley and Sons Network,2009

R2. P. P. Vaidyanathan, Multirate Systems and Filter Banks, Pearson-Education, Delhi, 2006

R3. Ashok Ambardar, "Digital Signal Processing: A Modern Introduction", Thomson Learning,2007

Web References:

1. https://nptel.ac.in/courses/117102060
2. https://nptel.ac.in/courses/108/105/108105055/
3. https://archive.nptel.ac.in/courses/108/101/108101174/

Course Code: 23ECT502		Course Title: Embedded Microcontrollers	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 3:0:0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on PIC microcontroller and ARM processors with interfacing.

Module I **22 Hours**

Microprocessor Architecture: Introduction to Microprocessor and Microcontroller – Evolution – Von Neumann and Harvard architecture- RISC vs CSIC-8085 Microprocessor-simple assembly language programs.

PIC Microcontroller: PIC 16/18F Architecture – memory organization – addressing modes – instruction set – PIC programming in Assembly & C –I/O port, Data Conversion, Interrupts, RAM & ROM Allocation, Serial programming, Timer programming, practice in MP-LAB.

Module II **23 Hours**

ARM Architecture: Architecture - memory organization - addressing modes -The ARM Programmers model –Registers - Pipeline – Interrupts - Coprocessors - Interrupt Structure

Arm Cortex: Understanding STM32 Microcontrollers. STM32 Family Overview. ARM Cortex-M Core Architectures.

Peripherals of PIC and ARM Microcontroller: PIC: ADC, DAC and Sensor Interfacing -Flash and EEPROM memories. ARM: I/O Memory -EEPROM - I/O Ports - SRAM - Timer -UART – Serial Communication with PC - ADC/DAC Interfacing-Case study: thin-film-transistor liquid-crystal display (TFT LCD)

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Design and implement real-time applications using the PIC microcontroller	Apply
CO 2: Analyze the PIC microcontroller to develop assembly and C language programs for various applications	Analyze
CO 3: Analyze the architecture and functionality of the STM32 microcontroller family to evaluate their suitability for embedded system applications	Analyze
CO 4: Explore and integrate peripherals such as UART, EEPROM, SRAM, and timers with the ARM microcontroller to implement advanced serial communication and data acquisition systems	Analyze
CO 5: Work as a team and make an oral presentation for real- time applications using appropriate tools.(for internal assessment only)	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-	3	-
CO5	-	-	-	-	2	-	-	-	2	2	-	2	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey ' PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education 2008

T2. Steve Furber, 'ARM system on chip architecture', Addision Wesley,2010

Reference Book(s):

R1. Discovering the STM32 Microcontroller, Geoffrey Brown, Indiana University,2016

R2. John Iovine, 'PIC Microcontroller Project Book ', McGraw Hill 2000

R3. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield 'ARM System Developer's Guide Designing and Optimizing System Software', Elsevier 2007.

Web References:

1. https://archive.org/details/microcontrollerp0000ibra/page/n1/mode/2up
2. https://archive.nptel.ac.in/courses/108/105/108105102/#.

Course Code: 23ECL501		Course Title: Embedded Microcontroller Laboratory	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on Microcontroller programming and its natural process of learning through interactive programming methods.

List of Experiments:

1. Arithmetic Operations using PIC16/18F assembly language programming
2. Sorting/ Searching of Data using PIC16/18F assembly language programming
3. Stepper Motor interfacing with PIC16/18F
4. ADC /DAC interfacing with PIC16/18F
5. Asynchronous serial communication using PIC16/18F Microcontroller
6. Seven segment display using PIC16/18F Microcontroller
7. LCD,LED, Switch ,Buzzer interfacing with LPC2148 ARM processor
8. Generation of PWM Signal and Relay interfacing with LPC2148 ARM processor
9. CAN protocol/ I2C Based 2 digit 7 Segment display interface using STM32-32bit ARM Cortex M4
10. Development of Real-World Applications Using PIC/ARM Microcontrollers

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Develop assembly language program using PIC instructions for a given operation.	Apply
CO 2: Use a tool to simulate the program for on-chip peripherals of the given processor for the given specifications	Apply
CO 3: Engage as an individual and Conduct experiment to Interface the given processor with an external device and verify its functionality for real time problems.	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	2	-	-	-	-	2	-	-	-	-
CO3	-	-	-	3	-	-	-	-	3	-	-	3	2	2

High-3; Medium-2; Low-1

References:

R1.Laboratory manual, prepared by the department

R2. Microcontroller Theory and Applications with the PIC18F" by M. Rafiquzzaman

R3. "Embedded Systems: Introduction to ARM Cortex-M Microcontrollers" by Jonathan W. Valvano

Course Code: 23ESL501		Course Title: Professional Skills 4: Communication Skills and Interview Essentials (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Introductory	
L:T:P(Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours:30	Max Marks:100

Course Objectives:

The course is intended to equip students with the necessary skills to effectively communicate in various professional settings and excel in the interview process

Module I **15 Hours**

Resume Building & Portfolio Management

Importance of a Strong Resume - Resume Content Development & Core Components – Formatting and Design - Tailoring and Customization – Proofreading - Portfolio Content, design and Structure : Components & Efficient portfolios – Preparing and Maintaining documents for interview – maintaining repositories - Enhancing Personal Brand - Digital Tools and Platforms

Interview - Dress code, Body Language and Grooming

Dress Code Essentials - Body Language – Facial expression, eye contact, gesture, posture, touch behavior & space- Personal Grooming

Effective Communication

Communication in Diverse Contexts - Presentations – Individual and group presentations - Public Speaking - Visual Aids and Presentation Tools

Module II **15 Hours**

Group Discussion

Introduction & types of Group Discussion – Prerequisites of GD – Techniques and tips of GD - Role of GDs in various professional contexts – GD Etiquettes – Strategies to enhance GD – Mock GD.

Interview Skills

Purpose of an interview - Types of Interviews –Interview Techniques – Interview Etiquette - Planning and Preparation - Mock Interviews with Feedback - Post-Interview Etiquette and Follow-Up

Activities:

Building Portfolio: Resume Building, Updating LinkedIn, Maintaining Repositories.

Effective Presentation:

Oral Presentation: Impromptu speech, Mini Presentation, Picture Perception (Both Speaking and Writing)

Visual presentation: Power Point Presentation, Vlog

Group Discussion: General, Technical

Mock Interview: General, Technical

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Communicate effectively and exhibit required competency in various professional environments and demonstrate proficiency in interview process.	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	3	3	-	1	-	-

High-3; Medium-2; Low-1

Textbook(s):

T1. Ashraf Rizvi, "Effective Technical Communication" 2nd Edition, McGraw-Hill India, 2018

T2. Pease, Allan, and Barbara Pease. "The Definitive Book of Body Language." Bantam, 2006.

Reference Book(s):

R1. Cheryl Hamilton, “Communicating for Results: A Guide for Business and the Professions”, 11th edition (1 January 2017), Wadsworth Publishing Co Inc.

R2. Whitcomb, Susan Britton. Resume Magic: Trade Secrets of a Professional Resume Writer. JIST Works, 2010.

R3. Carnegie, D. (2009). The Quick and Easy Way to Effective Speaking. Pocket Books.

Web References:

1 https://www.linkedin.com/pulse/interview-etiquette-dos-donts-interviews-brian-vander-waal-fmy8e/

2 https://www.simplilearn.com/group-discussion-tips-article

SEMESTER VI

Course Code: 23ECT601		Course Title: VLSI System Design	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 3: 0:0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on concepts of MOS transistor, CMOS processing technologies, layout design rules, I-V characteristics and examine different circuit families and datapath subsystems.

Module I **23 Hours**

MOS Transistor and CMOS Processing Technology

MOS Transistors, CMOS Logic-Inverter, NAND Gate, Combinational Logic, Pass Transistors, Transmission Gates, Multiplexers, Latches and Flip-Flops. CMOS Fabrication – Inverter Cross-section, Fabrication Process- n-well process, p-well process, twin-well process.

Layout Design Rules and I-V Characteristics

Layout Design Rules-Well Rules, Transistor Rules, Contact Rules, Metal Rules, Via Rules Gate Layout, Stick Diagrams, VLSI Design Flow, Ideal I-V Characteristics, C-V Characteristics, Non ideal I-V effects- Channel Length Modulation, Body Effect, Sub threshold Conduction, Junction Leakage

Module II **22 Hours**

Circuit Characterization and Combinational Circuit Design

Delay Estimation, Logical Effort and Transistor Sizing, Power Dissipation. Combinational Circuit Design – Static CMOS, Ratioed Circuits- Pseudo nMOS, Cascode Voltage Switch Logic, Dynamic Circuits – Domino Logic, Dual-rail Domino Logic. Pass-transistor Circuits-CMOS with Transmission Gates, Complementary Pass-transistor Logic.

Sequential Circuit Design and Datapath Subsystems

Sequencing static circuits-Sequencing Methods, Max-Delay Constraints, Min-delay Constraints, Clock Skew, Conventional CMOS Latches, Conventional CMOS Flip-flops, Pulsed Latches, Differential Flip-flops. Subsystems-Single-bit Addition, Carry-propagate Addition- Carry-ripple Adder, Carry Generation and Propagation, Carry skip Adder, Carry look ahead Adder, Memory Architectures.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1.Model MOS transistors and utilize different CMOS processing technologies.	Apply
CO2. Apply lambda based design rules and construct I-V characteristics of MOS transistors.	Apply
CO3.Develop combinational circuits using different logic techniques and identify various performance parameters.	Apply
CO4.Examine the sequential static circuits and different architectures of datapath sub systems.	Analyze
CO5. Design and implement digital and analog VLSI circuits using industry-standard tools, demonstrating proficiency in schematic creation, simulation, and layout design through project-based assignments.(Internal assessment only)	Create

Course Articulation matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	2	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-	-	3
CO5	-	-	-	-	3	-	-	2	2	-	2	-	-	-

High-3; Medium-2; Low-1-

Text Book(s):

T1. Neil H E.Weste, David Harris, Ayan Banerjee , “CMOS VLSI Design ”, Pearson , Third Edition, 2016.

T2. Jan M.Rabaey, Anantha Chandrakasan, Borivoje Nikolivc, ”Digital Integrated Circuits”, Pearson Education, Second Edition, 2016..

Reference Book(s):

R1. Kamran Eshragian, Douglas A.Pucknell,Sholeh Eshraghian, “Essentials of VLSI Circuits and Systems”, PHI , First Edition 2005.

R2. Adel S.Sedra, Kenneth C.Smith, “Microelectronic Circuits”, Seventh Edition, Oxford University Press, 2017.

Web References:

1. https://www.youtube.com/playlist?list=PL018645397D9487AF
2. https://www.youtube.com/playlist?list=PLBDB2c4Mp7hBLRcEpE19yyHB-zKzsyp_4
3. http://digimat.in/nptel/courses/video/108107129/L01.html

Course Code: 23ECI601		Course Title: Computer Communication Networks	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 3:0:2	Credits: 4	Total Contact Hours: 75	Max Marks: 100

Course Objectives:

The course is intended to impart knowledge on computer networking by exploring the functions of the physical, data link, network, transport, and application layers. The course emphasizes network protocols, performance metrics, routing techniques, and quality of service.

Module I **22 Hours**

Physical Layer: Data Communications – Network Edge - Network Core – Performance metrics - Networks models: OSI model – TCP / IP protocol suite – Addressing – Transmission Media: Twisted pair, Coaxial Cable.

Data Link layer: Framing – Flow Control and Error control techniques: Stop and wait – Go back N ARQ – Selective repeat ARQ – sliding window techniques – Multiple Access Techniques: Random access protocol, Controlled access protocol – Ethernet: IEEE 802.3 – Wireless LANS: IEEE802.11.

Network Layer: Internetworking devices: hub, repeater, bridge, switch, router, Gateway – Basic Internetworking (IP, ARP, DHCP, ICMP), IPV4, IPV6 – Routing: Link State Routing, Distance Vector Routing

Module II **23 Hours**

Transport Layer: Process – to – Process delivery – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control -Quality of services (QoS) – Techniques to improve QoS– Integrated Services – Differentiated Services.

Application Layer: Traditional Applications: Domain Name System (DNS) – E-mail (MIME, SMTP, POP3, IMAP) – WWW – HTTP – SNMP – Telnet.

List of Experiments: **30 Hours**

Perform the following experiments

1. Construct a wireless LAN network and allow PCs to communicate wirelessly.
2. Design a simple network for data transfer using switch or router.
3. Design a simple LAN and understand the operations of Address Resolution Protocol.
4. Implementation of WiFi Networks
5. Simulation and comparison of routing protocols for MANET mobility model

6. To understand the operation of TELNET by accessing the router in server room from a PC in IT office.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO 1: Apply fundamental networking concepts to configure network components and implement OSI and TCP models with a suitable transmission media, error free flow control mechanisms for efficient data communication	Apply
CO 2: Identify suitable routing algorithms for efficient network traffic management in IPV4 and IPV6 networks	Analyze
CO 3: Design congestion control mechanisms and their impact on network performance for flow based and class-based models.	Create
CO 4: Analyze the functionalities, network management and security implications of application-layer protocols in network communication.	Analyze
CO 5: Engage as an individual or team to conduct simulation of the operation and performance of wired and wireless networks with appropriate routing protocols, troubleshoot connectivity of a small network using a networking tool.	Analyze

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO5	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	3	-	2	-	3	3	-	3	2	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Behrouz A. Forouzan, —Data communication and Networking‖, 4th edition, Tata McGraw-Hill, 2007

T2. James .F. Kurose & Keith W. Ross, —Computer Networking: A Top down Approach Featuring the Internet‖, 3rd Edition, Pearson Education, 2007

Reference Book(s):

R1. Andrew S. Tanenbaum, —Computer Networks‖, Pearson Education, 4th Edition, 2003.

R2. Larry L.Peterson and Peter S. Davie, —Computer Networks‖ 4th edition, Harcourt Asia Pvt. Ltd, 2007.

R3. Introduction to Networks Companion Guide, Cisco Networking academy, cisco press,2014

Web References:

1.https://nptel.ac.in/courses/106/105/1061051832

2.https://www.computernetworkingnotes.com/ccna-study-guide/download-packet-tracer-for-windows-and-linux.html

3. http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf

Course Code: 23ECT602		Course Title: Antenna and Wave Propagation	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 3:0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on fundamental concepts of antennas, antenna arrays, analysis and design of different types of antennas for the given application and propagation of radio waves in free space.

Module I **22 Hours**

Antenna Fundamentals and Dipole Antennas: Fundamental Concepts - Concept of radiation, Radiation pattern, near-and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Beamwidth, Friis transmission equation, Radiation from Diploe antennas - Principle of Loop antenna.

Antenna Arrays: Types of antenna arrays - Broadside array, End fire array, Hansen-Woodyard end fire array, Parasitic array and Binomial array.

Aperture and Reflector Antennas: Huygen's Principle - radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and Cassegrain antennas.

Module II **23 Hours**

Broadband Antennas: Log-periodic, Rhombic antennas, Helical and broadcast antennas.

Special antennas: Microstrip antennas - Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas. Smart Antennas- concepts and benefits of smart antennas, fixed-weight beam forming and adaptive beam forming.

Radio Wave Propagation: Ground wave propagation - Attenuation characteristics for ground wave propagation – wave tilt. Sky wave Propagation - Structure of ionosphere – Critical frequency – Virtual height – skip distance – Refractive index. Space wave propagation - Calculation of LOS distance and field strength at a distance - Duct Propagation.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Design the different types of antennas based on their characteristics for the given applications	Apply
CO 2: Analyze an appropriate antenna array using their field patterns and directivity	Analyze
CO 3: Investigate different modes of propagation and their suitability for wireless communication	Analyze
CO 4: Simulate and conduct experiments in teams involving the design of special antennas using the simulation tools (Internal assessment only)	Evaluate

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	1	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	1	-
CO4	-	-	-	3	3	-	-	-	1	-	-	1	1	-

High-3; Medium-2;Low-1

Text Book(s):

T1. John D. Kraus, Ronald J. Marhefka and Ahmad S. Khan, “Antennas and Wave Propagation”, 5th Edition, McGraw Hill Education, 2017

T2. Edward C. Jordon and Keith G. Balmain, “Electromagnetic Waves and radiating systems”, 2nd Edition, Pearson Education, 2015

Reference Book(s):

R1. Balanis, C.A, “Antenna Theory and Applications”, 4th Edition, John Wiley & Sons, 2021

R2. Collin R.E, Antennas and Radio Wave Propagation”, 4th Edition, McGraw – Hill Inc, 1985

R3. Warren L. S. and Gary A.T., “Antenna Theory and Design”, Second Edition, John Wiley & Sons, 2009

Web References:

1. https://nptel.ac.in/courses/108/101/108101092/
2. https://nptel.ac.in/courses/117/101/117101056/
3. https://www.ll.mit.edu/outreach/adaptive-antennas-and-phased-arrays-online-course

Course Code: 23ECL601		Course Title: VLSI System Design Laboratory	
Course Category: Major		Course Level: Higher	
L:T:P(Hours/Week) 0:0:3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Course Objectives:

The course is intended to impart knowledge on design, simulation and physical design implementation of combinational circuits, sequential circuits using electronic design automation tools and FPGA implementation of adders and finite state machines.

List of Experiments:

1. Design and Simulation of Inverter.
2. Design and Simulation of basic gates –AND, OR, NAND, NOR.
3. Design and Simulation of Flip Flops – SR, JK, D and T.
4. Design and Simulation of 4-bit Adder.
5. Design and Simulation of carry look ahead adder.
6. Design, Simulation and report generation (timing, area and power) of 4-bit synchronous counter.
7. Design, simulation and report generation of sequence detector (Finite State Machine).
8. Design and simulation of ALU – perform ADD, SUB,AND, OR, 1's and 2s complement, Multiplication and Division.
9. Physical Design Implementation of Inverter.
10. Physical Design Implementation of synchronous counter.
11. FPGA Implementation of Adders and Subtractors.
12. FPGA Implementation of Finite state machine using Sequential Circuit.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Simulate different logic circuits with identification of circuit performance metrics using EDA tools.	Apply
CO 2: Examine the semi-custom flow for VLSI physical design of integrated circuit chip.	Analyze
CO3: Design digital circuits with HDL and implement using FPGA development boards.	Create

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	2	2	-	-	2	-	2
CO3	-	-	3	-	-	-	-	-	-	-	-	-	2	-

References:

R1. Laboratory manual, prepared by the department

R2. Samir Palnitkar, “VERILOG HDL – A Guide to Digital Design and Synthesis” , Second Edition, Pearson, 2003.

R3. Thomas & Moorby’s ,”The Verilog Hardware Description Language”, Fifth Edition, Springer, 2008.

Course Code:23ESL601		Course Title: Professional Skills 5: Campus to Corporate (Common to all B.E/B.Tech Programmes)	
Course Category: SEC		Course Level: Higher	
L:T:P (Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours: 30	Max Marks: 100

Course Objectives:

To enhance students' problem-solving skills in the aptitude segment while also equipping them with effective communication skills for professional settings and success in the interview process.

Module I Verbal Ability & Effective Communication **15 Hours**

Verbal Ability

Parts of Speech – Tenses – Subject Verb Agreement – Synonyms – Antonyms – Idioms and Phrases - One Word Substitution – Reading Comprehension – Cloze test – Error Spotting.

Verbal Enhancement

Self-Introduction – Just A Minute- Picture Perception - Writing Skills: Sentence Types (Simple, Compound, Complex), Email drafting.

Campus to Corporate

Professional Grooming –Group Discussion – Impromptu – Interview.

Module II Quantitative & Reasoning Ability **15 Hours**

Quantitative Ability

Simplification & Approximation, Number System, Percentage, Averages, Ratios and Proportion, Ages, Profit & Loss, Interest Calculation, Time and work, Time, speed and distance, Clocks and Calendar, Mixtures and alligation, Permutations and Combinations, Probability, Mensuration, Data Interpretation, Data Sufficiency

Reasoning Ability

Seating Arrangement, Blood relations, Directions Problems, Syllogisms, Number & Alpha Series, Coding and Decoding, Non Verbal Reasoning, Analogies, Cubes and Dices.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Exhibit strong problem-solving skills in the aptitude segment while enhancing their communication abilities for professional settings, enabling them to excel in interviews and placement processes.	**Apply**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	3	3	-	1	-	-

High-3; Medium-2; Low-1

Textbook(s):

T1: Technical Communication, 3E: Principles and Practice book. Authors. Meenakshi Raman, Sangeeta Sharma, 2006

T2: Pease, Allan, and Barbara Pease. "The Definitive Book of Body Language." Bantam, 2006.

T3: Dr. R. S. Aggarwal. “Quantitative Aptitude for Competitive Examinations” Sultan Chand & Sons Pvt. Ltd, New Delhi, 2024

T4: Dr. R. S. Aggarwal. “A Modern Approach to Verbal and Non-Verbal”, Sultan Chand & Sons Pvt. Ltd, New Delhi, 2024

Reference Book(s):

R1: Cheryl Hamilton, “Communicating for Results: A Guide for Business and the Professions”,

R2: Whitcomb, Susan Britton. Resume Magic: Trade Secrets of a Professional Resume Writer. JIST Works, 2010.

R3: Carnegie, D. (2009). The Quick and Easy Way to Effective Speaking. Pocket Books.

R4: Arun Sharma. “Quantitative Aptitude for Common Aptitude Test”, McGraw Hill Publications, 5th Edition, 2020

R5: Arun Sharma. “Logical Reasoning for Common Aptitude Test”, McGraw Hill Publications, 6th Edition, 2021.

Web References:

1. https://www.linkedin.com/pulse/interview-etiquette-dos-donts-interviews-brian-vander-waal-fmy8e/
2. https://www.simplilearn.com/group-discussion-tips-article
3. https://talentbattle.in
4. https://www.geeksforgeeks.org/aptitude-questions-and-answers/