Curriculum and Syllabi

Semesters I to IV

Regulations 2023

(2024 Batch Onwards)

Programme: B.E. Electronics Engineering (VLSI Design and Technology)
Curriculum and Syllabi: Semester I to IV
Recommended by Board of Studies on: 16.12.2024
Approved by Academic Council on: 03.01.2025

Action	Responsibility	Signature of Authorized Signatory
Designed and Developed By	B.E. Electronics Engineering (VLSI Design and Technology)	
Compiled By	Office of Controller of Examination	
Approved By	Principal	

Department of B.E. Electronics Engineering (VLSI Design and Technology)

Vision

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

Mission:

In order to foster growth and empowerment, we commit ourselves to

- Impart high quality technical education in Electronics and Semiconductor 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 with updated facilities to pursue research through creative thinking and team work.

Programme Educational Objectives (PEOs)

B.E. Electronics Engineering (VLSI Design and Technology) graduates will:

PEO1.Technical Expertise: Acquire a professional career and personal development in industries / higher studies / research assignments / entrepreneurs.

PEO2.Life-long learning: Sustain to develop their knowledge and skills throughout their career.

PEO3. Ethical Knowledge: Exhibit professionalism, ethical attitude, communication skills, team work and adapt to Current trends.

Programme Outcomes (POs) - Regulations 2023

On successful completion of B.E. Electronics Engineering (VLSI Design and Technology) programme, graduating students/graduates will be able to:

PO1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2. 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.

PO3. 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.

PO4. 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 for complex problems.

PO5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. 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.

PO7. 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.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

Programme Specific Outcomes (PSOs)
On successful completion of B.E. Electronics Engineering (VLSI Design and Technology) programme, graduating students/graduates will be able to:

PSO1. Design and Implementation of VLSI Circuits: Design and implement VLSI circuits utilizing appropriate design methodologies and optimization techniques.

PSO2. IC Design: Design ICs with optimal performance, power consumption, and area utilization, considering factors such as noise, timing constraints, and signal integrity.

Dr. Mahalingam College of Engineering and Technology, Pollachi
2023 Regulation - 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
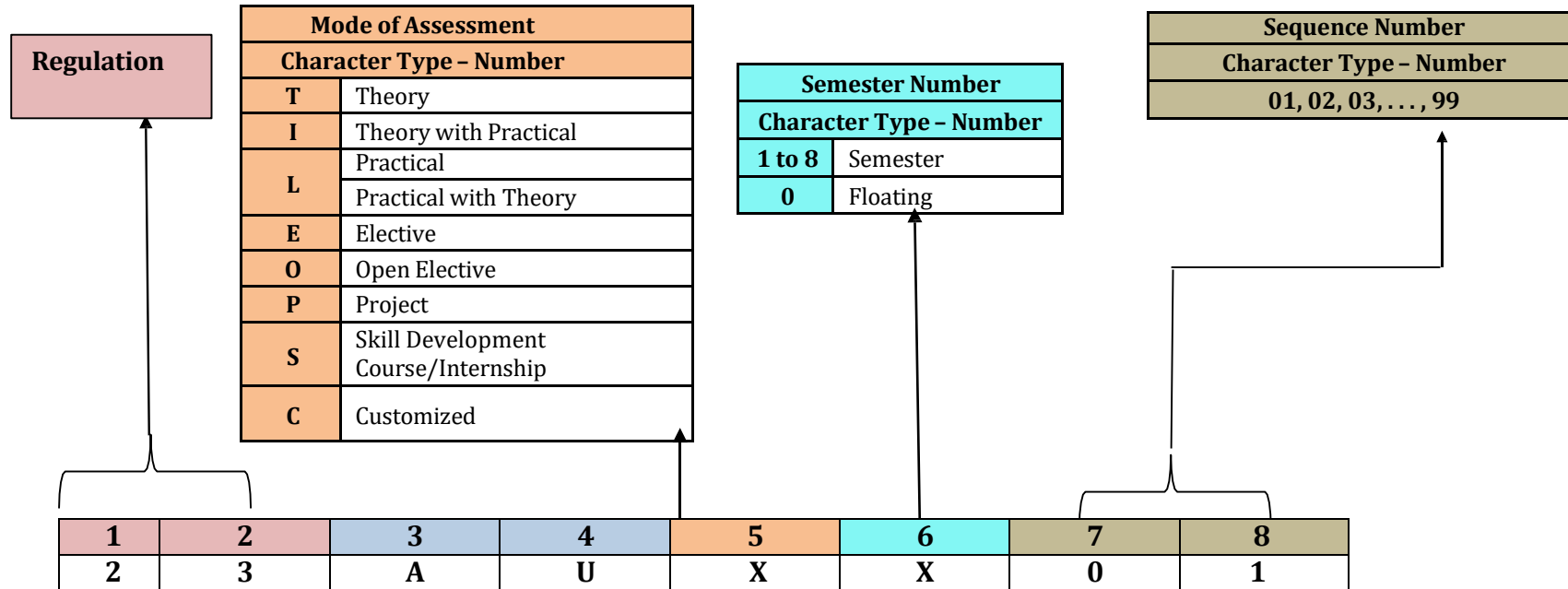
| Board/Department/Programme/Course Type			
Character Type – Alphabet			
AD	Artificial Intelligence & Data Science	ME	Mechanical
AM	CSE (Artificial Intelligence & Machine Learning)	SC	CSE (Cyber Security)
AU	Automobile	PH	Physics
CE	Civil	CH	Chemistry
CS	Computer Science	EN	English
EA	Advanced Communication 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		
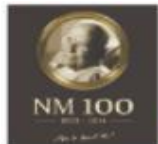
Programme: B.E. Electronics Engineering
(VLSI Design and Technology)
2023 Regulations
(From 2024 Batch Onwards)
Curriculum for Semester I to IV

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 L	T	P	Credits	Marks	Common to Programmes
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	23PHI101	Semiconductor Physics	3	0	2	4	100	-
Major	23EVI101	Electron Devices and Applications	3	0	2	4	100	-
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	தமிழர் மரபு / Heritage of Tamils	1	0	0	1	100	All
AEC	23SAL101	Studio Activities	0	0	2	-	-	All
		Total	**15**	**0**	**15**	**21.5**	**800**	-

Semester II

Course Category	Course Code	Course Title	Hours/ Week L	T	P	Credits	Marks	Common to Programmes
AEC	23ENI201/ 23FLT201/ 23FLT202	Communication Skills II	2	0	2	3	100	All
		Foreign Language-Japanese	3	0	0			
		Foreign Language-German	3	0	0			
Minor	23MAI202	Complex Variables and Transforms	3	0	2	4	100	AU, EC, EE,EV & ME
Minor	23CHI202	Chemistry for Electronics Engineering	3	0	2	4	100	-
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, CS, EA,EC,EE,EV,IT & SC
SEC	23ESL201	Professional Skills 1: Problem solving skills and Logical Thinking 1	0	0	2	1	100	All
VAC	23VAT201	தமிழரும் தொழில் நுட்பமும்/ 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	**14**	**0**	**13**	**18.5**	**800**	-

Semester III

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAI301	Numerical Techniques and Linear Algebra	3	0	2	4	100	-
Major	23EVT301	Digital Electronics	3	0	0	3	100	-
Major	23EVT302	Analog Electronics	3	0	0	3	100	-
Major	23EVT303	Circuit Theory and Network analysis	3	0	0	3	100	-
Multi-Disciplinary	23EVI301	Data Structures and Algorithms using Python	2	0	2	3	100	-
Major	23EVL301	Digital IC Laboratory	0	0	3	1.5	100	-
Major	23EVL302	Analog Electronics 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	**16**	**1**	**14**	**23**	**900**	**-**

Semester IV

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Minor	23MAI401	Probability Theory and Statistics	3	0	2	4	100	-
Major	23EVT401	Linear Integrated Circuits	3	0	0	3	100	-
Major	23EVT402	Signals and systems	3	1	0	4	100	-
Major	23EVI401	Fundamentals of VLSI	3	0	2	4	100	-
Major	23EVT403	Microprocessors and Microcontrollers	3	0	0	3	100	-
Major	23EVL401	Microprocessors and Microcontrollers Laboratory	0	0	4	2	100	-
Major	23EVL402	Linear Integrated Circuits Laboratory	0	0	4	2	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**	**16**	**23**	**800**	**-**

Course Category	Course Code	Course Title	Duration	Credits	Marks	Common to Programmes
SEC	23XXXXXX	Internship – 1 / Community Internship / Skill Development	2 Weeks - 4 Weeks	1	100	-

Tentative Curriculum for Semester V to VIII
Semester V

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXX	FPGA Based System Design	3	0	0	3	100	-
Major	23XXXXX	Control System	3	1	0	4	100	-
Major	23XXXXX	Digital Signal Processing	3	0	0	3	100	-
Major	23XXXXX	Professional Elective - I	3	0	0	3	100	-
Major	23XXXXX	Professional Elective - II	3	0	0	3	100	-
Major	23XXXXX	FPGA Based System Design Laboratory	0	0	3	1.5	100	-
Major	23XXXXX	Digital Signal Processing Laboratory	0	0	3	1.5	100	-
SEC	23ESL501	Professional Skills 4: Communication Skills and Interview Essentials	0	0	2	1	100	All
Project	23XXXXX	Reverse Engineering Project	0	0	6	3	100	All
AEC	23SAL501	Studio Activities	0	0	2	-	-	All
		Total	**15**	**1**	**16**	**23**	**900**	**-**

Semester VI

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	CMOS Analog IC Design	3	0	0	3	100	-
Major	23XXXXXX	ASIC Design	3	0	0	3	100	-
Minor	23XXXXXX	Low Power VLSI Design	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	23XXXXXX	CMOS Analog IC Design Laboratory	0	0	3	1.5	100	-
Major	23XXXXXX	ASIC 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**	**10**	**22**	**900**	**-**

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

Semester VII

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	VLSI Technology	3	0	0	3	100	-
Major	23XXXXXX	Mixed Signal IC Design	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	-
Major	23XXXXXX	PCB design Laboratory	0	0	4	2	100	
Major	23XXXXXX	Mixed Signal IC Design Laboratory	0	0	4	2	100	-
Project	23XXXXXX	Project Phase – I	0	0	8	4	100	-
		Total	**15**	**1**	**16**	**23**	**800**	**-**

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	**6**	**0**	**16**	**10**	**300**	**-**

Total Credits: 166

Vertical wise Electives

Vertical I - Analog VLSI Design

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	Active Filters	3	0	0	3	100	-
Major	23XXXXXX	Design of CMOS Phase Lock Loop	3	0	0	3	100	-
Major	23XXXXXX	High Speed Interconnects for VLSI design	3	0	0	3	100	-
Major	23XXXXXX	Art of Analog Layout design	3	0	0	3	100	-

Vertical II - Digital VLSI Design

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	Digital IC Design	3	0	0	3	100	-
Major	23XXXXXX	VLSI Digital Signal Processing	3	0	0	3	100	-
Major	23XXXXXX	Scripting Language for Electronic Design Automation	3	0	0	3	100	-
Major	23XXXXXX	Memory Devices and Circuits	3	0	0	3	100	-
Major	23XXXXXX	Verification Methodologies	3	0	0	3	100	-

Vertical III - VLSI Applications

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	VLSI Architectures for Image and Video Processing	3	0	0	3	100	-
Major	23XXXXXX	VLSI design of Neural Networks	3	0	0	3	100	-
Major	23XXXXXX	VLSI for wireless Communications	3	0	0	3	100	-
Major	23XXXXXX	Integrated Circuits for Optical Communication	3	0	0	3	100	-

Vertical IV - Fabrication and Advanced design Techniques

Course Category	Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
			L	T	P			
Major	23XXXXXX	Microchip fabrication	3	0	0	3	100	-
Major	23XXXXXX	Power management and clock distribution	3	0	0	3	100	-
Major	23XXXXXX	Reliability in VLSI circuits	3	0	0	3	100	-
Major	23XXXXXX	Synthesis and optimization of VLSI circuits	3	0	0	3	100	-
Major	23XXXXXX	IP core design and protection	3	0	0	3	100	-
Major	23XXXXXX	Electronics Packaging	3	0	0	3	100	-
Major	23XXXXXX	Thin Film Characterization	3	0	0	3	100	-

SEMESTER 1

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	PO10	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 At the end of this course, students will be able to:	Cognitive Level
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", 5[th]Edition, Cambridge University Press, South Asia Edition, 2022.

T2. Jack C. Richards, Jonathan Hull, and Susan Proctor, "Interchange - Student's Book 1", 5[th]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: 23PHI101		Course Title: Semiconductor Physics	
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 fundamentals of semiconductor physics and discuss the working and applications of few basic devices.

Module I   22 Hours

Semiconductors: Energy Band and Charge Carriers: Energy bands in semiconductors, Types of semiconductors, Charge carriers, Intrinsic and extrinsic materials. Carrier concentration: Fermi Level, Electron and hole concentration equilibrium, Temperature dependence of carrier concentration, Compensation and charge neutrality. Conductivity and mobility, Effect of temperature, Doping and high electric field.

Optical Excitation in Semiconductor: Optical absorption, carrier generation, Carrier life time, diffusion length and photo conductivity, Direct and indirect recombination and trapping, Photoconductive devices. Diffusion of carriers, Einstein relation, Continuity equation, Carrier injection, Diffusion length. Haynes-Shockley experiment.

Module II   23 Hours

Junctions: p-n junction and contact potential, Fermi levels, Space charge, Reverse and Forward bias, Zener and Avalanche breakdown. Capacitance of p-n junction, Schottky barriers; Schottky barrier height, C-V characteristics, current flow across Schottky barrier: thermionic emission, Rectifying contact and Ohmic contact.
Photonics: LED: Radiative transition, Emission spectra, Luminous efficiency and LED materials, Solar cell and photodetectors: Ideal conversion efficiency, Fill factor, Equivalent circuit, V_{oc}, I_{sc} and Load resistance, Spectral response. Reverse saturation current in photodetector.

List of Experiments (any six experiments)   **30 Hours**

1. Determination of band gap of semiconductor
2. Determination of resistance illumination characteristics of LDR
3. V-I Characteristics of PN Junction diode
4. V-I Characteristics of Zener diode
5. V-I Characteristics of LED
6. V-I Characteristics of Solar cell
7. V-I Characteristics of Photodiode

Course Outcomes	Cognitive
At the end of the course students will able to	Level
CO1: **Interpret** the basic properties of semiconductors including the band gap, charge carrier concentration, doping and charge carrier injection/excitation.	Apply
CO2: **Adapt** the fundamentals of semiconductors in explaining the design consideration and working of p-n junctions.	Apply
CO3: **Utilize** the concept of p-n junction in the design considerations and working of the various photonic devices like LEDs, solar-cells and photodetectors.	Apply
CO4: **Conduct, analyze and interpret** the data and results from the various 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	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2;Low-1

Textbooks:

T1. B. G. Streetman and S. K. Banerjee, "Solid State Electronics", Pearson, 7th Edition, 2016.

T2. S.M. Sze and Kwok K. Ng, "Physics of Semiconductor Devices", John Wiley, 3rd Edition, 2015.

Reference Book(s):

R1. M.S. Tyagi, "Introduction to semiconductor materials and devices", John Wiley, 2008.

R2. Umesh K. Mishra, and Jaspreet Singh, "Semiconductor Device Physics and Design", Springer, 2007.

R. F. Pierret, "Semiconductor Device Fundamentals", Pearson Education Inc., 2006.

Web References:

1. https://archive.nptel.ac.in/courses/108/108/108108122/

2. https://www.udemy.com/course/semiconductors-vlsi/?couponCode=IND21PM

3. https://vlab.amrita.edu/?sub=3&brch=269&sim=1371&cnt=1

Course Code:23EVI101		Course Title: Electron Devices and Applications	
Course Category: Major		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours: 75	Max Marks:100

Course Objective:

The course is intended to impart knowledge of basic electronic devices such as diodes, Bipolarjunction Transistors and Field Effect Transistors with its applications.

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.

                                                                                                          22 Hours

Module II

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 : 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.

List of Experiments: **30 Hours**

1.Half wave and Full wave Rectifier circuits

2.Regulator using Zener diode

3.Wave shaping circuits: Clippers and clampers

4.Characteristics of Common Emitter configuration

5.Characteristics of Common Base configuration

6.FET characteristics and its application as a switch.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Utilize the characteristics of PN diode to extract its resistance and various capacitances.	Apply
CO 2: Use PN junction and special diodes to design waveshaping circuits and voltage regulators.	Apply
CO 3: Utilize the charcateristics of BJT and MOSFETs to design switches and amplifiers.	Apply
CO 4: Design rectifiers, voltage regulators and wave shaping circuits using PN and special diodes (for laboratory components only).	Apply

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	-	-	2	-	-	-	3	-	-	-	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Millman J. , Halkias C. C. "Electronic Devices and Circuits ",4th edition Tata McGraw Hill, New Delhi, 2011.

Reference Book(s):

R1. Salivahanan.S, Suresh kumar.N and Vallavaraj.A, "Electronic Devices and Circuits", 2nd edition, TMH, New Delhi, 2008.

R2. Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory", Pearson Prentice Hall, 10th edition, 2008.

R3. Streetman Ben G. and Banerjee Sanjay, "Solid State Electronic devices", PHI, 6th dition, 2006

R4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th 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: **45 Hours**

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.2 இந்திய 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, கையெ முத்துப் 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 2

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	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	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
- Find gradient of a given scalar function, divergence and curl of a vector function. - Verify Green's theorem in a plane. - Graphically plot time and frequency domain of standard functions and compute Laplace transform of In- built functions. - Find the Fourier series of a periodic function. - 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: 23CHI202	Course Title: Chemistry for Electronics Engineering		
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 and Batteries, Lithium-ion battery, Corrosion and its control, Spectroscopic technique, E – Waste Management and Nanomaterials.

Module: I   **23 Hours**

Battery Chemistry: Basic working principle and terminologies in Battery Chemistry - Oxidation and reduction - types of batteries -Characteristics of batteries – Lead Acid battery. Fuel cells: Construction, working and applications – Hydrogen Oxygen fuel cell.

Lithium-ion battery: Introduction-Components of lithium battery, types - (LFP-NMC-NCA-LMO-LCO-LTO) and characteristics- Comparison of different types of Lithium battery. Applications of Lithium-ion battery in mobile electronics.

Corrosion and its Control: Corrosion – Dry and wet 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

Module: II   **22 Hours**

Analytical Techniques: Spectroscopy- Electromagnetic spectrum, Absorption and Emission spectroscopy – Relationship between absorbance and concentration – Derivation of Beer-Lambert's law. UV - Visible Spectroscopy, Atomic Absorption Spectroscopy and Flame Photometry

Electronic Waste Management: Introduction- Concepts of e-waste management. Global context in e-waste; E-waste pollutants and hazardous properties, Effects of pollutant (E- waste) on human health and environment. E – Waste Management - Technology of disposal and Recovery of materials (Landfilling, Acid Bath, Incineration, Recycling and Reuse). Status of E-waste management in India.

Nanomaterials: Introduction - Difference between bulk and nanomaterials - Size dependent properties. Types of nano scale materials: Particles, clusters, rods, and tubes. Applications of nanomaterials.

LIST OF EXPERIMENTS (Any six experiments)   **30 Hours**

1. Estimation of Fe2+ by potentiometric titration.

2. Determination of corrosion rate by weight loss method.

3. Estimation of iron in water by spectrophotometry

4. Green Synthesis of Silver Nanoparticles by Neem leaf.

5. Conductometric titration of strong acid against strong base.

6. Determination of strength of acid by pH metry.

7. Performance analysis of battery.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand and explain the chemistry involved in Electrochemistry, Batteries, Corrosion, Spectroscopic techniques, E-waste management and Nanomaterials.	Understand
CO2: Apply the acquired knowledge of chemistry to solve the Engineering and environmental problems.	Apply
CO3: Apply the engineering problems through the concept of Electro chemistry, Batteries, Spectroscopic techniques, E- waste techniques 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.	Apply

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	-	-	-	-	-	-	-	-	-	-

High-3; Medium-2;Low-1

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.
T3. Hester R.E., and Harrison R.M, "Electronic Waste Management", Science, 2009

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.
R4. Fowler B, "Electronic Waste" – 1st edition (Toxicology and Public Health Issues), Elsevier, 2017

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: 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, CS, EA, EC, EE, EV, IT, & 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: 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 ஒ 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 மற்றும் 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	Cognitive Level
மாணவர்கள் இப்பாடத்தை கற்றபின்	
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 At the end of this course, students will be able to:	Cognitive Level
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 3

Course Code: 23MAI301	Course Title: Numerical Techniques and Linear Algebra		
Course Category: Minor	Course Level: Intermediate		
L:T:P(Hours/Week) 3:0 :2	Credits: 4	Total Contact Hours:75	Max Marks:100

Course Objectives:

This course is designed to give an overview of numerical methods and provide knowledge and skills needed to apply these tools and techniques for decision making in various fields of science and engineering.

Module I   **23 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 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 ofvectors – 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.

List of Experiments: **30 Hours**

1. Use python to solve system of linear equations using Gauss elimination method.
2. Use python to solve algebraic and transcendental equation by Newton Raphson method.
3. Use python to interpolate using Newton's forward and backward interpolation method.
4. Use python to solve first order ordinary differential equation using Range kutta methodof 4th order.
   Use python to find the basis of row space, column space and null space of a given matrix.
5. Use python to compute the inner product of two vectors and to check whether the given vectors are orthogonal.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Solve the system of linear equations, nonlinear equations & calculate the dominant Eigen value	Apply
CO2: Determine the unknown values from the given set of data & Compute derivatives and integrals.	Apply
CO3: Solve first order ordinary differential equation using Numerical Techniques.	Apply
CO4: Apply the concept of vector spaces and inner product spaces to produce orthogonal and orthonormal basis.	Apply
CO5: Apply the concepts of Numerical techniques and Linear Algebra to electrical and electronics engineering.	Apply
CO6: Apply the concepts of Numerical techniques using modern tools and report the result and inference. (For laboratory content only)	Apply

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	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	2	-	-	-	-	-	-	-	-	1	-	1	-	-
CO6	3	-	-	-	3	-	-	-	1	-	-	1	-	-

High-3; Medium-2;Low-1

Text Book(s):

T1. Grewal, B.S. and Grewal, J. S., "Numerical Methods in Engineering and Science",11th Edition, Khanna Publishers, New Delhi, 2013.

T2. Curtis F. Gerald, Patric.O. Wheatley, "Applied Numerical Analysis", 7th Edition, Pearson Education, Asia, New Delhi, 2009.

Reference Book(s):

R1. Steven Chopra, Raymond.P. Canale, "Numerical Methods for Engineers", 7th Edition, 2015.

R2. Jain M.K, Iyengar.S.R. K and Jain.R. K, "Numerical Methods for Scientific and Engineering Computation", 6th Edition, New Age Publishers, 2012.

R3. Gilbert Strang, "Linear algebra and its applications", 4th 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: 23EVT301		Course Title: Digital Electronics		
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 teach Boolean laws, simplification techniques and implement the same to design combinational, synchronous, and asynchronous sequential circuits. Moreover, the course imparts a knowledge on the design of various memory devices, shift registers.

Module I   **23 Hours**
Boolean Algebra: Basic theorems, Representation of Boolean function in canonical and standard forms- Karnaugh Map – Quine McClusky minimization technique (4-variable), Basic gates, Universal realisation. **Logic Families**: -Introduction - TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, CMOS- NAND, NOR realization. **Combinational logic circuits:** Half adder – Full Adder – Half subtractor - Full subtractor – Parallel binary adder - 2's complement subtraction using parallel adders - Multiplexer/Demultiplexer – decoder - encoder - code converters - Magnitude Comparator.

Module II   **22 Hours**
Synchronous Sequential Circuits: Flip-flop and Latch: SR latches - JK flip-flop, T flip-flop, D flip - flop - Master-slave JK flip-flop- Shift registers (SISO, SIPO, PISO, PIPO)-Universal shift register - Counters: - Mealy and Moore model – Design of Synchronous Counters-Modulus-n Counter -Up-Down counter- State Reduction- State assignment. **Asynchronous Sequential Circuits:** Design of asynchronous sequential circuits, Asynchronous / Ripple counters - FSM - Sequence detector - Vending Machine. **Memory and Logic Devices:** RAM Memory decoding-ROM - Basic concepts: - Programmable Logic Devices (PLDs): Basic concepts - PROM as PLD- Programmable Array Logic (PAL) -Programmable Logic Array – Case Studies on Digital system design.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Utilize logic minimization techniques to simplify Boolean expressions.	Apply
CO 2: Develop the combinational circuits using logic gates implementing Boolean simplification.	Apply
CO 3: Design the synchronous and asynchronous sequential circuits using basic Flip Flops.	Apply
CO 4: Design applications using memory logic devices.	Apply
CO 5: Apply the basic digital concepts in real world application and present a case study. (only for Assignment)	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. A.Anandkumar,"Fundamentals of digital circuits", 4th Edition, PHI Learning Pvt Ltd, 2016

T2. John F.Wakerly, "Digital Design Principles and Practice", Pearson Education,5th edition, 2018.

Reference Book(s):

R1.Malvino and Leach, "Digital Principles and Applications", Tata Mc Graw Hill, New Delhi,8th Edition, 2014.

R2.S.Salivahanan and S.Arivazhagan,"Digital Circuits and Design", Oxford University Press,5th Edition, 2018.

R3. Morris Mano.M.Michael D Ciletti,"Digital Design", Pearson Education, 4th Edition, 2008.

R4: John M.Yarbrough, "Digital Logic Application & Design", Thomson, 2010.

R5: Donald D.Givone,"Digital Principles and Design",TMH, 2003.

Web References:

1. https://nptel.ac.in/courses/117105080/

2. https://nptel.ac.in/courses/117106086/

Course Code: 23EVT302		Course Title: Analog Electronics	
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 design and analysis of amplifier and oscillator circuitsusing BJTs and MOSFETs.

Module I   **22 Hours**

BJTs: Biasing -Load line, operating point, biasing techniques, stability, Analysis of CE amplifier - Gain and frequency response – Small signal model –Estimation of gain, input and output resistance, Basic operation of CB, CC amplifier. **Feedback Amplifiers:** Advantages of negative feedback – Voltage / Current, Series, Shunt feedbackAmplifiers; Positive feedback–Condition for oscillations, Phase shift – Wien bridge, Hartley, Colpitt's and Crystal oscillators.

Module II   **23 Hours**

MOSFET: Analysis of CS amplifier - Load line, operating point, small signal model– Estimation of gain,input and output resistance, Basic operation of CG amplifier and Source follower. MOS Differential amplifier – Principle of operation, calculation of common mode gain and differential gain, slew rate, CMRR and ICMR. - Cascode and Cascade Amplifier. **Power Amplifiers**: Class A, B, AB- push-pull Complementary amplifier, C – Calculation of power efficiency and linearity issues.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO 1: Construct amplifier circuits using BJT and derive equations for gain, input and output resistance.	Apply
CO 2: Construct oscillator circuits using BJT.	Apply
CO 3: Develop the MOSFET amplifier circuits and derive equations for gain, input and output resistance.	Apply
CO 4: Develop MOSFET power amplifiers and compare the power efficiency.	Apply
CO5: Select suitable amplifiers and oscillators based on the application, and present a report or seminar.	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	-	-	-	-	-	-	-	-	-	-	-	1	1
CO3	3	-	-	-	-	-	-	-	-	-	-	-	1	1
CO4	3	-	-	-	-	-	-	-	-	-	-	-	1	1
CO5	-	3	-	-	-	-	-	-	1	1	-	-	1	1

High-3; Medium-2; Low-1

Text Book(s):

T1. Adel S.Sedra, Kenneth C.Smith & Arun N.Chandorkar, "Microelectronic Circuits: Theory and Applications", 7th edition, Oxford University Press, New York, 2014.

T2. Donald A Neamen, "Microelectronics: Circuit Analysis and Design", 4th Edition, 2010.

Reference Book(s):

R1. P.Malvino, D.J.Bates, "Electronic Principles", 7/e, Tata McGraw-Hill, 2017.

R2. R.L.Boylestadad and L.Nashelsky "Electronic Devices and Circuit Theory", 11/e, Pearson Education, 2015.

Web References:

1. https://archive.nptel.ac.in/courses/108/105/108105158/

Course Code: 23EVT303	Course Title: Circuit Theory and Network Analysis			
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 explain the application of the nodal and mesh analysis to solve the circuit parameters, resonance in coupled circuits. Additionally, the course explains to utilize Network theorems for analysis and synthesis two port networks.

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, Mesh and nodal analysis. **Resonance in 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.

Module II   22 Hours

Network analysis: Overview of network analysis techniques, Network theorems: Superposition Theorem, Thevenin's Theorem, Norton's theorem and Maximum power transfer theorem; transient and steady-state sinusoidal response. Network graphs and their applications in network analysis. Tellegen's theorem, two-port networks, Z, Y, h, g, and transmission matrices. Combining two ports in various configurations. Analysis of transmission lines to motivate the scattering matrix. Scattering matrix and its applications in network analysis. Network functions, positive real functions, and network synthesis. Butterworth and Chebyshev approximations. Synthesis of lossless two-port networks. Synthesis of lattice all-pass filters.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1: Apply nodal and mesh analysis to solve simple resistive circuits.	Apply
CO2: Apply the condition for resonance to analyse RC and RL coupled circuits.	Apply
CO 3: Apply Network theorems to analyse steady state and transient analysis in circuits.	Apply
CO 4: Apply scattering matrix for network analysis to synthesis two port networks and all-pass filters.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. Van, Valkenburg.; ⁻Network analysis"; Prentice hall of India, 2000

T2 . Sudhakar, A., Shyammohan, S. P.; ⁻Circuits and Network"; Tata McGraw-Hill NewDelhi. 1994

Reference Book(s):

R1. A William Hayt, ⁻Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

R2. Ashfaq Husain, Networks and Systems, Khanna Book Publishing, 2021.

Web References:

1. https://nptel.ac.in/courses/108106075

Course Code: 23EVI301	Course Title: Data Structures and Algorithms using Python	
Course Category: Multi-Disciplinary	Course Level: Intermediate	
L:T:P(Hours/Week) 2:0 : 2	Credits:3	Total Contact Hours: 60	Max Marks:100

Course Objectives:

The course is intended to teach students to create and implement required linear and non-linear data structures for given applications. Also, the course is intended to provide ability to apply suitablesearching and sorting techniques to solve a given problem.

Module I   **16 Hours**

Linear Data structure: Data Structures types - Abstract Data Types - List ADT: Array and Linked List Implementation - Stack ADT: Implementation of Stack – Queue ADT: Implementation of Queue. **Non-Linear Data Structure:** Tree **-** Preliminaries - Binary tree - Tree traversal - Applications - Binary search tree. **Data Structures for Switching Functions:** Binary Decision trees - Introduction to Ordered Binary decision trees (OBDD) - Boolean functions - Boolean algebra - Switching functions - Subfunctions and Shannon's expansion - Visual representation.

Module II   **14 Hours**

Non Linear Data Structure: Graph Representation - Graph Traversals: Depth first and Breadth first traversal - Topological sort - Shortest path algorithms: Weighted Graphs - Dijkstra's algorithms - Minimum Spanning Tree: Prim's and Kruskal's algorithms. **Searching:** Linear Search – Binary Search. **Sorting:** Bubble sort- Insertion Sort - Merge sort –Quick Sort.

List of experiments   **30 Hours**
1. Implementation of stack and queue
2. Implementation of linked list
3. Applications of stack
   a. Infix to post fix conversion
   b. Evaluation of postfix expression
4. Implementation of Binary search tree
5. Implementation of searching - linear, Binary
6. Implementation of sorting technologies, Merge and Quick sort

Course Outcomes At the end of this course, students will be able to:	CognitiveLevel
CO 1: Identify the appropriate data structures as per the specified problem definition using Python.	Apply
CO 2: Develop Tree data structure for the given Scenario.	Apply
CO 3: Develop graph data structure for the given application.	Apply
CO 4: Demonstrate searching and sorting techniques for any given problem with an oral presentation.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1.Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures andAlgorithms in Python", Wiley, July 2021.

T2.Christoph Meinel and Thorsten Theobald, "Algorithms and Data Structures in VLSI Design",Springer 1998.

Reference Book(s):

R1. John Canning, Alan Broder, Robert Lafore, "Data Structures & Algorithms in Python", Addison-Wesley Professional, October 2022.

R2. Dr. Basant Agarwal, "Hands-On Data Structures and Algorithms with Python", Packt Publishing, July 2022.

R3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, PearsonEducation Asia, New Delhi, 2011.

Web References:

1. https://www.udemy.com/course/data-structures-and-algorithms-bootcamp-in-python/

2. https://www.udemy.com/course/data-structures-using-python/

3. https://onlinecourses.nptel.ac.in/noc24_cs78/

Course Code: 23EVL301	Course Title: Digital IC 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 explain the design principles of combinational and sequential circuits.

List of Experiments: **45 Hours**

1. Design of full adder / full subtractor using logic gates.
2. Design of encoder / decoder using logic gates.
3. Design 2:1 multiplexer using universal 7400 IC / 7402 IC.
4. Design of basic flip-flops.
5. Design 4-bit SISO shift register and implement the same using 7474 IC.
6. Design 4-bit SIPO shift register and implement the same using 7476 IC.
7. Realize state table, state diagram, circuit diagram of 3-bit synchronous counter, and implement the same using 7474 IC.
8. Realize state table, state diagram, circuit diagram of 3-bit synchronous counter, and implement the same using 7476 IC.
9. Realize state table, state diagram, circuit diagram of mod-5 counter, and implement thesame using 7474 IC.
10. Realize state table, state diagram, circuit diagram of mod-5 counter, and implement thesame using 7476 IC.

Course Outcomes At the end of this course, students will be able to:	CognitiveLevel
CO1: Design combinational circuits using basic gates	Apply
CO2: Build synchronous sequential circuits using Flip Flops.	Apply
CO3: Design shift registers and counters using Flip Flops.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Reference Book:
R1. Laboratory Manual Prepared by Faculty of EE(VLSI) Dr. Mahalingam College of Engineering and Technology

Course Code: 23EVL302	Course Title: Analog Electronics 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 design and analysis of amplifier and oscillator circuits with SPICEsimulations using BJTs and MOSFETs.

List of Experiments: **45 Hours**

1. Introduction to SPICE simulations and hardware workbench.
2. Design and analysis of Single Stage Amplifier for the given specification using BJT.
3. Design and analysis of Multistage Amplifier for the given specification using BJT.
4. Design and analysis of Class B Amplifier for the given specification using BJT.
5. Design and analysis of Class AB Amplifier for the given specification using BJT.
6. Design and analysis of MOS Single Stage Amplifier for the given specification.
7. Design and analysis of MOS Differential Amplifier for the given specification.
8. Design and analysis of Series Shunt Feedback Amplifier for the given specification.
9. Design of RC Phase Shift Oscillators for the given specification.
10. Design of Colpitts oscillator and Hartley oscillator for the given specification.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Analyze amplifier and oscillator circuits using BJTs for the given specification	Analyze
CO2: Analyze amplifier circuits using MOSFETs for the given specification	Analyze

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Reference Book:

R1. Laboratory Manual Prepared by Faculty of EE(VLSI) Dr. Mahalingam College of Engineering and Technology

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 andprivate sector exams and placement drives.

Module I   **20 Hours**

Quantitative Ability

Time and work –Pipes and cisterns- - Time Speed Distance-Problems on Trains-Boatsand 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 onCubes and Dices- Logical Venn diagram -Visual Reasoning- Element & logical series.

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	1	1

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 IndiaPvt.Ltd, 2013

R2:Arun Sharma. "Quantitative Aptitude for Common Aptitude Test", McGraw Hill Publications, 5thEdition, 2020

R3:Arun Sharma. "Logical Reasoning for Common Aptitude Test", McGraw Hill Publications, 6thEdition, 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

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 andnature/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 andProsperity: 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 aninstrument 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:	
CO1: Reflect on values, aspiration, relationships and hence identify strengths and weaknesses.	Responding
CO2: Appraise physical, mental and social wellbeing of self and practice techniques to promote wellbeing.	Responding
CO3: Value human relationships in family and society and maintain harmonious relationships.	Valuing
CO4: Respect nature and its existence for survival and sustainable of all life forms and hence practice conservation of nature	Valuing
CO5: Appreciate ethical behavior 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, NewDelhi, 2010.

Reference Book(s):

R1. Jeevan Vidya: E k 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 4

Course Code: 23MAI401		Course Title: Probability Theory and Statistics	
Course Category: Minor		Course Level: Intermediate	
L:T:P(Hours/Week)3:0 :2	Credits: 4	Total Contact Hours:75	Max Marks:100

Course Objectives:

This course aims at providing the student to acquire the knowledge on random variables and probability distributions. They gain knowledge regarding hypothesis testing for data.

Module I   **23 Hours**

Probability and Random Variables: Axioms of Probability- Conditional Probability- Total Probability -Baye's Theorem- Random Variables- Probability Mass Function- Probability Density Functions-Properties - Moments- Moment generating functions and their properties. **Standard Distributions:** Discrete Distributions - Binomial- Poisson- Properties, Moment generating functions. Continuous Distributions - Uniform –Exponential- Normal Distributions 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.

Module II   **22 Hours**

Test 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, Chi-square 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.

List of Experiments: **30 Hours**

1. R programing for basic arithmetic operators.
2. Probability distributions (Discrete & Continuous) using R Programming.
3. Calculate correlation coefficient using R Programming.
4. Small sample test using R Programming.
5. Large sample test using R Programming.
6. One way, two-way Classification using R Programming.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO1: Apply standard distributions and the concepts of random variables, to solve real-world problems.	Apply
CO2: Use the concept of probability distributions to solve real life problems.	Apply
CO3: Using correlation coefficient and discusses the relationship between two variables.	Apply
CO4: Apply variance to analyze the samples.	Apply
CO5: Demonstrate the concepts of standard distributions and testing of hypothesis using modern tools (For Laboratory component only)	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Text Book(s):

T1. Veerajan T, "Probability, Statistics and Random process", 3rd Edition, Tata McGraw-Hill, NewDelhi, 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 andScientists", 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,

Web References:

1 https://archive.nptel.ac.in/courses/111/105/111105090/
2. https://archive.nptel.ac.in/courses/111/105/111105041/

Course Code: 23EVT401		Course Title: Linear Integrated Circuits	
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 OPAMP internal structure, frequency characteristics and utilize the same to develop application circuits. Also the course imparts a depth knowledge on PLL and Timer circuit design.

Module I   **22 Hours**

Operational amplifier: Internal Structure, Characteristics of ideal OPAMP, IC 741 packages, open- loop configurations, non-ideal effects in op-amp, Frequency response of an op-amp. OPAMP with negative feedback: Voltage Series, Voltage Shunt feedback configurations. **Applications of OPAMP:** Linear OPAMP Applications - Summing amplifier, subtractor, integrator, differentiator, difference amplifier, instrumentation amplifier, voltage-to-current converter, current-to- voltage converter – OPAMP applications using Diodes: Logarithmic amplifiers, Rectifiers, Peak detectors, and as Voltage regulators.

Module II   **23 Hours**

Comparators and Waveform Generators: Comparator and its applications, Schmitt trigger, Free- running, One-shot Multivibrators, Barkhausen Criterion; Waveform generators- Sine, Square, Triangular, and Saw-tooth. **Active filters**: Classification of filters, frequency and impedance scaling, First and second order Low-pass and High pass filters, Band-pass filter, Notch filter. **PLL and Timers:** PLL-Phase detector, comparator, VCO, Applications of PLL; 555 timer IC- Astable and Monostable operations and applications.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO 1: Make use of the internal structure, characteristics, and frequency response of operational amplifiers to evaluate their suitability for various applications.	Apply
CO 2: Identify the feedback configurations in operational amplifier develop application circuits.	Apply
CO 3: Utilize OPAMPs to develop comparators, and waveform generators.	Apply
CO 4: Apply active filters, PLLs, and timers to design and implement circuits for signal processing and control applications.	Apply
CO 5: Select suitable amplifiers and oscillators based on the application, and present a report or seminar (only for Assignment)	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. J.D.Roy Choudhury,"Linear integrated Circuits",2017,5th Edition, New-Age International Publishers, Chennai.

T2. K. R. Botkar, "Integrated Circuits" 10th Edition, Kp, 2010.

Reference Book(s):

R1. Ramakant A.Gayakwad,"Op-Amps and Linear Integrated Circuits",2015,4th Edition, Pearson Education, Bangalore.

R2. Robert F.Coughlin and Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits",2015, 6th Edition, Pearson Education, Bangalore.

Web References:

1. https://onlinecourses.nptel.ac.in/noc24_ee73/preview
2. https://archive.nptel.ac.in/courses/108/108/108108111/

Course Code: 23EVT402		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 classify various continuous-time, discrete-time signals and systems. Also, the course imparts the spectral characteristics of continuous-time signals and systems using Fourier and Laplace transforms, and discrete time signals and systems using Z transform.

Module I   **23 + 5 Hours**

Classification of Signals: Continuous Time (CT) and Discrete Time (DT) signals - Deterministic and Random signals, Periodic and Aperiodic signals - Even and Odd signals - Energy and Power Signals -Unit step, Ramp, and Impulse signals - Operation on signals: Time shifting, scaling and folding. **Sampling and Reconstruction:** Sampling of continuous time signals - Frequency domain representation of samples - Sampling theorem - Effects of under sampling - Aliasing - Reconstruction of continuous time signals from samples. **Classification of Systems:** Continuous time systems - Discrete time systems - Linear system - Time invariant system - causal system - BIBO stable system - system with and without memory – LTI system.

Module II   **22+ 10 Hours**

Analysis of Continuous Time Signals and Systems: Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and Properties - Impulse response - Convolution integrals - Differential Equation- Fourier and Laplace transforms in analysis of CT systems - Systems connected in series / parallel. **Analysis of Discrete Time Signals and Systems:** Baseband signal Sampling–Fourier Transform of discrete time signals (DTFT) - Properties of DTFT - Z Transform & Properties - Impulse response– Difference Equations - Convolution sum- Discrete Fourier Transform and Z Transform analysis of Recursive & Non - Recursive systems-DT systems connected in series and parallel.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO1: Apply mathematical operations to classify signals based on their properties.	Apply
CO2: Apply the concept of Sampling and Reconstruction on continuous Time signals	Apply
CO3: Apply mathematical operations to classify systems based on their properties.	Apply
CO4: Analyze continuous-time signals and systems using Fourier Series, Fourier Transform, and Laplace Transform.	Analyze
CO 5: Analyze discrete-time signals and systems using DTFT and Z – Transform.	Analyze
CO 6: Identify the characteristics of EEG signals and arrive at suitable specifications to design an EEG amplifier also give suitable ESD values for human body model. (only for Assignment)	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	1	1
CO2	3	-	-	-	-	-	-	-	-	-	-	-	1	1
CO3	3	-	-	-	-	-	-	-	-	-	-	-	1	1
CO4	-	3	-	-	-	-	-	-	-	-	-	-	1	1
CO5	-	3	-	-	-	-	-	-	-	-	-	-	1	1
CO6	-	-	3	-	2	-	-	2	1	1	1	2	1	2

High-3; Medium-2;Low-1

Text Book(s):

T1. Allan V. Oppenheim, S. Wilsky and S.H.Nawab "Signals and System", Pearson education, 2007.

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

Reference Book(s):

R1. HPHsu,Rakesh Ranjan,"Signals and Systems",Schaum's Outlines,Tata McGraw Hill,IndianReprint, 2007.

R2. Edward W Kamen, Bonnie S Heck, "Fundamentals of Signals and Systems Using the Weband MATLAB", Pearson Education, 2007.

R3. Vinay K Ingle, John G Proakis, "Digital Signal Processing using MATLAB", Cengage Learning, 3rd edition, 2011.

Web References:

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011

2.http://www.ws.binghamton.edu/fowler/Fowler%20Personal%20Page/EECE301%20-%20Flipped.htm

3. https://nptel.ac.in/courses/117/104/117104074/

Course Code: 23EVI401	Course Title: Fundamentals of VLSI	
Course Category: Major	Course Level: Intermediate	
L:T:P(Hours/Week) 3:0:2	Credits:4	Total Contact Hours: 75	Max Marks:100

Course Objectives:
The course is intended to explain the design of various blocks of digital and analog systems and verify their functionality at pre-layout and at Layout level. Additionally, the course discusses the technologies involved in chip fabrication and packaging.

Module I   **22 Hours**
System and Architectural Design: Defining a system specification, performance analysis, cost analysis, identifying various functional blocks/modules; categorizing them in terms of digital, analog, RF and mixed signal blocks. **Functional verification, logic design:** Verifying the functionality of blocks, behavioural description, logic minimization, synthesis, verification and testing; PVT simulations.

Module II   **23 Hours**
Circuit Optimization and Physical Design: Optimization of synthesized blocks for various performance metric, Introduction to placement and routing, Layout vs Schematic (LVS) verification, Design for Manufacturability. **Tape Out:** Post layout simulations, Process Voltage Testing, Process Design Kit, Design Rule Check, GDSII. **Fabrication and Packaging:** CMOS process flow, dicing, various types of packaging. **Process followed in industry:** Roles and objectives of various streams within Semiconductor industry, Industry Terminologies.

List of Experiments   **30 Hours**

1. Arrive at the system specifications for a given real-time case.
2. For a given problem statement, arrive at the reduced logic circuit. Verify the functionality using SPICE simulations at different PVT corners.
3. Design a CMOS inverter and verify its DC characteristics through SPICE simulations. Estimate power dissipation, area, and processing delay. Understand rise and fall times through simulations.
4. Realize NAND and NOR gates in CMOS logic. Verify truth tables through SPICE simulations.
5. Design the physical layout of a CMOS inverter. Perform DRC clean and LVS.
6. Perform post-layout simulations of the CMOS inverter. Comparative study of layout and schematic parameters.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO 1: Design the simple digital and analog systems for the given specification	Apply
CO 2: Utilize circuit optimization in physical design of simple digital and analog systems	Apply
CO 3: Identify the technologies involved in chip fabrication, packaging and process integration in semiconductor industry	Apply
CO 4: Examine and report the analog and digital IC design process using SPICE simulations. (Lab Component only)	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	-	-	-	-	-	-	-	-	-	-	-	1	1
CO3	3	-	-	-	-	-	-	-	-	-	-	-	1	1
CO4	-	3	-	-	1	-	-	2	1	1	2	1	1	1

High-3; Medium-2; Low-1

Text Book(s):

T1.Sneh Saurabh, "Introduction to VLSI Design flow", Cambridge University Press.

Reference Book(s):

R1.M.Morris Mano and Michel.D.Ciletti, "Digital Design with an introduction to HDL,VHDL and Verilog", 6th edition Pearson education.

Web References:

1. https://nptel.ac.in/courses/117106092

Course Code: 23EVT403		Course Title: Microprocessors and Microcontrollers	
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 microprocessor and microcontroller architecture, develop programs for on-chip peripherals, and design systems using interfacing.

Module I   **22 Hours**

Microprocessor and Microcontroller Architecture: Introduction to Microprocessor and Microcontroller– Evolution – Von Neumann and Harvard architecture - Architecture of 8085 & 8051 - CISC Vs RISC. **PIC Microcontroller and Progamming:** PIC18FX Pin connection - File register - Data type and Time delay in C - Logical operation –Data conversion - Data sterilization - Program ROM Allocation - Data RAM allocation. **On-Chip Peripherals of PIC Microcontroller:** I/O Ports-Timer0/counter – UART - Interrupts - ADC - DAC - SPI - I2C.

Module II   **23 Hours**

Architecture of ARM: ARM7 processor fundamentals – Registers - Pipelining – Exception and Interrupt handling - Memory System - **on-chip peripherals of LPC2148**: GPIO, Timers, PWM, Serial ports–RTC-ADC- Introduction to ARM cortex Mx - Processors core overview - Programmers model. **System Design and Application:** LED and Switch interfacing-LCD Interfacing – Keyboard Interfacing- Relay interfacing – Sensor Interfacing - Stepper Motor Interfacing - PWM Module – DC Motor Interfacing.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Apply microprocessor and microcontroller architecture principles to design systems.	Apply
CO2: Develop application programs to design PIC18FX microcontroller based systems using on-chip peripherals.	Apply
CO3: Design systems and develop a program for on-chip peripherals in ARM7 and LPC2148.	Apply
CO4: Develop application systems using ARM7 and LPC2148 using interfaces.	Apply
CO5: Design and develop a program for real world application systems using microprocessor and microcontroller (only for Assignment)	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Text Book(s):

T1. R.S.Gaonkar,"Microprocessor Architecture, Programming and Applications with the 8085", 5th Edition, Prentice Hall, 2002.

T2. Muhammad ALI Mazidi, RolinD.Mckinlay, Danny Causery,"PIC Microcontroller and Embedded systems using assembly and C PIC18", Pearson international edition, 2008.

Reference Book(s):

R1. A.K Ray , K.M.Bhurchandi ,"Advanced Microprocessors and Peripherals" 3rd Edition McGraw Hill Education 2012

R2. Steve Furber, "ARM System-on-Chip Architecture" Pearson Education Limited, 2012

R3. Krishna Kant, "Microprocessor and Microcontroller Architecture, Programming and System Design using 8085, 8086, 8051 and 8096", PHI, 2011.

Web References:

1.https://www.nxp.com/docs/en/user-guide/UM10139.pdf

2.http://www.microchip.com/design-centers/microcontrollers

3.https://electrosome.com/category/tutorials/pic-microcontroller/hi-tech-c/

4.https://ww1.microchip.com/downloads/en/devicedoc/39582b.pdf

Course Code: 23EVL401	Course Title: Microprocessors and Microcontrollers 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 developing programs to perform arithmetic operations with 8085 Microprocessor, application development with interfacing techniques in PIC16Fxx/LPC2148.

List of Experiments   **45 Hours**

8085 Microprocssor

1. Arithmetic Operation-Addition & Subtraction

PIC16FXX/18FXX Microcontroller

2. LED and switch interfacing
3. Lamp control using Timer/Counter
4. Transmission and Reception of a byte using on chip serial port
5. Read the temperature sensor value using ADC and display it in LCD

LPC2148 Microcontroller

6. Program to read switch status and displayed in LEDs.
7. Waveform generation using 10 Bit DAC
8. Controlling PWM period with analogue input (POT)
9. Transmission from kit and reception from PC using Serial Port (UART)
10. IoT based Temperature/Moisture monitoring system.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO1: Develop assembly language program to perform addition and subtraction using the 8085 microprocessors.	Apply
CO2: Experiment with PIC16FXX/18FXX Microcontroller and its interfacing techniques.	Apply
CO3: Experiment with LPC2148 Microcontroller and its interfacing techniques.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Reference Book:

R1. Laboratory Manual Prepared by Faculty of EE(VLSI) Dr. Mahalingam College of Engineering and Technology

Course Code: 23EVL402	Course Title: Linear Integrated Circuits Laboratory		
Course Category: Major		Course Level: Intermediate	
L:T:P(Hours/Week)0:0 :4	Credits:2	Total Contact Hours:60	Max Marks:100

Course Objectives:

The course is intended to incorporate knowledge on design and analysis of simple linear integrated circuits using OP-AMP ICs.

List of Experiments: **60 Hours**

1. Design of Inverting, Non-Inverting amplifiers, and Voltage follower.
2. Perform mathematical operations using operational amplifier.
3. Design of Instrumentation amplifier.
4. Design and testing of Precision Rectifier.
5. Design of Comparator and Schmitt trigger circuits.
6. Design of Square wave generator for a specified frequency and duty cycle, using operational amplifier IC741.
7. Design of Triangular wave generator from Square wave generator.
8. Design of a Sinusoidal oscillator for specified frequency – Wien-bridge and RC phase shift oscillators using IC741.
9. Design of Audio Q Multiplier using IC741.
10. Design and testing of Active filters - LPF and HPF for specified frequency.
11. Design of Astable and Monostable Multivibrators using IC555.
12. Design of A/D and D/A converters.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Design simple analog circuits to perform mathematical operations, rectification and analog comparison.	Apply
CO 2: Design waveform generators, multivibrators, A/D and D/A converters.	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Reference Book:

R1.Laboratory Manual Prepared by Faculty of EE(VLSI) Dr. Mahalingam College of Engineering and Technology.

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 -

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	1	1

High-3; Medium-2; Low-1

Textbook(s):

T1. Sabina Pillai, Agna Fernandez, "Soft Skills & Employability Skills", Cambridge University Press2018

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