VELAMMAL

COLLEGE OF ENGINEERING AND TECHNOLOGY, MADURAI – 625 009

(Autonomous)

(Accredited by NAAC with 'A' Grade and by NBA for 6 UG Programmes)

(Approved by AICTE and affiliated to Anna University, Chennai)

DEPARTMENT OF ELECTRONICS ENGINEERING

(VLSI DESIGN AND TECHNOLOGY)

B.E. ELECTRONICS ENGINEERING

(VLSI DESIGN AND TECHNOLOGY)

REGULATIONS – 2021

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI
FOR (I - IV Semesters)

(For the students admitted in the academic year 2024-2025)

GOLDEN GOALS OF VET

1. Regularity & Punctuality.
2. Nil Failures, High Subject Average & More Centums.
3. Research & Development.
4. Focus in General Knowledge & Depth in the Subject.
5. Communication Skills (Spoken English & Learning more Languages).
6. Extracurricular Activities & Co-Curricular Activities (All-around Development).
7. Good Health and Food Habits.
8. Human Values.

VISION AND MISSION OF THE INSTITUTE

VISION OF VCET

To emerge and sustain as a center of excellence for technical and managerial education upholding social values.

MISSION OF VCET

Our aspirants are

- Imparted with comprehensive, innovative and value – based education.
- Exposed to technical, managerial and soft skill resources with emphasis on research and professionalism.
- Inculcated with the need for a disciplined, happy, married and peaceful life.

VISION AND MISSION OF EE(VLSI) DEPARTMENT

VISION

To emerge as a Centre of Innovation in VLSI Design & Technology through cutting-edge research, to drive advancements in Semiconductor Technologies with ethical responsibility.

MISSION

- To provide a unique learning environment in VLSI Design to meet the demands of Industries.
- To promote research-based activities in emerging areas of technology convergence.
- To inculcate entrepreneurial skills, ethical values and commitment to the society.

VELAMMAL COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
VIRAGANOOR, MADURAI–625 009.

B.E. ELECTRONICS ENGINEERING (VLSI DESIGN & TECHNOLOGY)

CHOICE BASED CREDIT SYSTEM
REGULATIONS 2021
BATCH 2024 - 2028

CURRICULUM FOR SEMESTERS I TO IV

SEMESTER I

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS
				L	T	P	
1.	21IP101	Induction Programme *(Common to all B.E./B.Tech. Programmes)*	-	-	-	-	0
THEORY							
2.	21EN101	Professional English– I *(Common to all B.E./B.Tech. Programmes)*	HS	3	2	0	4
3.	21MA101	Matrices and Calculus *(Common to all B.E./B.Tech. Programmes)*	BS	3	2	0	4
4.	21PH101	Engineering Physics *(Common to all B.E./B.Tech. Programmes)*	BS	3	0	0	3
5.	21CH101	Engineering Chemistry *(Common to all B.E./B.Tech. Programmes)*	BS	3	0	0	3
6.	21CB101	Problem Solving and C Programming *(Common to B.E. CSE (Cyber Security))*	ES	3	0	0	3
7.	21ME101	Engineering Graphics *(Common to all B.E./B.Tech. Programmes)*	ES	2	0	2	3
8.	21TA101	Heritage of Tamils *(Common to all B.E./B.Tech. Programmes)*	HS	1	0	0	1
PRACTICAL COURSES							
9.	21EM101	Engineering Practices Laboratory *(Common to all B.E./B.Tech. Programmes)*	ES	0	0	4	2
10.	21CB102	Problem Solving and C Laboratory *(Common to B.E. CSE (Cyber Security))*	ES	0	0	4	2
TOTAL CREDITS							**25**

SEMESTER II

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS
				L	T	P	
THEORY							
1.	21EN102	English–II *(Common to all B.E./B.Tech. Programmes)*	HS	3	0	0	3
2.	21MA204	Probability, Statistics and Numerical Methods. (*Common to B.E. CIVIL Engg. & MECH Engg.*)	BS	3	2	0	4
3.	21PH104	Physics for Electronics Engineering *(Common to B.E. ECE Programme)*	BS	3	0	0	3
4.	21CH103	Environmental Science *(Common to all B.E. /B.Tech. Programmes)*	BS	2	0	0	2
5.	21VD101	Semiconductor Devices	PC	3	0	0	3
6.	21VD102	Network Theory	PC	3	0	0	3
7.	21TA102	Tamils & Technology	HS	1	0	0	1
PRACTICAL COURSES							
8.	21PC101	Physics and Chemistry Laboratory *(Common to all B.E./B.Tech. Programmes)*	BS	0	0	4	2
9.	21VD103	Semiconductor Devices & Circuits Laboratory	PC	0	0	4	2
TOTAL CREDITS							**23**

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SEMESTER III

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS
				L	T	P	
THEORY							
1.	21MA201	Transforms and Partial Differential Equation *(Common to B.E. (CIVIL Engg, ECE & MECH Engg) Programmes)*	BS	3	2	0	4
2.	21VD201	Electromagnetic Interference	PC	3	0	0	3
3.	21VD202	Digital System Design	PC	3	0	0	3
4.	21VD203	Integrated Circuit Design	PC	3	0	0	3
5.	21CB103	Python Programming *(Common to B.E. CSE (Cyber Security))*	ES	3	0	0	3
THEORY WITH PRACTICAL COURSE							
6.	21VD204	Analog Circuits	PC	3	0	2	4
PRACTICAL COURSES							
7.	21VD205	Digital System Design Laboratory	PC	0	0	4	2
8.	21CB104	Python Programming Laboratory *(Common to B.E. CSE (Cyber Security))*	ES	0	0	4	2
TOTAL CREDITS							**24**

SEMESTER IV

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS
				L	T	P	
THEORY							
1.	21OMA01	Graph Theory and its Applications	BS	3	0	0	3
2.	21VD206	CMOS VLSI Design	PC	3	0	0	3
3.	21VD207	Flexible Electronics	PC	3	0	0	3
4.	21VD208	Discrete Time Signal Processing	PC	3	0	0	3
5.	21VD209	Microcontrollers & Computer Architecture	PC	3	0	0	3
6.	21CS214	Object Oriented Programming and Data Structures *(Common to B.E. ECE & B.E EEE Programme)*	ES	3	0	0	3
PRACTICAL COURSES							
7.	21EN301	Professional Communication Laboratory *(Common to all B.E./B.Tech. Programmes)*	HS	0	0	2	1
8.	21CS215	Object Oriented Programming Laboratory *(Common to B.E. ECE & B.E EEE Programme)*	ES	0	0	4	2
9.	21VD210	Microcontrollers Laboratory	PC	0	0	4	2
TOTAL CREDITS							**23**

SEMESTER I

21IP101	INDUCTION PROGRAMME *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		-	-	-	0

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, as a citizen and as a human being. Besides the above, several meta-skills and underlying values are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and don"ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the

student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and **therefore there shall be no tests / assessments** during this programme.

REFERENCE:

Guide to Induction program from AICTE

21EN101	PROFESSIONAL ENGLISH-I *(Common to all B.E./B.TECH. Programmes)*	L	T	P	C
		3	2	0	4

COURSE OBJECTIVES:

- To develop learners skills in listening and responding effectively.
- To apply basic grammar for better communication.
- To employ reading passages for understanding vocabulary.
- To construct logical sentences and participate in pair presentation, extempore.
- To organize ideas for various compositions in writing.

UNIT I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	12

Listening – Listening for general information - Specific details - Conversation: Introductionto classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form; **Speaking** - Self Introduction; Introducing a friend; Conversation - Politeness strategies; Telephone conversation; Leave a voicemail; Leave a message with another person; asking for information to fill details in a form; **Reading** - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails; **Writing** - Writing emails / letters introducing oneself; **Grammar** - Present Tense (simple, continuous); Question types: What/ Yes or No/ and Tags **Vocabulary** - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT II	NARRATION AND SUMMATION	12

Listening - Listening to podcast, anecdotes / stories / event narration; documentaries and interviews with celebrities; **Speaking** - Narrating personal experiences / events; Interviewing acelebrity; Reporting / and summarizing of documentaries / podcasts/ interviews; **Reading** - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs; **Writing** - Guided writing - Paragraph writing Short Report on an event (field trip etc.); **Grammar** - Past tense (Simple, continuous); Subject-Verb Agreement; and Prepositions; **Vocabulary** - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT III	DESCRIPTION OF A PROCESS / PRODUCT	12

Listening - Listen to a product and process descriptions; a classroom lecture; and advertisements about a products; **Speaking** - Picture description; Giving instruction to use the product; Presenting a product; and Summarizing a lecture; **Reading** - Reading advertisements, gadget reviews; user manuals; **Writing** - Writing definitions; instructions; and Product/Process description; **Grammar** - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect, Present and past perfect continuous tenses; **Vocabulary** - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words)

UNIT IV	CLASSIFICATION AND RECOMMENDATIONS	12

Listening - Listening to TED Talks; Scientific lectures; and educational videos; **Speaking** – Small Talk; Mini presentations and making recommendations; **Reading** - Newspaper articles; Journal reports - Non Verbal Communication (tables, pie charts etc,) **Writing** - Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from non verbal (chart, graph etc, to verbal mode) **Grammar** - Articles; Pronouns - Possessive & Relative pronouns; **Vocabulary** - Collocations; Fixed / Semi fixed expressions

UNIT V	EXPRESSIONS	12

Listening - Listening to debates/ discussions; different viewpoints on an issue; and panel discussions; **Speaking** - Group discussions, Debates, and Expressing opinions through Simulations & Role-play; **Reading** - Reading editorials; and Opinion Blogs; **Writing** - Essay Writing (Descriptive or narrative); **Grammar** - Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences; **Vocabulary** - Cause & Effect Expressions - Content vs. Function words.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Listen and comprehend complex academic texts.

CO2: Read and infer the denotative and connotative meanings of technical texts.

CO3: Write definitions, descriptions, narrations and essays on various topics.

CO4: Speak fluently and accurately in formal and informal communicative contexts.

CO5: Express their opinions effectively in both oral and written medium of communication.

TEXT BOOKS:

1. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University, "English for Science & Technology", 1st Edition, Cambridge University Press, 2021.
2. Board of Editors, Department of English, Anna University, "English for Engineers & Technologists" 1st Edition, Orient Blackswan Private Ltd, 2020.
3. Board of Editors, Department of English, Anna University, "Using English - A Course book for Under Graduate Engineers and Technologists", 1st Edition, Orient Blackswan Private Ltd, 2017.

REFERENCES:

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communication – Principles and Practices", 3rd Edition Oxford University Press, New Delhi, 2015.
2. Lakshminarayanan K.R, "A Course Book on Technical English", 1st Edition, SciTech Publications(India) Pvt. Ltd., 2012.
3. Ayesha Viswamohan. English for Technical Communication (With CD), 1st Edition, McGraw Hill Education, ISBN: 0070264244. 2008.
4. Kulbhusan Kumar, RS Salaria, "Effective Communication Skill", 1st Edition, Khanna PublishingHouse, 2018.
5. Dr. V. Chellammal, "Learning to Communicate", 1st Edition, Allied Publishing House, New Delhi,2003.

21MA101	MATRICES AND CALCULUS (*Common to all B.E. / B.Tech. Programmes*)	L	T	P	C
		3	2	0	4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To explain the students about differential calculus.
- To demonstrate the functions of several variables techniques to solve problems in many engineering branches.
- To demonstrate the various techniques of integration.
- To prepare the student to use mathematical tools in evaluating multiple integrals and their applications.

UNIT I	MATRICES	12

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane.

UNIT II	DIFFERENTIAL CALCULUS	12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications : Maxima and Minima of functions of one variable.

UNIT III	FUNCTIONS OF SEVERAL VARIABLES	12

Partial differentiation – Homogeneous functions and Euler‟s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor‟s series for functions of two variables – Applications : Maxima and minima of functions of two variables and Lagrange‟s method of undetermined multipliers.

UNIT IV	INTEGRAL CALCULUS	12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass.

UNIT V	MULTIPLE INTEGRALS	12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Areaenclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications: Moments and centres of mass, moment of inertia.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Use the matrix algebra methods for solving engineering problems.
CO2: Apply differential calculus tools in solving various application problems.
CO3: Make use of differential calculus ideas on several variable functions.
CO4: Identify suitable methods of integration in solving practical problems.
CO5**:** Solve practical problems of areas, volumes using multiple integrals.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons, New Delhi, 2016.
2. Grewal.B.S. “Higher Engineering Mathematics”, 44th Edition, Khanna Publishers, New Delhi, 2018.
3. James Stewart, "Calculus: Early Transcendentals", 8th Edition, Cengage Learning, New Delhi, 2015.

REFERENCES:

1. Bali. N., Goyal. M. and Watkins. C., “Advanced Engineering Mathematics”, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 2009.
2. Jain. R.K. and Iyengar. S.R.K., “Advanced Engineering Mathematics”, 5th Edition, Narosa Publications, New Delhi, 2016.
3. Ramana. B.V., "Higher Engineering Mathematics", 6th Edition, McGraw Hill Education Pvt. Ltd, New Delhi, 2010.
4. Thomas. G. B., Hass. J and Weir. M.D, “Thomas‟ Calculus”, 14th Edition, Pearson India, 2018.

21PH101	ENGINEERING PHYSICS *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To illustrate the students effectively to achieve an understanding of mechanics.
- To infer the students to gain knowledge of electromagnetic waves and its applications.
- To explain the basics of oscillations, optics and lasers.
- To outline the importance of quantum physics.
- To relate the students towards the applications of quantum mechanics.

UNIT I	MECHANICS	9

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

UNIT II	ELECTROMAGNETIC WAVES	9

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

UNIT III	OSCILLATIONS, OPTICS AND LASERS	9

Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave – sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference– Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein‟s coefficients - population inversion - Nd-YAG laser, CO2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT IV	BASIC QUANTUM MECHANICS	9

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

UNIT V	APPLIED QUANTUM MECHANICS	9

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Explain the importance of mechanics.

CO2: Extend their knowledge in electromagnetic waves.

CO3: Illustrate a strong foundational knowledge in oscillations, optics and lasers.

CO4: Interpret the importance of quantum physics.

CO5: Summarize quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow," An Introduction to Mechanics", 1st Edition, McGraw Hill Education, 2017.
2. E.M.Purcell and D.J.Morin, "Electricity and Magnetism", 3rd Edition, Cambridge University Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", 7th Edition, McGraw-Hill, 2017.

REFERENCES:

1. R.Wolfson. "Essential University Physics", Volume 1 & 2, 1st Edition (Indian Edition) Pearson Education, 2009.
2. Paul A. Tipler, "Physics"- Volume 1 & 2, 1st Edition (Indian Edition), CBS Publishers & Distributors, 2004.
3. K.Thyagarajan and A.Ghatak. "Lasers: Fundamentals and Applications", 2nd Edition, Laxmi Publications, (Indian Edition), 2019.
4. D.Halliday, R.Resnick and J.Walker, "Principles of Physics", 10th Edition (Indian Edition), Wiley, 2015.
5. N.Garcia, A.Damask and S.Schwarz, "Physics for Computer Science Students", 1st Edition, Springer Verlag, 2012.

21CH101	ENGINEERING CHEMISTRY *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To describe water quality parameters and water treatment techniques.
- To discuss basic principles and preparatory methods of nanomaterials.
- To demonstrate the basic concepts and applications of phase rule and composites.
- To identify different types of fuels, their preparation, properties and combustion characteristics.
- To illustrate the operating principles, working processes and applications of energyconversion and storage devices.

UNIT I	WATER AND ITS TREATMENT	9

Water: Sources and impurities, **Water quality parameters:** Definition and significance of-colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. **Municipal water treatment:** primary treatment and disinfection (UV, Ozonation, break-point chlorination)**.Desalination of brackish water**: Reverse Osmosis. **Boiler troubles:** Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. **Treatment of boiler feed water**: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.

UNIT II	NANOCHEMISTRY	9

Basics: Distinction between molecules, nanomaterials and bulk materials; **Size-dependent properties** (optical, electrical, mechanical and magnetic); **Types of nanomaterials**: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. **Preparation of nanomaterials:** sol-gel, solvo thermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. **Applications** of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III	PHASE RULE AND COMPOSITES	9

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

UNIT IV	FUELS AND COMBUSTION	9

Fuels: Introduction: Classification of fuels; **Coal and coke**: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). **Petroleum and Diesel:** Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; **Power alcohol and biodiesel. Combustion of fuels:**

Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; **Ignition temperature**: spontaneous ignition temperature, Explosive range; **Flue gas analysis** - ORSAT Method. **CO_2 emission and carbon foot print.**

UNIT V	ENERGY SOURCES AND STORAGE DEVICES	9

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

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.

CO2: Describe the basic concepts of nano science and nanotechnology in designing the synthesis of nano materials for engineering and technology applications.

CO3: Apply the knowledge of phase rule and composites for material selection requirements.

CO4: Identify suitable fuels for engineering processes and applications.

CO5: Demonstrate different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:

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

REFERENCES:

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

21CB101	PROBLEM SOLVING AND C PROGRAMMING *(Common to B.E. CSE(Cyber Security))*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To describe the basics of algorithmic problem solving.
- To demonstrate the fundamentals of C programming.
- To describe the reusable modules (collections of function).
- To examine code, document, test, and implement a well-structured program using the C.
- To use the C programming concepts in trivial problem solving.

UNIT I	PROBLEM SOLVING AND C FUNDAMENTALS	9

Introduction-Problem Solving Using Computer-Algorithms-Flowchart-Pseudo code-Programming Languages as tools-Converting pseudo code to program-Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process

UNIT II	ARRAYS AND STRINGS	9

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT III	FUNCTIONS AND POINTERS	9

Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions – Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference

UNIT IV	STRUCTURES AND UNION	9

Structure - Nested structures – Pointer and Structures – Array of structures – Self-referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility

UNIT V	FILE PROCESSING	9

Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Develop simple applications in C using basic constructs.

CO2: Design and implement applications using arrays and strings.
CO3: Develop and implement modular applications in C using Functions.
CO4: Develop applications in C using structures and pointers.
CO5: Design applications using sequential and random access file processing.

TEXT BOOKS:

1. ReemaThareja, "Programming in C", 2nd Edition, Oxford University Press, 2016.
2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", 2nd Edition, Pearson Education, 2015.
3. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

REFERENCES:

1. Yashwant Kanetkar, "Let us C", 17th Edition, BPB Publications, 2020.
2. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", 2nd Edition, McGraw-Hill education, 1996.
3. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", 2nd Edition, Oxford University Press, 2013.

21ME101	ENGINEERING GRAPHICS *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To sketch the projection of points, lines and planes.
- To sketch the projection of simple solids.
- To sketch the projection of sectioned solids and development of lateral surfaces.
- To sketch the isometric and perspective views of simple solids.
- To sketch the orthographic projection of various objects free handly.

UNIT I	PROJECTIONS OF POINTS, LINES AND PLANE SURFACE	12

Importance of graphics in engineering applications – Use of drafting instruments - Lettering and dimensioning. Introduction to Orthographic projections - Principles -Principal planes-First angle projection. Projection of points located in all quadrants. Projection of straight lines inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (regular polygonal and circular surfaces) inclined to both the principal planes by rotating object method. (Not for Examination)

UNIT II	PROJECTION OF SOLIDS	12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT III	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT IV	ISOMETRIC AND PERSPECTIVE PROJECTIONS	12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

UNIT V	FREEHAND SKETCHING	12

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects. Introduction to drafting packages and demonstration. (Not for examination).

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Construct the orthographic projections of points, straight lines and plane surfaces.
CO2: Sketch the orthographic projections of simple solids.
CO3: Sketch the orthographic projections of sectional solids and lateral surfaces of the solids.
CO4: Construct the isometric projections and perspective projections of simple solids.
CO5: Sketch the orthographic projection of objects using free hand.

TEXT BOOKS:

1. Natarajan K.V., "A text book of Engineering Graphics", 31st Edition, Dhanalakshmi Publishers, Chennai, 2018.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", 15th Edition, New Age International (P) Limited, 2018.
3. Bhatt N.D. and Panchal V.M., "Engineering Drawing", 53rd Edition, Charotar Publishing House, 2014.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", 2nd Edition, Tata McGraw Hill Publishing Company Limited, 2013.
2. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", 2nd Edition, Oxford University Press, New Delhi, 2015.
3. Shah M.B., and Rana B.C., "Engineering Drawing", 2nd Edition, Pearson, 2009.

21TA101	HERITAGE OF TAMILS *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		1	0	0	1

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

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published

by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: 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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

21TA101	தமிழர் மரபு	L	T	P	C
		1	0	0	1

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 பங்களிப்பு.

அலகு 2	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை- சிற்பக்கலை	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	நாட்டுப்புற கலைகள் மற்றும் வீர விளையாட்டுக்கள்	3

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

அலகு 4	தமிழர்களின் திணைக் கோட்பாடுகள்	3

தமிழகத்தின் தாவரங்களும், விலங்குகளும், தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள், தமிழர்கள் போற்றிய அறக்கோட்பாடு, சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் சங்ககால நகரங்களும் துறை முகங்களும், சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு 5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு,இந்தியாவின் பிற பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம், சுயமரியாதை இயக்கம், இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கைழுத்துப்படிகள்,தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL: 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

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

21EM101	ENGINEERING PRACTICES LABORATORY *(Common to all B.E / B.Tech. Programmes)*	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To draw pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work.
- To demonstrate the basic switch board wiring, fluorescent lamp wiring and stair case wiring using various electrical components.
- To choose various joints in steel plates using arc welding work and machining various simple processes like turning, drilling, tapping in parts.
- To build a tray out of metal sheet using sheet metal work.
- To develop electronic circuit and testing for soldering and desoldering using PCB board.

LIST OF EXPERIMENTS:

GROUP – A (CIVIL & ELECTRICAL)

PART – I

CIVIL ENGINEERING PRACTICES

PLUMBING WORK:

1. Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
2. Preparing plumbing line sketches.
3. Laying pipe connection to the suction side of a pump
4. Laying pipe connection to the delivery side of a pump.
5. Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

1. Sawing, Planning and Making joints like T-Joint, Cross lap and Dovetail joint.

PART – II

ELECTRICAL ENGINEERING PRACTICES

- Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
- Staircase wiring
- Fluorescent Lamp wiring with introduction to CFL and LED types.
- Energy meter wiring and related calculations/ calibration
- Study of Iron Box wiring and assembly
- Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
- Measurement of resistance to earth of an electrical equipment.

GROUP – B (MECHANICAL & ELECTRONICS)

PART III

MECHANICAL ENGINEERING PRACTICES

WELDING WORK:

- Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
- Practicing gas welding.

BASIC MACHINING WORK:

- Usage of Spanners and screw drivers
- Facing and Turning.
- Taper Turning

ASSEMBLY WORK:

- Assembling a centrifugal pump.
- Assembling a household mixer.
- Assembling an air conditioner.

SHEET METAL WORK:

- Making of a square tray

FOUNDRY WORK:

- Demonstrating basic foundry operations.

PART IV

ELECTRONIC ENGINEERING PRACTICES

SOLDERING WORK:

- Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

- Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

- Study elements of smart phone.
- Assembly and dismantle of computer / laptop

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Build various plumbing joints.
CO2: Develop various carpentry joints.
CO3: Construct various wiring electrical joints in common household electrical wire work.
CO4: Construct various welded joints, sheet metal and basic machining operations.
CO5: Develop the electronic circuit for soldering and testing using PCB board.

21CB102	PROBLEM SOLVING AND C LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To demonstrate the fundamentals of C programming.
- To describe the reusable modules (collections of function).
- To examine code, document, test, and implement a well-structured program using the C.
- To use the C programming concepts in trivial problem solving.
- To develop logics which will help them to create programs, applications in C.

LIST OF EXPERIMENTS:

1. I/O statements, operators, expressions
2. Decision-making constructs: if-else, goto, switch-case, break-continue
3. Loops: for, while, do-while
4. Arrays: 1D and 2D, Multi-dimensional arrays, traversal
5. Strings: operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7. Recursion
8. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
9. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10. Files: reading and writing, File pointers, file operations, random access, processor directives.

TOTAL: 60 PERIODS

COURSE OUTCOMES :

At the end of the course, learners will be able to

CO1: Develop simple applications using basic C components.

CO2: Solve applications adopting array and string concepts.

CO3: Construct and implement applications in C using functions and pointers.

CO4: Prepare applications in C by employing structure and union concepts.

CO5: Build applications using sequential and random access file processing.

SEMESTER II

21EN102	ENGLISH-II *(Common to all B.E./B.TECH. Programmes)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- To prepare and write convincing job applications and effective reports.
- To demonstrate their speaking skills to make technical presentations and participate in group discussions.
- To apply their Listening skill which will help them comprehend lectures and talks in their areas of specialization.
- To choose appropriate soft skills to suit the situation.

UNIT I	INTRODUCTION TO TECHNICAL ENGLISH	9

Listening - Factual and Academic speeches; **Speaking** - Asking for and giving directions - **Reading** - Technical texts from - Newspapers /websites; **Writing -** Statements - Definitions - issue based writing instructions - Checklists - Recommendations; **Vocabulary Development**- technical vocabulary; **Grammar** - Error spotting - Compound words; **Soft skills** - Leadership Skills.

UNIT II	READING AND STUDY SKILLS	9

Listening - Listening to longer technical talks and completing exercises based on them; **Speaking** - Describing a general process; **Reading** - Reading longer technical texts - Identifying the various transitions in a text - Paragraphing; **Writing** - Interpreting charts, graphs; **Vocabulary Development** - Vocabulary used in formal letters/emails and reports **Grammar -** Impersonal passive voice, numerical adjectives - **Soft skills** – Teamwork.

UNIT III	TECHNICAL WRITING AND GRAMMAR	9

Listening - Listening to classroom lectures, talks on engineering /technology; **Speaking** - introduction to technical presentations; **Reading** - longer texts both general and technical, practice in speed reading; **Writing** - Describing a technical process; **Vocabulary Development**- Sequence words - Misspelled words; **Grammar** - Embedded sentences ; **Soft skills** - Decision making.

UNIT IV	JOB APPLICATIONS	9

Listening - Listening to documentaries and making notes. **Speaking** - Mechanics of presentations; **Reading -** Reading for detailed comprehension; **Writing** - Email etiquette - job application - Cover Letter - Resume preparation(via email and hard copy) - Analytical essay writing - **Vocabulary Development -** finding suitable synonyms - paraphrasing; **Grammar** - clauses - If conditionals - **Soft skills** - Time Management.

UNIT V	GROUP DISCUSSION AND REPORT WRITING	9

Listening - TED talks; **Speaking** - Participating in a group discussion - **Reading** - Reading and understanding technical articles; **Writing** - Writing reports - Survey report, accident report and minutes of a meeting - **Vocabulary Development** - Verbal analogies; **Grammar** - reported speech; **Soft skills** - Conflict Resolution.

TOTAL: 45 PERIODS

COURSE OUTCOMES :

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

CO1: Interpret by reading information in technical texts.
CO2: Choose appropriate language to write convincing job applications, resume and reports.
CO3: Formulate the technical ideas effectively in spoken and written forms.
CO4: Analyze and understand spoken language in lectures and talks.
CO5: Demonstrate basic soft skills in life.

TEXT BOOKS:

1. Board of Editors, "Fluency in English-A Course book for Undergraduate Engineers and Technologist", 2nd Edition, Orient Blackswan Pvt Ltd, Hyderabad, 2018.
2. Jawahar, Jewelcy & Rathna.P, "Communicative English Workbook", 1st Edition, VRB Publishers Pvt Ltd. Chennai. 2018.
3. Board of Editors, Department of English, Anna University, Chennai, "Mindscapes-English for Technologists and Engineers", 1st Edition, Orient Black Swan Pvt Ltd, Chennai, 2012.

21MA204	PROBABILITY, STATISTICS AND NUMERICAL METHODS (*Common to B.E. MECH Engg. & CIVIL Engg.*)	L	T	P	C
		3	2	0	4

COURSE OBJECTIVES:

- To provide necessary basic concepts in probability.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations and numerical techniques of integration which plays an important role in engineering and technology disciplines.
- To describe various techniques and methods of solving ordinary differential equations.
- To familiarize various techniques and methods of solving partial differential equations.

UNIT I	PROBABILITY	12

Introduction-Sample Spaces and Events-Axioms of Probability-Interpretations and Properties of Probabilities-Conditional Probabilities-Baye‟s theorem- Independence.

UNIT II	TESTING OF HYPOTHESIS	12

Large sample test based on Normal distribution for single mean and difference of means – Tests based on t, $\chi 2$ and F distributions for testing means and variances – Contingency table (Test for Independency) – Goodness of fit.

UNIT III	SOLUTION OF EQUATIONS AND NUMERICAL INTEGRATION	12

Newton Raphson method – Solution of linear system of equations: Gauss elimination method – Pivoting – Gauss Jordan method – Gauss Seidel method – Numerical integration by Trapezoidal and Simpson‟s rule.

UNIT IV	NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS	12

Taylor‟s series method – Euler‟s method – Modified Euler‟s method – Fourth order Runge-Kutta method for solving first order equation – Milne‟s Predictor and Corrector method – Adam‟s Bashforth predictor – corrector method for solving first order equation.

UNIT V	BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS	12

Finite difference methods for solving second order two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace‟s and Poisson‟s equations on rectangular domain – One dimensional heat flow equation by explicit methods – One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1**:** Grasp the basic concepts of Probability and Random variables.

CO2 : Explain the test of hypothesis for small and large samples by using various test like t-test, F-test, Z-test and $\chi 2$ test.

CO3**:** Apply a suitable method to solve algebraic and transcendental equations.

CO4 : Explain the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

CO5 : Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:

1. JAY.L. Devore, "Probability and Statistics for Engineering and the Science", 8th Edition, Cengage Learning, 2012.
2. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis", 7th Edition, Pearson Education, Asia, New Delhi, 2006.
3. Johnson, R.A., Miller, I and Freund J, "Probability and Statistics for Engineers", 8th Edition, Pearson Education, Asia, 2015.

REFERENCES:

1. S.C.Gupta, V.K.Kapoor, "Fundamentals of Mathematical Statistics", 11th Edition, Sultan Chand & Sons, 2015.
2. Chapra. S.C. and Canale. R.P, "Numerical Methods for Engineers", 5th Edition, Tata McGraw Hill, New Delhi, 2007.
3. S.K.Gupta, "Numerical Methods for Engineers", 7th Edition, New Age International Private Ltd Publishers, 2015.

21PH104	PHYSICS FOR ELECTRONICS ENGINEERING *(Common to B.E. ECE Programme)*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

UNIT I	CRYSTALLOGRAPHY	9

Crystal structures: Crystal lattice - basis - unit cell and lattice parameters -Crystal systems and Bravais lattices - Structure and packing fractions of SC, BCC, FCC structures -Crystal planes, directions and Miller indices -Distance between successive planes -Linear and planar densities - Crystalline and non-crystalline materials - Example use of Miller indices: wafer surface orientation -Wafer flats and notches -Pattern alignment - Imperfections in crystals

UNIT II	ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS	9

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity, expression - Quantum free electron theory: tunneling -Degenerate states - Fermi-Dirac statistics.Density of energy states - Electron effective mass -Concept of hole. Magnetic materials: dia, para and ferromagnetic effects -Domain theory of ferromagnetism-M–H curve - Quantum interference devices - GMR devices.

UNIT III	SEMICONDUCTORS AND TRANSPORT PHYSICS	9

Intrinsic Semiconductors - Energy band diagram -Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors -Extrinsic semiconductors - Carrier concentration in n-type &p-type semiconductors - Variation of carrier concentration with temperature - Carrier transport in Semiconductors: Drift, mobility and diffusion - Hall effect and devices - Ohmic contacts - Schottky diode.

UNIT IV	OPTICAL PROPERTIES OF MATERIALS	9

Classification of optical materials - Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption, loss and gain. Optical processes in quantum wells - Optoelectronic devices: light detectors and solar cells -Light emitting diode -Laser diode - Optical processes in organic semiconductor devices - Excitonic state - Electro-optics and nonlinear optics: Modulators and switching devices.

UNIT V	NANO DEVICES	9

Density of states for solids - Significance between Fermi energy and volume of the material - Quantum confinement - Quantum structures - Density of states for quantum wells, wires and dots- Band gap of nanomaterials - Tunneling - Single electron phenomena - Single electron Transistor. Conductivity of metallic nanowires - Ballistic transport - Quantum resistance and conductance - Carbon nanotubes: Properties and applications - Spintronic devices and applications - Optics in quantum structures - quantum well laser.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Know basics of crystallography and its importance for varied materials properties.

CO2: Gain knowledge on the electrical and magnetic properties of materials and their applications.

CO3: Understand clearly of semiconductor physics and functioning of semiconductor devices.

CO4: Understand the optical properties of materials and working principles of various optical devices.

CO5: Appreciate the importance of nanotechnology and nano devices.

TEXT BOOKS:

1. S.O. Kasap, "Principles of Electronic Materials and Devices", 4th Edition, McGraw Hill Education (Indian Edition), 2020.
2. R.F.Pierret, "Semiconductor Device Fundamentals", 1st Edition, Pearson (Indian Edition), 2006.
3. G.W.Hanson, "Fundamentals of Nanoelectronics", 1st Edition, Pearson Education (Indian Edition), 2009.

REFERENCES:

1. Laszlo Solymar, Walsh, Donald, Syms and Richard R.A., "Electrical Properties of Materials", 9th Edition, Oxford Univ. Press (Indian Edition), 2015.
2. Jasprit Singh, "Semiconductor Optoelectronics: Physics and Technology", 1st Edition, McGraw-Hill Education (Indian Edition), 2019.
3. Charles Kittel, "Introduction to Solid State Physics", 1st Edition, Wiley India Edition, 2019.
4. Mark Fox, "Optical Properties of Solids", 1st Edition, Oxford Univ.Press, 2001.
5. N. Gershenfeld, "The Physics of Information Technology", 1st Edition, Cambridge University Press, 2011.

21CH103	ENVIRONMENTAL SCIENCE	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To describe the structure and function of an ecosystem and biodiversity.
- To interpret the environmental impacts of natural resources.
- To demonstrate causes, effects and control measures of different types of pollution.
- To manipulate the importance of disaster management, environmental ethics and values.
- To dramatize the important social issues and sustainable practices.

UNIT I	ENVIRONMENT, ECOSYSTEM AND BIODIVERSITY	6

Multidisciplinary nature of environmental studies - ecosystem- general structure and function of an ecosystem- ecological succession-biodiversity-types-values of biodiversity- endangered and endemic species-red data book- hot spots of biodiversity-criteria- hot spots in India-threats to biodiversity(man-animal conflicts, habitat loss, poaching)-case studies-conservation of biodiversity- in-situ and ex-situ conservation.

UNIT II	NATURAL RESOURCES AND ITS ENVIRONMENTAL IMPACTS	6

Natural resources-forest resource-ecological functions – causes, effects and control measures of deforestation-water resource-sources-conflict over water-dams benefits and problems-food resource-overgrazing- impacts of over grazing- impacts of modern agriculture-energy resource- environmental impacts of wind mills and solar panels- role of an individual in conservation of natural resources.

UNIT III	ENVIRONMENTAL POLLUTION AND CONTROL	6

Air pollution-causes, effects and control methods - water pollution- causes, effects-waste water treatment-soil pollution-causes, effects-solid waste management–e-waste- causes, effects and management-Pollution control acts-air(prevention and control of pollution) act,1981-water(prevention and control of pollution) act,1974- wildlife (protection) act,1972 - e-waste management rules,2016-case studies - role of an individual in control of pollution.

UNIT IV	DISASTER MANAGEMENT AND ENVIRONMENTAL ETHICS	6

Disaster management-causes, effects and management of- flood, landslide, earthquake and tsunami-case studies- environmental ethics- value education-traditional value systems in India-water conservation-rain water harvesting-watershed management.

UNIT V	SOCIAL ISSUES AND SUSTAINABLE PRACTICES	6

Unsustainable development- social issues-climate change-causes, effects and control measures- global warming-causes, effects and control measures-Acid rain-causes, effects and control measures-ozone layer depletion-causes, effects and control measures-nuclear accident and holocausts-EIA-Sustainable development-goals-target- green buildings- ISO 14000 series.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1 : Explain the concept, structure and function of an ecosystem and biodiversity.

CO2 : Demonstrate the environmental impacts of natural resources.

CO3 : Illustrate the suitable management method for pollution control.

CO4 : Relate the proper way of managing disaster with environmental ethics.

CO5 : Apply social issues and adopt suitable sustainable practices.

TEXT BOOKS:

1. Kaushik, A & Kaushik. C.P, "Environmental Science and Engineering", 6th Edition, New Age International, 2018.
2. Garg S.K &Garg, "Ecological and Environmental studies", 1st Edition, Khanna Publishers, 2015.
3. Wright & Nebel, "Environmental science towards a sustainable future", 12th Edition, Prentice Hall of India Ltd, 2015.

REFERENCES:

1. ErachBharucha, "Text book of Environmental studies for Undergraduate courses", 3rd Edition, UGC, 2021.
2. Ravi P. Agrahari, "Environmental ecology, Biodiversity, climatic change & Disaster management", 1st Edition, McGraw Hill, 2020.
3. Benney Joseph, "Environmental Science and Engineering", 1st Edition, McGraw Hill Education (India) Pvt Ltd, New Delhi, 2017.

21VD101	SEMICONDUCTOR DEVICES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To explain about basic semiconductor diodes, their characteristics and applications.
- To impart knowledge on different configurations and models of bipolar junction transistors.
- To demonstrate the construction and working principle of field effect transistors.
- To infer the operations of special semiconductor devices.
- To interpret the theory, construction and operation of power and display devices.

UNIT I	BASIC SEMICONDUCTOR DIODES	9

PN Junction Diode, Current equations, Energy band diagram, Diffusion and Drift current densities, Forward and Reverse bias characteristics, Transition and Diffusion capacitances, Switching characteristics, Breakdown in PN Junction Diodes, Zener diode - Varactor diode - Tunnel diode

UNIT II	BIPOLAR JUNCTION TRANSISTORS	9

NPN -PNP -Operations - Early effect - Current equations – Input and Output characteristics of CE,CB, CC - Hybrid -π model - h-parameter model, Ebers Moll model.

UNIT III	FIELD EFFECT TRANSISTORS	9

JFETs – Drain and Transfer characteristics - Current equations - Pinch off voltage and its significance – MOSFET - Characteristics - Threshold voltage - Channel length modulation, D-MOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET.

UNIT IV	SPECIAL SEMICONDUCTOR DEVICES	9

Metal semiconductor junction - MESFET, Multigate transistors-Double Gate, FINFET, DUAL GATE MOSFET, Gate and Channel Engineering , Carbon nanotubes and Carbon nanowires , Schottky barrier diode, LASER diode and LDR.

UNIT V	POWER DEVICES AND DISPLAY DEVICES	9

UJT, SCR, DIAC, TRIAC, Power BJT- Power MOSFET, LED, LCD, Photo transistor, Opto coupler, Solar cell and CCD.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Explain the operation and characteristics of semiconductor diode.
CO2: Outline the construction and working of bipolar junction transistors.
CO3: Explain the construction and characteristics of field effect transistors devices.

CO4: Summarize the working principles of special semiconductor devices.
CO5: Illustrate the construction and working of power & display devices.

TEXT BOOKS:

1. Donald A Neaman, "Semiconductor Physics and Devices", 4th Edition, Tata McGraw Hill Inc, 2012.
2. Salivahanan. S, Suresh Kumar. N, Vallavaraj. A, "Electronic Devices and Circuits", 3rd Edition, Tata McGraw-Hill, 2008.
3. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford Higher education press 2010.

REFERENCES:

1. Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory", 10th Edition, Pearson Prentice Hall, July 2008.
2. R. S. Sedha, "A Text Book of Applied Electronics", 10th Edition, S.Chand Publications, 2006.
3. Yang, "Fundamentals of Semiconductor Devices", 1st Edition, McGraw Hill International Edition, 1978.

21VD102	NETWORK THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To outline the basic concepts and behavior of DC circuits.
- To infer about circuit analysis using network theorems for DC circuits.
- To understand about AC circuit analysis using network theorems.
- To know more about the transient response of the circuits subject to DC excitations and AC with sinusoidal excitations.
- To gain knowledge on the concept of coupling in circuits and topologies.

UNIT I	DC CIRCUIT ANALYSIS	9

Basic components of Electric circuits, Charge, Current, Voltage and Power, Voltage and Current sources, Ohms law, Kirchoff„s current law, Kirchoff„s voltage law, The single Node – Pair circuit, Series and Parallel connected independent sources, Resistors in series and parallel, Voltage and Current division, Nodal analysis and Mesh analysis.

UNIT II	NETWORK THEOREM FOR DC CIRCUITS AND DUALITY	9

Circuit analysis techniques - Linearity and Superposition, Thevenin and Norton equivalent circuits, Maximum power transfer, Delta-Wye conversion, Duality, Dual circuits, Analysis using dependent current sources and voltage sources.

UNIT III	AC CIRCUIT ANALYSIS	9

Sinusoidal steady – state analysis, Characteristics of sinusoids, Nodal and Mesh analysis, Circuit analysis techniques - Linearity and Superposition, Thevenin and Norton equivalent circuits, Maximum power transfer.

UNIT IV	TRANSIENTS AND RESONANCE IN RLC CIRCUITS	9

Basic RL and RC circuits, The source - free RL circuit, The source-free RC Circuit, The Unit-Step function, Driven RL circuits, Driven RC circuits, RLC circuits, Frequency response, Parallel resonance, Series resonance and Quality factor.

UNIT V	COUPLED CIRCUITS AND NETWORK TOPOLOGY	9

Magnetically coupled circuits, Mutual inductance, Linear transformer, Ideal transformer, An introduction to Network topology, Trees and General nodal analysis, Links and Loop analysis.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of this course, learners will be able to

CO1: Make use of the basic voltage and current laws for analysis of DC circuits.

CO2: Select suitable network theorems to analyze DC circuits.

CO3: Analyze the AC circuits using network theorems.
CO4: Identify the transient and frequency response of RLC circuits.
CO5: Solve the various parameters of coupled circuits and infer the network topologies.

TEXT BOOKS:

1. Hayt Jack Kemmerly and Steven Durbin, "Engineering Circuit Analysis", 9th Edition, McGraw Hill, 2018.
2. Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", 2nd Edition, McGraw Hill, 2003.
3. Joseph Edminister and Mahmood Nahvi, "Electric Circuits, Schaum's Outline Series", 5th Edition, Tata McGraw Hill Publishing Company, New Delhi, Reprint 2016.

REFERENCES:

1. Robert.L. Boylestead, "Introductory Circuit Analysis", 12th Edition, Pearson Education India, 2014.
2. David Bell, "Fundamentals of Electric Circuits", 7th Edition, Oxford University press, 2009.
3. John O Mallay, "Basic Circuit Analysis", 2nd Edition, Schaum's Outlines, McGraw Hill, 2011.
4. 4. Allan H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", 5th Edition, Cengage Learning, 1st Indian Reprint 2013.

21TA102	TAMIL AND TECHNOLOGY	L	T	P	C
		1	0	0	1

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

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: 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) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

21TA102	**தமிழரும் தொழில்நுட்பமும்**	**L**	**T**	**P**	**C**
		1	**0**	**0**	**1**
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 **&** சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமை ப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும்- சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங் கோயில்கள் 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 - சாரோஸெனிக் 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 - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு 4	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்	3

அணை , ஏரி, குளங்கள், மதகு – சோழர் காலக் குமுழித் தூம்பின் முக்கியத்துவம் –கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் –வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார்சமூகம்.

அலகு 5	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்	3

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின் பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் -தமிழ் மின்நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் –கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: 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) (Publishedby: 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.

21PC101	PHYSICS AND CHEMISTRY LABORATORY *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS: (Any 7 Experiments)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia ofregular and irregular objects
2. Simple harmonic oscillations of cantilever
3. Non-uniform bending - Determination of Young‟s modulus
4. Uniform bending – Determination of Young‟s modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle

   b) Compact disc- Determination of width of the groove using laser
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids
9. Ultrasonic interferometer – Determination of the velocity of sound and compressibility of liquids
10. Post office box - Determination of Band gap of a semiconductor
11. Photoelectric effect
12. Michelson Interferometer
13. Melde‟s string experiment
14. Experiment with lattice dynamics kit

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

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

REFERENCES :

1. Physics Laboratory Manual, Department of Physics, Velammal College of Engineering & Technology, Madurai (2021)
2. P. Mani, "Physics Laboratory",1st Edition, Dhanam Publications, 2021.

*****Each class is divided in to two batches (30 students / batch) and each batch will perform their experiments alternatively per week in physics and chemistry laboratory.

CHEMISTRY LABORATORY

COURSE OBJECTIVES:

- To identify the required glass wares and instruments for chemical analysis.
- To estimate water quality parameters such as hardness, dissolved oxygen and chloride content.
- To relate electrochemical techniques such as pH metry, conductometry and potentiometry.
- To interpret the data collected from the analysis.
- To express the skills to get accurate results.

LIST OF EXPERIMENTS : (Any seven experiments to be conducted)

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in water sample. -Split the firstexperiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler"s method
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry

7. Estimation of TDS of a water sample by gravimetry
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer
12. Estimation of sodium /potassium present in water using flame photometer
13. Preparation of nanoparticles (TiO_2/ZnO/CuO) by Sol-Gel method
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

TOTAL: 30 PERIODS

COURSE OUTCOMES :

At the end of the course, learners will be able to

CO1: Extent the skills to choose and handle appropriate glass wares.
CO2: Interpret the water quality parameters using volumetric method.
CO3: Estimate the conductivity, pH &emf by electro chemical methods.
CO4: Infer the collected data for appropriate chemical analysis.
CO5: Demonstrate systematic approach to obtain accurate results.

TEXT BOOK:

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, "Textbook of Quantitative Chemical Analysis", 1st Edition, Vogel, 2009.

21VD103	SEMICONDUCTOR DEVICES & CIRCUITS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES :

- To gain knowledge about KVL, KCL, Thevenin, Norton and Superposition theorems.
- To study the transient analysis of RLC circuits.
- To infer the characteristics of Diode.
- To summarize the characteristics of BJT, FET and SCR.
- To demonstrate the working principle of half wave and full wave rectifiers.

LIST OF EXPERIMENTS:

1. Verification of KVL and KCL
2. Verification of Superposition theorem
3. Verification of Thevenin and Norton theorem
4. Verification of Maximum power transfer and reciprocity theorem
5. Determination of Resonance frequency of series and parallel RLC Circuits
6. Characteristics of PN Junction diode and Zener diode
7. Common Emitter input-output Characteristics
8. Common Base input-output Characteristics
9. FET Characteristics
10. SCR Characteristics
11. Half-wave rectifier and Full-wave rectifier

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Build circuits to verify Kirchoff‟s laws and network theorems.
CO2: Make use of RLC circuits to determine their frequency response.
CO3: Examine the characteristics of PN and Zener diodes.
CO4: Compare the characteristics of BJT, FET and SCR.
CO5: Distinguish half wave rectifier with full wave rectifier.

SEMESTER III

21MA201	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (*Common to B.E.(CIVIL Engg.,ECE & MECH. Engg.) Programmes*)	L	T	P	C
		3	2	0	4

COURSE OBJECTIVES:

- To use various methods of Laplace transforms for efficiently solving the problems that occur in various branches of engineering disciplines.
- To identify Fourier series which is essential to many applications in engineering.
- To explain the mathematical tools for the solutions of partial differential equations that model several physical processes.
- To explain the student with Fourier transform techniques used in wide variety of situations.
- To develop Z transform techniques to solve difference equations for discrete time systems.

UNIT I	LAPLACE TRANSFORM	12

Laplace transform- conditions for existence –Transform of elementary functions –Basic properties –First shifting theorem –Transform of derivatives on $t\,f(t), f(t)/t$ and periodic functions- Transform of unit step function and impulse functions. Inverse Laplace transform by partial function method and convolution theorem (excluding proof)-Initial and finial value theorems-Solutions of linear ODE of second order with constant coefficients using Laplace transform techniques.

UNIT II	FOURIER SERIES	12

Dirichlet's conditions – General Fourier series odd and even functions – Half range sine series – half range cosine series – Parseval's identity – Harmonic Analysis.

UNIT III	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	12

Classifications of PDE – Solutions of one dimensional wave equations – one dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

UNIT IV	FOURIER TRANSFORMS	12

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

UNIT V	Z- TRANSFORMS AND DIFFERENCE EQUATIONS	12

Z- Transforms – Elementary properties – Inverse Z- Transforms (Using partial fractions and residues) – Convolution theorem – Formation of difference equations – Solution of difference equations using Z-transforms.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1**:** Compute Laplace transform and inverse Laplace transform of different functions.

CO2: Expand the Fourier series to represent the given function in the given interval.

CO3: Classify the second order PDE and to know about solving initial and final value problems.

CO4: Apply Fourier transform techniques to evaluate the given integral.

CO5: Solve the given difference equations using Z-transforms.

TEXT BOOKS:

1. Kreyszig Erwin, "Advanced Engineering Mathematics ", 10th Edition, John Wiley and Sons, New Delhi**,** 2016.
2. Peter V.O. Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage, New Delhi, 2012.

REFERENCES:

1. Grewal.B.S. “Higher Engineering Mathematics”, 44th Edition, Khanna Publishers, New Delhi, 2018.
2. Wylie C. R. and Barrett L. C "Advanced Engineering Mathematics", 6th Edition, Tata McGraw-Hill, New Delhi, 2012.

21VD201	ELECTROMAGNETIC INTERFERENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To explain the fundamentals of EMI and EMC.
- To outline the basic principles of coupling.
- To illustrate various EMI mitigation techniques.
- To summarize the comprehensive insight about the current EMC standards.
- To explain EMI test methods and equipments.

UNIT I	BASIC THEORY	9

Introduction to EMI and EMC- Intra and inter system EMI-Elements of Interference-Sources and Victims of EMI- Conducted and Radiated EMI emission and susceptibility- Radiation hazards to humans- Various issues of EMC- EMC Testing categories - EMC Engineering Application.

UNIT II	COUPLING MECHANISM	9

Electromagnetic field sources and Coupling paths, Coupling via the supply network, Common mode coupling, Differential mode coupling, Impedance coupling, Inductive and Capacitive coupling, Radioactive coupling, Ground loop coupling, Cable related emissions and coupling, Transient sources, Automotive transients.

UNIT III	EMI MITIGATION TECHNIQUES	9

Shielding - Principle of Grounding, Isolated grounds, Grounding strategies for Large systems, Grounding for mixed signal systems – Filtering – EMI Suppression Cables – EMC connectors- EMC Gaskets – Isolation Transformers – Opto-Isolators - Transient and Surge Suppression devices.

UNIT IV	STANDARDS AND REGULATIONS	9

Need for Standards - Generic/General Standards for Residential and Industrial environment - Basic Standards - Product Standards - National and International EMI Standardizing Organizations; IEC, ANSI, FCC, AS/NZS, CISPR, BSI, CENELEC, ACEC – Electro Magnetic Emission and susceptibility standards and specifications, MIL461E Standards.

UNIT V	EMI TEST METHODS AND INSTRUMENTATION	9

Fundamental considerations - EMI Shielding effectiveness tests - Open field test, TEM cell for immunity test - Shielded anechoic chamber - EMI test receivers - EMI test wave simulators - EMI coupling networks - Line impedance stabilization networks -Feed through capacitors - Antennas- Current probes - MIL -STD test methods, Civilian STD test methods.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Infer the basic concepts of electromagnetic interference and compatibility.
CO2: Utilize various EMI coupling principles to achieve compatibility.
CO3: Outline EMI mitigation techniques.
CO4: Summarize the EMC standards and regulations in measurement techniques.
CO5: Select EMI methods and equipments based on specific requirements.

TEXT BOOKS

1. V Prasad Kodali, "Engineering Electromagnetic Compatibility", 2nd Edition, IEEE Press, New York, 2001.
2. Henry W. Ott, "Electromagnetic Compatibility Engineering", 2nd Edition, John Wiley & Sons Inc, Newyork, 2009.
3. Xingcun Colin Tong, "Advanced Materials and Design for Electromagnetic Interference Shielding", 1st Edition, CRC Press, 2008

REFERENCES:

1. Clayton Paul, "Introduction to Electromagnetic Compatibility", 2nd Edition, Wiley Inderscience, 2010.
2. W Scott Bennett, "Control and Measurement of Unintentional Electromagnetic Radiation", 1st Edition, John Wiley & Sons Inc., (Wiley Inderscience Series), 1997.
3. Dr Kenneth L Kaiser, "The Electromagnetic Compatibility Handbook", 1st Edition, CRC Press, 2005.

21VD202	DIGITAL SYSTEM DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To outline the digital fundamentals, Boolean algebra and its applications in digital systems.
- To summarize the design of various combinational digital circuits using logic gates.
- To infer the design procedures for synchronous sequential circuits.
- To familiarize with the analysis and design procedures for asynchronous sequential circuits.
- To explain various semiconductor memories.

UNIT I	DIGITAL FUNDAMENTALS	9

Number systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map minimization, NAND and NOR implementations.

UNIT II	COMBINATIONAL CIRCUIT DESIGN	9

Design of Half and Full adders, Half and Full subtractors, Binary parallel adder – Carry look ahead adder, BCD adder, Multiplexer, Demultiplexer, Magnitude comparator, Decoder, Encoder and Priority Encoder.

UNIT III	SYNCHRONOUS SEQUENTIAL CIRCUITS	9

Flip flops – SR, JK, T, D, Master / Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design - state minimization, state assignment, circuit implementation – Design of Counters- Ripple counters, Ring counters, Shift registers and Universal shift register.

UNIT IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	9

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Design of Hazard free circuits.

UNIT V	MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS	9

Basic memory structure – ROM -PROM – EPROM – EEPROM , RAM – Static and dynamic RAM - Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) ,Digital integrated circuits: Logic levels, propagation delay, power dissipation, fan-out and fan- in, noise margin, logic families and their characteristics-RTL, TTL, ECL, CMOS

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Make use of minimization techniques to simplify Boolean algebraic equations.

CO2: Build various combinational circuits using logic gates.

CO3: Develop synchronous sequential circuits using flip flops.
CO4: Construct asynchronous sequential circuits using flip flops.
CO5: Explain various semiconductor memories and programmable logic devices.

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", 6th Edition, Pearson Education, 2017.
2. S.Salivahanan and S.Arivazhagan, "Digital Electronics", 1st Edition, Vikas Publishing House Pvt Ltd, 2012.
3. Soumitra Kumar Mandal, "Digital Electronics", 1st Edition, McGraw Hill Education Private Limited, 2016.
4. J.Bhaskar-, "VHDL Primer", 1st Edition, Pearson Education Asia, 2001.

REFERENCES:

1. Charles H.Roth, "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
2. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
3. A.Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI Learning Private Limited, 2016.
4. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL Design", 1st Edition, McGraw-Hill Higher Education, 2009.

21VD203	INTEGRATED CIRCUIT DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To illustrate the fabrication steps of integrated circuits.
- To learn about the basic applications of Op-amp based circuits.
- To understand the function of Op-Amp as comparator, wave generator and data converter.
- To gain knowledge about the internal structure of specialICs such as 555 Timers,PLL circuits.
- To study about the functional blocks and applications of IC voltage regulator.

UNIT I	INTEGRATED CIRCUIT FABRICATION	9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance, Field Effect Transistors (FETs) and Photo Voltaic (PV) Cell.

UNIT II	OPERATIONAL AMPLIFIER CHARACTERISTICS AND APPLICATIONS	9

Ideal Operational amplifier of characteristics, DC characteristics and AC characteristics, differential amplifier; frequency response of Op-Amp-Basic applications of Op-Amp - Inverting and Non-inverting Amplifiers, summer, differentiator and integrator- Voltage - Current and Current -Voltage converters- Log and Antilog Amplifiers.

UNIT III	COMPARATOR, WAVE GENERATOR AND CONVERTER	9

Comparators, multivibrators, waveform generators, clippers, clampers, rectifiers, peak detector, Sample and Hold (S&H) circuit, Digital to Analog (D/A) converter, Analog to Digital (A/D) converters using Op-Amps.

UNIT IV	SPECIAL ICs	9

Functional block, characteristics of 555 Timer and its Pulse width Modulation (PWM) application - IC566 Voltage Controlled Oscillator (VCO)-Phase Locked Loop (PLL), Analog multiplier IC.

UNIT V	IC REGULATORS	9

IC voltage regulators -LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 123 Variable voltage regulators, switching regulator- Switched Mode Power Supply (SMPS).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Outline the steps involved in IC fabrication.
CO2: Illustrate the basic applications of Op-Amp.
CO3 : Explain the role of Op-Amp in wave generator, comparator and converter circuit. .
CO4: Infer special ICs namely Timers and Phase locked Loop (PLL) circuits with their applications.
CO5: Analyze the role of ICs in voltage regulating circuits.

TEXT BOOKS:

1. D. Roy Choudhary, Sheil B. Jani, "Linear Integrated Circuits", 5th Edition , New Age, 2018.
2. S. Salivahanan, "Linear Integrated Circuits", 2nd Edition, Tata Mc Graw Hill, 2015.
3. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th Edition, Pearson education, 2015.
4. Robert F. Coughlin, Fredrick F. Driscoll, "Op-amp and Linear ICs", 6th Edition, Pearson Education, 2012.

REFERENCES:

1. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits, 4th Edition, McGraw Hill, 2016.
2. David A. Bell, "Operational Amplifiers & Linear ICs", 3rd Edition, Oxford Higher Education, 2011.
3. G B Clayton, Steve winder, "Operational Amplifiers", 5th Edition, Newnes, 2003.
4. William D. Stanley, "Operational Amplifiers with Linear Integrated Circuits", 4th Edition, Pearson education, 2004.

21CB103	PYTHON PROGRAMMING *(Common to B.E. CSE (Cyber Security))*	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the syntax and semantics of Python Programming Language.
- To writ e Python functions to facilitate code reuse and manipulate strings.
- To illustrate the process of structuring the data using lists, tuples and dictionaries.
- To demonstrate the use of built-in functions to navigate the file system.
- To appraise the need for working on web scraping.

UNIT I	PYTHON BASICS	9

Introduction: Importance – limitations - Python impressions - Internal working – comments. Basics: Identifiers -reserved keywords – literals - fundamental data types - base conversion - type casting –escape characters - eval(),input(), and print() functions - command line arguments - delete statement. Operators - operator precedence – conditional, iterative and transfer statements - loops with else block. Strings: multiline string literal – accessing characters of string - operators for string - string operations – formatting.

UNIT II	DATA STRUCTURES, FUNCTIONS AND MODULES	9

Data structures: list, tuple, set, dictionary - Types of Functions - Return Statement - arguments in a function – scope of variables - global keyword - recursive, Lambda - filter(), map(), and reduce() function – function aliasing - nested, decorator, and generator functions. Modules: Module Aliasing - Member Aliasing - Reloading a Module - Dir() Function - Math Module - Random Module - Packages.

UNIT III	OBJECT ORIENTED PROGRAMMING AND EXCEPTION HANDLING	9

Class – object – self variable – constructor – types of variables and methods – setter and getter methods – passing members of one class to another class. Types of Error – Exception - Default Exception Handling – Customized. Exception Handling: Using Try- Except - Multiple Except Blocks – finally block - Nested Try- Except Finally Block -Types of Exception - Raise User-Defined Exception – Assertion.

UNIT IV	ADVANCED OOPS CONCEPTS	9

Inner class - Garbage collection – destructor - Finding the number of references of an object – Encapsulation –Inheritance – Aggregation vs Composition – Inheritance types – method resolution order – super() method –polymorphism – abstract class and method – interface - __str__() method.

UNIT V	FILE HANDLING AND PACKAGES	9

Introduction to file – With statement – seek() and tell() methods – Testing the existence of a file – Handling binary data and CSV files – Zipping and unzipping files – Directory – Get information about a file – Pickling and unpickling of objects, using Packages: Math – Numpy - Matplotlib

TOTAL :45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Explore the basics of Python programming such as operators and control structures.
CO2: Construct functions and modules with various data structures.
CO3: Create Classes and Objects using Python and handle exceptions.
CO4: Apply advanced OOP concepts in solving real-world problems.
CO5: Work on files and packages.

TEXT BOOKS:

1. Vijay Kumar Sharma, Vimal Kumar, Swati Sharma, Shashwat Pathak, "Python Programming – A Practical Approach", 1st Edition, CRC Press, 2022.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Shroff, O'Reilly Publishers, 2016.
3. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python 3.2",1st Edition Network Theory Ltd., 2011

REFERENCES:

1. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press, 2013.
2. Charles Dierbach, "Introduction to Computer Science using Python", 1st Edition Wiley India Edition, 2016.
3. Timothy A. Budd, "Exploring Python", 1st Edition, Mc-Graw Hill Education (India) Private Ltd., 2011.
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2021.

21VD204	ANALOG CIRCUITS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES :

- To gain knowledge about the single stage BJT amplifiers.
- To study the basic design of MOSFET amplifiers.
- To analyze multistage amplifier circuits.
- To infer about feedback amplifiers and oscillators principles.
- To understand about the power amplifiers and converters.

UNIT I	BJT AMPLIFIERS	9

Load line, operating point, biasing methods for BJT, BJT hybrid Π small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response – High frequency analysis.

UNIT II	MOSFET AMPLIFIERS	9

Load line, operating point, biasing methods for MOSFET, MOSFET hybrid Π small signal model – Analysis of CS, CG and Source follower – Gain and frequency response- High frequency analysis.

UNIT III	MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER	9

Cascode amplifier, Differential amplifier – Common mode and Difference mode analysis – MOSFET input stages – tuned amplifiers – Gain and frequency response – Neutralization methods.

UNIT IV	FEEDBACK AMPLIFIERS AND OSCILLATORS	9

Advantages of negative feedback – Voltage / Current, Series, Shunt feedback Amplifiers – Positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

UNIT V	POWER AMPLIFIERS AND CONVERTERS	9

Power amplifiers- class A-Class B-Class AB-Class C-Power MOSFET-Temperature Effect-Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Frequency response of CE amplifier
2. Frequency response of CB amplifier
3. Frequency response of CC amplifier
4. Frequency response of CS amplifier
5. Frequency response of Cascode Amplifier
6. CMRR measurement of Differential Amplifier
7. Analysis of BJT with Fixed bias and Voltage divider bias using PSPICE
8. Analysis of frequency response of CE and CS amplifier using PSPICE

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the learners will be able to

CO1: Analyze single stage BJT amplifiers.
CO2: Construct single stage MOSFET amplifiers.
CO3: Design and analyze multistage amplifier circuits.
CO4: Build feedback amplifiers and oscillators.
CO5: Interpret the design of power amplifiers and supply circuits.

TEXT BOOKS:

1. David A. Bell, "Electronic Devices and Circuits", 5th edition, Oxford Higher Education Press, 2010.
2. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th edition, Pearson Education, PHI, 2008.
3. Adel.S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 7th Edition, Oxford University Press, 2014.

REFERENCES:

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

21VD205	DIGITAL SYSTEM DESIGN LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES :

- To understand the basic construction of logic gates and its working.
- To gain knowledge about the design of combinational circuits using logic gates.
- To know about the design of sequential circuits using logic gates.
- To study the design of synchronous and Asynchronous counters.
- To explore about the design of basic digital circuits using VHDL programming.

LIST OF EXPERIMENTS:

1. Introduction to Digital Electronics Lab- Nomenclature of Digital ICs, Specifications, Study of the Data Sheet, Concept of Vcc and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs.
2. Implementation of the Given Boolean Function using Logic Gates in Both SOP and POS forms.
3. Verification of State Tables of RS, JK, T and D Flip-Flops using logic Gates.
4. Implementation and Verification of Decoder/De-Multiplexer and Encoder using LogicGates.
5. Implementation of 4x1 multiplexer using Logic Gates
6. Design , and Verify the 4- Bit Synchronous Counter
7. Design, and Verify the 4-Bit Asynchronous Counter
8. Design of a basic logic gates using VHDL
9. Design of a half and full adder/subtractor using VHDL.
10. Design of flipflops using VHDL

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Construct digital circuit to examine Boolean algebra, truth table of different logic gates.
CO2: Design various combinational digital circuits.
CO3: Construct sequential circuits using basic logic gates.
CO4: Build synchronous and Asynchronous counters using logic gates.
CO5: Make use of VHDL programming to design digital circuits.

21CB104	PYTHON PROGRAMMING LABORATORY *(Common to B.E. CSE (Cyber Security))*	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To describe the problem solving approaches.
- To solve the basic programming constructs in Python.
- To illustrate various computing strategies for Python-based solutions to real world problems.
- To make use of Python data structures - lists, tuples, and dictionaries.
- To explain input/output with files in Python.

LIST OF EXPERIMENTS

1. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
2. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern).
3. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building – operations of list & tuples)
4. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
5. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
6. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
7. Implementing programs using written modules and Python Standard Libraries (pandas,numpy. Matplotlib, scipy)
8. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
9. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation).

TOTAL:60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Develop algorithmic solutions to simple computational Problems.
CO2: Illustrate and execute basic Python programs using simple statements.
CO3: Build program for scientific problems using strings, functions and control statements.
CO4: Utilize compound data types lists, tuples and dictionaries for real-time applications.
CO5: Experiment the python packages, files and exceptions for developing software applications.

SEMESTER IV

21OMA01	GRAPH THEORY AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand fundamentals of graph theory.
- To study the concepts of trees.
- To estimate graph coloring, matching and covering number.
- To study concepts of directed graphs and its properties.
- To explore modern application of graph theory in various fields.

UNIT I	INTRODUCTION	9

Basic definitions in graphs, walk, path, circuits, isomorphism, Connected and disconnected graph. Operations on graphs , Eulerian graph – Hamiltonian graph.

UNIT II	TREES (CONNECTIVITY) PLANARITY	9

Properties of trees – distance and centers in tree –Algorithms (Kruskal's and Dijkstra Algorithm) - Rooted and binary trees, Spanning trees – Planar graphs: Definition and Properties.

UNIT III	MATRICES AND COLORING	9

Adjacency matrix and its properties, incidence matrix and its properties, Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering.

UNIT IV	DIRECTED GRAPHS	9

Directed graphs – Types of directed graphs – digraphs & its properties and binary relations – directed paths and connectedness – Euler graphs.

UNIT V	APPLICATIONS OF GRAPH THEORY	9

Graphs in switching and coding theory, Electrical network analysis by graph theory, Graph theory in Markov Processes: Multi step Transition Probabilities, Transient analysis of a Markov Process.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Apply various types of graphs and determine the existence of Eulerian, Hamiltonian path & circuits.

CO2: Explain the planarity of graphs and the classes of trees with properties.

CO3: Construct the adjacent matrix and incident matrix for the given graph and also develop the chromatic polynomial for the given graph.

CO4: Classify the types of directed graphs with its properties.

CO5: Apply suitable graph model for solving the Engineering and Science problems.

TEXT BOOKS:

1. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", 1st Edition, Dover Publications, IAC, 2016.
2. J.A.Bondy and USR.Moorthy, "Graph Theory with Applications", 2nd Edition, Indian Reprint, Springer Publishers, 2015.
3. Frank Harary, "Graph Theory", 1st Edition, Narosa Publishers, New Delhi, 2013.

REFERENCES:

1. William Kocay & Donald.L,Kreher, "Graphs, Algorithm and Optimization", 1st Edition, CRT Press, 2005.
2. Krishnaiyan, Thulasiraman, "Handbook of Graph Theory, Combinatorial Optimization, and Algorithms", 1st Edition, CRC Press Taylor & Francis Group, 2016.
3. R. Diestel, "Graduate Texts in Mathematics, Graph theory", 5th Edition, Springer 2017.

21VD206	CMOS VLSI DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To outline the fundamentals of CMOS circuits and its characteristics.
- To gain knowledge about design of combinational circuits using CMOS.
- To analyze sequential digital circuits using CMOS.
- To study about the timing issues in VLSI circuits.
- To illustrate the design of arithmetic building blocks using CMOS.

UNIT I	MOS CIRCUIT DESIGN PROCESS	9

Overview of VLSI Design Process - MOSFET Enhancement Transistors - MOS Physics - nFET Current- Voltage Equations - CMOS Inverter - DC Characteristics - Switching Characteristics - Dynamic Behavior- Power, Energy and Energy delay - Interconnects.

UNIT II	COMBINATIONAL CMOS LOGIC DESIGN	9

Static CMOS Design- Complementary CMOS- Pass Transistor Logic- Transmission Gate Logic -Dynamic CMOS Design- Signal Integrity Issues.

UNIT III	SEQUENTIAL CMOS LOGIC DESIGN	9

Static Latches and Registers - Dynamic Latches and Registers - Pulse Registers - Sense Amplifier based Registers - Pipelining - Nonbistable Sequential Circuits.

UNIT IV	TIMING ISSUES IN VLSI CIRCUITS	9

Timing Classification of Digital Systems - Timing Issues in Synchronous Design - Self Timed Circuit Design - Synchronizers and Arbiters.

UNIT V	DESIGN OF ARITHMETIC BUILDING BLOCKS	9

Data paths in Digital Processor Architecture - Design of Adders: Binary Adder and Full Adder - Multiplier- Barrel and Logarithmic Shifters - Magnitude and Equality Comparators - Power and Speed Trade-offs in Datapath Structures.

TOTAL:45 PERIODS

COURSEOUTCOMES:

CO1: Outline the concepts of digital building blocks using MOS transistor.
CO2: Make use of CMOS to design combinational circuits.
CO3: Examine combinational MOS circuits and sequential circuits.
CO4: Infer about the timing issues in VLSI circuits.
CO5: Develop arithmetic building blocks using CMOS.

TEXTBOOKS:

1. Jan M Rabaey, Anantha Chandrakasan and Borivoje Nikolic, “Digital Integrated Circuits - A Design Perspective”, 2nd Edition, Prentice Hall, 2012.
2. John P.Uyemura, “Introduction to VLSI Circuits and Systems”, 1st Edition, John Wiley & Sons, 2012.
3. Neil H. E. Weste and Kamran Eshraghian, “Principles of CMOS VLSI Design - A Systems Perspective”, 2nd Edition, Pearson Education, 2010.

REFERENCES:

1. Kamran Eshraghian, Douglas A. Pucknell, “Essentials of VLSI Circuits and Systems”, 1st Edition, Prentice Hall, 2011
2. C.Mead and L.Conway, "Introduction to VLSI Systems", 1st Edition, Addison Wesley, 1999.
3. Kang, "CMOS Digital Integrated Circuits", 1st Edition, McGraw Hill, 2002.

21VD207	FLEXIBLE ELECTRONICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To identify the advantages, drawbacks, performances, complementarity, and uniqueness of large-area manufacturing vs. silicon technology.
- To categorize processing methods of flexible devices.
- To predict the device characteristics of flexible thin film transistor and circuits.
- To study the interfaces of organic and inorganic electronic devices.
- To classify various flexible devices and its integration.

UNIT I	INTRODUCTION TO FLEXIBLE AND PRINTED ELECTRONICS	9

Evolution of Flexible Electronics, review of cutting edge research on electronics that can be flexible, plastic, stretchable, conformable or printed. Electronic materials, components, and systems, applications for IoT.

UNIT II	MATERIALS, PROCESSING, AND MANUFACTURING	9

Various semiconductors, dielectric, and conducting materials, Organic semiconductors, from chemical bonds to bands, Charge injection and transport, Examples of printable functional materials, Thin-film Deposition and Processing Methods for Flexible Devices, Solution-based Patterning Processes; Ink-jet printing, gravure, and other processes, surface energy effects, multilayer patterning.

UNIT III	FLEXIBLE THIN-FILM TRANSISTORS AND CIRCUITS	9

Thin-Film Transistor; Device structure and performance, Electrical characteristics, parameter extraction, characterization methods for rigid and flexible devices, electrical stability, printed transistors; organic/polymer, metal-oxide, electrolyte gated, Case studies; sub micrometer OTFTs and gravure printed OTFTs, From transistors to circuits.

UNIT IV	ORGANIC AND INORGANIC ELECTRONIC DEVICES	9

Circuits on flexible and non-silicon substrates, Contacts, and Interfaces to Organic and Inorganic Electronic Devices: Schottky contacts, defects, carrier recombination, the effect of applied mechanical strain.

UNIT V	FLEXIBLE DEVICES AND SYSTEM INTEGRATION	9

Organic Light Emitting Diodes, Organic Solar Cells, thin flexible OLED displays, OLED lighting, smart wallpaper, sensors, logic, and memory, RFID tags, Latest applications of printed electronics, Encapsulation, Roll to roll printing processes, Integration Issues, and Designs for the future.

TOTAL:45 PERIODS

COURSEOUTCOMES:

CO1: Outline the evolution of flexible electronics.
CO2: Classify the material and manufacturing process of flexible devices.
CO3: Infer the electrical characteristics of thin film transistor and circuits.
CO4: Examine the interface and contact of organic and inorganic electronic devices.
CO5: Summarize the various flexible devices and system integration.

TEXTBOOKS:

1. G. Nisato, D. Lupo, S. Ganz, "Organic and Printed Electronics: Fundamentals and Applications", CRC Press, 2009.
2. M. M. Hussain and N. El-Atab, "Handbook of Flexible and Stretchable Electronics", 1st Edition, CRC Press, 2020.
3. Sabrie Soloman, "3D Bioprinting Revolution", 1st Edition, Khanna Publishing House, 2020.

REFERENCES:

1. Mario Caironi & Yong-Young Noh, "Large Area and Flexible Electronics", 1st Edition, Wileyvch, 2015.
2. Wong, William S., and Alberto Salleo, "Flexible electronics: materials and applications", Vol. 11. 1st Edition, Springer, 2015.

21VD208	DISCRETE TIME SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain the concepts of basic classification of signals and systems.
- To analyze the continuous time signal and system using transforms.
- To gain knowledge about the analysis of discrete time signals.
- To apply discrete fourier transforms and fast fourier transform techniques.
- To illustrate the design process of digital filters.

UNIT I	CLASSIFICATION OF SIGNALS AND SYSTEMS	9

Introduction to signals and systems, Real time Applications of Signals, Fundamental Signals- Unit impulse, Step, Ramp, Various operations on signals- Time Shifting. Time reversal, Time Scaling, Amplitude Scaling, Signal Addition and Multiplication. Classification of Continuous and Discrete time signals- Periodic and Aperiodic, Even and Odd, Energy and Power, Deterministic and Random, Types of Systems- Linear and Nonlinear, Time Variant and invariant, Causal and Non-Causal, Static, and dynamic, Stable and unstable systems.

UNIT II	ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS	9

Fourier Transform and Inverse Fourier Transform, Properties of Fourier Transform, Analysis of LTI CT system using Fourier Transform, Frequency Response, Impulse Response and Step response, Laplace Transform and Inverse Laplace Transform, Region of Convergence (RoC) and Properties, Analysis of LTI CT system using Laplace Transform.

UNIT III	ANALYSIS OF DISCRETE TIME SIGNALS AND SYSTEMS	9

Fourier Transform of discrete time signals (DTFT), Properties of DTFT, Z Transform & Properties, Region of Convergence (RoC) and Properties, Inverse Z Transform, Analysis of LTI DT system using Z-transform, Transfer function, Stability and causality using Z-transform.

UNIT IV	DISCRETE FOURIER TRANSFORMS	9

Introduction to Discrete Fourier Transform (DFT) and Inverse Discrete Fourier Transform (IDFT), Properties of DFT, Efficient computation of DFT– FFT algorithms, Radix-2 FFT algorithms, Decimation in Time, Decimation in Frequency algorithms, Use of FFT algorithms in Linear Filtering, Linear Convolution and Circular Convolution.

UNIT V	DESIGN OF DIGITAL FILTERS	9

FIR design: Windowing Techniques, Need and choice of windows, Linear phase characteristics. Analog filter design, Butterworth and Chebyshev approximations; IIR digital Filter design using impulse invariant and bilinear transformation Warping, prewarping.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of this course, learners will be able to

CO1: Classify the signals and systems.

CO2: Analyze continuous time signal using various transforms.

CO3: Analyze discrete time signal and determine its stability.

CO4: Ability to apply DFT and FFT to solve practical problems.

CO5: Realize FIR Filters using Windowing and Frequency Sampling techniques.

TEXT BOOKS:

1. John G. Proakis and Dimitris G.Manolakis, "Digital Signal Processing - Principles, Algorithms & Applications", 4th Edition, Pearson Education, 2007.
2. B.Venkatramani and M.Bhaskar, "Digital Signal Processors: Architecture, Programming and Applications", 2nd Edition, Tata McGraw Hill, 2017.
3. V. Oppenheim, R. W. Shafer and J.R.Buck, "Discrete-Time Signal Processing", 4th Edition, Pearson Education, 2011.

REFERENCES:

1. Ifeachor E.C. and Jervis B.W., "Digital Signal Processing: A Practical Approach", 2nd Edition, Pearson Education, 2002.
2. Sanjit. K. Mitra "Digital Signal Processing - A computer based approach", 4th Edition, Tata McGraw Hill, 2011.
3. Andreas Antoniou, "Digital Signal Processing: Signals, Systems and Filters", 1st Edition, Tata McGraw Hill, 2006.
4. Monson H Hayes, "Schaum's Outlines of - Digital Signal Processing", 2nd Edition, Tata McGraw Hill, 2012.

21VD209	MICROCONTROLLERS AND COMPUTER ARCHITECTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To understand the basic concepts of computer architecture.
- To study the basics of 8085 microprocessor.
- To gain knowledge about the programmable interface and its features.
- To know more about the microcontroller architecture.
- To explore the interfacing using Assembly language programming.

UNIT I	COMPUTER ARCHITECTURE	9

Functional units of a computer, Von Neumann and Harvard computer architectures, CISC and RISC architectures. Processor Architecture – General internal architecture, Address bus, Data bus, control bus. Register set – status register, accumulator, program counter, stack pointer, general purpose registers. Processor operation – instruction cycle, instruction fetch, instruction decode, instruction execute, timing response, instruction sequencing and execution. Algorithms for binary multiplication and division. Fixed and floating-point number representation.

UNIT II	8085 MICROPROCESSOR	9

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing. Basic interfacing concepts, interfacing output displays, Interfacing input devices, Memory mapped I/O, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Addressing modes, Writing assembly language programs, Programming techniques: looping, counting and indexing. Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays. Subroutines. Interrupts

UNIT III	PROGRAMMABLE PERIPHERAL INTERFACE	9

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

UNIT IV	MICROCONTROLLER ARCHITECTURE	9

Microcontrollers and Embedded Processors. Architecture – Block diagram of 8051, Pin configuration, Registers, Internal Memory, Timers, Port Structures, Interrupts. Assembly Language Programming - Addressing Modes, Instruction set (Detailed study of 8051 instruction set is required).

UNIT V	INTERFACING	9

Simple programming examples in assembly language. Interfacing with 8051 using Assembly language programming: LED, Seven segment LED display. Programming in C – Declaring variables, Simple examples – delay generation, port programming, code conversion.
Interfacing of – LCD display, Keyboard, Stepper Motor, DAC and ADC -- with 8051 and its programming. 8051 Timers/Counters - Modes and Applications. Serial Data Transfer – SFRs of serial port, working, Programming the 8051 to transfer data serially

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Explain the functional units with respect to computer architecture.
CO2: Outline the basic concepts of 8085 microprocessor.
CO3: Summarize the operation of programmable interface and DMA controller.
CO4: Illustrate the features of 8051 microcontroller.
CO5: Outline the Interfacing of 8051 with peripherals using assembly language/C.

TEXT BOOKS:

1. Mano M M, "Computer System Architecture", 3rd Edition, Prentice Hall India, 1992.
2. Ramesh S Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", 6th Edition, Penram International, 2013.
3. Muhammed Ali Mazidi & Janice Gill Mazidi, "The 8051 microcontroller and Embedded systems", 2nd Edition, Pearson Education, 2007.

REFERENCES:

1. Bruce Carlson A & Paul B Crilly, "Communication Systems", 4th Edition, McGraw Hill, 2009.
2. J.G Proakis, M. Salehi, "Digital Communication", 5th Edition, TMH, 2014.
3. B.P.Lathi, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press, 2017.
4. Dennis Roddy & John Coolen, "Electronic Communication", 4th Edition, Prentice Hall of India, 1995.

21CS214	OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES :

- To describe the fundamentals of object oriented programming in C++.
- To explain the basics of OOP and Object-oriented approach to design software.
- To illustrate the concept of data structures through ADT including List, Stack, Queues.
- To demonstrate the concept of Non-Linear Data Structures and their applications.
- To choose the various sorting and searching techniques.

UNIT I	BASIC OOPS CONCEPTS	9

Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference Variables – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Overloading: Function overloading and Operator Overloading.

UNIT II	INHERITANCE & POLYMORPHISM	9

Base Classes and Derived Classes – Protected Members – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes - Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer – Virtual Destructors – Dynamic Binding.

UNIT III	LINEAR DATA STRUCTURES	9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists –Polynomial Manipulation - Stack ADT – Queue ADT - Evaluating arithmetic expressions

UNIT IV	NON-LINEAR DATA STRUCTURES	9

Trees – Binary Trees – Binary tree representation and traversals – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Representation of Graphs – Breadth-first search – Depth-first search - Connected components

UNIT V	SORTING AND SEARCHING	9

Sorting algorithms: Insertion sort - Quick sort - Merge sort - Searching: Linear search – Binary Search

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Develop simple applications using Basic OOPS concepts.

CO2: Build C++ programs using inheritance.

CO3: Construct the concept of stack, linked list and memory allocation.

CO4: Solve problems related to trees and Graphs.
CO5: Compare different sorting and searching algorithms.

TEXT BOOKS:

1. Herbert Schildt, "C++: The Complete Reference", 4th Edition, McGraw Hill Education, 2017.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Addison-Wesley, 2014**.**
3. Ellis Horowitz, SartajSahni and Dinesh Mehta, "Fundamentals of Data Structures in C++", 2nd Edition, Universities Press, 2008.

REFERENCES:

1. Bhushan Trivedi, "Programming with ANSI C++, A Step-By-Step approach", 1st Edition, Oxford University Press, 2010.
2. Goodrich, Michael T., Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", 2nd Edition, Wiley. 2013.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, McGraw Hill, 2010.

21EN301	PROFESSIONAL COMMUNICATION LABORATORY *(Common to all B.E./B.Tech. Programmes)*	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To demonstrate communication skills that can lead to improved interpersonal relationships.
- To plan to set and achieve goals with focus.
- To organize themselves in work life to face the professional set up with confidence.
- To interpret ideas and participate in group discussion with positive attitude.
- To develop their confidence and help learners to attend interviews successfully.

UNIT I	COMMUNICATION AND PROFESSIONAL ETIQUETTES	6

Importance and Types of Communication Verbal communication -Presentation skills- Non-Verbal communication - Personal Appearance, Posture, Gestures, Facial Expressions, Eye Contact and Space Distancing - Professional Etiquette

UNIT II	GOAL SETTING AND MOTIVATION	6

Short term and Long term Goals- Strategies to set and achieve goals- Motivation

UNIT III	TIME AND STRESS MANAGEMENT	6

Importance of Time - Time Management Skills - Sources of Stress - Managing Stress - Analysis of the Case Studies on time and stress management

UNIT IV	GROUP DISCUSSIONS AND POSITIVE ATTITUDE	6

Group Discussions - Leadership Qualities - Decision Making - Problem Solving - Negotiation Skills - Positive Attitude

UNIT V	RESUME MAKING AND INTERVIEW SKILLS	6

Preparing Resume - E - Resume - Covering Letter – Job Application through email - Career Portfolio - Types of Interviews - Mock Interviews

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Demonstrate effective communication skills through presentations.
CO2: Utilize their knowledge of motivation in setting and achieving goals.
CO3: Examine time and stress management.
CO4: Formulate their ideas into an effective communication in formal contexts.
CO5: Develop a well-composed resume and face interviews confidently.

TEXT BOOKS:

1. Dhanavel S P, "English and Soft Skills", 1st Edition, Orient Black Swan Ltd, Hyderabad 2012.
2. Dr. Tobin Porterfield & Bob Graham, "The 55 Soft Skills That Guide Employee and Organizational Success", 1st Edition, Mason – West Publishing House, 2018.

3. Prashant Sharma, "Soft Skills Personality Development for Life Success",1st Edition, BPB Publications, New Delhi, 2018.

REFERENCES:

1. M. Ashraf Rizvi, "Effective Technical Communication", 1st Edition, Tata McGraw Hill Education Pvt. Ltd. New Delhi, 2016.
2. Mohan Krishna & Meera Banerji, "Developing Communication Skills", 1st Edition, Trinity Press, 2017.
3. N. Krishnaswami & T. Sriraman, "Creative English for Communication", 3rd Edition, Laxmi Publications Private Limited, 2017.

21CS215	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES :

- To describe the fundamentals of object oriented programming, particularly in C++.
- To use object oriented programming to implement data structures.
- To illustrate linear data structures and their applications.
- To demonstrate non-linear data structures and their applications.
- To explain the concept of data structures through ADT.

LIST OF EXPERIMENTS

1. Basic Programs for C++ Concepts
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list implementation of List ADT
4. Cursor implementation of List ADT
5. Stack ADT - Array and linked list implementations
6. Implement stack Applications using Stack ADT
7. Queue ADT – Array and linked list implementations
8. Implement Queue Applications using Queue ADT
9. Search Tree ADT - Binary Search Tree
10. Graphs- Breadth first and Depth first search
11. Insertion sort
12. Quick Sort
13. Develop a C++ application to solve real world problem using ADT algorithms

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1: Develop simple applications using Basic OOPS concepts.
CO2: Execute and Implement programs using inheritance and use them in programs.
CO3: Construct the concept of stack, linked list and memory allocation.
CO4: Solve problems related to trees and Graphs.
CO5: Compare different sorting and searching algorithms.

TEXT BOOKS:

1. Herbert Schildt, "C++: The Complete Reference", 4th Edition, McGraw Hill Education, 2017.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Addison- Wesley, 2014**.**
3. Ellis Horowitz, SartajSahni and Dinesh Mehta, "Fundamentals of Data Structures in C++", 2nd Edition, Universities Press, 2008.

REFERENCES:

1. Bhushan Trivedi, "Programming with ANSI C++, A Step-By-Step approach", 1st Edition, Oxford University Press, 2010.
2. Goodrich, Michael T., Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", 2nd Edition, Wiley. 2011.

3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, McGraw Hill, 2010.
4. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley, 2013.

21VD210	MICROCONTROLLERS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES :

- To study the assembly language programming of 8051 microcontroller for the basic arithmetic operations.
- To gain knowledge to write the assembly language program to perform code conversion, generate delay and timer circuits.
- To make the students familiar to write assembly language program to interface a simple toggle switch to 8051.
- To understand the basics of C programming to transmit and receive a set of characters.
- To provide an insight of interfacing of 8051 with converters and stepper motor.

I. PROGRAMMING

1. Data Transfer: Block Move, Exchange, Sorting, Finding largest element in an array
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable)
3. Counters
4. Boolean & Logical Instructions (Bit manipulations)
5. Conditional CALL & RETURN
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX
7. Programs to generate delay, Programs using serial port and on-Chip timer/counter

II. INTERFACING

1. Interface a simple toggle switch to 8051 and write an ALP to generate an interrupt which switches on an LED (i) continuously as long as switch is on and (ii) only once for a small time when the switch is turned on.
2. Write a C program to (i) transmit and (ii) to receive a set of characters serially by interfacing 8051 to a terminal
3. Write ALPs to generate waveforms using ADC interface
4. Write ALP to interface an LCD display and to display a message on it
5. Write ALP to interface a Stepper Motor to 8051 to rotate the motor
6. Write ALP to interface ADC-0804 and convert an analog input connected to it

TOTAL PERIODS : 60

COURSE OUTCOMES:

At the end of the course, learners will be able to

CO1:Develop Assembly language programs in 8051 for solving simple problems that manipulate input data using different instructions of 8051.

CO2:Analyze Interfacing with different input and output devices to 8051 and control them using Assembly language programs.

CO3:Construct Interfacing of serial devices to 8051 and do the serial transfer using C programming.

CO4:Develop Assembly language programs in 8051 to generate waveforms.

CO5:Build interfacing with ADC to convert the signal.