I SEMESTER SYLLABI
COMMON FOR ALL BRANCHES

Applicable to the students admitted to

R-2021: CBCS

Academic year 2021-2022
onwards

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

#60, Avadi – Vel Tech Road, Vel Nagar,
Avadi, Tamil Nadu 600062

LIST OF ABBREVIATIONS

S. No.	Abbreviations	Detailed Description
1	**HSMC**	Humanities & Social Science including Management Courses
2	**BSC**	Basic Science Courses
3	**ESC**	Engineering Science Courses
4	**PCC**	Professional Core Courses
5	**PEC**	Professional Elective Courses
6	**OEC**	Open Elective Courses
7	**PROJ**	Project Work
8	**EEC**	Employability Enhancement Courses
9	**MC**	Mandatory Courses

Curriculum (R2021)

SEMESTER I										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EN11T	Communicative English	HSMC	40	60	100	3	0	0	3
2	21MA12T	Matrices and Differential Calculus	BSC	40	60	100	3	1	0	4
3	21PH13T	Engineering Physics I	BSC	40	60	100	3	0	0	3
4	21CY14T	Engineering Chemistry	BSC	40	60	100	3	0	0	3
5	21CS15IT	Problem Solving and Python Programming	ESC	40	60	100	2	0	4	4
6	21ME16T	Engineering Graphics	ESC	40	60	100	4	0	0	4
PRACTICAL										
7	21BS17P	Physics and Chemistry Laboratory	BSC	40	60	100	0	0	4	2
8	21ME18P	Engineering Practices Laboratory	ESC	40	60	100	0	0	4	2
TOTAL										**25**

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Course code	21EN11T	Semester	I			
Category	HUMANITIES & SOCIAL SCIENCE INCLUDING MANAGEMENT COURSES (HSMC)		L	T	P	C
Course Title	COMMUNICATIVE ENGLISH (COMMON FOR ALL BRANCHES)		3	0	0	3

COURSE OBJECTIVES:

- To exhibit the students of Engineering and Technology to develop their listening and to recall the pattern of listening.
- To facilitate the learners to develop speaking skills to convey their ideas and views in the real context.
- To develop their reading skills and grasp the central ideas of the text.
- To expose them to acquire writing technique with basic grammar.
- To motivate the students to use appropriate vocabulary in academic and categorize the inferences in writings.

PREREQUISITE:

- Foundation of language with Basic English Grammar.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C101. 1	***Listen*** to different talks and lectures and understand them easily.	K1
C101. 2	***Communicate*** their thoughts confidently using communicative strategies	K2
C101. 3	***Read*** and grasp different genres of texts effortlessly	K2
C101. 4	***Write*** grammatically correct academic, business and technical texts	K3
C101. 5	***Apply*** the appropriate vocabulary to communicate efficiently in all forms of communication.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C101. 1	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 2	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 3	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 4	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 5	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101. 6	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-
C101	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I BASIC GRAMMAR I AND READING FOR INFORMATION 9

PRACTICAL

LISTENING: Listening to short dialogues with good accent

SPEAKING : Introducing oneself - Exchanging personal information

TUTORIAL

READING : Reading short comprehension passages- practice skimming and scanning for specific information

WRITING: Parts of speech - Sentence patterns – Tenses – 'wh'- questions - Yes/No questions -Countable and Uncountable nouns

VOCABULARY AND GRAMMAR: Affixation – word formation - Synonyms and Antonyms.

UNIT II BASIC GRAMMAR II AND SHARING INFORMATION 9

PRACTICAL

LISTENING : Listening to documentaries - inspiring speeches of great leaders and practicing opinion sharing

SPEAKING : Self-introduction - peer introduction - picture description - JAM

TUTORIAL

READING: Note-making- Critical reading finding key information in a given text - shifting facts from opinions and paraphrasing

WRITING: Autobiographical writing (writing about one's leisure time activities, hometown - favourite place and school life) - Biographical writing (place, people)

VOCABULARY AND GRAMMAR: Compound Words – Guessing meaning of words contexts - One Word substitutes – Pronouns- Adjectives – Adverbs – Imperatives - Direct and Indirect questions.

UNIT III BASIC GRAMMAR III AND FREE WRITING 9

PRACTICAL

LISTENING : News Bulletins - Ted talks - telephonic conversations

SPEAKING : functions of Language - giving reasons - talking about future plans - comparing and contrasting - making suggestions

TUTORIAL

READING: Current Affairs - newspaper reading /magazines - loud in the classroom

WRITING: Coherence and cohesion in writing- cause and effect - compare & contrast and narrative & analytical paragraphs.

VOCABULARY AND GRAMMAR: Discourse marker - Reference words - Process description - Conjunctions – Prepositions - Articles - Degrees of comparison.

UNIT IV BASIC GRAMMAR IV AND FREE WRITING 9

PRACTICAL

LISTENING : Listen to audio/ Conversation from BEC/IELTS /TOFEL.

SPEAKING : Interpersonal Skills: Role play/group discussion/debate/ conduct of meeting

TUTORIAL

READING: Reading different types of texts /genres/ for comprehension and pleasure – related with human values.

WRITING: Letter writing (informal letters) and formal letters – rejecting and accepting Letters - Personal emails and etiquette.

VOCABULARY AND GRAMMAR: Single Word substitutes - Use of abbreviations Acronyms - Cloze reading - interpreting visual materials - Jumbled sentences - Subject verb agreement - Modal verbs - Phrasal verbs.

UNIT V BASIC GRAMMAR V AND LANGUAGE DEVELOPMENT 9

PRACTICAL

LISTENING : Listen to official meetings to know about the project proposal.

SPEAKING : Discussing the project and the proposals in the group - Creative writing and speaking - Poster making and description - project proposals.

TUTORIAL

READING: Reading comparison and contrast text with the deeper level of meaning **WRITING :** Essay writing - different types of essays - dialogue writing

VOCABULARY AND GRAMMAR: Word association (connotations) - Lexical items (fixed / semi fixed expressions) - Clause - Direct and indirect speech - Correction of errors.

Total: 45 Periods

Extensive Reading:

Kalam , Abdul. The Wings of Fire , Universities Press, Hyderabad. 19

LEARNING RESOURCES:

TEXT BOOKS:

1. Board of Editors, Department of English, Anna University, Chennai. Using English:A Course Book for Undergraduate Engineers and Technologists, Orient Black Swan: Chennai,2017.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai,2011.

REFERENCES:

1. Raman, Meenakshi & Sangeetha Sharma, Technical Communication: English Skills for Engineers. Oxford University Press, NewDelhi.2011.

2. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2006

3. Rizvi M, Ashraf. Effective Technical Communication. Tata McGraw- Hill Publishing Company Limited, New Delhi, 2007.

4. Rutherford, Andrea J. Basic Communication Skills for Technology. Pearson Edition (II Edition), NewDelhi, 2001.

5. Mandel, Steve. *Effective Presentation Skills*. New Delhi: Viva Books Pvt. Ltd., 2004.

6. Kilmet, Stephen. "The Resume and "The Computerized Resume." In Writing for Design Professionals.

7. Writing Cover Letters-Kilmet, Stephen. "Cover Letter, "and" Enclosures and Attachments." in Writing for Design Professionals New York.

Course code	21MA12T	Semester	I			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	MATRICES AND DIFFERENTIAL CALCULUS (COMMON FOR ALL BRANCHES)		4	0	0	4

COURSE OBJECTIVES:

- To apply advanced matrix knowledge to solve engineering problems
- To improve their ability in solving geometrical applications of differential calculus
- To familiarize with the application of differential equations

PREREQUISITE:

- Basic Mathematics skills at 12th level

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students are able to		
C102.1	***Solve*** Engineering problems using matrices.	K3
C102.2	***Use*** various test to discuss the convergence of infinite series.	K2
C102.3	***Apply*** the geometrical concepts to solve differential calculus.	K4
C102.4	***Compute*** partial derivatives of functions of several variables.	K2
C102.5	***Apply in Engineering many physical initial*** and boundary value problems can be described by ODE.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C102.1	3	3	-	-	-	-	-	-	-	-	-	-
C102.2	3	2	-	-	-	-	-	-	-	-	-	-
C102.3	3	3	-	-	-	-	-	-	-	-	-	-
C102.4	3	2	-	-	-	-	-	-	-	-	-	-
C102.5	3	2	-	-	-	-	-	-	-	-	-	-
C102	3	2	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I MATRICES 12

Matrix operations, special types of matrices, matrices as linear transformations, linear independence, Orthogonalization, Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley – Hamilton theorem, Orthogonal reduction of a symmetric matrix to diagonal form – Orthogonal matrices – Reduction of quadratic form to canonical form by orthogonal transformations- Nature of quadratic forms.

UNIT II INFINITE SERIES 12

Sequences of real numbers-Series-General properties of series-Comparison test- Integral test, D' Alemberts ratio test and Cauchy's root test- Power series, radius and interval of convergence of power series, Convergence of exponential, logarithmic and Binomial Series, Properties of uniformly convergence series

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS 12

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelops – Evolute as envelope of normals

UNIT IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES 12

Limits and Continuity –Partial derivatives –Homogeneous Functions-Total derivative –Change of variables –Jacobian and properties –Taylor's series for functions of two variables –Maxima and minima of functions of two variables –Lagrange's method of undetermined multipliers.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 12

Second and Higher Order Equations, homogeneous and non-homogeneous linear equations and linear systems with constant coefficients, method of variation of parameters, method of undetermined coefficients, Equations reducible to linear equations with constant coefficients-Simultaneous linear equations with constant coefficients.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2015.

REFERENCES:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons. Singapore, 10thEdition, 2015.
2. M.K. Venkataraman, Engineering Mathematics- First Year, 2nd Edition, National Publishing., Chennai 2001.
3. T. Veerarajan, Engineering Mathematics-I, Tata McGraw Hill Publishing Co, New Delhi, 2017.

Course code	21PH13T	Semester	I			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	ENGINEERING PHYSICS I (COMMON FOR ALL BRANCHES)		3	0	0	3

COURSE OBJECTIVES:

- To understand the importance of polarization, optical fiber and Lasers
- To familiar the knowledge of electromagnetic waves oscillations
- To understand the importance of quantum physics
- To cognize the basics of heat and thermodynamics
- To express the basics of crystal physics

PREREQUISITE:

- High School Maths and Physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C103.1	***Utilize*** the concepts of polarization, optical fiber and Lasers for engineering applications	K3
C103.2	***Apply*** the knowledge of electromagnetic waves oscillations	K3
C103.3	***Understand*** the importance of quantum physics.	K2
C103.4	***Cognize*** the basics of heat and thermodynamics	K2
C103.5	***Express*** the basics of crystal physics	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C103.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C103.2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C103.3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
C103.4	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C103.5	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-
C103	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I PHOTONICS 9

Polarization and Fiber Optics: Electromagnetic waves - Production and analysis of linearly, elliptic and circularly polarized light-Polaroid and applications of polarization. Fiber optics - principle of operation – numerical aperture - acceptance angle and applications of fiber optics.

Optical Sources: Characteristics of Lasers - Spontaneous and Stimulated Emission of Radiation - Population Inversion - Einstein's Coefficients and Relation between them - Applications of Lasers.

UNIT II WAVES AND OSCILLATION 9

Oscillatory motion: Differential equation of SHM- Velocity and acceleration- Restoring Force- Frequency response - phase response and resonance-Analogy with LCR circuits and oscillators- Energy and energy loss- Damped oscillations- Significance in control systems - vibration and vibration isolation.

Wave motion: Definition of a plane progressive wave- Attenuation of waves- Phase Velocity- Introduction to numerical methods for solution of wave equation- Importance of spherical and plane wave fronts.

UNIT III QUANTUM MECHANICS 9

Need for Quantum Physics-Historical overviews - Matter waves - De-Broglie's concept of matter waves - Properties of matter waves - Photo electric effect - Heisenberg's uncertainty principle – Statement - Interpretation and application - Schrödinger's time dependent and time independent equations - Operators - Eigen values and Eigen functions - Expectation values -Physical significance of wave function-Quantum superposition and entanglement for Qbits (quantitatively)

UNIT IV HEAT AND THERMODYNAMICS 9

Heat and internal energy - Specific heat and calorimetry - Latent Heat coefficient of linear thermal expansion - Methods of measurement of thermal expansion - Thermal expansion -Applications - The bimetallic strip - Differential equation of one-dimensional heat flow - Lee's disc apparatus for determination of thermal conductivity - Thermal Insulation- Heat dissipation and heat sinking of electronic devices-solid state refrigerators (qualitatively)

UNIT V CRYSTAL PHYSICS 9

Introduction of Crystallography - Space Lattice - Unit Cell - Lattice Parameters – Crystal Systems - Bravais Lattices - Miller Indices and its applications - Crystal Planes and Directions- Inter Planar Spacing of Orthogonal Crystal Systems - Atomic Radius - Co-ordination Number and Packing Factor of SC, BCC, FCC – Crystal growth –Solution growth -Structure determination by x-ray diffraction method (cubic structure).

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Richard Wolfson, "Essential University Physics", Vols. 1 and 2. Pearson Education, Singapore, 2011.
2. Gaur R K, Gupta S L, "Engineering Physics", DhanpatRai Publications, 2013.

REFERENCES:

1. Halliday D., Resnick R. and Walker J., “Fundamentals of Physics”, Wiley Publications,2008.
2. Avadhanulu M. N., “Engineering Physics”, S. Chand & Co., 2007.
3. Purcell E. M., “Electricity and Magnetism – Berkeley Physics Course”, Vol. 2, Tata McGraw-Hill, 2008.
4. Paul A. Tipler and Geene Mosca, “Physics for Scientists and Engineers”, W.H. Freeman and Company, New York, 2004.

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Course code	21CY14T	Semester	I			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	ENGINEERING CHEMISTRY (COMMON FOR ALL BRANCHES)		3	0	0	3

COURSE OBJECTIVES:

- To make the students conversant with water quality parameters and treatment techniques.
- To get the basic idea about the polymers, electrochemistry and corrosion.
- To deal with the information about various types of fuels and energy sources.

PREREQUISITE:

- Basic Chemistry Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students are able to		
C104.1	***Understand*** the water related problems and their treatment techniques.	K2
C104.2	***Explain*** the applications of polymers and reinforced plastics.	K2
C104.3	***Acquire*** knowledge on electrochemistry and corrosion.	K2
C104.4	***Summarize*** the types of fuels and its production process and calculate the CV values.	K2
C104.5	***Classify*** the non-conventional energy sources and its applications.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C104.1	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.2	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.3	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.4	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104.5	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C104	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I WATER AND ITS TREATMENT 9

Introduction - characteristics - alkalinity - types and determination - hardness - types expression of hardness - units - estimation of hardness of water by EDTA - numerical problems -boiler feed water-requirements-boiler troubles – scale & sludge -disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) -softening of hard water - external treatment process - demineralization and zeolite, internal treatment - boiler compounds (carbonate, phosphate, Calgon, sodium aluminate and colloidal conditioning methods) – desalination of brackish water –reverse osmosis.

UNIT II POLYMERS AND REINFORCED PLASTICS 9

Introduction - classification of polymers - Natural and synthetic - Thermoplastic and Thermosetting, Functionality - Degree of polymerization, Properties of polymers: Tg, Tacticity, Molecular weight - weight average, number average and polydispersity index. Types – addition, condensation and Copolymerization – free radical, cationic and anionic polymerization mechanism - Preparation, properties and uses of PVC, Nylon- 6,6, Teflon and Epoxy resin. Plastics - Compounding of plastics – moulding methods – injection, extrusion and compression – Engineering plastics-applications-fibre-reinforced plastics (FRP) – carbon and glass– applications.

UNIT III ELECTROCHEMISTRY AND CORROSION 9

Electrochemical cell - redox reaction, electrode potential- origin of electrode potential-oxidation potential-reduction potential - measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- causes- factors- types: chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints- constituents and function Electroplating of Copper and electroless plating of nickel-Chemical conversion coatings-phosphate, chromate, chemical oxide, and anodized coatings.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum – refining- manufacture of synthetic petrol (Bergius process) – knocking - octane number- cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) – synthesis, advantages and commercial application of power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value –problems- ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Energy-Types- Non-renewable energy- Nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries - primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells - H_2-O_2 fuel cell.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. P.C. Jain and Monika Jain, Engineering Chemistry, DhanpatRai, Publishing Company (P) Ltd., New Delhi, 2015.
2. S.S Dara&S.S Umare, A Text book of Engineering Chemistry, S.Chand & Company Ltd., New Delhi, 2015.

REFERENCES:

1. S. Vairam,P. Kalyani and Suba Ramesh., Engineering Chemistry, Wiley India Pvt. Ltd, New Delhi, 2013.
2. B.K.Sharma, Engineering Chemistry, Krishna Prakasan Media (P) Ltd., Meerut, 2014.
3. Prasanta Rath, Engineering Chemistry, Cengage Learning India Pvt. Ltd, Delhi, 2015.
4. Shikha Agarwal, Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, 2015.
5. V.R.Gowariker, N.V.Viswanathan, J.Sreedhar, Polymer Science, New Age International (P) Ltd., Publishers, New Delhi, 2011.

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Course code	21CS15IT	Semester	I			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	PROBLEM SOLVING AND PYTHON PROGRAMMING (COMMON FOR ALL BRANCHES)		2	0	4	4

COURSE OBJECTIVES:

- To be familiar with the basics of algorithmic problem solving.
- To construct python programs with conditionals, loops and functions.
- To use python data structures-Lists, Tuples and Dictionaries.

PREREQUISITE:

- Basic Mathematics Skills and Computer Knowledge

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students will be able to		
C105. 1	***Develop*** algorithmic solutions to simple computational problems	K3
C105. 2	***Construct*** simple Python programs for solving problems.	K3
C105. 3	***Build*** Python programs with conditionals and loops.	K3
C105. 4	***Demonstrate*** a Python program into functions.	K2
C105. 5	***Show*** compound data using Python lists, tuples, and dictionaries.	K2
C105. 6	***Read*** and write data from/to files in Python Programs.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C105. 1	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 2	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 3	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 4	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 5	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105. 6	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C105	3	2	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT- I ALGORITHMIC PROBLEM SOLVING AND BASICS OF PYTHON 8

Algorithms-building blocks of algorithms (statements, state, control flow, functions), simple Strategies for developing algorithms (iteration, recursion)-pseudo code- flow chart-programming language. Introduction to Python-Features of Python-Python Interpreter: Interactive and script mode- Values and types, variables, Keywords, Identifiers, operators, precedence of operators, expression, Comments.

UNIT-II CONTROL FLOW, FUNCTIONS 8

Conditional statements-Iterative statements, Functions: Built-in functions, user defined function-Function Arguments-Fruitful functions and void functions- local and global variable - function composition- recursion-Lambda Functions.

UNIT-III MODULES, PACKAGES, STRINGS 4

Modules-Packages-Strings-string operations, string functions and methods.

UNIT-IV LISTS, TUPLES, DICTIONARIES 5

Lists- list operations, list methods, list loop, mutability, aliasing, cloning lists-Tuples-Tuple assignment, Operations on Tuples, Tuple as return value- Dictionaries- operations and methods-Sets-Operations on sets.

UNIT-V FILES AND EXCEPTIONS 5

Files –Types of files, file operations, file methods, format operator-command line arguments-Errors and Exceptions, handling exceptions.

List of Experiments: 30 Periods

1. Write a python program to demonstrate basic data types in python.
2. Write a python program using conditional statements.
3. Write a python program using Iterative statements.
4. Write a python program using built-in and user defined functions.
5. Write a python program using lambda functions and recursions.
6. Write a python program to demonstrate Strings and its Operations.
7. Write a python program to demonstrate lists, tuples and its operations.
8. Write a python program to demonstrate Sets and its operations.
9. Write a python program to demonstrate Dictionaries and its operations.
10. Write a python program to demonstrate Files and its Operations.

30 Periods

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Reema Thareja, "Python Programming using Problem Solving Approach", OXFORD University Press, 2017.
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.

REFERENCES:

1. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 2018.
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd, 2016.
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1	Standalone desktops with Python [Open Source]	30 Nos

VEL TECH HIGH TECH

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Course code	21ME16T	Semester	I			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	ENGINEERING GRAPHICS (COMMON FOR ALL BRANCHES)		1	3	0	4

COURSE OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

PREREQUISITE:

- Engineering Drawing Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students are able to		
C106.1	***Familiarize*** with the fundamentals and standards of Engineering graphics.	K2
C106.2	***Develop*** freehand sketching of basic geometrical constructions and multiple views of objects.	K3
C106.3	***Draw*** orthographic projection of lines and plane surfaces.	K3
C106.4	***Construct*** projection of solids, Section and development of surfaces.	K3
C106.5	***Visualize*** isometric and perspective projections	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C106. 1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C106. 2	3	3	-	-	-	-	-	-	-	-	-	1	1	-	-	-
C106. 3	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-
C106. 4	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-
C106. 5	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-
C106	3	3	2	-	-	1	-	1	-	1	-	1	1	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

CONCEPTS AND CONVENTIONS (Not for Examination) 1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square, Triangle and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three-Dimensional objects – Layout of views– Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection– principles-Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method. Applications – Drawing interpretation and process planning, circuit design.

UNIT III PROJECTION OF SOLIDS 5+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, auxiliary plane method. Applications – Engineering design, automotive modelling, X-rays.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 5+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. Applications – Design of piping, Fabrication, body building, defect analysis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6 + 12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones– combination of two solid objects in simple vertical positions – Perspective projection of simple solids–Prisms, pyramids and cylinders by visual ray method and vanishing point method. Applications–constructions, photography, animation and image processing.

Total: 90 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2010.
2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 51th Edition, 2019.

REFERENCES:

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited,2015.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 3rd Edition, 2013.

Publication of Bureau of Indian Standards:

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

Special points applicable to Semester End Examination on Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. Students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

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Course code	21BS17P	Semester	I			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	PHYSICS AND CHEMISTRY LABORATORY (COMMON FOR ALL BRANCHES)		0	0	4	2

COURSE OBJECTIVES:

- To test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To encourage the students to familiarize with experimental determination of velocity of ultrasonic waves and band gap determination.

PREREQUISITE:

- Basic measurement skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C107.1	***Estimate*** the various water quality parameters like alkalinity, hardness (total, temporary, & permanent), dissolved oxygen content, and chloride content.	K2
C107.2	***Investigate*** the metals and ions present in any given sample using various analytical techniques.	K2
C107.3	***Analyze*** the properties such as conductance of solutions, and redox potentials.	K2
C107.4	***Determine*** various moduli of elasticity and also various thermal and optical properties of materials.	K2
C107.5	***Determine*** the velocity of ultrasonic waves, band gap determination and viscosity of liquids.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C107.1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107.2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107.3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107.4	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107.5	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
C107	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

PHYSICS LABORATORY
LIST OF EXPERIMENTS
(Any SIX Experiments)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Lee's disc Determination of thermal conductivity of a bad conductor
4. Laser- Determination of the wave length of the laser using grating, Estimation of laser parameters
5. Optical fibre -Determination of Numerical Aperture and acceptance angle
6. Ultrasonic interferometer - determination of the velocity of sound and compressibility of Liquids
7. Determination of Band gap of a semiconductor
8. Spectrometer- Determination of wavelength using gating

Total: 30 Periods

REFERENCES:

1. Physics Practicals, Department of Physics, Vel Tech High Tech Dr.Rangarajan Dr.Sakunthala Engineering College 2021
2. Wilson J.D. and Hernandez C.A., "Physics Laboratory Experiments", Houghton Mifflin Company, New York 2005

Lab Requirements

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	Torsional Pendulum, stop clock, suspension metallic wire: two different thickness, two identical cylindrical mass, screw gauge, wooden scale	5
2.	Uniform bending: 1-meter wooden scale, two-knife edges, travelling microscope, two weight hanger with slotted weights, screw gauge, Vernier calliper, pin	5
3.	Non-uniform bending: 1 meter wooden scale, two-knife edges, travelling microscope, weight hanger with slotted weights, screw gauge, Vernier calliper, pin	5
4.	Diode laser (green or red), fiber optic cable, movable arrangement with a screen for measuring spot size (zig), meter scale, stand	5
5.	He-Ne/Diode laser (red), Green diode laser, Grating, Screen, Iron stand (3 Nos), 1m wooden scale, thread.	5
6.	Ultrasonic interferometer apparatus with high frequency wave generator, cell, micrometer, PZ crystal, water or other liquids	5
7.	450 inclined glass plate set-up, two optically plane glass plates, sodium vapour lamp, travelling microscope, thin wire/thin strip of paper	5
8.	Post office box, 5V power supply, thermometer, galvanometer, semiconductor (thermistor), variable temperature bath set-up (oil, temperature controller, vessel, hot plate.	5

CHEMISTRY LABORATORY
LIST OF EXPERIMENTS
(Any SIX Experiments)

1. Determination of permanent, total and temporary hardness of water sample.
2. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
3. Determination of DO Content of water sample by Wrinkler's method.
4. Determination of chloride content of water sample by Argentometric method.
5. Determination of strength of given HCl using pH meter.
6. Estimation of Fe^{2+} by Potentiometric titration.
7. Determination of molecular weight of PVA using Ostwald viscometer.
8. Estimation of Iron content in water sample using spectrophotometer (1,10 – Phenanthroline/thiocyanate method).
9. Conductometric titrations of strong acid Vs strong base.
10. Determination of strength of acid in a mixture using conductivity meter.
11. Corrosion experiment-weight loss method.
12. Estimation of sodium and potassium present in water using flame photometer.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Jeffery G.H., Bassett J., Mendham J. and Denny vogel's R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
2. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980.
3. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel's Textbook ofpractical organic chemistry", LBS Singapore (1994).

Lab Requirements

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	PH meter	10 nos
2.	Conductivity meter	10 nos
3.	Potentiometer	10 nos
4.	Flame photometer	2 nos
5.	Electronic Balance (Four digit)	1 no
6.	Hot Air Oven	1 no
7.	Spectrophotometer	2 nos
8.	Magnetic stirrer	2 nos

Course code	21ME18P	Semester	I			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	ENGINEERING PRACTICES LABORATORY (COMMON FOR ALL BRANCHES)		0	0	4	2

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering

PREREQUISITE:

- Basic knowledge of engineering skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
At the end of the course students will be able to		
C108. 1	Demonstrate on Smithy operations, Foundry operations models and machine assembly practice of centrifugal pump and air-conditioner	K2
C108. 2	Experiment with pipe connections and plumbing works	K3
C108. 3	Make use of welding equipment to join the structures.	K3
C108. 4	Explain carpentry components, for the joint used in roofs, doors, windows and furniture.	K5
C108. 5	Develop sheet metal models, fitting models and do basic machining operations	K6

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C108. 1	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108. 2	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108. 3	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108. 4	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108. 5	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-
C108	3	-	-	-	-	2	2	-	2	1	1	2	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

I CIVIL ENGINEERING PRACTICE 12

Buildings:

a) Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects.

Plumbing Works:

a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers and elbows in household fittings.
b) Study of pipe connections requirements for pumps and turbines.
c) Preparation of plumbing line sketches for water supply and sewage works.
d) Hands-on-exercise:

   Basic pipe connections-Mixed pipe material connection-Pipe connections with different joining components
e) Demonstration of plumbing requirements of high-rise buildings

Carpentry using Power Tools only:

a) Study of the joints in roofs, doors, windows and furniture.
b) Hands-on-exercise:

   Wood work, joints by sawing, Planning and cutting.

II MECHANICAL ENGINEERING PRACTICE 18

Welding:

a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
b) Gas welding practice

Basic Machining:

a) Simple Turning and Taper turning
b) Drilling Practice

Sheet Metal Work:

a) Forming & Bending:
b) Model making – Trays and funnels.
c) Different type of joints.

Machine assembly practice:

a) Study of centrifugal pump
b) Study of air conditioner

Demonstration on:

a) Smithy operations, upsetting, swaging, setting down and bending. Example –Exercise – Production of hexagonal headed bolt.
b) Foundry operations like mould preparation for gear and step cone pulley.
c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

Total: 30 Periods

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE **14**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.

2. Fluorescent lamp wiring.

3. Stair case wiring

4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.

5. Measurement of energy using single phase energy meter.

6. Measurement of resistance to earth of an electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE **16**

1. Study of Electronic components and equipments – Resistor, colour coding

measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.

2. Study of logic gates AND, OR, EX-OR and NOT.

3. Generation of Clock Signal.

4. Soldering practice – Components Devices and Circuits – Using general purpose

PCB.

5. Measurement of ripple factor of HWR and FWR.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Chapman, W.A.J. Workshop Technology, Edward Arnold, 2001.

REFERENCES:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, DhanpathRai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2 Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT. and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Sl.No.	Description of Equipment	Required Numbers (for batch of 30 students)
Part I: Civil Engineering Practices		
(a)	**Plumbing Work:**	
1)	Pipe Vice	15 Nos.
2)	Die Holder with Die set	15 Nos.
(b)	**Wood Work**	
1)	Tri Square	15 Nos.
2)	Hand Saw	15 Nos.
3)	Carpentry bench wise	15 Nos.
4)	Firmer Chisel	15 Nos.
5)	Motrin Chisel	15 Nos.
6)	Iron Jack	15 Nos.
7)	Mallet	15 Nos.
8)	Bench hold fastens	15 Nos.
9)	Wooden Bench Hook	15 Nos.
10)	Wood Cutting Machine	2 Nos.
Part II: Mechanical Engineering Practices		
(a)	**Welding Work:**	
1)	Arc welding unit	5 Nos.
2)	Gas welding unit	2 Nos.
(b)	**Basic Machining Work:**	
1)	Lathe Machines	5 Nos.
2)	Drilling Machines	5 Nos.
(c)	**Assembly Work:**	
1)	Centrifugal pump	2 Nos.
2)	Air-conditioner unit	2 Nos.
3)	Household mixer	2 Nos.
(d)	**Sheet Metal Work:**	
1)	Steel rule	2 Nos.
2)	Bend snips	5 Nos.
3)	Straight snips	5 Nos.
4)	Scriber	5 Nos.
5)	Divider	5 Nos.
6)	Trammel	5 Nos.
7)	Prick Punches	5 Nos.
8)	Centre punches	5 Nos.
9)	Pliers	5 Nos.
10)	Ball pean hammer	5 Nos.
11)	Raising hammer	5 Nos.
12)	Riverting hammer	5 Nos.
13)	Square free hammer	5 Nos.
14)	Anvil	3 Nos.
15)	Swage block	3 Nos.
16)	Wige gauges	2 Nos.
(e)	**Foundry Work**	
1)	Cope and Drag Box	5 Nos.
2)	Pattern	5 Nos.
3)	Solid pattern	5 Nos.
4)	Split pattern	5 Nos.
5)	Runner	5 Nos.

6)	Riser	5 Nos.
7)	Sprue	5 Nos.
8)	Sand reamer	5 Nos.
9)	Trowel	5 Nos.
PART-III Electrical Practices		
1)	Assorted electrical components for house wiring	15 sets
2)	Electrical measuring instruments	10 sets
3)	Study purpose items: Iron box, fan and regulator, emergency lamp	One each
4)	Megger (250V/500V)	1 No.
5)	Power Tools: (a) Range Finder (b) Digital Live-wire detector	2 Nos 2 Nos
PART-IV Electronics Practices		
1)	Soldering guns	10 No.
2)	Assorted electronic components for making circuits	50 No.
3)	Small PCBs	10 No.
4)	Multi Meters	10 No.
5)	Study purpose items: Telephone, FM radio, low-voltage power supply	2 each

CURRICULUM AND
II SEMESTER SYLLABI

Applicable to the students admitted to

B.E- ELECTRONICS AND COMMUNICATION ENGINEERING

R-2021: CBCS

Academic year 2021-2022
onwards

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R-2021: CBCS CURRICULA

II SEMESTER SYLLABI

LIST OF ABBREVIATIONS

S. No.	Abbreviations	Detailed Description
1	**HSMC**	Humanities & Social Science including Management Courses
2	**BSC**	Basic Science Courses
3	**ESC**	Engineering Science Courses
4	**PCC**	Professional Core Courses
5	**PEC**	Professional Elective Courses
6	**OEC**	Open Elective Courses
7	**PROJ**	Project Work
8	**EEC**	Employability Enhancement Courses
9	**MC**	Mandatory Courses

Category Based Credit Split-Up–Semester Wise

Semester	HSMC	BSC	ESC	PCC	PEC	OEC	Project /EEC	MC	Total Credit
1	3	12	10	-	-	-	-	-	**25**
2	3	7	13	-	-	-	-	-	**23**
3	-	4	5	13	-	-	-	0	**22**
4	-	4	-	16	-	-	1	0	**21**
5	-	-	-	18	3	3	-	-	**24**
6	-	-	-	15	3	-	2	-	**20**
7	-	-	-	12	3	3	3	-	**21**
8	-	-	-	-	6	-	6	-	**12**
Total Credits	**6 (3.57%)**	**27 (16.07 %)**	**28 (16.66%)**	**74 (44.04%)**	**15 (8.92%)**	**6 (3.57%)**	**12 (7.14%)**	**0 (0%)**	**168**

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B.E-Electronics and Communication Engineering Curriculum (R2021)

SEMESTER I										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EN11T	Communicative English	HSMC	40	60	100	3	0	0	3
2	21MA12T	Matrices and Differential Calculus	BSC	40	60	100	3	1	0	4
3	21PH13T	Engineering Physics I	BSC	40	60	100	3	0	0	3
4	21CY14T	Engineering Chemistry	BSC	40	60	100	3	0	0	3
5	21CS15IT	Problem Solving and Python Programming*	ESC	40	60	100	2	0	4	4
6	21ME16T	Engineering Graphics	ESC	40	60	100	4	0	0	4
PRACTICAL										
7	21BS17P	Physics and Chemistry Laboratory	BSC	40	60	100	0	0	4	2
8	21ME18P	Engineering Practices Laboratory	ESC	40	60	100	0	0	4	2
									TOTAL	**25**

SEMESTER II										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EN21T	Technical English	HSMC	40	60	100	3	0	0	3
2	21MA22T	Vector Calculus and Complex Integration	BSC	40	60	100	3	1	0	4
3	21PH23T	Engineering Physics II	BSC	40	60	100	3	0	0	3
4	21EC24T	Circuit Analysis	ESC	40	60	100	3	0	0	3
5	21EC25T	Electronic Devices	ESC	40	60	100	3	0	0	3
6	21IT26T	Programming in C	ESC	40	60	100	3	0	0	3
PRACTICAL										
7	21EC27P	Circuits and Devices Laboratory	ESC	40	60	100	0	0	4	2
8	21IT28P	Programming in C Laboratory	ESC	40	60	100	0	0	4	2
									TOTAL	**23**

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SEMESTER III										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EC31T	Analog Electronics	PCC	40	60	100	3	0	0	3
2	21MA32T	Linear Algebra and Partial Differential Equations	BSC	40	60	100	3	1	0	4
3	21HC33T	Object Oriented Programming using Java	ESC	40	60	100	3	0	0	3
4	21EC34T	Signals and Systems	PCC	40	60	100	3	0	0	3
5	21EC35T	Digital System Design	PCC	40	60	100	3	0	0	3
6	21MC01T	Constitution of India	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21HC37P	Object Oriented Programming using Java Laboratory	ESC	40	60	100	0	0	4	2
8	21EC38P	Digital System Design Laboratory	PCC	40	60	100	0	0	4	2
9	21EC39P	Analog Electronics Laboratory	PCC	40	60	100	0	0	4	2
									TOTAL	**22**

SEMESTER IV										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EC41T	Communication Theory	PCC	40	60	100	3	0	0	3
2	21MA42T	Probability and Random Processes	BSC	40	60	100	3	1	0	4
3	21EC43T	Linear Integrated Circuits	PCC	40	60	100	3	0	0	3
4	21EC44T	Electromagnetic Fields	PCC	40	60	100	3	1	0	4
5	21EC45T	Control Systems Engineering	PCC	40	60	100	3	1	0	4
6	21MC02T	Environmental Sciences	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21EC47P	Linear Integrated Circuits Laboratory	PCC	40	60	100	0	0	4	2
8	21EE01P	Mini Project-I	EEC	40	60	100	0	0	2	1
									TOTAL	**21**

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SEMESTER V										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EC51T	Digital Communication	PCC	40	60	100	3	0	0	3
2	21EC52T	Digital Signal Processing	PCC	40	60	100	3	1	0	4
3	21EC53T	Transmission Lines and RF Systems	PCC	40	60	100	3	0	0	3
4	21HE54IT	Microprocessor and Microcontroller	PCC	40	60	100	2	0	4	4
5	-	Professional Elective-I	PEC	40	60	100	3	0	0	3
6	-	Open Elective- I	OEC	40	60	100	3	0	0	3
PRACTICAL										
7	21EC57P	Communication Systems Laboratory	PCC	40	60	100	0	0	4	2
8	21EC58P	Digital Signal Processing Laboratory	PCC	40	60	100	0	0	4	2
									TOTAL	**24**

SEMESTER VI										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EC61T	VLSI Design	PCC	40	60	100	3	0	0	3
2	21EC62T	Antennas and Microwave Engineering	PCC	40	60	100	3	0	0	3
3	21EC63T	Communication Networks	PCC	40	60	100	3	0	0	3
4	21EC64T	Internet of Things	PCC	40	60	100	2	0	4	4
5		Professional Elective -II	PEC	40	60	100	3	0	0	3
PRACTICAL										
6	21EC66P	VLSI Design Laboratory	PCC	40	60	100	0	0	4	2
7	21EC67P	Mini Project 2	EEC	40	60	100	0	0	2	1
8	-	Internship	EEC	100	-	100	0	0	2	1
									TOTAL	**20**

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SEMESTER VII										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EC71T	Optical Communication	PCC	40	60	100	3	0	0	3
2	21EC72T	Embedded and Real Time Systems	PCC	40	60	100	2	0	4	4
3	21EC73T	Wireless Communication	PCC	40	60	100	3	0	0	3
4	-	Professional Elective –III	PEC	40	60	100	3	0	0	3
5	-	Open Elective – II	OEC	40	60	100	3	0	0	3
PRACTICAL										
6	21EC76P	Advanced Communication Laboratory	PCC	40	60	100	0	0	4	2
7	21EC77P	Project Work – Phase – I	PROJ	40	60	100	0	0	4	2
8	21EC78P	Technical Seminar	EEC	100	-	100	0	0	2	1
									TOTAL	**21**

SEMESTER VIII										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	-	Professional Elective –IV	PEC	40	60	100	3	0	0	3
2	-	Professional Elective –V	PEC	40	60	100	3	0	0	3
PRACTICAL										
3	21EC83P	Project Work –Phase II	PROJ	40	60	100	0	0	12	6
									TOTAL	**12**

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LIST OF PROFESSIONAL ELECTIVES

S. No.	Course Code	Engineering Stream Courses
PROFESSIONAL ELECTIVE I		
1	21EC551PT	Medical Electronics
2	21EC552PT	Digital Audio and Video Engineering
3	21HC44T	Operating Systems
4	21ME02OT	Robotics and Industrial Automation
5	21EC555PT	Bio-Medical Instrumentation
6	21EC556PT	Automotive Electronics
PROFESSIONAL ELECTIVE II		
7	21EC651PT	Wireless Networks
8	21EC652PT	Principles of Management
9	21EC653PT	Sensors For Engineering Applications
10	21EC654PT	Video Analytics
11	21EC655PT	Disaster Management
12	21EC656PT	Foundations Skills in Integrated Product Development
PROFESSIONAL ELECTIVE III		
13	21EC741PT	ASIC Design
14	21EC742PT	Data Science and Machine Learning
15	21EC743PT	Digital Image Processing
16	21EC744PT	Millimeter Wave Technology
17	21EC745PT	Wireless Sensor Networks
18	21EC746PT	Cryptography and Network Security
PROFESSIONAL ELECTIVE IV		
19	21EC811PT	Cognitive Radio
20	21EC812PT	Satellite Communication
21	21EC813PT	Advanced Wireless Communication
22	21EC814PT	Mobile App Development for IoT
23	21EC815PT	Total Quality Management
24	21EC816PT	Fuzzy logic And Neural Network
PROFESSIONAL ELECTIVE V		
25	21EC821PT	MEMS and NEMS
26	21EC822PT	Fundamentals of Nano Science
27	21EC823PT	Professional Ethics in Engineering
28	21EC824PT	Electronics Packaging and Testing
29	21EC825PT	Avionics
30	21EC826PT	Augmented Mixed Reality

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LIST OF OPEN ELECTIVE COURSE

S. No.	Course Code	Course Title
1	21EC01OT	Microcontroller System Design
2	21EC743PT	Digital Image Processing
3	21EC03OT	Internet of Things and Applications
4	21EC556PT	Automotive Electronics

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Course code	21EN21T	Semester	II			
Category	HUMANITIES & SOCIAL SCIENCE INCLUDING MANAGEMENT COURSES (HSMC)		L	T	P	C
Course Title	TECHNICAL ENGLISH (Common for all Branches)		3	0	0	3

COURSE OBJECTIVES:

- To make the students of engineering and technology to enhance their ability on reading and comprehencing the different texts
- To improve their creative and critical thinking so as to use in demanding contexts
- To equip the learners with the skills of writing convincing job Applications and effective reports
- To develop their speaking skills to make technical presentations and participate in group discussions
- To facilitate them to hone their soft skills

PREREQUISITE:

- Technical writing and basic English grammar.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C201. 1	***Read*** and understand general and technical texts	K2
C201. 2	***Apply*** creative and critical thinking and communicate their ideas efficiently	K2
C201. 3	***Participate*** in group discussions and deliver short speeches effectively	K3
C201. 4	***Write*** effectively and persuasively in academic and workplace contexts	K3
C201. 5	***Experiment with*** the future challenges confidently and successfully	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C201. 1	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 2	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 3	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 4	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201. 5	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-
C201	-	-	-	-	-	-	-	-	1	3	-	2	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

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SYLLABUS **No. of Credits: 3**

UNIT-I TECHNICALWRITING AND VISUAL CONVERSION 9

PRACTICAL

LISTENING : Listening to pronunciation of longer words.

SPEAKING : Making out meaning of pictorial and graphical representations.

TUTORIAL

READING : Understanding logic and sequencing in reading inferring the exact meaning of text

WRITING : Extended Definition- Writing Instructions, Checklists & Recommendations- Reading short technical text from Journal.

VOCABULARY: Technical vocabulary- Regular and Irregular verbs.

UNIT- II TECHNICAL WRITING AND GUIDELINES PREPARATION 9

PRACTICAL

LISTENING : Comprehensive listening - Listening to telephonic conversations – short and long conversations from different domains, listening to various pre-recorded conversations and speeches.

SPEAKING : Delivering short speeches in the class.

TUTORIAL

READING : Technical reading on innovations and innovators.

WRITING : Conditional clauses, Numerical adjectives, Process Description

VOCABULARY: Collocation, Verbal Analogies.

UNIT-III TECHNICAL PROCESS WRITING 9

PRACTICAL

LISTENING : Listening to documentaries and making notes.

SPEAKING : Basic speaking practice based on BEC, IELTs, and TOFEL.

TUTORIAL

READING : longer text both general and technical –practice in speed reading

WRITING : Purpose statements, words are used as nouns and verbs- describing a process – use of sequence word - Interpretation of Graphs and Charts.

VOCABULARY: Sequence words –Misspelled words -Embedded sentences.

UNIT- IV TECHNICAL WRITING AND BUSINESS LETTERS 9

PRACTICAL

LISTENING : listening to native accents.

SPEAKING : Group Discussions - Process, Skills, Guidelines, Evaluation, Oral Presentation - Planning, Preparing, Organizing and Presenting.

TUTORIAL

READING : Reading for detailed comprehension.

WRITING : Cause and effect, impersonal passive voice, idioms and phrases, - Letter writing, job application, business correspondence (letters) – calling for quotations, placing order, complaint letters, preparing a memo, notice and e-mail itinerary.

VOCABULARY: clauses and If conditionals.

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UNIT-V TECHNICAL WRITING AND REPORT WRITING 9

PRACTICAL

LISTENING : TED /ink talks

SPEAKING : Starting a Career — vision statement, preparing logo and tagline, making short term and long-term goals, setting plans.

TUTORIAL

READING : Reading and understanding technical articles.

WRITING : Degrees of comparison, editing, Email etiquette, Mispronounced words – Report writing survey, feasibility, industrial visit, reporting various incidents and accidents, Minutes of meeting.

VOCABULARY: Reported speech.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Department of English, Anna University, Chennai. Mindscapes: English for Technologists and Engineers. Orient Black Swan, Chennai.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai, 2011.

REFERENCE BOOKS:

1. Rizvi, M. Ashraf, "Effective Technical Communication", Tata McGraw— Hill,2006.
2. Ibbotson, Mark, "Cambridge English for Engineering", Cambridge University Reference Press, 2008
3. Richard Johnson-Sheehan, "Technical Communication Today"4th EditionBooks Longman Publishing Group, 2011.
4. Richard Johnson-Sheehan, "Technical Communication Today"4th EditionBooks Longman Publishing Group, 2011
5. Porter, Patricia A., and Margaret Grant, "Communicating Effectively in English: Ora1 Communication for Non-Native Speakers", 2nd Edition, Wadsworth, 1992.
6. Gopalaswamy, Ramesh & Ramesh Mahadevan. ACE of Soft Skills: Attitude, Communication and Etiquette for Success, New Delhi: Pearson, 2010.

Extensive Reading:

Wells, H G. The Time Machine, Peacock, India, 2008.

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Course code	21MA22T	Semester	II			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	VECTOR CALCULUS AND COMPLEX INTEGRATION (Common for all Branches)		3	1	0	4

COURSE OBJECTIVES:

- To improve their ability in vector calculus
- To expose to the ideas of analytic functions
- To solve differential equation using the concept of Laplace Transform.

PREREQUISITE:

- Mathematics skills at Sem-I level

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C202.1	***Apply*** the vector calculus concepts to solve engineering problems.	K3
C202.2	***Apply*** the concept of mapping to solve Linear equation.	K3
C202.3	***Apply*** the complex integration problem ideas to solve engineering problems.	K3
C202.4	***Understand*** the concepts of multiple integrals.	K2
C202.5	***Apply*** the concepts of Laplace transformation to solve Differential Equations.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C202.1	3	2	-	-	-	-	-	-	-	-	-	-
C202.2	3	2	-	-	-	-	-	-	-	-	-	-
C202.3	3	2	-	-	-	-	-	-	-	-	-	-
C202.4	2	2	-	-	-	-	-	-	-	-	-	-
C202.5	3	2	-	-	-	-	-	-	-	-	-	-
C202	3	2	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

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SYLLABUS **No. of Credits: 4**

UNIT I VECTOR CALCULUS 12

Gradient, divergence, curl – Solenoidal and irrotational fields – Vector identities– Directional derivatives – Line, surface and volume integrals –Green's, Gauss divergence and Stoke's theorems (without proof) .

UNIT II ANALYTIC FUNCTIONS 12

Limit of a complex functions-Derivative of f(z)-Definition of Analytic Function – Cauchy Riemann equations – Properties of analytic functions - Determination of harmonic conjugate – Milne-Thomson's method – Conformal mappings: 1/z, az , az+b and bilinear transformation.

UNIT III COMPLEX INTEGRATION 12

Line integral – Cauchy's integral theorem (statements only) – Cauchy's integral formulae and its applications – Taylor's and Laurent's expansions (statements only) – Singularities – Poles and Residues – Cauchy's residue theorem (statement only) – Contour integration – Unit circle and semicircular contour.

UNIT IV MULTIPLE INTEGRALS 12

Double integration in Cartesian and polar coordinates – Change of order of integration – Area as double integral – Triple integration in Cartesian coordinates – Conversion from Cartesian to polar – Volume as a double and Triple Integral.

UNIT V LAPLACE TRANSFORMS 12

Definition-Conditions for existence- Transforms of elementary functions – Properties of Laplace Transform-Transforms of periodic functions – Transforms of derivatives and integrals– Inverse transforms – Convolution theorem– Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients only- Unit step function and Unit impulse function [simple problems only]

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. B. S. Grewal, Higher **Engineering Mathematics**, Khanna Publishers, New Delhi, 42nd Edition, 2012.

REFERENCES:

1. E. Kreyszig, **Advanced Engineering Mathematics**, John Wiley & Sons. Singapore, 10thEdition, 2012.
2. M.K. Venkataraman, Engineering **Mathematics: Vol I and II**, National Publishing., Chennai 2001.
3. T. Veerarajan, **Engineering Mathematics**, Tata McGraw Hill Publishing Co, New Delhi, 2004.

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Course code	21PH23T	Semester	II			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	ENGINEERING PHYSICS II Common for (CSE, IT, ECE, CHEMICAL, CIVIL, AI&DS)		3	0	0	3

COURSE OBJECTIVES:

- To equip the students with the knowledge of carrier concentration and doping in semiconductors.
- To familiarize the basics of Magnetic and Superconducting materials.
- To empower the students in understanding the importance of fluid properties.
- To elucidate the physics and instrumentation of spectrometry

PREREQUISITE:

- High School Maths and Physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C203.1	***Understand*** basics of electronic states and energy band structure formation	K2
C203.2	***Understand*** the importance of carrier concentration and doping in semiconductors	K2
C203.3	***Understand*** physics of magnetic and superconducting materials.	K2
C203.4	***Understand the*** importance of fluid properties.	K2
C203.5	***Understand*** the physics of spectrometry and its instrumentation.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C203.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203.5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C203	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

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SYLLABUS **No. of Credits: 3**

UNIT I SOLID STATE ELECTRONICS 9

Band theory of solids - Classification of solids on the basis of band theory - Classical free electron theory - expression for electrical conductivity - thermal conductivity - Wiedemann-Franz law - electrons in metals - Fermi-Dirac probability function - Position of Fermi level Temperature variation of carrier concentration - density of energy states - electron effective mass - concept of hole.

UNIT II SEMICONDUCTING MATERIALS AND DEVICES 9

Elemental and compound semiconductors - Intrinsic and extrinsic semiconductors - Properties. Carrier concentration in intrinsic, n-type and p-type semiconductors. Hall effect - experimental determination of Hall coefficient. Application - Hall and Peltier devices - Formation of p-n junctions - position of Fermi level in equilibrium - forward and reverse bias - p-n junction diode: I-V characteristics in forward and reverse bias - Photodiode - LDR, LED, and solar cell.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Introduction to magnetic materials - Domain theory of ferromagnetism, Hysteresis. Soft and Hard magnetic materials - Anti-ferromagnetic materials - Ferrites, magneto resistance material Superconducting phenomena - properties of superconductors - Meissner effect and isotope effect. Type-I and Type-II superconductors, High TC superconductors - Magnetic levitation and SQUIDS.

UNIT IV FLUID MECHANICS 9

Introduction to ideal and real fluids- Basic concepts of density and pressure in a fluid-Newtonian fluids, Non-Newtonian fluids - Capillarity – Surface tension - Experimental determination of surface tension by capillary rise method – Viscosity - Coefficient of viscosity - Role of temperature on surface tension and viscosity - Measurement of pressure by strain-gauge diaphragms.

UNIT V SPECTROMETRY 9

Theory of Infrared absorption spectrometry – Quantum treatment– Instrumentation – Infrared sources and detectors. Applications – Theory of Raman spectroscopy – excitation mechanism. Instrumentation – Sources and detectors. Nuclear Magnetic Resonance – Relaxation process in NMR – Free induction decay – Chemical Shift – Instrumentation and components of NMR.

Total: 45 Periods

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LEARNING RESOURCES:

TEXT BOOKS:

1. N.Garcia, A. Damask and S.Schwarz "Physics for Computer Science Students", SpringerVerlag, 2012.
2. Umesh Mishra and Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
3. C. Kittel , Introduction to solid state physics, Wiley. 2004
4. Yunus a. Çengel, john m. Cimbala Fluid Mechanics: fundamentals and applications Fourth edition Mc Graw Hill 2018
5. Aruldas Molecular Structure and Spectroscopy Prentice Hall 2007.

REFERENCES:

1. Arthur Beiser Concepts of Modern Physics; Tata McGraw – Hill Edition. 2003
2. Steven H. Simon, The Oxford Solid State Basics 1st Edition Oxford 2013
3. S O Pillai, Solid State Physics, New Age International 2006
4. Willard H H, Meritt L L Dean J A and Settle F A, "Instrumental Methods of Analysis", CBS Publishers and Distributions, New Delhi, 2001.
5. C.N.Banwell Fundamentals of Molecular Spectroscopy , Fourth edition Tata Mc.Graw Hill
6. Bruce R. Munson, Alric P. Rothmayer, Theodore H. Okiishi, Wade W. Huebsch Fundamentals of fluid mechanics Wiley, 2012

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Course code	21EC24T	Semester	II			
Category	ENGINEERING SCIENCE COURSE(ESC)		L	T	P	C
Course Title	CIRCUIT ANALYSIS		3	0	0	3

COURSE OBJECTIVES:

- To provide the basic concepts of DC and AC circuits.
- To introduce different methods of circuit analysis using Network theorems and transient response
- To offer the basic concepts of resonance circuits and two port network parameters

PREREQUISITE:

- Basics of Mathematics
- Fundamentals of high school physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C204.1	***Understand*** the concept of circuit elements, energy sources, circuit laws	K2
C204.2	***Apply*** network theorems to solve the electrical network using mesh and nodal analysis.	K3
C204.3	***Analyze*** the steady state and transient response of RLC circuit.	K4
C204.4	***Illustrate*** the characteristics of two port network	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C204.1	2	1	-	-	-	-	-	-	-	-	1	3
C204.2	3	2	1	-	-	-	-	-	-	-	1	3
C204.3	3	3	2	1	-	-	-	-	-	-	1	3
C204.4	2	1	-	-	-	-	-	-	-	-	1	3
C204	3	2	2	1	-	-	-	-	-	-	1	3

Note: 1: Slight, 2: Moderate, 3: Substantial

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SYLLABUS **No. of Credits: 3**

UNIT-I BASIC CIRCUIT ELEMENTS &METHODS OF ANALYZING CIRCUITS 9

Classification of Circuit Elements – Node, Loop, Path & Branch-, Ohm‘s Law, Energy sources – Network topology -Incidence Matrix, Tie Set & Cut Set. Kirchoff's Laws – Series and Parallel – Voltage and Current division rule- Mesh – Super mesh – Nodal – Super nodal, star- delta-wye conversion, Source Transformation Technique.

UNIT-II NETWORK THEOREMS & DUALITY FOR AC AND DC CIRCUITS 9

Network theorems-Superposition, Thevenin, Norton, Reciprocity, Compensation, Maximum power transfer, Millman-Duality-dual networks. Case Study: Design of Radio speaker circuit

UNIT-III TRANSIENT ANALYSIS FOR AC AND DC CIRCUITS 9

Basics - Source free and Forced Response of RL, RC and RLC Series Circuits – Forced Response of RL, RC & RLC Series circuits with Sinusoidal Excitation Case Study: Design of telephone circuit system to separate voice channels using RLC circuit

UNIT-IV RESONANCE AND COUPLED CIRCUITS 9

Resonance: Introduction – series resonance – parallel resonance – Definition: Q Factor- Half power frequency resonant frequency – Bandwidth. Coupled Circuits: Mutual inductance – Co-efficient of Coupling – Dot Convention – Energy Consideration – Analysis of Coupled Circuits. Case study: Design a radio receiver circuit to select certain frequency.

UNIT-V NETWORK PARAMETERS 9

Z, Y, h and ABCD parameters, Interconnection of two port networks, Inter-relationship of different parameters, Symmetrical properties of T and pi network, Applications of two port network. Case Study: Design of Filters

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. William H.Hayt, Jr.Jack E. Kemmerly, Steven M.Durbin, “Engineering Circuit Analysis”, Sixth Edition, 8th Edition,Tata McGraw-Hill Edition, 2013
2. Sudhahar.A,ShyammohanS.P,“Circuits and Networks: Analysis and Synthesis”, 5th Edition,Tata McGraw Hill, 2017.

REFERENCES:

1. Charles K. Alexander & Mathew N.O.Sadiku, “Fundamentals of Electric Circuits”, Sixth revised Edition, McGraw- Hill 2016.
2. D.R.Cunningham, J.A.Stuller, “Basic Circuit Analysis”, Jaico Publishing House, 2005
3. David A Bell, “Electric Circuits”, Oxford University Press,2009

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Course code	21EC25T	Semester	II			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	ELECTRONIC DEVICES		3	0	0	3

COURSE OBJECTIVES:

- To acquire knowledge about the operation and characteristics of semiconductor diodes, BJT, JFET and MOSFET.
- To learn the principles and operation of special semiconductor devices.
- To introduce about the various power and smart display devices.

PREREQUISITE:

- Basics of semiconductor physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C205.1	***Explain*** the operation and characteristics of semiconductor diodes, BJT, JFET and MOSFET.	K2
C205.2	***Understand*** the principles and operation of varactor diode, tunnel diode and Schottky barrier diode	K2
C205.3	***Demonstrate*** the construction and working principles of UJT, SCR, DIAC, TRIAC and smart display devices.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C205.1	3	2	2	-	-	-	-	1	-	-	-	-
C205.2	3	2	1	-	-	-	-	1	-	-	-	-
C205.3	3	2	1	-	-	-	-	1	-	-	-	-
C205	3	2	1	-	-	-	-	1	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

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SYLLABUS **No. of Credits: 3**

UNIT I SEMICONDUCTOR DIODE 9

PN junction diode, Current equations, Energy band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion capacitances, Rectifiers - Half wave and Full wave rectifiers with capacitor filter, Bridge rectifier. Zener diode - Zener diode as a voltage regulator.

UNIT II BIPOLAR JUNCTION TRANSISTORS 9

Transistor types – operations and characteristics of CE, CB, CC configurations – Early effect - Current equations - Hybrid -π model, h-parameter model, Ebers Moll Model- Gummel Poon-model. Multi Emitter Transistor.

UNIT III FIELD EFFECT TRANSISTORS 9

JFETs – Characteristics and principle of operation of JFET - JFET parameters - CS, CD, CG Configurations. MOSFET- Characteristics- Threshold voltage - Channel length modulation, CMOS.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

MESFET, FINFET, PINFET, CNTFET, DUAL GATE MOSFET, Schottky barrier diode, Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

UNIT V POWER AND DISPLAY DEVICES 9

UJT, SCR, Diac, Triac, Power BJT- Power MOSFET – DMOS - VMOS. Photo transistor, LED, LCD, CCD, OLED, AMOLED, Retina display and touch screen.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Donald A Neumann, “Semiconductor Physics and Devices”, Fourth Edition, Tata Mc GrawHill Inc. 2012.
2. Salivahanan. S, Suresh Kumar. N, Vallavaraj.A, “Electronic Devices and circuits”, Third Edition, Tata McGraw- Hill, 2008.

REFERENCES:

1. Robert Boylestad and Louis Nashelsky, “Electron Devices and Circuit Theory” Pearson Prentice Hall, 10th edition, July 2008.
2. Mill man J. and Halkias C. C. and Satyabrata J, "Electronic Devices and Circuits”, Tata McGraw Hill, New Delhi, 2011.
3. Floyd T. L., "Electronic Devices and Circuits", Pearson Education, New Delhi, 2011.
4. R. S. Sedha, ”A Text Book of Applied Electronics”, S. Chand Publications, 2006.

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VEL TECH HIGH TECH

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Course code	21IT26T	Semester	II			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	PROGRAMMING IN C (Common for CSE, IT, ECE, BIOTECH, CHEM, CSE(AI&ML))		3	0	0	3

COURSE OBJECTIVES:

- To learn Introduction of Algorithm and Basic Structure of C Programming.
- To gain knowledge on Implementation of Arrays and Strings concept in C Programming.
- To understand the Basic functions and Pointer declaration in C Programming.
- To apply the concepts of Structures and Unions in an example program.
- To write a sample C program to implement file handling and accessing Graphic Library function.

PREREQUISITE:

- Basic Mathematics Skills

COURSE OUTCOMES:

CO. No.	Course Outcome	Blooms level
On successful completion of this Course, students will be able to		
C206.1	***Explain*** the data types, syntax and control structures for solving different problems.	K2
C206.2	***Apply*** the concepts of Arrays, Strings in 'C' language for user defined problems	K3
C206.3	***Make use of*** functions and concepts of pointers in 'C' language	K3
C206.4	***Organize*** data using structures and unions in 'C' Programs.	K3
C206. 5	***Develop*** and implement applications using File handling Process and Graphics.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3	PSO-4
C206.1	2	1	-	-	-	-	-	-	-	-	-	-	2	1	-	-
C206.2	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-
C206.3	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-
C206.4	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-
C206. 5	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-
C206	3	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

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SYLLABUS **No. of Credits: 3**

UNIT-I INTRODUCTION TO PROGRAMMING 9

Basic Organization of a Computer - Introduction to Algorithm, Pseudo code, Flow Chart. Structure of 'C' program, compilation and linking processes - C Tokens: Keywords, Data Types, Constants, Variables - Declaration –Operator: precedence and associativity -Expressions - Input/Output statements -Assignment statements – Decision making statements Switch statement - Looping Statements-Bitwise operations- pre-processor-Syntax and Logical Errors in compilation solving simple scientific and statistical problems.

UNIT-II ARRAYS AND STRINGS 9

Arrays: Declaration, Initialization - One dimensional array: Assigning an array to another array – Equating an array with another array –Two dimensional Arrays: Declaration – usage of two-dimensional arrays – reading, storing and accessing elements in two dimensional arrays –String operations: Initialization of Strings – string library functions - command line arguments – Searching and Sorting of Strings.

UNIT-III FUNCTIONS AND POINTERS 9

Introduction to functions: Classification of functions – function definition – function call –function with inputs and outputs - recursive function –example programs: copy one string to another string using recursion, binary search using recursion -Pointer Fundamentals: Pointer Declaration – Passing Pointers to a Function- Operations on pointers: Pointer Arithmetic - Pointer comparisons -Array of pointer: Pointers and one-dimensional arrays- Pointers and multi-dimensional arrays.

UNIT-IV STRUCTURES AND UNIONS 9

Introduction to Structures: Defining structures - initializing structures -Array of Structures – Nested structures - Introduction to union Creating and using union variables - memory allocation of union – example programs: Store and display N employees information using Union- Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays.

UNIT-V FILE HANDLING AND GRAPHICS 9

Files: Introductions - Data hierarchy - Types of file processing- Sequential access: Reading data from sequential access file - Updating sequential access file - Random access: Reading data from random access file - Writing data randomly to random access file –C Graphics: libraries and functions – 2D shapes – 3D shapes – Examples.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Sumitabha Das, "Computer Fundamentals & C Programming", McGraw Hill, 2018.
2. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
3. Yashavant Kanetkar" Let usC", 15th edition.

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REFERENCES:

1. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Byron S Gottfried and Jitendar Kumar Chhabra, “Programming with C”, Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
3. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.
4. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.

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VEL TECH HIGH TECH

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Course code	21EC27P	Semester	II			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	CIRCUITS AND DEVICES LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To learn the characteristics of Active devices.
- To understand the working of RL, RC and RLC circuits
- To verify Kirchhoff laws and Network theorems

PREREQUISITE:

- Basic knowledge of circuits and devices

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C207. 1	***Operate*** the basic electronic devices.	K2
C207. 2	***Test*** KVL & KCL, Thevenin & Norton theorem, Reciprocity, Maximum power transfer theorem and Super Position Theorem	K3
C207. 3	***Determine*** the resonant frequency of RL, RC and RLC circuits	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C207. 1	3	3	3	-	-	-	-	-	3	-	-	-
C207. 2	3	3	3	-	-	-	-	-	3	-	-	-
C207. 3	3	3	3	-	-	-	-	-	3	-	-	-
C207	3	3	3	-	-	-	-	-	3	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

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SYLLABUS **No. of Credits:2**

1. Verification of KVL and KCL
2. Verification of Thevenin's & Norton's theorem
3. Verification of Super position theorem
4. Verification of maximum power transfer & reciprocity theorem
5. Determination of Resonance frequency of RL, RC and RLC Circuits
6. Transient analysis of RL and RC circuits
7. Characteristics of PN junction diode and Zener diode
8. Input and output characteristics of CE, CB and CC configurations.
9. Drain and Transfer characteristics of JFET.
10. Characteristics of UJT , SCR
11. Characteristics of Photo transistor
12. Simulation of KVL, KCL, Super position theorem and characteristics of SCR using simulation software

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Donald A Neumann, ―Semiconductor Physics and Devices‖, Fourth Edition, Tata Mc GrawHill Inc. 2012.
2. Salivahanan. S, Suresh Kumar. N, Vallavaraj.A, ―Electronic Devices and circuits‖, Third Edition, Tata McGraw- Hill, 2008.

REFERENCES:

1. Robert Boylestad and Louis Nashelsky, ―Electron Devices and Circuit Theory‖ Pearson Prentice Hall, 10th edition, July 2008.
2. Mill man J. and Halkias C. C. and Satyabrata J., Electronic Devices and Circuits ", Tata McGraw Hill, New Delhi, 2011.

Sl. No.	Description of Equipment	Required numbers (for batch of 30 students)
1	Resistors, Capacitors, Inductors, Transistors, PN junction diode and Zener diode JFETs, UJT, SCR, Photo transistor – sufficient quantities. Bread Boards	15 Nos
2	CRO (30MHz)	10 Nos
3	Function Generators (3MHz)	10 Nos
4	Dual Regulated Power Supplies (0 – 30V)	15 Nos
5	Voltmeter (Suitable range)	15 Nos

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Course code	21IT28P	Semester	II			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	PROGRAMMING IN C LABORATORY (Common for CSE, IT, ECE, BIOTECH, CHEM, CSE(AI&ML))		0	0	3	2

COURSE OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures
- To develop applications in C using file processing, Graphics

PREREQUISITE:

- Basic Mathematics Skills

COURSE OUTCOMES:

CO. No.	Course Outcome	Blooms level
On successful completion of this Course, students will be able to		
C208.1	***Utilize*** decision making and looping statements for problem solving.	K3
C208.2	***Apply*** the concepts of Arrays and String to solve problem statements.	K3
C208.3	***Examine*** the dynamic behaviour of memory by the use of pointers.	K4
C208.4	***Develop*** simple applications using Structures and unions.	K3
C208.5	***Design*** and develop simple applications using File Processing and Graphics.	K6

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C208.1	3	2	1	-	-	1	-	-	1	-	1	1	1	2
C208.2	3	2	1	-	-	1	-	-	1	-	1	1	2	1
C208.3	3	3	2	1	-	1	-	-	1	-	1	1	2	1
C208.4	3	2	1	-	-	1	-	-	1	-	1	1	2	1
C208.5	3	3	3	3	2	1	-	-	1	-	1	1	2	1
C208	3	2	2	3	2	1	-	-	1	-	1	1	2	1

Note: 1: Slight, 2: Moderate, 3: Substantial

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LIST OF EXPERIMENT **No. of Credits: 4**

1. a) Write a C program to perform input / output of all basic data types.

   b) Write a C program using decision making construct.

   c) Write a program that finds if a given number, is a prime number.

2. a) Write a program to find whether the given year is a leap year or not?
   (Hint: not every Centurion year is a leap. For example, 1700, 1800 and 1900 is not a leap year)
   b) Write a program using looping statements.

   c) Write a program to use swapping operations.

3. a) Write a C program for print pyramids and patterns.

   b) Write a C program to generate Fibonacci series.

4. a) Write a C program to shut down or turn off the computer.

   b) Write a C program to perform sorting operations.

5. Write a program using one dimensional and two-dimensional arrays.

6. From a given paragraph perform the following using built-in functions:
   a) Count total number of vowels and consonants.
   b) Capitalize the first word of each sentence.
   c) Replace a given word with another word.

7. Write a program using user defined functions and recursive functions.

8. Write a C program using pointers functions.

9. Write a program using structures and unions.

10. Write a program using text files and binary files.

11. Write a program using string functions.

12. Write a program using dynamic memory allocation.

Total: 60 Periods

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LEARNING RESOURCES:

TEXT BOOKS:

1. Sumitabha Das, “Computer Fundamentals & C Programming”, McGraw Hill, 2018.
2. ReemaThareja, “Programming in c”, Oxford University Press, Second Edition, 2016
3. Yashavant P. Kanetkar, “Let Us C”, Sixteenth Edition, BPB Publications, 2018.

REFERENCES:

1. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Byron S Gottfried and Jitendar Kumar Chhabra, “Programming with C”, Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2011.
3. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
4. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	Systems with Linux Operating System with GNU compiler[Open Source]	30

3rd SEMESTER
CURRICULUM & SYLLABI

Applicable to the students admitted to

B.E-ELECTRONICS AND COMMUNICATION ENGINEERING

R-2021: CBCS

Academic year 2021-2022

Onwards

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B.E.- ELECTRONICS AND COMMUNICATION ENGINEERING

R-2021: CBCS CURRICULUM

SEMESTER III										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total marks	Credits			
							L	T	P	C
THEORY										
1	21EC31T	Analog Electronics	PCC	40	60	100	3	0	0	3
2	21MA32T	Linear Algebra and Partial Differential Equations	BSC	40	60	100	3	1	0	4
3	21HC33T	Object Oriented Programming using Java	ESC	40	60	100	3	0	0	3
4	21EC34T	Signals and Systems	PCC	40	60	100	3	0	0	3
5	21EC35T	Digital System Design	PCC	40	60	100	3	0	0	3
6	21MC01T	Constitution of India	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21HC37P	Object Oriented Programming using Java Laboratory	ESC	40	60	100	0	0	4	2
8	21EC38P	Digital System Design Laboratory	PCC	40	60	100	0	0	4	2
9	21EC39P	Analog Electronics Laboratory	PCC	40	60	100	0	0	4	2
									TOTAL	**22**

Dean Academics **Principal**

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Course code	21EC31T	Semester	III			
Category	PROFESSIONAL CORE COURSE(PCC)		L	T	P	C
Course Title	ANALOG ELECTRONICS		3	0	0	3

COURSE OBJECTIVES:

- To understand the methods of FET and BJT biasing and to explain single stage and multistage amplifier circuits using small signal analysis.
- To derive the frequency response of large signal amplifiers, tuned amplifiers, and to construct Multivibrators and power amplifiers.
- To give a comprehensive exposure to all types of transistorized amplifiers and oscillators constructed with discrete components.

PREREQUISITE:

- Fundamentals of Circuit Analysis concepts Functional understanding of Electron Devices

COURSE OUTCOMES:

CO. No	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C301.1	***Discuss*** various biasing methods in BJT and FET and to design single stage and multi stage amplifiers.	**K2**
C301.2	***Determine*** the frequency response of BJT and FET amplifiers.	**K3**
C301.3	***Construct*** oscillators, tuned amplifiers, wave shaping circuits, multivibrators and power amplifiers.	**K3**

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C301.1	2	1	-	-	-	-	-	-	-	-	-	-
C301.2	3	2	-		-	-	-	-	-	-	-	-
C301.3	3	2	1	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

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SYLLABUS **No. of Credits: 3**

UNIT I BIASING OF BJT, JFET AND MOSFET 9

BJT-DC Load line, Operating point, Various Biasing Methods for BJT- Stability factors- JFET - DC Load Line and Bias Point - Various biasing methods of JFET –MOSFET biasing. Bias Compensation, Thermal Stability.

UNIT II SMALL SIGNAL ANALYSIS OF BJT, JFET AND MOSFET AMPLIFIER 9

Small signal Analysis of Single stage BJT amplifiers, Darlington amplifier, Bootstrap, cascode and cascade amplifier - Differential amplifier. Small signal analysis of JFET and MOSFET amplifiers.

UNIT III HIGH FREQUENCY ANALYSIS OF AMPLIFIERS AND POWER AMPLIFIER 9

High frequency Analysis of CE Amplifier. Miller effect, Short Circuit Current gain, Cut off frequency $-f_\beta$, f_T. High frequency analysis of JFET and MOSFET amplifiers. Class A/B/AB/C - single ended and Push-pull power amplifiers - Complementary-symmetry power amplifiers.

UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Concept of feedback Amplifiers, Effect of Feedback on Amplifier characteristics, Feedback amplifiers. -Stability Problem-Gain and Phase-margins. Oscillators - Barkhausen criteria - RC and LC oscillators - Frequency stability - Crystal oscillator.

UNIT V TUNED AMPLIFIERS AND MULTIVIBRATORS 9

Coil losses, unloaded and loaded Q of tank circuits, Analysis of single tuned amplifier, double tuned, stagger tuned amplifiers, Stabilization Techniques, Class C tuned amplifiers. Multivibrators –Astable, Monostable and Bistable , Schmitt Trigger- UJT Oscillator.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, Mc Graw Hill Education (India) Private Ltd., 2010.
2. Jacob Millman, _Microelectronics‘, McGraw Hill, 2nd Edition, Reprinted, 2017.

REFERENCES:

1. Boylestad L Robert and Nashelsky Louis, ―Electronic Devices and circuits‖, Prentice Hall of India, New Delhi, 11 th edition 2015.

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2. S.Salivahanan, N.SureshKumar, A.Vallavaraj, Electronic Devices and Circuits, Tata McGraw Hill ltd., 3rd Edition,2012.
3. B.VisvesvaraRao,K.RajaRajeswari,P.ChalamRajuPantuluandK.BhaskaraRama,"Electronic Circuit Analysis", Pearson, 1st Edition,2012.
4. Sedra and Smith, ―Micro Electronic Circuits‖; Sixth Edition, Oxford University Press, 7th edition,2012.
5. Allen Mottershed ―Electronic Devices and Circuits‖, Prentice Hall of India, New Delhi, 4 th edition 2019.
6. David A Bell, ―Electronic Devices and Circuits‖, Prentice Hall of India, New Delhi, 2008.

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Course code	21MA32T	Semester	III			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS (For ECE Branch)		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.
- To understand the concepts of vector space, linear transformations and diagonalization.
- To apply the concept of inner product spaces in orthogonalization.
- To understand the procedure to solve partial differential equations.
- To give an integrated approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.

PREREQUISITE:

- ODEs and multivariable calculus

COURSE OUTCOMES:

CO No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C302.1	***Use the concepts*** of vector space	K2
C302.2	***Use the concepts*** of linear transformations and diagonalization.	K2
C302.3	***Apply*** the concept of inner product spaces in orthogonalization.	K3
C302.4	***Compute*** partial differential equations.	K2
C302.5	***Integrated*** approach to number theory and abstract algebra, and provide a firm basis for further reading and study in the subject.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C302.1	3	2	-	-	-	-	-	-	-	-	-	-
C302.2	3	2	-	-	-	-	-	-	-	-	-	-
C302.3	3	3	-	-	-	-	-	-	-	-	-	-
C302.4	3	2	-	-	-	-	-	-	-	-	-	-
C302.5	3	2	-	-	-	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

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SYLLABUS **No. of Credits: 4**

UNIT I VECTOR SPACES 12

Vector spaces –Sub spaces–Linear combinations and linear system of equations–Linear independence and linear dependence–Bases and dimensions. Composition of Linear transformations and Matrix multiplications – Invertibility and isomorphism

UNIT II LINEAR TRANSFORMATION AND DIAGONALIZATION 12

Linear transformation–Null spaces and ranges–Composition of Linear transformations and Matrix multiplications – Invertibility and isomorphism-Dimension theorem–Matrix representation of a linear transformations–Eigen values and eigenvectors–Diagonalizability

UNIT III INNER PRODUCT SPACES 12

Inner product, norms–Gram Schmidt orthogonalization process–Adjoint of linear operations–Least square approximation-Bilinear and quadratic forms

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 12

Formation–Solutions of first order equations–Linear equations of first order-Nonlinear equations of the first order-Standard types and equations reducible to standard types–Singular solutions –Lagrange‘s linear equation–Integral surface passing through a given curve–Classification of partial differential equations – Solution of linear equations of higher order with constant coefficients–Linear non-homogeneous partial differential equations.

UNIT V FOURIER SERIES SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Dirichlet‘s conditions–General Fourier series– Half range sine and cosine series –Method of separation of variables–Solutions of one-dimensional wave equation and one –dimensional heat equation–Steady state solution of two-dimensional heat equation–Fourier series solutions in Cartesian coordinates-Laplace equation in three dimensions.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Grewal B.S., ―Higher Engineering Mathematics‖, Khanna Publishers, New Delhi, 43rd Edition,2014.
2. Friedberg,A.H.,Insel,A.J. and Spence, L., ―Linear Algebra‖, Prentice Hall of India, New Delhi,2004.
3. Lay, D.C., ―Linear Algebra and its Applications‖, 5thEdition,Pearson Education, 2015.

REFERENCES:

1. Burden,R.L.andFaires,J.D,"NumericalAnalysis",9th Edition,CengageLearning,2016.
2. James,G.―AdvancedModernEngineeringMathematics‖,PearsonEducation, 2007.
3. Kolman, B. Hill, D.R.,―Introductory Linear Algebra‖, Pearson Education, New Delhi, FirstReprint,2009.
4. Kumaresan, S.,―Linear Algebra –A Geometric Approach‖, Prentice –Hall of India, New Delhi, Reprint,2010.

Course code	21HC33T	Semester	III			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	OBJECT ORIENTED PROGRAMMING USING JAVA (Common to CSE & ECE)		3	0	0	3

COURSE OBJECTIVES:

- To impart the core language features of Java and its Application Programming Interfaces(API).
- To demonstrate the use of threads, exceptions, files and collection frame works in Java.
- To familiarize students with GUI based application development and database connectivity.

PREREQUISITE:

- Basic Programming Skills

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C303. 1	***Interpret*** Java programs using Object Oriented Programming principles	K2
C303. 2	***Explain*** Java programs with the concepts of inheritance and interfaces	K2
C303. 3	***Contrast*** Java applications using exceptions and I/O streams	K2
C303. 4	***Relate*** Java applications with threads and generics classes	K2
C303. 5	***Apply*** interactive Java programs using Swings& JDBC	K3
C303.6	***Understand*** the concepts of JDBC connectivity	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C303. 1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C303. 2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C303. 3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C303. 4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C303. 5	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C303.6	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION TO OOPS AND JAVA FUNDAMENTALS 10

Object Oriented Programming–- Abstraction – objects and classes - Encapsulation- Inheritance – Polymorphism- OOPS in Java – Characteristics of Java – The Java Environment – Java Source File Structure – Compilation. Basics of Java programming– Data Types, Variables, Operators, Control Flow, -Defining classes in Java –methods - constructors -access specifiers – static members – Comments- JavaDoc comments, Arrays – Strings-Use of Wrapper Class–Java API packages – Using system packages – Creating, accessing and using a package – Adding a class to a package.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces – the Object class – abstract classes and methods- final methods and classes- Comparison between Abstract Class and interface -Object cloning -inner classes- Array Lists.

UNIT III EXCEPTION HANDLING AND I/O PROGRAMMING 8

Exceptions – Exception hierarchy – throwing and catching exceptions – built-in exceptions, creating own exceptions. Input / Output Basics – Streams – Byte streams and Character streams– Readers and Writers, File Class, File Input Stream, File Output Stream, Input Stream Reader, Output Stream Writer, File Reader, File Writer, Buffered Reader.

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8

Introduction about Multithreading-Differences between multi-threading and multitasking-Java thread Model- thread life cycle, creating threads, synchronizing threads, Inter-thread communication - thread groups. Generic Programming – Generic classes – Generic methods – Bounded Types – Restrictions and Limitations- Lambda Expressions.

UNIT V EVENT DRIVEN PROGRAMMING AND DBMS CONNECTIVITY 10

Graphics programming- Frame – AWT Components- Introduction to Swing – Layout management – Swing Components –Text Fields, Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes- JApplet –Event Handling Mechanisms - Event Classes – Event Listener-Data Base Connectivity: Basic structure of JDBC API-Database Management; Mechanism for connecting to a back-end database; Loading the ODBC driver.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Herbert Schildt, ―Java The complete reference‖, 11th Edition, McGraw Hill Education, 2020.
2. Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals‖, 11th Edition, Prentice Hall, 2020.

REFERENCES:

1. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers‖, 3rd Edition, Pearson, 2015.
2. Steven Holzner, ―Java 2 Black book‖, Dreamtech press, 2011.
3. Timothy Budd, ―Understanding Object-oriented programming with Java, Updated Edition, Pearson Education, 2000.

Course code	21EC34T	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	SIGNALS AND SYSTEMS		3	0	0	3

COURSE OBJECTIVES:

- To study basic properties of signals and systems.
- To learn Fourier series, Fourier Transform, Laplace Transform, Z-Transform & DTFT and their properties.
- To characterize the analysis of continuous time systems using Laplace transform.
- To study the sampling process and analysis of discrete time systems.

PREREQUISITE:

- Linear Algebra and partial Differential Equations

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C304.1	***Solve*** the classification of signals and systems.	K3
C304.2	***Apply*** Fourier series, Fourier transform, Laplace transform, Z-transform & DTFT in signal analysis.	K4
C304.3	***Analyze*** CT & DT LTI systems using Fourier transform, Laplace transform, Z-transform & DTFT.	K4
C304.4	***Convert*** the CT signals into DT signals and understand the effect of sampling.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C304.1	3	3	3	-	-	-	-	-	-	-	-	-	2	2
C304.2	3	3	3	-	-	-	-	-	-	-	-	-	2	2
C304.3	3	3	3	-	-	-	-	-	-	-	-	-	2	2
C304.4	3	2	-	-	-	-	-	-	-	-	-	-	1	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous time signals (CT signals)-Discrete time signals (DT signals)-Elementary signals-Step, Ramp, Parabolic, Pulse, Impulse, Sinusoidal, Exponential- Basic operations on signals-Classification of CT and DT signals - Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals, odd & even signals, CT systems and DT systems-Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non causal, Stable & Unstable, Invertibility & inverse.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier series analysis, Gibbs Phenomenon, Fourier transform, Existence, frequency spectrum using FT, Properties of Fourier Transform, Inverse Fourier transform, Laplace transform, Relation between Laplace and Fourier transforms, Region of Convergence , Properties of Laplace transform, Inverse Laplace transform.

UNIT III LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS 9

Differential equation, Impulse response, Convolution integral, frequency response, Fourier and Laplace transforms in Analysis of CT systems, Block diagram representation.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 9

Sampling: Theorem, Aliasing, Reconstruction, Sampling of band pass signals, Z- Transform , Region of Convergence , Inverse Z Transform , Properties of Z-transform, Fourier Transform of Discrete Time Signals(DTFT).

UNIT V LINEAR TIME INVARIANT - DISCRETE TIME SYSTEMS 9

Difference equations, Impulse response, Convolution sum, Z-transform and DTFT Analysis of Recursive & Non-Recursive systems. Block diagram representation.

. **Total: 45 Periods**

LEARNING RESOURCES:

TEXT BOOKS:

1. Allan V.Oppenhim, S.Wilsky and S.H.Nawab," Signals and Systems, 2nd Edition, Pearson Education, 2015.
2. B.P. Lathi, " Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.

REFERENCES:

1. Zeimer R.E, Tranter W.H and Fannin R.D, Signals & Systems-Continuous and Discrete, Prentice-Hall, Fourth Edition, 1998.
2. Oktay Alkin, Signals and Systems: A MATLAB® Integrated Approach, CRC Press, First Edition, 2017.
3. Salivahanan S, Digital Signal Processing, McGraw Hill Education, Fourth Edition, 2019.
4. Roberts M.J, Signals & Systems Analysis using Transform Methods & MATLAB, Tata-McGraw Hill, First Edition, 2003.

Course code	21EC35T	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DIGITAL SYSTEM DESIGN		3	0	0	3

COURSE OBJECTIVES:

- To introduce basic Boolean algebra and apply minimization of logic.
- To the design of various combinational digital circuits using logic gates.
- To bring out the analysis and design procedures for synchronous and asynchronous Sequential circuits.
- To outline the basic concepts of VLSI Modules, memory and programmable logic devices.

PREREQUISITE:

- Fundamentals of Basic Electronic circuits

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C305. 1	***Solve*** Boolean function using K-map, tabulation method and simplify arithmetic operations in number system for logic circuit diagram.	K3
C305.2	***Analysis*** of an adder, subtractor, multiplexer and encoder of Combinational logic circuit.	K4
C305.3	***Design*** and implement of synchronous and asynchronous sequential logic circuits.	K3
C305.4	***Interpret*** simple HDL codes for digital circuits.	K2
C305.5	***Design*** and implementation of memory and programmable logic devices.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C305. 1	3	3	3	-	-	-	-	-	-	-	-	1
C305.2	3	3	3	-	-	-	-	-	-	-	-	1
C305.3	3	3	3	-	-	-	-	-	-	-	-	1
C305.4	3	2	-	-	-	-	-	-	-	-	-	1
C305.5	3	3	3	-	-	-	-	-	-	-	-	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I BASIC CONCEPTS AND MINIMIZATION TECHNIQUES 9

Number systems: decimal, binary, octal and hexadecimal systems, conversion from one base to another, 1‘s and 2‘s complements. Codes: BCD, excess- 3, gray code, ASCII. Logic gates, Universal gates, Boolean Postulates and laws, canonical and standard forms, Sum of Product, Product of Sums, Karnaugh Map, Don’t care conditions, Quine-Mcclusky method.

UNIT II COMBINATIONAL CIRCUITS 9

Design procedure of basic adders, subtractors, BCD adder, ripple carry look ahead adders, Binary multiplier, parity generator/ checker, encoders, decoders, multiplexers, de-multiplexers, Magnitude Comparator, Realization of Boolean expressions- using decoders and MUX & DEMUX.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Basic Latch, SR, D, JK and T flip flops, triggering of flip-flops, asynchronous and synchronous, Up-down Binary Counter – Ring Counter – Johnson Counters, Shift registers, universal shift register, Design of synchronous sequential circuits-Moore and Melay models.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Design of fundamental and pulse mode Circuits –cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Design of Hazard free circuit, Introduction to HDL – HDL Models of Combinational and sequential circuits using VHDL.

UNIT V MEMORY DEVICESANDINTEGRATED CIRCUITS 9

Basic memory structure – ROM -PROM – EPROM – EEPROM – RAM – Static and dynamic RAM – Programmable Logic Devices(PLD) – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using ROM, PLA, PAL. 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

LEARNING RESOURCES:

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, “Digital Design, 6thEdition, Pearson Education, 2018.
2. Charles H.Roth. “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.

REFERENCES:

1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, fourth edition.
2. T. L. Floyd, Digital Fundamentals, Prentice Hall, June 2005.
3. A.Anand Kumar, “Fundamentals of Digital circuits”, PHI, Fourth edition.
4. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill.

Course code	21MC01T	Semester	III			
Category	MANDATORY COURSE (MC)		L	T	P	C
Course Title	CONSTITUTION OF INDIA		2	0	0	0

COURSE OBJECTIVES:

- To understand the importance of constitution.
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India.

PREREQUISITE:

- Civic Knowledge.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C001.1	***Understand*** historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration	K2
C001.2	***Understand*** the directive principle of state policy, and strengthening of the constitutional institutions.	K2
C001.3	***Analyze*** the role of Governor and Chief Minister, role of state election commission, the decentralization of powers.	K2
C001.4	***Understand*** the Public Election Process.	K2
C001.5	***Know*** the Special Provisions for Various category of People.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C001.1	-	-	-	-	-	3	-	2	-	-	-	1	-	-	-
C001.2	-	-	-	-	-	2	-	2	-	-	-	1	-	-	-
C001.3	-	-	-	-	-	2	-	2	-	-	-	1	-	-	-
C001.4	-	-	-	-	-	1	-	2	-	-	-	1	-	-	-
C001.5	-	-	-	-	-	1	-	2	-	-	-	1	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 0**

UNIT I INTRODUCTION TO INDIAN CONSTITUTION 6

The Necessity of the Constitution, The Societies before and after the Constitution adoption. **Introduction to the Indian constitution,** The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India.

UNIT II FUNDAMENTAL RIGHTS AND DIRECTIVE PRINCIPLES 6

Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building. Directive Principles of State Policy (Art. 36-51).

UNIT III UNION EXECUTIVE AND STATE EXECUTIVE 6

Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Parliamentary Terminologies**.** Supreme Court of India, State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts.

UNIT IV ELECTIONS, AMENDMENTS AND EMERGENCY PROVISIONS 6

Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments Important Constitutional Amendments. Emergency Provisions, types of Emergencies and its consequences.

UNIT V DIRECTIVE PRINCIPLES & FUNDAMENTAL DUTIES 6

Fundamental Duties (Art. 51A), Basic Features of Constitution & Constitutional **special provisions:** Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. N. Shukla, Constitution of India, Eastern Book Agency, 2014.
2. P. Jain, Indian Constitutional Law, Lexis Nexis, 2013.
3. M. Seervai, Constitutional Law of India, Universal Law Publishing Co., Reprint 2013.

REFERENCES:

1. Glanville Austin, Indian Constitution – cornerstone of the Nations, Oxford University Press, 1999.
2. M. Bakshi, The Constitution of India, Universal Law Publishing Co., 2014.
3. D. Basu, Shorter Constitution of India (14^{th} Ed. 2008, reprint 2010).

Course code	21HC37P	Semester	III			
Category	ENGINEERING SCIENCE COURSE (ESC)		L	T	P	C
Course Title	OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY (Common to CSE & ECE)		0	0	4	2

COURSE OBJECTIVES:

- Practice object-oriented programs and build java applications.
- Implement java programs for establishing interfaces.
- Implement sample programs for developing reusable software components.
- Create database connectivity in java and implement GUI applications.

PREREQUISITE:

- Basic Programming Skill

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C307. 1	***Develop and implement*** Java programs for simple applications that make use of classes	K3
C307. 2	***Develop and implement*** Java programs with Array List	K3
C307. 3	***Build*** software development skills using java programming for real-world applications	K3
C307. 4	***Apply*** the concepts of classes, packages, interfaces, exception handling, Multithreading	K3
C307. 5	***Develop*** applications using File Processing, generic programming and event handling	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C307. 1	3	2	2	1	-	-	-	-	-	-	-	-	1	-	1
C307. 2	3	2	2	1	-	-	-	-	-	-	-	-	2	-	2
C307. 3	3	2	2	1	-	-	-	-	-	-	-	-	2	-	2
C307. 4	3	2	2	1	-	-	-	-	-	-	-	-	2	1	2
C307. 5	3	2	2	1	-	-	-	-	-	-	-	-	3	1	3

Note: 1: Slight, 2: Moderate, 3: Substantial

List of Experiment **No. of Credits: 2**

1. Develop a Java Program for understanding reference to an instance of a class (object), methods
2. Develop a Program to implement constructor overloading.
3. Develop a Java Program to implement String Handling Methods
4. Implementation of Inheritance using Java.
5. Implementation of Interfaces and Packages using Java.
6. Implementation on Abstract Class in Java.
7. Write a Java Program using Exception Handling.
8. Implementation of I/O Streams in Java Interface.
9. Implementation of Multithreaded Programming using Java.
10. Implementation of Generic Function in Java Interface.
11. Implementation of AWT controls and Event classes using Java Program.
12. Develop a mini project for any application using JDBC

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Herbert Schildt, ―Java The complete reference‖, 11th Edition, McGraw Hill Education, 2020.
2. Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals‖, 11th Edition, Prentice Hall, 2020.

REFERENCES:

1. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers‖, 3rd Edition, Pearson, 2015.
2. Steven Holzner, ―Java 2 Black book‖, Dreamtech press, 2011.
3. Timothy Budd, ―Understanding Object-oriented programming with Java, Updated Edition, Pearson Education, 2000.

ONLINE RESOURCES:

1. docs.oracle.com/java/6/tutorial/doc/girgm.html
2. www.webreference.com/programming/java.html
3. www.apl.jhu.edu/~hall/java/Documentation.html

LIST OF EQUIPMENT REQUIRED

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	Systems with either NetBeans or Eclipse	30

Course code	21EC38P	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DIGITAL SYSTEM DESIGN LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To design and implement the construction of digital combinational and sequential circuits.
- To simulate basic combinational and sequential circuits using Hardware Description Language.

PREREQUISITE:

- Understanding on the design principles of combinational and sequential digital circuits

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C308.1	***Design*** combinational circuits using adder, subtractor, multiplexer/ De-multiplexer and encoder/Decoder.	K3
C308.2	***Design*** synchronous sequential circuits using flip-flops, counter and shift register.	K3
C308.3	***Implement*** and simulate the digital logic circuits using VHDL	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C308.1	3	2	2	-	1	-	-	1	1	-	-	1
C308.2	3	2	2	-	1	-	-	1	1	-	-	1
C308.3	3	2	2	-	1	-	-	1	1	-	-	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 2**

LIST OF EXPERIMENTS

1. Study the pin details of digital ICs and verification of their respective truth tables and identify IC fault using digital IC tester.
2. Implementation of a Boolean function using universal gate.
3. Design and implementation of adder/subtractor and BCD adder.
4. Design and implementation of code converters using logic gates BCD to Excess-3, Binary to gray and Vice-versa.
5. Design and implementation of 2-bit Magnitude Comparator and parity checker/generator.
6. Implementation of Boolean expressions using multiplexer and De-multiplexer.
7. Implementation of Boolean expressions using Encoder/ Decoder.
8. Verification of RS, JK, T and D flip-flops.
9. Design and implementation of ripple and synchronous counters using flip-flops.
10. Design and implementation of Mod-N counters, Johnson counter using flip-flops.
11. Implementation of SISO, SIPO, PISO, PIPO shift register using flip-flops.
12. Simulation of experiments 3, 6, 9 and 11 using VHDL.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, “Digital Design, 5thEdition, Pearson Education, 2014.
2. Charles H.Roth. “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.

REFERENCES:

1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, fourth edition.
2. T. L. Floyd, Digital Fundamentals, Prentice Hall, June 2005.
3. A.Anand Kumar, “Fundamentals of Digital circuits”, PHI, Fourth edition.
4. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill.

LIST OF EQUIPMENT REQUIRED

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	IC Trainer Kit	15
2.	Bread Boards	15
3.	PC with HDL Software	15
4.	Seven Segment Display	15
5.	ICs 7400/7402/7404/7486/7408/7432/7483/74150/74151/ 74147/7445/7476/7491/7494/7447/74180/7485/7473/ 7411/7474	Each 50

Course code	21EC39P	Semester	III			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	ANALOG ELECTRONICS LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To design BJT and FET amplifiers and determine its frequency response.
- To determine fundamental principles of amplifier circuits.
- To differentiate feedback amplifiers, oscillators and multivibrators.
- To learn simulation software used in circuit design.

PREREQUISITE:

- Basic knowledge on circuits and electronic devices.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Knowledge level
On successful completion of this Course, students will be able to		
C309.1	***Experiment with*** various biasing methods of BJT and FET and determine characteristics of differential amplifier	K3
C309.2	***Determine*** frequency response of Darlington, cascode amplifier and feedback amplifiers and distinguish different classes of power amplifiers and tuned amplifiers.	K3
C309.3	***Design*** of various oscillators and multivibrators.	K3
C309.4	***Examine*** the biasing techniques of FET , various multivibrators and tuned amplifiers using simulation software.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
C309.1	3	2	1	-	-	-	-	-	-	-	-	-
C309.2	3	2	1	-	-	-	-	-	-	-	-	-
C309.3	3	2	1	-	-	-	-	-	-	-	-	-
C309.4	3	2	2	-	2	-	-	-	-	-	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 2**

1. Design and analysis of fixed bias and voltage divider bias using BJT.
2. Design of Darlington and cascode amplifier.
3. Determine CMRR and transfer characteristics of differential amplifier
4. Design and analysis of FET with fixed bias and voltage divider bias
5. Determine the frequency response, input and output impedance of series and shunt feedback amplifiers.
6. Design and testing of RC Phase Shift and Wien Bridge Oscillators.
7. Design and testing of Hartley and Colpitts Oscillators.
8. Design of Astable and Monostable Multivibrators.
9. Design and testing of Power amplifiers.
10. Design and testing of Schmitt trigger.
11. Design and testing of single tuned, double tuned and stagger tuned amplifiers.
12. Design of RC Phase shift oscillator, Wien bridge oscillator, Hartley oscillator, Colpitts oscillator ,Astable and Monostable Multivibrators using Simulation software.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, Mc Graw Hill Education (India) Private Ltd., 2010.

2. Jacob Millman, _Microelectronics‘, McGraw Hill, 2nd Edition, Reprinted, 2009.

REFERENCES:

1. Boylestad L Robert and Nashelsky Louis, ―Electronic Devices and circuits‖, Prentice Hall of India, New Delhi, 2009.

2. S.Salivahanan, N.SureshKumar, A.Vallavaraj, Electronic Devices and Circuits, Tata McGraw Hill ltd., 2nd Edition,2009.

3. B.VisvesvaraRao,K.RajaRajeswari,P.ChalamRajuPantuluandK.BhaskaraRama,"ElectronicCircuitAnalysis",Pearson, 1st Edition,2012.

4. Sedra and Smith, ―Micro Electronic Circuits‖; Sixth Edition, Oxford University Press, 2011.

5. Allen Mottershed ―Electronic Devices and Circuits‖, Prentice Hall of India, New Delhi, 2009.

6. David A Bell, ―Electronic Devices and Circuits‖, Prentice Hall of India, New Delhi, 2008.

LIST OF EQUIPMENT REQUIRED

Sl. No.	Description of Equipment	Required numbers (For batch of 30 students)
1.	CRO(30MHZ)	15
2.	FUNCTION GENERATOR(3MHZ)	15
3.	DUAL REGULATED POWER SUPPLIES(0-30V)	15
4.	Standalone desktop PCs With SPICE	15
5.	Transistor/FET(BJT-NPN-PNP & NMOS/PMOS)	25
6.	Resistor Capacitors, Inductors	Each 50
7.	PN Diodes, Zener Diodes	Each 10
8.	Bread Boards	10

IV & V SEMESTER
CURRICULUM AND SYLLABI

Applicable to the students admitted to

B. E- ELECTRONICS AND COMMUNICATION ENGINEERING

R-2021: CBCS

Academic year 2021-2022
onwards

VEL TECH HIGH TECH
Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE
An Autonomous Institution
#60, Avadi – Vel Tech Road, Vel Nagar,
Avadi, Tamil Nadu 600062

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

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

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

B.E – Electronics and Communication Engineering (R2021)

SEMESTER IV										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total Marks	Credits			
							L	T	P	C
THEORY										
1	21EC41T	Communication Theory	PCC	40	60	100	3	0	0	3
2	21MA42T	Probability and Random Processes	BSC	40	60	100	3	1	0	4
3	21EC43T	Linear Integrated Circuits	PCC	40	60	100	3	0	0	3
4	21EC44T	Electromagnetic Fields	PCC	40	60	100	3	1	0	4
5	21EC45T	Control Systems Engineering	PCC	40	60	100	3	1	0	4
6	21MC02T	Environmental Sciences	MC	40	60	100	2	0	0	0
PRACTICAL										
7	21EC47P	Linear Integrated Circuits Laboratory	PCC	40	60	100	0	0	4	2
8	21EE01P	Mini Project-I	EEC	40	60	100	0	0	2	1
									TOTAL	**21**

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Course code	21EC41T	Semester	IV			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	COMMUNICATION THEORY		3	0	0	3

COURSE OBJECTIVES:

- To introduce the concepts of various analog modulations and their spectral characteristics.
- To understand the properties of random process.
- To know the effect of noise on communication systems.
- To study the principles of sampling and quantization

PREREQUISITE:

- Signals and Systems

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C401.1	***Apply*** the AM modulation and its sideband generation.	K2
C401.2	***Construct*** the FM modulation and Demodulation in communication systems.	K2
C401.3	***Apply*** the various random process involved in communication systems.	K2
C401.4	***Identify*** the characteristics of noise in AM and FM.	K2
C401.5	***Understand*** the types of sampling and quantization schemes for communication systems.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C401.1	3	1	1	-	-	-	-	-	-	-	-	1	3	3
C401.2	3	2	1	-	-	-	-	-	-	-	-	1	2	2
C401.3	3	2	1	-	-	-	-	-	-	-	-	1	2	2
C401.4	3	3	1	-	-	-	-	-	-	-	-	1	2	2
C401.5	3	2	1	-	-	-	-	-	-	-	-	1	2	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I AMPLITUDE MODULATION 9

Elements of Communication System - Communication Channels - Need for Modulation - Amplitude Modulation - Linear Modulation Schemes: DSB-SC Modulation - SSB Modulation - VSB Modulation - Frequency Spectrum of AM signals, DSB-SC, SSB-SC - AM modulators: Power law modulator - Switching Modulator - Balanced Modulator - Ring Modulator- AM Transmitters.

UNIT II ANGLE MODULATION 9

Phase Modulation - Frequency Modulation - Narrow Band FM - Wide Band FM - Frequency Spectrum of FM - Transmission Bandwidth of FM Signals - Direct FM generation: Varactor diode modulator, Reactance Modulator - Narrowband FM generation-Indirect FM generation - FM Transmitters.

UNIT III AM & FM RECEIVERS 9

AM Demodulators: Envelope detector, Coherent Detection of DSB-SC, SSB-SC - Costas Receiver - Frequency Translation - Multiplexing: Frequency Division Multiplexing, Quadrature Carrier Multiplexing- AM Receivers: Superheterodyne.

FM Demodulators: Slope detector, Balanced Slope Detector, Foster Seeley Discriminator, Ratio Detector, PLL Demodulator, Quadrature FM Demodulator - FM Receivers.

UNIT IV NOISE CHARACTERIZATION 9

Noise sources - Noise figure, noise temperature and noise bandwidth - Noise in cascaded systems. Representation of Narrow band noise -In-phase and quadrature, Envelope and Phase - Noise performance analysis in AM & FM systems - Threshold effect, Pre-emphasis and de-emphasis for FM.

UNIT V PULSE MODULATION 9

Sampling Process - Pulse Amplitude Modulation - Pulse Width Modulation - Pulse Position Modulation - Bandwidth - Noise Trade-off - Quantization Process - Pulse Code Modulation - Time Division Multiplexing - Frequency Division Multiplexing.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. J.G.Proakis, M.Salehi, Fundamentals of Communication Systems, Pearson Education 2014.
2. Simon Haykin, Communication Systems, 4th Edition, Wiley, 2014.

REFERENCES:

1. B.P.Lathi, ―Modern Digital and Analog Communication Systems, 3rd Edition, OxfordUniversity Press, 2017.
2. D.Roody, J.Coolen, ―Electronic Communications, 4th edition PHI 2006
3. A.Papoulis, ―Probability, Random variables and Stochastic Processes, McGraw Hill, 4th edition, 2017.
4. B.Sklar, ―Digital Communications Fundamentals and Applications, 2nd Edition PearsonEducation 2007
5. H P Hsu, Schaum Outline Series - ―Analog and Digital Communications TMH 2006.
6. Couch.L., "Modern Communication Systems", Pearson, 2001.

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Course code	21MA42T	Semester	IV			
Category	BASIC SCIENCE COURSE (BSC)		L	T	P	C
Course Title	PROBABILITY AND RANDOM PROCESSES		3	1	0	4

COURSE OBJECTIVES:

- To provide necessary basic concepts in probability and random processes.
- To understand the basic concepts of random processes and spectral densities.
- To understand the significance of linear systems with random inputs.

PREREQUISITE:

- Basic concepts in probability

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C402.1	***Understand*** the fundamental knowledge of the concepts of probability.	K2
C402.2	***Understand*** the basic concepts of one and two dimensional random variables and apply in engineering applications.	K2
C402.3	***Apply*** the concept random processes in engineering disciplines.	K3
C402.4	***Understand*** and apply the concept of correlation and spectral densities.	K3
C402.5	Able to ***analyze*** the response of random inputs to linear time invariant systems.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C402.1	2	1	1	-	-	-	-	-	-	-	-	-	3	3
C402.2	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C402.3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C402.4	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C402.5	2	1	1	-	-	-	-	-	-	-	-	-	2	2

Note:1:Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 4**

UNIT I PROBABILITY AND RANDOM VARIABLES 9+3

Discrete and continuous random variables- Distribution function of random variable – Properties – Probability mass function – Probability density function – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 9+3

Joint Distributions – Marginal and conditional distributions – covariance – correlation and linear regression – transformation of random variables.

UNIT III RANDOM PROCESSES 9+3

Classification of random process– stationary process – Markov process - Markov chain - Poisson process – properties – random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 9+3

Auto correlation functions – cross correlation functions – properties – power spectral density – cross spectral density – properties.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 9+3

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Ibe, O.C.," Fundamentals of Applied Probability and Random Processes ", 1st Indian Reprint, Elsevier, 2014.
2. Peebles, P.Z., Bertram Emil Shi "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 2015.

REFERENCES:

1. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012.
2. G.Balaji, “Probability and Random Process”, Balaji Publication, 7th Edition 2020.
3. T. Veerarajan, “Probability and Statistics, Random Process and Queuing Theory”, McGraw Hill Education, 1st Edition, 2018.
4. P. Sivaramakrishna Das, “Probability and Random Process”, Pearson Education, 6th Edition, 2019.
5. P.Kandasamy, Thilagavathi. K and Gunavathi.K., “Probability Random variable and Random Process”, S.Chand&Co. Pvt. Ltd, 2nd Edition, 2015.
6. Yates. R.D. and Goodman. D.J., ―Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 3rd Edition 2014.

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Course code	21EC43T	Semester	IV			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	LINEAR INTEGRATED CIRCUITS		3	0	0	3

COURSE OBJECTIVES:

- To understand the characteristics of operational amplifier.
- To learn linear and non-linear applications of operational amplifiers.
- To demonstrate the concepts of PLL, ADC, DAC, Timer, waveform generators and special function ICs

PREREQUISITE:

- Circuit Analysis and Analog Electronics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C403.1	***Comprehend*** the ideal and practical characteristics of Operational Amplifiers	K2
C403.2	***Design*** circuits for various mathematical operations using operational amplifier.	K3
C403.3	***Realize*** circuits with analog multiplier and PLL.	K3
C403.4	***Categorize*** various Converters using OP-AMP.	K3
C403.5	***Classify*** the different waveform generators and special function ICs.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C403.1	2	1	-	-	-	-	-	-	-	-	-	1	3	1
C403.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C403.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C403.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C403.5	2	1	-	-	-	-	-	-	-	-	-	1	3	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Stability Limitations, Frequency Compensation.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Inverting and Non-Inverting amplifier, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 8

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type –Counter type - Single Slope type – Dual Slope type - A/D Converter.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS 10

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Switched capacitor filter, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Optocouplers and fibre optic IC

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. D.RoyChoudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 2021, Sixth Edition.
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 4th Edition, Tata McGraw-Hill, 2016

REFERENCES:

1. Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4th Edition, Prentice Hall / Pearson Education, 2015.
2. Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.
3. Gray and Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley International,5th Edition, 2009.
4. S.Salivahanan& V.S. KanchanaBhaskaran, “Linear Integrated Circuits”, TMH,2nd Edition,4th Reprint, 2016.

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Course code	21EC44T	Semester	IV			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	ELECTROMAGNETIC FIELDS		3	1	0	4

COURSE OBJECTIVES:

- To understand the fields and potentials due to static electric charges and static magnetic fields.
- To know how materials affect electric and magnetic fields.
- To relate Electric and Magnetic fields under time varying situations.
- To understand propagation of uniform plane waves in various media.

PREREQUISITE:

- Engineering Physics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C404.1	***Demonstrate*** knowledge and understanding of fundamental electromagnetic laws and concepts	K2
C404.2	***Classify*** the effects of materials on electric and magnetic fields	K2
C404.3	***Analyze*** electric and magnetic field quantities from simple charge and current distributions	K3
C404.4	***Interpret*** electric and magnetic field of uniform plane wave in a dielectric material	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C404.1	2	1	-	-	-	-	-	-	-	-	-	-	3	1
C404.2	3	2	-		-	-	-	-	-	-	-	-	3	2
C404.3	3	2	1	-	-	-	-	-	-	-	-	-	3	2
C404.4	3	2	1	-	-	-	-	-	-	-	-	-	3	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I VECTOR ANALYSIS **9+3**

Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem, Null identities, Helmholtz's theorem.

UNIT II STATIC ELECTRIC FIELDS **9+3**

Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions, Current density and Ohm's law, Electromotive force and Kirchhoff's voltage law, Equation of continuity and Kirchhoff's current law.

UNIT III STATIC MAGNETIC FIELDS **9+3**

Lorentz force equation, Law of no magnetic monopoles, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques.

UNIT IV TIME-VARYING FIELDS AND MAXWELL'S EQUATIONS **9+3**

Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields.

UNIT V UNIFORM PLANE WAVES **9+3**

Plane waves in lossless media, Plane waves in lossy media, Group velocity, Electromagnetic power flow and Pointing vector, Normal incidence and oblique incidence - plane conducting boundary and dielectric boundary.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. D.K. Cheng, Field and wave electromagnetics, 2nd ed., Pearson (India), 1989
2. W.H. Hayt and J.A. Buck, Engineering electromagnetics, 7th ed., McGraw-Hill (India), 2006.

REFERENCES:

1. D.J. Griffiths, Introduction to electrodynamics, 4th ed., Pearson (India), 2013
2. B.M. Notaros, Electromagnetics, Pearson: New Jersey, 2011
3. M.N.O. Sadiku and S.V. Kulkarni, Principles of electromagnetics, 6th ed., Oxford (Asian Edition), 2015.

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Course code	21EC45T	Semester	IV			
Category	PROFESSIONAL CORE COURSES (PCC)		L	T	P	C
Course Title	CONTROL SYSTEMS ENGINEERING		3	1	0	4

COURSE OBJECTIVES:

- To introduce the components and their representation of control systems
- To provide various methods for analysing the time response, frequency responseand stability of the systems.
- To design various controllers and compensators.

PREREQUISITE:

- Linear Algebra and Calculus, Ordinary Differential Equations and Laplace Transforms.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C405.1	***Identify*** the various control system components and their representations.	K3
C405.2	***Analyze*** the various time domain parameters.	K4
C405.3	***Analysis*** the various frequency response plots and its system.	K4
C405.4	***Apply*** the concepts of various system stability criterions.	K3
C405.5	***Design*** simple controllers and compensators to improve system performance.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C405.1	3	3	2	2	-	-	-	-	-	-	-	1	-	-
C405.2	3	3	3	2	-	-	-	-	-	-	-	1	-	-
C405.3	3	3	3	2	-	-	-	-	-	-	-	1	-	-
C405.4	3	3	3	3	-	-	-	-	-	-	-	1	-	-
C405.5	3	3	2	2	-	-	-	-	-	-	-	1	-	-

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I INTRODUCTION TO CONTROL SYSTEM 12

Control System: Terminology and Basic Structure-Feed forward and Feedback control theory-Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models.

UNIT II TIME RESPONSE ANALYSIS 12

Time response analysis of first order and second order system. Transient response-steady state analysis -steady error constant and system- type number.

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS 12

Closed loop frequency response-Performance specification in frequency domain-Frequency response of standard second order system -Graphical method- Bode Plot - Polar Plot-Inference of Bode and polar plot.

UNIT IV CONCEPTS OF STABILITY ANALYSIS 12

Concept of stability-Bounded - Input Bounded - Output stability- effect on an additional zero and an additional pole. Graphical method - Routh stability criterion-Relative Stability-Root locus concept-Guidelines for sketching root locus-Nyquist stability criterion.

UNIT V COMPENSATOR AND CONTROLLER DESIGN 12

Compensators - Lag, lead and lag-lead compensators design using Bode plot – Design of feedback controller - P, PI, PD and PID Controller.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. M. Gopal, “Control System – Principles and Design”, Tata McGraw Hill, 4th Edition, 2012.

REFERENCES:

1. J.Nagrath and M.Gopal, “Control System Engineering”, New Age International Publishers, 5 th Edition, 2007
2. K. Ogata, ‘Modern Control Engineering’, 5th edition, PHI, 2012.

Course code	21MC02T	Semester	IV			
Category	MANDATORY COURSE (MC)		L	T	P	C
Course Title	ENVIRONMENTAL SCIENCES (Common for All Branches except Chemical)		2	0	0	0

COURSE OBJECTIVES:

- To study the nature, interrelationship between living organism and environment, biodiversity, natural resources, pollution control and waste management.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To appreciate the importance of environment by assessing its impact on the human world.

PREREQUISITE:

- Basic awareness on environment.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C002.1	***Illustrate*** the interrelationship between living organism and environment.	K2
C002.2	***Relate*** Public awareness, environmental pollution and its problem.	K2
C002.3	***Classify*** the dynamic processes and the features of natural resources.	K2
C002.4	***Measure*** the development and improvement in standard of living.	K2
C002.5	***Summarize*** the knowledge about human health and welfare.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C002.1	1	-	-	-	-	-	1	-	-	-	-	-
C002.2	2	-	-	-	-	-	1	-	-	-	-	-
C002.3	1	-	-	-	-	-	1	-	-	-	-	-
C002.4	1	-	-	-	-	-	2	1	-	-	-	1
C002.5	1	-	-	-	-	-	1	1	-	-	-	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 0**

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) –Introduction to biodiversity definition: genetic, species and ecosystem diversity –biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity –threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts –endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds, etc., Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources. Field study of local area to document environmental assets – river / forest / grassland /
hill / mountain.

UNIT III ENVIRONMENTAL POLLUTION AND DISASTER MANAGEMENT 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution(c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards, accidents and holocaust – solid waste management: causes, effects and control measures of municipal solid wastes- E waste and Scrap tyres – Recycling of Plastic, Glass and Paper wastes-role of an individual in prevention of pollution – pollution case studies –disaster management: floods, earthquake, cyclone and landslides- case studies. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 8

From unsustainable to sustainable development- Equitable use of resources for sustainable lifestyles – urban problems related to energy –water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of nongovernmental organization- environmental ethics: Issues and possible

solutions –principles of green chemistry–climate change, global warming, acid rain, ozone layer depletion, case studies. – wasteland reclamation – consumerism and waste products – environment protection act – Air (Prevention and Control of Pollution) act – Water(Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – environmental impact assessment- enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 7

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – women and child welfare – HIV/AIDS –SARS- Covid-19- role of information technology in environment and human health – Case studies.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill, New Delhi, 2014.
2. Anubha Kaushik, and Kaushik, C. P., Environmental Science and Engineering, New Age International Publishers, 6thEdition, 2019.

REFERENCES:

1. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, 2nd Edition, University Grants Commission, Universities Press, 2013.
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Pearson Education, 2004.
3. Tyler Miller, G., and Scott E. Spoolman, Environmental Science, Cengage Learning India Pvt, Ltd, Delhi, 2014.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

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

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EC47P	Semester	IV			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	LINEAR INTEGRATED CIRCUITS LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To understand the characteristics of the operational amplifier
- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function IC.
- To use SPICE software for IC Design

PREREQUISITE:

- Analog Electronics

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C407.1	***Understand*** the basics of liner integrated circuits and available ICs.	K2
C407.2	***Design*** oscillators, amplifiers and filters using Op-amp.	K3
C407.3	***Implement*** the frequency multiplier using PLL	K3
C407.4	***Design*** DC power supply using ICs.	K3
C407.5	***Simulate*** the performance of low-pass, High-pass and band-pass filters, multivibrator, A/D converter and analog multiplier using spice tool.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C407.1	3	2	2	-	1	-	-	1	2	2	-	1	3	3
C407.2	3	2	2	-	1	-	-	1	2	2	-	1	3	3
C407.3	3	2	2	-	1	-	-	1	2	2	-	1	3	3
C407.4	3	2	2	-	1	-	-	1	2	2	-	1	3	3
C407.5	3	2	2	-	1	-	-	1	2	2	-	1	3	3

Note: 1: Slight, 2: Moderate, 3: Substantial

List of Experiments **No. of Credits: 2**

DESIGN AND TESTING OF

1. Inverting, Non inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low-pass, High-pass and band-pass filters.
5. Astable&Monostablemultivibrators using OP-AMP
6. Schmitt Trigger using OP-AMP.
7. Phase shift and Wien bridge oscillators using OP-AMP.
8. Astable and monostablemultivibrators using NE555 Timer.
9. PLL characteristics and its use as Frequency Multiplier, Clock Synchronization
10. R-2R Ladder Type D/A Converter using Op-amp
11. DC power supply using LM317 and LM723.
12. A/D Convertors using ADC0809

SIMULATION USING SPICE

13. Filters and Oscillators using Op-amp
14. Astable and Monostablemultivibrators using NE555 Timer.
15. A/ D and D/A converters
16. Analog multiplier

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. D.RoyChoudhry, Shail Jain, ―Linear Integrated Circuits‖, New Age International Pvt. Ltd., 2018, Fifth Edition.
2. Sergio Franco, ―Design with Operational Amplifiers and Analog Integrated Circuits‖, 4th Edition, Tata McGraw-Hill, 2016

REFERENCES:

1. Ramakant A. Gayakwad, ―OP-AMP and Linear ICs‖, 4th Edition, Prentice Hall / Pearson Education, 2015.
2. Robert F.Coughlin, Frederick F.Driscoll, ―Operational Amplifiers and Linear Integrated Circuits‖, Sixth Edition, PHI, 2001.
3. B.S.Sonde, ―System design using Integrated Circuits‖ , 2nd Edition, New Age Pub, 2001.
4. Gray and Meyer, ―Analysis and Design of Analog Integrated Circuits‖, Wiley International,5th Edition, 2009.
5. William D.Stanley, ―Operational Amplifiers with Linear Integrated Circuits‖, Pearson Education,4th Edition,2001.
6. S.Salivahanan& V.S. KanchanaBhaskaran, ―Linear Integrated Circuits‖, TMH,2nd Edition,4 th Reprint, 2016.
7. Linear Integrated Circuits Laboratory Manual.

Course code	21EE01P	Semester	IV			
Category	EMPLOYABILITY ENHANCEMENT COURSE (EEC)		L	T	P	C
Course Title	MINI PROJECT – I		0	0	2	1

COURSE OBJECTIVES:

- To introduce project-based learning

PREREQUISITE:

- All Core Courses

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C001.1	***Evaluate*** specific problem statements for real time problems with reasonable assumptions and constraints.	K5
C001.2	***Perform*** literature search and / or patent search in the area of interest	K3
C001.3	***Design*** the Proposal System and execute the final output	K4
C001.4	***Document*** the results in the form of technical report / presentation	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C001.1	3	3	2	2	2	1	1	1	3	2	2	2	2	2
C001.2	3	3	2	2	2	1	1	1	3	2	2	2	2	2
C001.3	3	3	2	2	2	1	1	1	3	2	2	2	2	2
C001.4	3	3	2	2	2	1	1	1	3	2	2	2	2	2

Note: 1: Slight; 2: Moderate; 3: Substantial

DOMAINS

Students are advised to carry out the projects in the following domains/ Applications, but not limited with

- Basic Circuits.
- Basic Electron Devices.
- Linear and Digital IC's.
- Arduino Based Projects
    - Home Automation
    - Weather Monitoring System
    - Fire Alarm System
    - Smart Irrigation System

Total: 30 Periods

ONLINE RESOURCES

1. https://swayam.gov.in/nc_details/NPTEL
2. https://ieeexplore.ieee.org/Xplore/home.jsp
3. Taylor and Francis Journal Articles
4. https://www.ibm.com/docs/en/zvse/6.2?topic=technical-articles-white-papers

VEL TECH HIGH TECH

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B.E – Electronics and Communication Engineering (R2021)

SEMESTER V										
S. No.	Course Code	Course Title	Category	CIE Marks	SEE Marks	Total Marks	Credits			
							L	T	P	C
THEORY										
1	21EC51T	Digital Communication	PCC	40	60	100	3	0	0	3
2	21EC52T	Digital Signal Processing	PCC	40	60	100	3	1	0	4
3	21EC53T	Transmission Lines and RF Systems	PCC	40	60	100	3	0	0	3
4	21HE54IT	Microprocessor and Microcontroller	PCC	40	60	100	2	0	4	4
5	-	Professional Elective-I	PEC	40	60	100	3	0	0	3
6	-	Open Elective- I	OEC	40	60	100	3	0	0	3
PRACTICAL										
7	21EC57P	Communication Systems Laboratory	PCC	40	60	100	0	0	4	2
8	21EC58P	Digital Signal Processing Laboratory	PCC	40	60	100	0	0	4	2
									TOTAL	**24**

Course code	21EC51T	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DIGITAL COMMUNICATION		3	0	0	3

COURSE OBJECTIVES:

- To understand the various band pass signalling schemes
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To study the limits set by Information Theory
- To know the fundamentals of error control coding

PREREQUISITE:

- Signals and Systems

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C501.1	***Understand*** the coding techniques in information theory	K2
C501.2	***Explain*** base band transmission schemes	K2
C501.3	***Describe*** band pass signalling schemes	K2
C501.4	***Analyze*** the spectral characteristics of band pass signalling schemes and their noise performance	K3
C501.5	***Understand*** error control coding schemes.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C501.1	3	3	3	-	-	-	-	-	-	-	-	1	2	3
C501.2	3	3	3	-	-	-	-	-	-	-	-	1	2	3
C501.3	3	3	3	-	-	-	-	-	-	-	-	1	2	3
C501.4	3	3	3	-	-	-	-	-	-	-	-	1	2	3
C501.5	3	3	3	-	-	-	-	-	-	-	-	1	2	3

Note: 1:Slight, 2: Moderate, 3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I DIGITAL MODULATION SCHEME 9

Geometric Representation of Signals – Generation, Detection, PSD& BER of Coherent BASK, BPSK, BFSK & QPSK - QAM - Carrier Synchronization - Structure of Non-Coherent Receivers - Principle of DPSK.

UNIT II WAVEFORM CODING & REPRESENTATION 9

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding - Comparison of PCM and DM on the basis of Speech Signal- Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ - Bipolar NRZ – Manchester.

UNIT III BASEBAND TRANSMISSION & RECEPTION 9

ISI – Nyquist Criterion for Distortion Less Transmission - Pulse Shaping - Correlative Coding - Eye Pattern - Correlation Receiver - Adaptive Equalization - Gram-Schmidt Orthogonalization Procedure.

UNIT IV INFORMATION THEORY AND SCHEMES FOR SOURCE CODING 9

Discrete Memory less source – Information - Uncertainty Information and Entropy – Basic Properties of Entropy-Conditional Entropy-Joint Entropy-Mutual Information - Discrete Memory Less Channels, Channel Capacity - Source Coding Theorem - Shannon – Fano& Huffman codes – Efficiency Calculations.

UNIT V ERROR CONTROL CODING 9

Channel Coding Theorem - Linear Block Codes - Hamming Codes - Cyclic Codes –Generator Polynomial-Parity Check Polynomial– Calculation of Syndrome - Convolutional Codes - Viterbi Decoder.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Simon Haykins, "Digital Communications Systems", Wiley,5th Edition 2019
2. Roberto Togneri, Christopher J.S DeSilva, "Fundamentals of Information Theory and Coding Design", CRC press,2003

REFERENCES:

1. Bernard Sklar, Pabitra Kumar Ray, "Digital Communications: Fundamentals and Applications", Pearson Education, 2nd Edition, 2009.
2. John G. Proakis, "Digital Communications", McGraw Hill International Edition, 4th Edition,2001.
3. Taub& Schilling, "Principles of Communication Systems", Tata McGraw Hill, 4th Edition,2013.
4. Thomas M. Cover and Joy A. Thomas, "Elements of Information Theory", John Wiley & Sons, 2nd Edition,2006.
5. Todd K.Moon, "Error Correction Coding: Mathematical Methods and algorithms", John Wiley & Sons,2005.

Course code	21EC52T	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DIGITAL SIGNAL PROCESSING		3	1	0	4

COURSE OBJECTIVES:

- To learn discrete Fourier transform and its properties.
- To learn the design of digital IIR and FIR filters to filter undesirable signals.
- To understand Finite word length effects.
- To study Digital signal processor architecture and various application.

PREREQUISITE:

- Signals and Systems

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C502.1	***Understand*** the Discrete Fourier Transform computation and Fast Fourier Transform algorithm for digital signals and Systems.	K2
C502.2	***Design***, analyze and realize digital IIR and FIR filters.	K3
C502.3	***Analyze*** the finite word length effects in DSP system design.	K3
C502.4	***Interpret*** the architecture and application of a digital signal processor.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C502.1	3	3	2	1	-	-	-	-	-	-	-	-	3	3
C502.2	3	3	2	1	-	-	-	-	-	-	-	-	3	3
C502.3	3	3	2	1	-	-	-	-	-	-	-	-	3	3
C502.4	3	3	2	1	-	-	-	-	-	-	-	-	3	3

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 4**

UNIT I DISCRETE FOURIER TRANSFORM 9+3

Review of discrete time signals and discrete time systems - Sampling Theorem, Discrete Fourier Transform – Definition – Properties – Circular convolution - Overlap add method and Overlap save method for computing convolution – Fast Fourier Transform – Radix 2 FFT – Decimation in time –Decimation in frequency – Computing inverse DFT by doing a direct DFT.

UNIT II INFINITE IMPULSE RESPONSE FILTERS 9+3

Design of Discrete time IIR Butterworth and Chebyshev type I (LPF, HPF, BPF, BRF) - Design of IIR Filter by Approximation of derivatives, Impulse Invariance and Bilinear Transformation - Structure of IIR Systems - Direct, Cascade and Parallel form structures.

UNIT III FINITE IMPULSE RESPONSE FILTERS 9+3

Symmetric and Antisymmetric FIR Filters - Design of Linear (LPF,HPF) FIR Filters using Fourier series method- Windows (Rectangular, Hamming and Hanning window) and Frequency Sampling Method - Structure of FIR Systems- linear phase structures, direct form realizations.

UNIT IV FINITE WORD LENGTH EFFECTS 9+3

Fixed point and floating point number representations – ADC – Quantization- Truncation and Rounding errors - Quantization noise – coefficient quantization error – Product quantization error – Round-off noise power - limit cycle oscillations due to product quantization and summation – Principle of scaling.

UNIT V INTRODUCTION TO DIGITAL SIGNAL PROCESSORS 9+3

Fixed Point and Floating Point DSPs - Features of Digital Signal Processing Architecture - Bus Architecture - DSP Computational Building Blocks - On-Chip Memory - TMS320C5X family Architecture - Addressing Modes - Instructions sets- Application examples.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. John G Proakis and Dimitris G Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", PearsonEducation, 4th Edition, 2007.
2. V. Oppenheim, R. W. Shafer and J.R.Buck, "Discrete-Time Signal Processing", Pearson Education, 4th Edition,2011.

REFERENCES:

1. Lonnie C.Ludeman, "Fundamentals of Digital Signal Processing", Wiley, 2009.
2. B.VenkataRamani, M.Bhaskar,"Digital Signal Processors, Architecture, Programming and Applications", Tata McGraw-Hill, 2002.
3. Monson H Hayes, "Schaum's Outlines of - Digital Signal Processing",Tata McGraw Hill, 2nd Edition,2012.

Course code	21EC53T	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	TRANSMISSION LINES AND RF SYSTEMS		3	0	0	3

COURSE OBJECTIVES:

- To introduce the various types of transmission lines and its characteristics.
- To understand high frequency line, power and impedance measurements.
- To impart technical knowledge in impedance matching using smith chart.
- To study the characteristics of Transverse Electric and Transverse Magnetic waves.
- To get acquaintance with RF system transceiver design.

PREREQUISITE:

- Electromagnetic Fields

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C503.1	***Explain*** the characteristics of transmission lines and its losses	K2
C503.2	***Explain*** about the standing wave ratio and input impedance in high frequency transmission lines	K2
C503.3	***Apply*** impedance matching by stubs using smith charts	K3
C503.4	***Analyze*** the characteristics of TE and TM waves	K3
C503.5	***Understand*** RF transceiver system for wireless communication	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C503.1	2	1	-	-	-	-	-	-	-	-	-	1	-	2
C503.2	2	1	-	-	-	-	-	-	-	-	-	1	-	2
C503.3	3	2	1	-	-	-	-	-	-	-	-	1	-	2
C503.4	3	2	1	-	-	-	-	-	-	-	-	1	-	2
C503.5	3	2	-	-	-	-	-	-	-	-	-	1	-	2

Note: 1:Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I TRANSMISSION LINE THEORY 9

General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance -Open and short-circuited lines - reflection factor and reflection loss.

UNIT II HIGH FREQUENCY TRANSMISSION LINES 9

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES 9

Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV WAVEGUIDES 9

General Wave behaviour along uniform guiding structures – Transverse Electromagnetic Waves, Transverse Magnetic Waves, Transverse Electric Waves – TM and TE Waves between parallel plates. Field Equations in rectangular waveguides, TM and TE waves in rectangular waveguides, Bessel Functions, TM and TE waves in Circular waveguides, TLineSim and its features.

UNIT V RF SYSTEM DESIGN CONCEPTS 9

Active RF components: Semiconductor basics in RF, bipolar junction transistors, RF field effect transistors, High electron mobility transistors Basic concepts of RF Mixers, Low noise amplifiers, voltage controlled oscillators, Power amplifiers, transducer power gain and stability considerations.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. John D Ryder, “Networks, lines and fields”, 2nd Edition, Prentice Hall India, 2015.
2. Mathew M. Radmanesh, “Radio Frequency &Microwave Electronics”, Pearson Education.

REFERENCES:

1. Reinhold Ludwig and Powel Bretchko," RF Circuit Design – Theory and Applications", Pearson Education Asia, First Edition, 2001.
2. D. K. Misra, "Radio Frequency and Microwave Communication Circuits- Analysis and Design", John Wiley & Sons, 2004.
3. E.C.Jordan and K.G. Balmain, ―Electromagnetic Waves and Radiating Systems Prentice Hall of India, 2006.
4. G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.

Course code	21HE54IT	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	MICROPROCESSOR AND MICROCONTROLLER (Common to ECE, CSE & IT)		2	0	4	4

COURSE OBJECTIVES:

- To introduce the architectures of microprocessors, microcontroller.
- To familiarize with assembly language programming in 8086 microprocessor.
- To interface the peripherals with the 8051 microcontroller.
- To execute ALP concepts with processor and controller.
- To execute different Peripheral interfacing.

PREREQUISITE:

- Digital System Design

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C504.1	***Understand*** the basic architecture of Microprocessor and Microcontroller.	K2
C504.2	***Explain*** the interfacing of Microprocessor and Microcontroller to external devices.	K3
C504.3	***Develop*** ALP's using various addressing modes of Microprocessor and Microcontroller.	K3
C504.4	***Design*** to interface various peripherals with Microprocessor and Microcontroller.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C504.1	2	1	1	-	-	-	-	-	-	-	-	1	2	1
C504.2	3	2	1	-	-	-	-	-	-	-	-	1	2	1
C504.3	3	2	1	-	1	-	-	1	1	1	-	1	2	1
C504.4	3	2	1	-	1	-	-	1	1	1	-	1	2	1

Note: 1: Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 4**

UNIT I 8086 MICROPROCESSOR 6

Introduction to 8086 — Microprocessor architecture — Addressing modes —Instruction Set— Macros — Interrupts and interrupt service.

UNIT II 8086 SYSTEM BUS STRUCTURE 6

8086 signals — Basic configurations — System bus timing –System design using 8086 — I/O programming— System Bus Structure — Multiprocessor configurations.

UNIT III I/O INTERFACING 6

Memory Interfacing and I/O interfacing — Parallel communication interface (8255) — Serial communication interface (8251)— Keyboard /display controller (8279) — Interrupt controller (8259)— DMA controller (8257).

UNIT IV MICROCONTROLLER 6

Architecture of 8051 — Special Function Registers (SFRs) — I/O Pins Ports and Circuits — Instruction Sets: Data Processing - Stack, Arithmetic, Logical; Branching – Unconditional and Conditional— Addressing Modes.

UNIT V INTERFACING MICROCONTROLLER 6

Programming 8051 Timers — Serial Port Programming — Sensor with Signal Conditioning Interface - Stepper Motor and Waveform generation — Comparison of Microprocessor, Microcontroller, PIC and ARM processors.

Total: 30 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”,Second Edition,Pearson education, 2011.

REFERENCES:

1. Doughlas V.Hall,”Microprocessors and Interfacing, Programming and Hardware‖”,TMH,2012.
2. A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012

LIST OF EXPERIMENTS:

CYCLE 1

PROGRAMMING 8086 USING 8086 KITS AND MASM

1. Basic arithmetic and Logical operations.
2. Move a data block without overlap.
3. Code conversion, decimal arithmetic and Matrix operations.
4. Counters and Time Delay.
5. Traffic light control.
6. Stepper motor control.

CYCLE 2

PROGRAMMING 8051 USING 8051 KITS AND PROTEUS SOFTWARE

7. Digital clock.
8. Key board and Display.
9. Serial interface and Parallel interface.
10. A/D and D/A interface and Waveform Generation.
11. Basic arithmetic and Logical operations using 8051.
12. Square and Cube program, Find 2's complement of a number.

Total:60 Periods

Course code	21EC551PT	Semester	V			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	MEDICAL ELECTRONICS		3	0	0	3

COURSE OBJECTIVES:

- To gain knowledge about the origin of bio potentials and the methods of recording bio potentials.
- To understand various non- electrical parameters and the methods of recording those parameters.
- To study about the various implantable and non-implantable assist devices
- To gain knowledge about the equipment used for physical medicine and its application.
- To gain knowledge about the recent technological development in diagnosis and therapy.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Knowledge Level
On successful completion of this Course, students will be able to		
C5501.1	***Illustrate*** and explain various bio-potential measuring instruments	K2
C5501.2	***Distinguish*** and categorize bio chemical and Non electrical parameter measurements	K2
C5501.3	***Identify*** and differentiate various assist devices	K2
C5501.4	***Comprehend*** physical medicine methods and biotelemetry principles.	K2
C5501.5	***Identify*** and explain the operation of advanced diagnostic devices.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C5501.1	3	2	-	-	-	-	-	-	-	-	-	1	1	2
C5501.2	3	2	-	-	-	-	-	-	-	-	-	1	1	2
C5501.3	3	2	-	-	-	-	-	-	-	-	-	1	1	2
C5501.4	3	2	-	-	-	-	-	-	-	-	-	1	1	2
C5501.5	3	2	-	-	-	-	-	-	-	-	-	1	1	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials; bio-potential electrodes; biological amplifiers-Instrumentation amplifier, Isolation amplifier, ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

pH, PO2, PCO2, colorimeter, Auto analyzer, Blood flow meter-Electromagnetic and Ultrasonic blood flow meter, cardiac output - Fick's method, Indicator dilution and Dye dilution method, respiratory measurement, Blood pressure, temperature, pulse, Blood Cell Counters.

UNIT III ASSIST DEVICES 9

Cardiac pacemakers, DC Defibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging systems, Ultrasonic Imaging systems.

UNIT IV PHYSIOTHERAPY AND DIATHERMY EQUIPMENT 9

Diathermies-Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermograph, Endoscopy unit, Laser in medicine, cryogenic application, Introduction to Telemetry principles, frequency selection, Radiopill, Brain machine Interface, Lab on a chip.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007
2. John G.Webster, "Medical Instrumentation Application and Design", 3rd Edition, Wiley India Edition, 2007

REFERENCES:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2003.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2004.
3. Steve Webb, "The Physics of Medical Imaging", Taylor & Francis, New York.1988.
4. D.N.Chesney and M.O.Chesney, "Radio Graphic Imaging", CBS Publications, New Delhi, 1987.
5. Peggy, W., Roger D.Ferimarch, "MRI for Technologists", McGraw Hill, New York, 1995.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

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

Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EC552PT	Semester	V			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	DIGITAL AUDIO AND VIDEO ENGINEERING		3	0	0	3

COURSE OBJECTIVES:

- To know the concept of fundamentals of digital audio.
- To understand the concept of audio in digital TV broadcasting.
- To understand the basic techniques in digital video processing.
- To Analyse motion estimation techniques on video sequence.
- To understand the various application of digital audio and video.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5502.1	***Describe*** the type of dither.	K2
C5502.2	***Explain*** the recording and transmission principles in digital audio.	K2
C5502.3	***Explain*** basic techniques in digital video processing.	K2
C5502.4	***Analyse*** motion estimation techniques on video sequence.	K4
C5502.5	***Describe*** the various application of digital audio and video.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C5502.1	3	1	1	-	-	-	-	-	-	-	-	-	3	3
C5502.2	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C5502.3	3	2	1	-	-	-	-	-	-	-	-	-	2	2
C5502.4	3	3	1	-	-	-	-	-	-	-	-	-	2	2
C5502.5	3	2	1	-	-	-	-	-	-	-	-	-	2	2

Note:1:Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I FUNDAMENTALS OF DIGITAL AUDIO 9

Discrete time sampling - sampling theorem - Nyquist frequency – aliasing – prevention – quantization– signal to error ratio – distortion – other architectures – dithers – types of dither.

UNIT II RECORDING AND TRANSMISSION PRINCIPLES 9

PCM – record processing – recording oriented codes – transmission oriented codes – audio in digital TV broadcasting – DAB.

UNIT III BASICS OF VIDEO PROCESSING 9

Video formation, perception and representation: Principle of color video, video cameras, video display, pinhole model, CAHV model, Camera motion, Shape model, motion model, Scene model, two dimensional motion models.-Three Dimensional Rigid Motion, Approximation of projective mapping.

UNIT IV MOTION ESTIMATION TECHNIQUES 9

Optical flow, motion representation, motion estimation criteria, optimization methods, pixel based motion estimation, Block matching algorithm, gradient Based, Intensity matching, feature matching, frequency domain motion estimation, Depth from motion.-Motion analysis applications: Video Summarization, video surveillance.

UNIT V APPLICATIONS OF DIGITAL AUDIO AND VIDEO 9

Internet audio – MP3 – SDMI – audio MPEG 4 – PC – MIDI – sound cards. Radio-Construction & working principle of camcorder.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. John Watkinson, “An Introduction to Digital Audio”, Focal Press, Second edition. 2013
2. Ken C Pohlmann, “Principles of Digital audio”, McGraw Hill, Sixth edition, 2010.
3. A Murat Tekalp, “Digital Video processing”, Prentice Hall, Second edition 2015.

REFERENCES:

1. Then Ballin, “ Handbook for sound Engineers Taylor & Francis”, Fifth edition, 2015
2. John Watkinson, “The art of Digital Audio” Focal Press, Third edition, 2013
3. Al Bovik, “Handbook of Image and Video processing”, Academic press, second Edition, 2000.

VEL TECH HIGH TECH

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Course code	21HC44T	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	OPERATING SYSTEMS (Common to CSE , IT, ECE & AI&DS)		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics and functions of operating systems.
- To analyze scheduling algorithms and process synchronization.
- To understand the concept of deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and file systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android**.**

PREREQUISITE:

- Basic knowledge in Computer.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C404.1	***Analyze*** various scheduling algorithms and process synchronization.	K3
C404.2	***Explain*** deadlock prevention and avoidance algorithms.	K2
C404.3	***Compare*** and contrast various memory management schemes.	K3
C404.4	***Explain*** the functionality of file systems, I/O systems, and Virtualization	K2
C404.5	***Compare*** iOS and Android Operating Systems.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C404.1	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C404.2	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C404.3	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C404.4	3	2	1	-	-	-	-	-	-	-	-	1	3	2
C404.5	3	2	1	-	-	-	-	-	-	-	-	1	3	2

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION **9**

Computer System - Elements and organization; Operating System Overview - Objectives and Functions Evolution of Operating System; Operating System Structures – Operating System Services – User Operating System Interface - System Calls — System Programs - Design and Implementation - Structuring methods.

UNIT II PROCESS MANAGEMENT **9**

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithread Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware — Semaphores — Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III MEMORY MANAGEMENT **9**

Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table -Segmentation, Segmentation with paging; Virtual Memory - Demand Paging– Copy on Write - PageReplacement - Allocation of Frames –Thrashing.

UNIT IV STORAGE MANAGEMENT **9**

Mass Storage system — Disk Structure - Disk Scheduling and Management; File-System Interface- File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.

UNIT V VIRTUALIZATION AND MOBILE OPERATING-SYSTEM **9**

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Ninth Edition, 2012, Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", TataMcGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, PrenticeHall, 2018.
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

Course code	21ME02OT	Semester	V			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	ROBOTICS AND INDUSTRIAL AUTOMATION		3	0	0	3

COURSE OBJECTIVES:

- To understand the functions of the basic components and accessories of a Robot.
- To impart knowledge on Robot Kinematics and Programming.
- To learn Robot safety issues and economics.

PREREQUISITE:

- Electrical Drives & Control, Mechatronics and Kinematics of machinery.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C002.1	***Implement*** the concepts of a productive system in automation	K2
C002.1	***Apply*** the knowledge of automated flow lines for industrial applications.	K3
C002.1	***Classify*** different drives systems, End Effectors and robot sensors.	K3
C002.1	***Compute*** forward and inverse kinematics of robots and trajectory plan.	K3
C002.1	***Program*** robot to perform typical tasks including Pick and Place in material handling systems.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C002.1	3	2	2	1	1	-	-	-	-	-	1	1	3	2	3
C002.1	3	3	3	2	1	2	1	-	1	-	1	1	3	2	3
C002.1	3	3	3	2	1	1	1	-	1	-	1	1	3	2	3
C002.1	2	2	2	2	1	1	1	2	1	1	1	1	3	2	3
C002.1	3	3	3	2	1	1	1	2	1	1	1	1	3	2	3

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION TO AUTOMATION 9

Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

UNIT II AUTOMATED FLOW LINES 9

Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT III INTRODUCTION TO INDUSTRIAL ROBOTICS 9

Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers. Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

UNIT IV MANIPULATOR KINEMATICS, MANIPULATOR DYNAMICS 9

Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics. Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

UNIT V ROBOT PROGRAMMING, APPLICATION IN MANUFACTURING 9

Robot Programming: Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages. Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

TOTAL: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Automation, Production Systems and Computer Integrated Manufacturing, Groover M.P, Prentice – Hall Ltd., 1997.
2. Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2001.
3. Klafter R.D., Chmielewski T.A and Negin M., "Robotic Engineering - An Integrated Approach", Prentice Hall, 2003.

REFERENCES:

1. Robotics and Industrial Automation, NPTEL Course Contents & Videos, MHRD.
2. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
3. Deb S.R., "Robotics Technology and Flexible Automation" Tata McGraw Hill Book Co., 1994.
4. Koren Y., "Robotics for Engineers", Mc Graw Hill Book Co., 1992.
5. Fu.K.S., Gonzalz R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 1987.
6. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.
7. Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.
8. Surender Kumar, "Industrial Robots and Computer Integrated Manufacturing", Oxford and IBH Publishing Co. Pvt. Ltd., 1991.
9. Computer Control of Manufacturing Systems Yoram Koren, Tata McGraw-Hill Edition 2005.

Course code	21EC555PT	Semester	V			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	BIO-MEDICAL INSTRUMENTATION		3	0	0	3

COURSE OBJECTIVES:

- To Illustrate origin of bio potentials and its propagations.
- To understand the different types of electrodes and its placement for various recordings.
- To design bio amplifier for various physiological recordings.
- To learn the different measurement techniques for non-physiological parameters.
- To Summarize different biochemical measurements.

PREREQUISITE:

- Engineering Physics.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5505.1	***Differentiate*** different bio potentials and its propagations.	K2
C5505.2	***Illustrate*** different electrode placement for various physiological recordings	K2
C5505.3	***Design*** bio amplifier for various physiological recordings	K3
C5505.4	***Explain*** various technique for non-electrical physiogical measurements	K2
C5505.5	***Demonstrate*** different biochemical measurement techniques.	K2

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C5505.1	3	2	-	-	-	-	-	-	-	-	-	1	1	2
C5505.2	3	2	-	-	-	-	-	-	-	-	-	1	1	2
C5505.3	3	2	-	-	-	-	-	-	-	-	-	1	1	2
C5505.4	3	2	-	-	-	-	-	-	-	-	-	1	1	2
C5505.5	3	2	-	-	-	-	-	-	-	-	-	1	1	2

Note:1:Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I BIO POTENTIAL GENERATION AND ELECTRODES TYPES 9

Origin of bio potential and its propagation. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes.

UNIT II BIOSIGNAL CHARACTERISTICS AND ELECTRODECONFIGURATIONS 9

Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode.

UNIT III SIGNAL CONDITIONING CIRCUITS 9

Need for bio-amplifier - differential bio-amplifier, Impedance matching circuit, isolation amplifiers, Power line interference, Right leg driven ECG amplifier, Band pass filtering.

UNIT IV MEASUREMENT OF NON-ELECTRICALPARAMETERS 9

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - Auscultatory method, direct methods: electronic manometer, Systolic, diastolic pressure, Blood flow and cardiac output measurement: Indicator dilution, and dye dilution method, ultrasound blood flow measurement.

UNIT V BIO-CHEMICAL MEASUREMENT 9

Blood gas analyzers and Non-Invasive monitoring, colorimeter, Sodium Potassium Analyser, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

Total Periods:45

LEARNING RESOURCES:

TEXT BOOKS:

1. Leslie Cromwell, Biomedical Instrumentation and measurement, 2nd edition, Prentice hall of India, New Delhi, 2015.

REFERENCES:

1. John G. Webster, Medical Instrumentation Application and Design, 4th edition, Wiley India Pvt Ltd,New Delhi, 2015.
2. Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment Technology, Pearson Education, 2004.
3. Myer Kutz, Standard Handbook of Biomedical Engineering and Design, McGraw Hill Publisher, 2003.
4. Khandpur R.S, Handbook of Biomedical Instrumentation, 3rd edition, Tata McGraw-Hill New Delhi, 2014.

Course code	21EC556PT	Semester	V			
Category	PROFESSIONAL ELECTIVE COURSE (PEC)		L	T	P	C
Course Title	AUTOMOTIVE ELECTRONICS		3	0	0	3

COURSE OBJECTIVES:

- The intention and purpose of this course is to study the basics of electronics, emission controls and its Importance in automobiles.
- To study the various sensors and actuators used in automobiles for improving fuel economy and emission control.
- To study the various blocks of control units used for control of fuel, ignition and exhaust systems.

PREREQUISITE:

- Electronic Devices

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C5506.1	***Interpret*** the importance of emission standards in automobiles	K2
C5506.2	***Explain*** the electronic fuel injection/ignition components and their function.	K2
C5506.3	***Understand*** the usage of sensors and equipment for measuring mechanical quantities, temperature and appropriate actuators	K2
C5506.4	***Relate d***iagnose electronic engine control systems problems with appropriate diagnostic tools.	K2
C5506.5	***Analyze*** the chassis of vehicle safety system.	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
C5506.1	1	1	1	-	-	-	-	-	-	-	-	-	3	3	2
C5506.2	1	1	1	-	-	-	-	-	-	-	-	-	2	2	1
C5506.3	1	2	1	-	-	-	-	-	-	-	-	-	2	2	1
C5506.4	1	1	2	-	-	-	-	-	-	-	-	-	2	2	1
C5506.5	3	3	2	1	-	-	-	-	-	-	-	-	2	2	1

Note:1:Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS 9

Components for electronic engine management system, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Switches, active resistors, Transistors, Current mirrors/amplifiers, Voltage and current references, Comparator, Multiplier. Amplifier, filters, A/D and D/A converters.

UNIT II IGNITION AND INJECTION SYSTEMS 9

Ignition systems: Ignition fundamentals – Electronic ignition systems – Programmed Ignition – Distribution less ignition – Direct ignition – Spark Plugs. Electronic fuel Control: Basics of combustion – Engine fueling and exhaust emissions – Electronic control of carburetion – Petrol fuel injection – Diesel fuel injection.

UNIT III SENSOR AND ACTUATORS IN AUTOMOTIVES 9

Working principle and characteristics of Airflow rate, Engine crankshaft angular position, Hall effect, Throttle angle, temperature, exhaust gas oxygen sensors – study of fuel injector, exhaust gas recirculation actuators, stepper motor actuator, vacuum operated actuator.

UNIT IV ENGINE CONTROL SYSTEM 9

Control modes for fuel control-engine control subsystems – ignition control methodologies – different ECU's used in the engine management – block diagram of the engine management system. In vehicle networks: CAN standard, format of CAN standard, Buses-CAN, LIN, FlexRay and MOST – diagnostics systems in modern automobiles.

UNIT V CHASSIS AND SAFETY SYSTEMS 9

Traction control system – Cruise control system – electronic control of automatic transmission antilock braking system – electronic suspension system – working of airbag and role of MEMS in airbag systems -centralized door locking system – climate control of cars.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Ribbens, "Understanding Automotive Electronics", 8th Edition, Elsevier, Indian Reprint, 2013.
2. Bosch, "Automotive Electrics and Automotive Electronics. System and Components Networking and Hybrid drive", Fifth edition, Springer view 2014.

REFERENCES:

1. Barry Hollembeak, "Automotive Electricity, Electronics and Computer Controls", Delmar Publishers, 2001.
2. Richard K. Dupuy "Fuel System and Emission controls", Check Chart Publication, 2000.
3. Ronald. K. Jurgon, "Automotive Electronics Handbook", McGraw-Hill, 1999.

Course code	21EC01OT	Semester	V			
Category	OPEN ELECTIVE COURSE (OEC)		L	T	P	C
Course Title	MICROCONTROLLER SYSTEM DESIGN		3	0	0	3

COURSE OBJECTIVES:

- To introduce the architectures of microcontroller.
- To familiarize the students with assembly language programming in 8051 microcontroller.
- To design the interfacing of peripherals interfacing with the 8051 microcontroller.
- To develop skill to explore system design technique.

PREREQUISITE:

- Digital Logic Design

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms Level
On successful completion of this Course, students will be able to		
C001.1	***Comprehend*** and analyze architecture of Microcontroller	K2
C001.2	***Showcase*** the skill, knowledge and ability of programming using instruction set	K3
C001.3	***Comprehend*** and use peripheral serial communication and Interface 8051 microcontroller with the input and output devices such as display and keypad in 8051 microcontrollers.	K2
C001.4	***Design*** hardware and software for specific application using Arduino	K2
C001.5	***Design*** hardware and software for specific application using MSP430.	K2

COURSEOUTCOMESMAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFICOUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO1	PSO2
C001.1	2	1	-	-	2	-	-	-	-	-	-	-	2	1
C001.2	3	3	-	-	2	-	-	-	-	-	-	1	2	1
C001.3	3	2	1	-	1	-	-	-	-	-	-	-	2	1
C001.4	2	-	-	-	1	-	-	-	-	-	-	-	2	1
C001.5	2	2	1	-	1	-	-	-	-	-	-	1	2	1

Note: 1: Slight, 2: Moderate, 3: Substantial

SYLLABUS **No. of Credits: 3**

UNIT I MICROCONTROLLER ARCHITECTURE AND INSTRUCTION SET 9

Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT II PROGRAMMING ON-CHIP PERIPHERALS 9

Parallel Port Structure and bit-manipulation programming, timer/counter-Operating Modes-Programming Timers - Counter Programming-Serial Communication: UART-Operating Modes-RS232 Standards-Serial Port Programming.

UNIT III INTERFACING WITH MICROCONTROLLER 9

Interfacing to: matrix display, (16x2) LCD, OLED Display Interface, high power devices, Stepper Motor, DC Motor speed Control using PWM, interface using I2C protocol and SPI, Actuators and sensors-temperature, Pressure and vibration.

UNIT IV ARDUINO DEVELOPMENT BOARD 9

Architecture of Arduino UNO Board -I/O ports Capability of Arduino Uno-ADC & its features-Programming IDE - Interfacing of Digital Input and output devices - Interfacing of LCD and OLED display, Interfacing sensors-Temperature, IR and LDR. Case study: Smart irrigation system, weather monitoring system

UNIT V MSP430 DEVELOPMENT BOARD 9

MSP-430 Architecture and pin functions, CPU Registers, Instruction Set and addressing modes, MSP 430 starter kit, Aspects of C for embedded system, Programming IDE

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Alaxander G, James M. Conard, " Creating fast, Responsive and energy efficient Embedded systems using the Renesas RL78 microcontroller", Micrium press, USA, Reprinted by S.P Printers, 2011
2. Joseph Yiu, ―The Definitive Guide to ARM Cortex M3‖, Second Edition, Newnes 2010.
3. Douglas V. Hall, "Microprocessor and Interfacing, Programming and Hardware", Tata McGraw Hill, Revised 2 nd Edition 2006, 11th reprint 2015.
4. Massimo Banzi, “Getting Started with Arduino: The Open Source”, Shroff Publishers & Distributors Pvt Ltd, 2014
5. Simon Monk, “Programming Arduino: Getting Started with Sketches”, McGraw-Hill Education, Second Edition,2016

6. “MSP430 Microcontroller Basics” John H. Davis, , Elsevier 2010.
7. “Embedded Systems Design using the TI MSP430 series”, Cris Nagy, Newnes, Elsevier.

REFERENCES:

1. John H. Davies, "MSP 430 Micro controller basics", Elsevier, 2008.Joseph Yiu, ―The Definitive Guide to ARM Cortex M3 and Cortex M4 Processors‖, First Edition, Newnes 2014.
2. Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinley, "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Pearson Education 2008. 12th impression 2018
3. Krishna Kant, “Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096’’, PHI, 2007, 7th Reprint, 2015.
4. Kenneth J. Ayala., “The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning’’, 2012.

Course code	21EC743PT	Semester	V			
Category	OPEN ELECTIVE COURSE (OEC)		L	T	P	C
Course Title	DIGITAL IMAGE PROCESSING		3	0	0	3

COURSE OBJECTIVES:

- To understand the mathematical concept of image and theoretical concept of fundamental digital image processing techniques
- To analyze image enhancement, segmentation, restoration and compression techniques
- To develop algorithm for feature extraction and classification of image
- To understand the practical techniques for digital image analysis

PREREQUISITE:

- Digital signal processing

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C7403.1	***Explain*** the digital image and its mathematical representation to transform a given image	K2
C7403.2	***Interpret*** basic image processing algorithms for image segmentation and image enhancement	K2
C7403.3	***Apply*** different algorithms for image classification and restoration techniques in noisy images	K3
C7403.4	***Apply*** the performance of different image recognition and compression techniques	K3
C7403.5	***Implement*** feature extraction and classification for given image	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C7403.1	3	1	1	-	-	-	-	-	-	-	-	1	3	3
C7403.2	3	2	1	-	-	-	-	-	-	-	-	1	2	2
C7403.3	3	2	1	-	-	-	-	-	-	-	-	1	2	2
C7403.4	3	3	1	-	-	-	-	-	-	-	-	1	2	2
C7403.5	3	2	1	-	-	-	-	-	-	-	-	1	2	2

Note:1:Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I DIGITAL IMAGE FUNDAMENTALS **9**

Digital image representation, Image I/O and display, Classes and image types, M-function programming, Color image representation, Basics of color image processing, conversion of gray to color.

UNIT II IMAGE TRANSFORMS **9**

2DDFT, DCT, Hadamard Transform, Wavelet transform, Fast wavelet transform, Computing and visualization of 2D DFT, Color transformation.

UNIT III IMAGE ENHANCEMENT **9**

Basic intensity transformations – Histogram equalization and specification techniques, Spatial Filtering, Frequency domain filtering, Homomorphic filtering.

UNIT IV IMAGE RESTORATION AND SEGMENTATION **9**

Wiener filtering constrained least squares restoration, Edge detection, Segmentation based on thresholding, region-based segmentation and watershed transform, Morphological Processing. Study of Line and Edge Detection Techniques.

UNIT V IMAGE COMPRESSION **9**

Compression fundamentals, Variable length Coding, Huffman, Arithmetic coding, Bit plane coding, Run Length encoding, Predictive coding, Transform coding, study of lossless compression techniques.

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing', 3rd Edition, Pearson Education, 2011.
2. Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson Education, 2003.
3. Alberto S. Aguado and Mark S. Nixon, Feature extraction and image processing, Academic Press, Third Edition, 2012.
4. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing using MATLAB', 2nd Edition, McGraw Hill Education, 2017.

REFERENCES:

1. Anerozdemi R, Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms, John Wiley & Sons.
2. Gonzalez and Woods, Digital Image Processing, Pearson, Third Edition, 2008.
3. Anil. K. Jain, Fundamentals of Digital Image Processing, PHI, Second Edition, 2004.
4. Milan SonkaetaI, “Image Processing, Analysis and Machine Vision”, 3rd Edition, Vikas Publishing House, 2007.

Course code	21EC03OT	Semester	V			
Category	OPEN ELECTIVE COURSE (OEC)		L	T	P	C
Course Title	INTERNET OF THINGS AND APPLICATIONS		3	0	0	3

COURSE OBJECTIVES:

- To understand smart objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C003.1	***Explain*** the concept of IoT	K2
C003.2	***Analyze*** various protocols for IoT	K4
C003.3	***Design*** PoC of an IoT system using Raspberry Pi/Arduino	K4
C003.4	***Apply*** data analytics and use cloud offerings related to IoT	K3
C003.5	***Analyze*** application of IoT in real time scenario	K4

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO No.	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
C003.1	3	1	1	-	-	-	-	-	-	-	-	1	3	3
C003.2	3	2	1	-	-	-	-	-	-	-	-	1	2	2
C003.3	3	2	1	-	-	-	-	-	-	-	-	1	2	2
C003.4	3	3	1	-	-	-	-	-	-	-	-	1	2	2
C003.5	3	2	1	-	-	-	-	-	-	-	-	1	2	2

Note:1:Slight,2: Moderate,3:Substantial

SYLLABUS **No. of Credits: 3**

UNIT I INTRODUCTION TO IoT **10**

Definitions and Functional Requirements - M2M Architecture - IoT Architecture - Basics of Sensors and Actuators - Analog Sensors - Digital Sensors - Actuators - IoT Architecture for Enterprises - Enterprise IoT – Technology Stack-Middle ware layer –Micro service Vs Monolithic Architecture

UNIT II DESIGN AND DEVELOPMENT **9**

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

UNIT III IoT PROTOCOLS **8**

IoT Protocol Standardization - Efforts - The Connectivity Standards - IEEE 802.15.4 – Zigbee Architecture -IEEE 802.11 - LoRA - 5G for IoT

UNIT IV MOVING INTELLIGENCE TO THE EDGE **9**

The Need for Edge Analytics - Challenges in Centralized IoT - Edge Analytics Architecture - Capabilities needed at Edge Devices - Running Data Analytics at Edge Devices - The Edge Analytics Platforms - Case Studies

UNIT V IoT PLATFORM AND CASE STUDIES **9**

IoT Platform- Cisco IoT system, IBM Watson IoT platform –Case Studies– Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

Total: 45 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Honbo Zhou , "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
2. Arvind Ravulavaru , "Enterprise Internet of Things Handbook: Build end-to-end IoT solutions using popular IoT platforms", Packt Publishing Limited, 2018.
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, and Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things”, Cisco Press, 2017

REFERENCES:

1. Dieter Uckelmann, Mark Harrison and Florian Michahelles , "Architecting the Internet of Things", Springer, 2011.
2. Oliver Hershent, David Boswarthick , "The Internet of Things - Key applications and Protocols", Wiley, 2012.
3. David Boswarthick, Omar Elloumi, Olivier Hersent , "M2M Communications: A Systems Approach", Wiley & Sons Ltd, UK, 2012.
4. Arshdeep Bagha, Vijay Madisetti , "Internet of Things: A Hands-On Approach", 2014.

VEL TECH HIGH TECH

Dr. RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

An Autonomous Institution

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Accredited by NBA, New Delhi & Accredited by NAAC with "A" Grade & CGPA of 3.27

Course code	21EC57P	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	COMMUNICATION SYSTEMS LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- Visualize the effects of sampling and TDM.
- Implement AM and FM modulation schemes.
- Implement PCM and DM modulation schemes.
- Simulate Digital Modulation schemes and Error control coding schemes.

PREREQUISITE:

- Basic Knowledge on digital modulation schemes.

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C507.1	***Design*** AM,FM PCM modulation schemes and find the outputs.	K3
C507.2	***Implement*** and simulate various modulation and demodulation techniques using MATLAB.	K3
C507.3	***Implement*** and simulate error control coding schemes using MATLAB.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C507.1	3	2	2	1	-	-	-	-	-	-	-	-	1	1	-
C507.2	3	2	2	-	-	-	-	-	-	-	-	-	1	1	-
C507.3	3	2	2	-	-	-	-	-	-	-	-	-	1	1	-

Note:1:Slight,2: Moderate,3:Substantial

List of Experiment **No. of Credits: 2**

1. Design and implementation of Signal Sampling and Reconstruction.
2. Design and implementation of Time Division Multiplexing.
3. Design and implementation of AM Modulator and Demodulator.
4. Design and implementation of FM Modulator and Demodulator.
5. Design and implementation of Pulse Code Modulation and Demodulation.
6. Design and implementation of Delta Modulation and Demodulation.
7. Design and implementation of Line Coding schemes.
8. Simulation of ASK, FSK and BPSK generation and detection schemes.
9. Simulation of DPSK, QPSK and QAM generation and detection schemes.
10. Simulation of signal constellation of BPSK, QPSK and QAM.
11. Simulation of Linear Block and Cyclic error control coding schemes.
12. Simulation of Convolutional coding schemes.

Total: 60 Periods

LEARNING RESOURCES:

TEXT BOOKS:

1. Bernard Sklar, "Digital Communications: Fundamentals and Applications", Pearson Education, 2nd Edition, 2009.

REFERENCES:

1. Simon Haykin, "Digital Communications", John Wiley & Sons, Inc 2011.
2. Dennis Silage, "Digital Communication Systems Using MATLAB and Simulink", 2009.
3. Communication Sytems Laboratory Manual.

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Course code	21EC58P	Semester	V			
Category	PROFESSIONAL CORE COURSE (PCC)		L	T	P	C
Course Title	DIGITAL SIGNAL PROCESSING LABORATORY		0	0	4	2

COURSE OBJECTIVES:

- To implement generation of sequence, linear and circular convolution and FFT using MATLAB.
- To design and realize IIR and FIR filters.
- To study the architecture of DSP processor and implement DSP algorithms using digital signal processor.

PREREQUISITE:

- Basic Programming Skill

COURSE OUTCOMES:

CO. No.	Course Outcomes	Blooms level
On successful completion of this Course, students will be able to		
C508.1	***Design*** and simulation of convolution, FFT, FIR filters, IIR filters using MATLAB code.	K3
C508.2	***Simulation*** and performance analysis of waveform generation, convolution, FIR filters, IIR filters using digital signal processor kit.	K3

COURSE OUTCOMES MAPPING WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

CO. No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C508.1	3	3	3	3	3	-	-	-	-	-	1	1	2	1
C508.2	3	3	3	3	3	-	-	-	-	-	1	1	2	1

Note:1:Slight,2: Moderate,3:Substantial

List of Experiments **No. of Credits: 2**

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of elementary Discrete-Time sequences.
2. Linear and Circular Convolutions.
3. Auto correlation and Cross Correlation
4. FFT algorithms - Decimation in Time / Decimation in Frequency.
5. Frequency Analysis using DFT.
6. IIR Filter(LPF/HPF/BPF/BSF)Design using bilinear transformation and impulse invariant technique.
7. FIR Filter (LPF/HPF/BPF/BSF) design using windows.

DSP PROCESSOR BASED IMPLEMENTATION

8. MAC operation using various addressing modes
9. Linear through Circular Convolution in time domain
10. Waveform generation
11. FIR Implementation
12. IIR Implementation

Total: 60 Periods

LEARNING RESOURCES:

REFERENCE BOOKS:

1. Vinay K Ingle and John G Proakis, "Digital signal processing using MATLAB, Brooks / Cole, California, United States, 2010.
2. Stormy Attaway, "MATLAB: A practical introduction to programming and problem solving" Fifth Edition, Butterworth-Heinemann, 2018.
3. Digital Signal Processing Laboratory Manual

ONLINE RESOURCES:

1. https://www.mathworks.com

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LIST OF PROFESSIONAL ELECTIVES

S. No.	Course Code	Engineering Stream Courses
PROFESSIONAL ELECTIVE I		
1	21EC551PT	Medical Electronics
2	21EC552PT	Digital Audio and Video Engineering
3	21HC44T	Operating Systems
4	21ME02OT	Robotics and Industrial Automation
5	21EC555PT	Bio-Medical Instrumentation
6	21EC556PT	Automotive Electronics
PROFESSIONAL ELECTIVE II		
7	21EC651PT	Wireless Networks
8	21EC652PT	Principles of Management
9	21EC653PT	Sensors For Engineering Applications
10	21EC654PT	Video Analytics
11	21EC655PT	Disaster Management
12	21EC656PT	Foundations Skills in Integrated Product Development
PROFESSIONAL ELECTIVE III		
13	21EC741PT	ASIC Design
14	21EC742PT	Data Science and Machine Learning
15	21EC743PT	Digital Image Processing
16	21EC744PT	Millimeter Wave Technology
17	21EC745PT	Wireless Sensor Networks
18	21EC746PT	Cryptography and Network Security
PROFESSIONAL ELECTIVE IV		
19	21EC811PT	Cognitive Radio
20	21EC812PT	Satellite Communication
21	21EC813PT	Advanced Wireless Communication
22	21EC814PT	Mobile App Development for IoT
23	21EC815PT	Total Quality Management
24	21EC816PT	Fuzzy logic And Neural Network
PROFESSIONAL ELECTIVE V		
25	21EC821PT	MEMS and NEMS
26	21EC822PT	Fundamentals of Nano Science
27	21EC823PT	Professional Ethics in Engineering
28	21EC824PT	Electronics Packaging and Testing
29	21EC825PT	Avionics
30	21EC826PT	Augmented Mixed Reality

LIST OF OPEN ELECTIVE COURSE

S. No.	Course Code	Course Title
1	21EC01OT	Microcontroller System Design
2	21EC743PT	Digital Image Processing
3	21EC03OT	Internet of Things and Applications
4	21EC556PT	Automotive Electronics