Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Electronics Engineering
B.Tech. Electronics and VLSI Engineering

Sr. No.	Subject	Code	Scheme L-T-P	Credits (Min.)	Notional hours of Learning (Approx.)
	First Semester (1st year of UG)				
1	Semiconductor Physics and Devices	EC101	3-1-0	4	70
2	Mathematics-I	MA117	3-1-0	4	70
3	Fundamentals of Computer and Programming	CS110	3-0-2	4	85
4	Fundamentals of Electrical Engineering	EE110	3-0-2	4	85
5	English and Professional Communication	HS110	3-1-0	4	70
			Total	**20**	**380**
6	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	ECV01 / ECP01	0-0-10	5	200 (20 x 10)
	Second Semester (1st year of UG)				
1	Mathematics-II	MA116	3-1-0	4	70
2	Electronic Circuits	EC102	3-0-2	4	85
3	Digital Logic Design	EC104	3-0-2	4	85
4	Network Analysis and Synthesis	EE104	3-1-0	4	70
5	Energy and Environmental Engineering	EG110	3-0-2	4	85
6	Indian Value System and Social Consciousness	HS120	2-0-0	2	35
			Total	**22**	**430**
7	Vocational Training / Professional Experience (Optional) (Mandatory for Exit)	ECV02 / ECP02	0-0-10	5	200 (20 x 10)

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B.Tech. I (ECE) Semester – I SEMICONDUCTOR PHYSICS AND DEVICES EC101	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	understand the fundamental concepts and equations of semiconductor physics
CO2	apply the Basics of Semiconductor Physics
CO3	analyse Underline knowledge of semiconductor physics at device level
CO4	evaluate the carrier transport, V-I equations and various capacitances at device level
CO5	design of various industrial semiconductor devices

2.	Syllabus	
	FUNDAMENTALS OF SEMICONDUCTOR PHYSICS	**(12 Hours)**
	General material properties & crystal structures, elements of quantum mechanics, energy band/bond model, E-K diagrams and concept of effective mass, density of state,Classifications of semiconductors, Fermi-Dirac distribution function, equilibrium carrier concentration of holes/electrons in intrinsic/extrinsic semiconductors, drift, diffusion, excess carrier generation/recombination, carrier lifetime, continuity equation.	
	PN JUNCTION DIODE	**(10 Hours)**
	Junction Terminologies, Qualitative and Quantitative Analysis of Diode (Poisson Equation, space charge, built-in potential, depletion width), energy bands under different bias conditions, step vs linearly graded junctions, ideal diode volt-ampere equation, deviation from ideal characteristics, Avalanche and Zener breakdown, diode capacitances. reverse recovery transients.	
	BIPOLAR JUNCTION TRANSISTORS	**(06Hours)**
	Terminology, Simplified Structure, Electrostatics, General Operation Considerations, Performance Parameters, I-V characteristics of CE/CB/CC configuration, Ebers-Moll Model, base width modulation, Transistor as an Amplifier and Switch.	
	MOS FIELD EFFECT TRANSISTORS	**(11 Hours)**
	Classification, MOS Fundamentals, energy bands and charge under different bias conditions, flatband/accumulation/depletion/inversion condition in MOS junction, maximum depletion width, gate voltage relationships, C-V characteristics of MOS junction, threshold voltage of MOSFETs, qualitative and quantitative theory of MOSFETs, gradual channel approximation, channel length modulation, substrate bias effects, MOSFET Capacitances.	
	INDUSTRIAL SEMICONDUCTOR DEVICES	**(06 Hours)**
	Qualitative and Quantitative Theory of Schottky Diode, LED, Photo Diode, Solar Cell, UJT, JFETs.	
	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	**Tutorials**
1	Draw of E-K diagram under different material conditions
2	Density of states in semiconductor
3	Finding of Fermi position using Fermi-Dirac distribution function
4	Calculation of carrier concentration for intrinsic and extrinsic semiconductor under thermal equilibrium and Non- equilibrium
5	Mobility, conductivity evaluation and their temperature dependency
6	Evaluation of drift and diffusion carrier transport
7	V-I calculation of P-N Junction
8	Calculation of Built-in Potential, capacitance and break down voltages
9	V-I evaluation, and current gain relations in CE, CB and CC BJT
10	Evaluation of maximum depletion width and threshold voltage in MOS capacitor
11	Oxide capacitances and Fermi potential in MOS Junction
12	Drain current calculations and threshold voltage calculation of MOSFET
13	Substrate bias effects on threshold voltage and VI characteristics of MOSFET
14	Band gap calculation for LED and Solar cell
15	Barrier height calculation of Schottky Diode

4.	**Books Recommended**
1	R. F. Pierret, “Semiconductor Device Fundamentals”, 2nd Edition, Pearson, 2006.
2	Donald Neamen, “Semiconductor Physics & Devices”, 4th Edition, TMH, 2021.
3	B. G. Streetman and S. K. Banerjee, “Solid State Electronic Devices”, 7th Edition, Pearson, 2014.
4	S. M. Sze, “Physics of Semiconductor Devices”, 4th Edition, Wiley-Blackwell, 2021.
5	Y. Taur and H. Ning, “Fundamentals of Modern VLSI Devices”, 3rd Edition, Cambridge University Press, 2021.

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B.Tech. I (ECE) Semester – I MATHEMATICS-I MA117	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	learn various methods of solving ordinary differential equations of the first order and their importance in engineering problems
CO2	develop mathematical models through ordinary differential equations of the first order
CO3	describe the convergence and divergence of infinite series and analyse the Fourier integral and Fourier transform of a function
CO4	familiarise with special functions to evaluate some proper and improper integrals using beta and gamma functions
CO5	develop the basic concept of linear algebra for electronics engineering problems.

2.	Syllabus	
	ORDINARY DIFFERENTIAL EQUATION OF FIRST ORDER FIRST DEGREE AND FIRST ORDER HIGHER DEGREE	**(07 Hours)**
	Reorientation of differential equation first order first degree, Exact differential equation and Integrating factors, first order higher degree odes, solvable for p, y and x, Clairaut's equation.	
	APPLICATION OF DIFFERENTIAL EQUATION(MATHEMATICAL MODELLING)	**(07 Hours)**
	Modelling of Real-world problems, particularly Engineering Systems, Electrical network models (RL & RC circuit), the spread of epidemic (SI, SIS, SIR), Newton's Law of cooling, Single compartment modelling.	
	INFINITE SERIES	**(07 Hours)**
	Introduction, Positive term series, Comparison test, Cauchy's root test, D'Alembert's test, Raabe's test, Logarithmic test, Integral test, Gauss's test, Series with arbitrary terms, Rearrangement of terms.	
	FOURIER SERIES	**(07 Hours)**
	Definition, Fourier Series with Arbitrary Period, In Particular Periodic Function With Period 2π. Fourier Series of Even and Odd Functions, Half Rang Fourier Series.	
	FOURIER INTEGRAL AND TRANSFORM	**(07 Hours)**
	Fourier Integral Theorem, Fourier Sine and Cosine Integral Complex Form of Integral, Inversion Formula for Fourier Transforms, Fourier Transforms of the derivative of a Function.	
	BETA AND GAMMA FUNCTION	**(05 Hours)**
	Beta and Gamma function with their properties and duplications formula without proof.	
	SYSTEM OF LINEAR ALGEBRAIC EQUATION	**(05 Hours)**
	Linear systems, Elementary row and column transformation, Rank of matrix, consistency of the linear system of equations, Linear Independence and Dependence of vectors, Gauss Elimination method,	

	Gauss-Jordan Method, Gauss-Jacobi Iteration Method.	
	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	**Tutorials**
1	ORDINARY DIFFERENTIAL EQUATION OF FIRST ORDER -I
2	ORDINARY DIFFERENTIAL EQUATION OF FIRST ORDER-II
3	APPLICATION OF DIFFERENTIAL EQUATION
4	INFINITE SERIES-I
5	INFINITE SERIES-II
6	FOURIER SERIES-I
7	FOURIER SERIES-II
8	FOURIER INTEGRAL AND TRANSFORM-I
9	FOURIER INTEGRAL AND TRANSFORM-II
10	FOURIER INTEGRAL AND TRANSFORM-II
11	BETA AND GAMMA FUNCTION-I
12	BETA AND GAMMA FUNCTION-II
13	SYSTEM OF LINEAR ALGEBRAIC EQUATION-I
14	SYSTEM OF LINEAR ALGEBRAIC EQUATION-II
15	SYSTEM OF LINEAR ALGEBRAIC EQUATION-III

4.	**Books Recommended**
1	Kreyszig E., “Advanced Engineering Mathematics”, 10th Edition (Int. Student Ed.), John Wiley & Sons, Singapore, 2015.
2	James Steward De, “Calculus”, 9th Edition, Thomson Asia, Singapore, 2020.
3	O’Neel Peter, “Advanced Engg. Mathematics”, 7th Edition, Cengage, Singapore, 2012.
4	Tomas B. CO, “Methods of Applied Mathematics for Engineers and Scientists”, Cambridge University Press, 2013.
5	Prasad A. R., Erwin Kreyszig E., “Advanced Engineering Mathematics”, Wiley, 2014.

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B.Tech. I (ECE) Semester – I FUNDAMENTALS OF COMPUTER AND PROGRAMMING CS110	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, students will be able to
CO1	acquire knowledge about computer architecture, network and software development.
CO2	install an operating system and configure the network along with programming skills to solve the given problem.
CO3	debug network and operating system related issues and analyse the given problem.
CO4	evaluate programming solutions with different aspects.
CO5	design and develop solution for given problems.

2.	Syllabus	
	INTRODUCTION TO COMPUTER AND ITS ARCHITECTURE	**(02 Hours)**
	Introduction and Characteristics, Computer Architecture, Generations, Classifications, Applications, Central Processing Unit and Memory, Communication between various Units, Processor Speed, Multiprocessor System, Peripheral Buses, Motherboard Demonstration.	
	MEMORY AND VARIOUS INPUT AND OUTPUT DEVICES	**(02 Hours)**
	Introduction to Memory, Input and Output Devices, Memory Hierarchy, Primary Memory and its Types, Secondary Memory, Classification of Secondary Memory, Various Secondary Storage Devices and their Functioning.	
	NUMBER SYSTEMS	**(01 Hours)**
	Introduction and type of Number System, Conversion between Number System, Arithmetic Operations in different Number System, Signed and Unsigned Number System.	
	INTRODUCTION TO SYSTEM SOFTWARES AND PROGRAMMING LANGUAGES	**(04 Hours)**
	Classification of Computer Languages, Introduction of Operating System, Evolution, Type and Function of OS, Unix Commands, Evolution and Classification of programming Language, Feature and Selection of good Programming Language, Development of Program, Algorithm and Flowchart, Program Testing and Debugging, Program Documentation and Paradigms, Characteristics of good Program.	
	WINDOWS OPERATING SYSTEM AND ITS ENVIRONMENT	**(02 Hours)**
	Introduction to GUI based OS, Configuration, Setup, Services, Network Configuration.	
	LINUX OPERATING SYSTEM AND ITS ENVIRONMENT	**(02 Hours)**
	Introduction to Unix based OS, Configuration, Setup, Services, Scripting, Network Configuration.	

	DEBUGGING TOOLS AND COMPILER OPTION	**(04 Hours)**
	Different Debugging tools, Commands, Memory dump, Register and Variable Tracking, Instruction and Function level debugging, Compiler Options, Profile Generation.	
	DATA COMMUNICATION, COMPUTER NETWORK AND INTERNET BASICS	**(02 Hours)**
	Data Communication and Transmission media, Multiplexing and Switching, Computer Network and Network Topology, Communication Protocols and Network Devices, Evolution and Basic Internet Term, Getting Connected to Internet and Internet Application, Email and its working, Searching the Web, Languages of Internet, Internet and Viruses.	
	PROGRAMMING USING 'C' LANGUAGE – INTRODUCTION	**(06 Hours)**
	Characteristics of C Language, Identifiers and Keywords, Data Types Constants and Variables, Declarations and Statements, Representation of Expressions, Classification of Operators and Library Functions for Data Input and Output Statements, Formatted Input and Output Statements.	
	PROGRAMMING USING 'C' LANGUAGE – CONTROL STATEMENT, STRUCTURES, POINTERS	**(12 Hours)**
	Conditional Control Statements, Loop Control Statements, One Dimensional Array of Numbers and Characters, Two-Dimensional Array, Introduction and Development of User Defined Functions, Different Types of Variables and Parameters, Structure and Union, Introduction to Pointers, Pointer Arithmetic, Array of Pointers, Pointers and Functions, Pointers and structures, File Handling Operations.	
	PROGRAMMING USING 'C' LANGUAGE – FUNCTIONS	**(06 Hours)**
	Functions, Passing the arguments, Return values from functions, Recursion, Header Files Design, File handling operations, Read and Write to Secondary Devices, Read and Write to Input and Output Ports.	
	PROGRAMMING USING 'C' LANGUAGE – GRAPHICS, DEBUGGING	**(02 Hours)**
	Include Graphics Library, Debugging, Linking, Compilation Option for Optimization, Make file.	
	Practicals will be based on the coverage of the above topics separately.	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practical**
1	Basic commands of Windows and Linux
2	Flow chart drawing and writing pseudo steps or algorithms steps
3	Programming for logic development using different control statements
4	Programming for familiarity with control statement, array, pointers
5	Programming using structures, pointers,programming using functions

4.	**Books Recommended**
1.	ITL Education Solutions Limited, "Introduction to Computer Science", Pearson Education, 2011.
2.	Gottfried B.S., "Programming with C-Schaum's outline Series", Outline Series, 4nd Edition, Tata McGraw-Hill, 2018.
3.	Brian W. Kernighan, Dennis M. Ritchie, "The C Programming language", 2nd Edition, Pearson Education India, 2015.
4.	E. Balagurusamy, "Programming in ANSI C", 8th Edition, Tata Mc-Graw Hill, 2019.
5.	Pradip Dey, "Programming in C", 2nd Edition, Oxford University Press, 2012.

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B.Tech. I (ECE) Semester – I FUNDAMENTALS OF ELECTRICAL ENGINEERING EE110	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	apply different methods to solve dc circuits
CO2	understand and solve coupled magnetic circuits
CO3	apply vector algebra for single-phase and three-phase AC circuits
CO4	understand the working principle of single-phase transformer and three-phase inductor motor
CO5	understand electrical wiring for domestic circuits

2.	Syllabus	
	ELECTRICALNETWORKANALYSIS	**(12 Hours)**
	Circuit Laws: KVL and KCL, Current division and voltage division rules, Independent and dependent sources, Mesh current analysis, Node voltage analysis, Thevenin's theorem, Norton's theorem, Source transformations, Superposition theorem, Maximum power transfer theorem, Reciprocity theorem, Star network to delta network transformation	
	MAGNETIC CIRCUITANDELECTROMAGNETICINDUCTION	**(08 Hours)**
	Ampere's circuital law, the analogy between electric & magnetic circuits, series-parallel magnetic circuits, Faraday's law, Lenz law, self-inductance, mutual inductance, coefficient of mutual inductance, coefficient of coupling, Equivalent inductance of series, parallel and series-parallel coupled coils, Analysis of coupled coils, dot rule, conductively coupled equivalent circuit.	
	SINGLE-PHASEAC CIRCUITS	**(08 Hours)**
	Complex algebra and its application to the analysis of AC circuits, R-L, R-C, R-L-C series and parallel circuits, series, and parallel resonance.	
	THREE-PHASE ACCIRCUITS	**(06 Hours)**
	Balanced three-phase systems, star and delta connections, the relation between line and phase variables in star and delta connections, three-phase phasor diagrams, and measurement of power in three-phase circuits.	
	SINGLEPHASETRANSFORMERS	**(05 Hours)**
	Construction and working principle of the transformer, transformer on no-load and with load, phasordiagram for transformer under no-load and loaded condition (with unity, lagging power factor load),equivalent circuit, open circuit, and short circuit tests, losses in the transformer, efficiency, and voltageregulation	
	THREE-PHASEINDUCTIONMOTOR	**(03 Hours)**

	Rotating magnetic field, construction and working principle, slip, equivalent circuit, different power stages, losses, and efficiency.	
	ELECTRICWIRING ANDILLUMINATION	**(03 Hours)**
	Circuits in domestic wiring, Types of lamps, fixtures & reflectors, illumination schemes for domestic, industrial & commercial premises, Lumen requirements for different categories, working principle of tube light (fluorescent tube), fan, and LED.	
	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practical**
1	Studythedifferenttypesofwiringinelectrical circuits.
2	Tostudytheworkingprincipleoftubelightand fan.
3	Verifications of network theorems.
4	HysteresislooponCRO.
5	PowermeasurementinsinglephaseR-L/R-Cseriescircuits.
6	Verification of star-delta connections in a three-phasecircuit.
7	Three-phasepowermeasurementusingtwo wattmetermethod.
8	Determination of single-phase transformer equivalent circuit parameters using open-circuit and short-circuittests.
9	Loadteston a single-phasetransformer.

4.	**Books Recommended**
1	V.N. Mittle and Arvind Mittal, “Basic Electrical Engineering”, 2nd Edition, Tata Mcgraw-Hill Education Private Limited, 2015.
2	Robert Boylestad, “Introductory Circuit Analysis”, 13th Edition, Pearson Education India, 2015.
3	Charles K. Alexander and Matthew N.O. Sadiku, “Fundamentals of Electric Circuits”, 5th Edition, McGraw Hill Education 2013.
4	D.P Kothari and I.J. Nagrath, “Basic Electrical Engineering”, 4th Edition, Tata Mcgraw-Hill Education Private Limited, 2019.
5	C. L. Wadhwa, “Basic Electrical Engineering”, 5th Edition, New Age International Private Limited, 2023.

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B.Tech. I (ECE) Semester I ENGLISH AND PROFESSIONAL COMMUNICATION HS110	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	show enhanced reception towards the use of English language.
CO2	choose and employ appropriate words for professional communication.
CO3	develop sentences and text in English coherently and formally.
CO4	demonstrate overall improvement in oral communication.
CO5	analyze and infer from written and oral messages.

2.	Syllabus	
	COMMUNICATION	**(05 Hours)**
	Introduction to Communication, Different forms of Communication, Barriers to Communication and some remedies,Non-Verbal Communication – Types, Non-Verbal Communication in Intercultural Context.	
	VOCABULARY AND USAGE OF WORDS	**(05 Hours)**
	Common Errors, Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words.	
	LANGUAGE THROUGH LITERATURE	**(09 Hours)**
	Selected short stories, essays, and poems to discuss nuances of English language.	
	LISTENING AND READING SKILLS	**(06 Hours)**
	Types of listening, Modes of Listening-Active and Passive, Listening and note taking practice, Practice and activities Reading Comprehension (unseen passage- literary /scientific / technical) Skimming and scanning, fact vs opinion, Comprehension practice	
	SPEAKINGSKILLS	**(10 Hours)**
	Effective Speaking, JAM, Presentation Skills- types, preparation and practice. Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice	
	WRITING SKILLS	**(10 Hours)**
	Prerequisites of effective writing, Memo-types, Letter Writing- types, Email etiquette and Netiquette, Résumé-types, Report Writing and its types, Editing.	
	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	**Tutorials**
1	Letter and Resume
2	Group Discussion
3	Presentation Skills (Individual)
4	Role Play on Nonverbal communication
5	Group Presentation
6	Debate
7	Body language and intercultural communication
8	Listening Activities
9	Editing
10	Report Writing
11	Mock interviews
12	JAM

4.	**Books Recommended**
1	Kumar, Sanjay and Pushp, Lata, “Communication Skills”, 2nd Edition, OUP, New Delhi, 2015.
2	Raman, Meenakshi & Sharma Sangeeta, “Technical Communication Principles and Practice”, 3rd Edition, OUP, New Delhi, 2015.
3	Raymond V. Lesikar and Marie E Flatley, “Basic Business Communication skills for Empowering the Internet generation”, 10th Edition, Tata McGraw Hill publishing company limited. New Delhi, 2005.
4	Courtland L. Bovee, John V. Thill, and Mukesh Chaturvedi, “Business Communication Today”, 15th Edition, Pearson, 2021.
5	Mike Markel, “Practical Strategies for Technical Communication,” 4th Edition, Bedford/ St. Martin's, 2022.
6	Laura J. Gurak and John M. Lannon, “Strategies for Technical Communication in the Workplace,” 4th Edition, Pearson, 2019.

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B.Tech. I (ECE) Semester – II MATHEMATICS-II MA116	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	learn various methods of solving higher-order ordinary differentials and their importance to engineering problems
CO2	develop mathematical modelling through higher-order differential equations
CO3	analyse the importance of the Laplace transform, including its applications to differential equations
CO4	explain the fundamental concepts ofvector calculus and their role in modern mathematics and applied contexts.
CO5	find the eigenvalues and eigenvectors of the matrix and the importance of vector spaces and subspaces.

2.	Syllabus	
	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER	**(09 Hours)**
	Solution of homogenous equations higher order, complementary functions, Particular Integrals, Linear differential equation with variable coefficient, Cauchy's Euler and Legendre's equation with variable coefficient, Method of variation of parameters Regular point, Singular point, series solution of ODE of 2nd order with variable coefficient with special emphasis to the differential equation of Legendre's and Bessel's for different cases of roots of indicial equations.	
	APPLICATION OF HIGHER ORDER ORDINARY DIFFERENTIAL EQUATION (MATHEMATICAL MODELLING)	**(04 Hours)**
	Electrical network models (LCR circuit), Bending of beam models.	
	LAPLACE TRANSFORM	**(06 Hours)**
	Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Inverse Laplace transform, Unit step functions, Dirac –delta functions, Laplace transform of periodic functions, Convolutions theorem, Application to solve simple linear and simultaneous differential equations.	
	VECTOR CALCULUS	**(07 Hours)**
	Partial differentiation, Euler's theorem for homogeneous function, Modified Euler's theorem Scalar and vector point function, differential operator, gradient, directional derivative, divergence, curl and Laplacian operator with their properties, Line integral, Surface Integral, Volume integral, Green's, Gauss and Stokes theorem (Only statement) & application.	
	MATRICES	**(06 Hours)**
	Properties of matrices, Non-singular Matrices, Reduced Row-Echelon form, Systems of linear equations, Solution of system of linear equations, LU Decomposition Method.	
	EIGENVALUES AND EIGENVECTORS	**(07 Hours)**
	Eigenvalues and eigenvectors, Characteristic polynomials, Minimal polynomials, Diagonalizability, Triangularization, Rational canonical form, Jordon canonical form, Positive Define Matrices, Singular Value Decomposition.	

	VECTOR SPACE AND SUBSPACES	**(06 Hours)**
	Fields, Vector spaces over a field, subspaces, Linear independence and dependence, coordinates, Bases and dimension, Gram-Schmidt orthonormalisation, Orthonormal basis, Orthogonal projection.	
	Tutorials will be based on the coverage of the above topics separately	**(15 Hours)**
	(Total Contact Time: 45 Hours + 15 Hours = 60 Hours)	

3.	**Tutorials**
1	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER I
2	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER-II
3	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER-III
4	APPLICATION OF HIGHER-ORDER ORDINARY DIFFERENTIAL EQUATION
5	LAPLACE TRANSFORM-I
6	LAPLACE TRANSFORM-II
7	VECTOR CALCULUS-I
8	VECTOR CALCULUS-II
9	VECTOR CALCULUS-III
10	MATRICES-I
11	MATRICES-II
12	EIGENVALUES AND EIGENVECTORS-I
13	EIGENVALUES AND EIGENVECTORS-II
14	VECTOR SPACE AND SUBSPACES-I
15	VECTOR SPACE AND SUBSPACES-II

4.	**Books Recommended**
1	Malik S.C., and Arora S., “Mathematical Analysis”, 5th Edition, Wiley Eastern Ltd., New Age International Publishers, 2017.
2	Kreyszig E., “Advanced Engineering Mathematics”, 10th Edition, John Wiley, 2018.
3	Zill D. G, Wright W. S., “Advance Engineering Mathematics”, 5th Edition, Jones and Bartlett Publishers, Inc, 2012.
4	Gilbert Strang, “Introduction to Linear Algebra”, 5th Edition, Wellesley-Cambridge Press, 2016.
5	Kenneth Hoffman and Ray Kunze, “Linear Algebra”, 2nd Edition, PHI publication, 2009.

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B.Tech. I (ECE) Semester – II ELECTRONIC CIRCUITS EC102	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	design the diode based voltage limiter and regulator circuits
CO2	analyse the biasing techniques to stabilize the operating conditions of BJT/MOSFET based circuits
CO3	analyse different small signal amplifiers using BJT and MOSFETs
CO4	determine the low/mid frequency response of amplifier circuits
CO5	design the signal generators and evaluate the stability of analog circuits

2.	Syllabus	
	DIODE CIRCUIT	**(12 Hours)**
	Fundamentals of diode, Diode based circuits, clippers, clampers, voltage multipliers, peak detectors, half/full wave rectifiers, diode as gate, Zener diode voltage regulators, Varactor diode, Small Signal analysis of diode circuits.	
	BIASING OF TRANSISTORS	**(12 Hours)**
	Overview of BJT/MOSFETs, Load Line Analysis, DC Operating Points, Need of Biasing, current/voltage mode biasing, Fixed Bias Circuits, Self-Bias Circuits, Voltage Divider Bias Circuits, Stability Factor, Thermal Runaway, Thermal Stability, Transistor as a Diode.	
	LOW FREQUENCY SMALL SIGNAL AMPLIFIERS	**(11 Hours)**
	BJT as an amplifier, small signal models of BJT, CE/CC/CB amplifiers, emitter degeneration, multistage amplifiers, low frequency analysis of amplifiers, distortion in amplifiers, MOSFET as an amplifier, small signal models of MOSFET, CS/CD/CG amplifiers, source degeneration, multistage amplifiers with MOSFETs, analysis in the presence of external capacitors, swing limits, design examples.	
	OSCILLATORS	**(10 Hours)**
	Feedback concept, Stability Criterion, Sinusoidal Oscillators, Barkhausen Criterion, Analysis and design of RC Phase Shift (MOSFET/ BJT) Oscillator, Wien Bridge Oscillators. Resonant Circuit Oscillators, General form of Oscillator Circuit (Hartley and Colpitts), Crystal Oscillators, Multivibrators.	
	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practical**
1	Diode Characteristic
2	Rectifiers and Filters
3	Zener as a voltage Regulator
4	BJT Characteristics
5	FET Characteristics
6	Common Emitter Amplifier
7	Common Source Amplifier
8	RC Phase Shift Oscillator
9	Wien Bridge Oscillator
10	Hartley/Colpitt Oscillator
11	Astable Multivibrator
12	MINI - PROJECT

4.	**Books Recommended**
1	R. L. Boylestad and L. Nashlesky, "Electronics Device & Circuits Theory", PHI, 11th Edition, 2015
2	J. Millman and C. Halkias, "Integrated Electronics", McGraw-Hill, 2nd Edition, 2017
3	D. A. Neamen, “Microelectronic :Circuits, Analysis & Design”, McGraw Hill, 4th Edition, 2021
4	J. Milman and A. Grabel, Microelectronics, McGraw Hill, 2nd Edition, 2017
5	A.S. Sedra and K.C. Smith, Microelectronic Circuits, Oxford Publishing House, 7th Edition, 2017
6	B. Razavi, “Fundamental of Microelectronics”, 3rd Edition, Wiley India, 2021

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B.Tech. I (ECE) Semester – I DIGITAL LOGIC DESIGN EC104	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	understand Boolean algebra, binary logic and logic circuits.
CO2	formulate combinational logic problems and solve using truth table and optimize using K-map and other equivalent technique.
CO3	design and analyse various sequential logic circuits
CO4	explain operation of synchronous sequential circuit, counters, registers and memory
CO5	describe digital hardware using RTL (Register Transfer Language) statements and derive logic circuit
CO6	realize circuits for ALU, Shifter and various Control unit architectures (Hardwired, Microprogram, PLA etc.)

2.	Syllabus	
	BOOLEAN ALGEBRA AND SIMPLIFICATION	**(08 Hours)**
	Basic Logic Operation and Logic Gates, Truth Table, Basic Postulates and Fundamental Theorems of Boolean Algebra, Standard Representations of Logic Functions- SOP and POS Forms, Simplification of Switching Functions-K-Map and Quine-Mccluskey Tabular Methods, Synthesis of Combinational Logic Circuits	
	COMBINATIONAL LOGIC CIRCUITS	**(08 Hours)**
	Binary Parallel Adder, BCD Adder, Encoder Priority Encoder, Decoder, Multiplexer and Demultiplexer Circuits, Implementation of Boolean Functions using Decoder and Multiplexer, Arithmetic and Logic Units, BCD-To-Segment Decoder, Common Anode and Common Cathode, Random Access Memory, Read Only Memory and Erasable Programmable ROMs, Programmable Logic Arrays(PLA) and Programmable Array Logic(PAL)	
	LATCHES AND FLIP-FLOPS	**(06Hours)**
	Cross-Coupled SR Flip-Flop Using NAND or NOR Gates, Clocked Flip-flops, D-Types and Toggle Flip-flops, Truth Tables and Excitation Tables for Flip-flop. Master Slave Configuration, Edge Triggered and Level Triggered Flip-flop, Flip-flop with Preset and Clear	
	SEQUENTIAL LOGIC CIRCUIT	**(08 Hours)**
	Introduction to State Machine, Mealy and Moore Model, State Machine Notation, State Diagram, State Table, Transition Table, Table Excitation, Table and Equation, Basic Concepts of Counters and Register, , Shift Left and Right Register, Registers with Parallel Load, Serial-in-Parallel-Out(SIPO) and Parallel-In-Serial-Out(PISO), Register Using Different Types of Flip-flop, Binary Counters, BCD Counters, Up Down Counter, Johnson Counter, Module-N Counter, Design of Counter using State Diagrams and Tables,	

	Sequence Generators	
	PROCESSOR LOGIC DESIGN	**(08 Hours)**
	Arithmetic, Logic and Shift Micro-Operation, Arithmetic Shifts, Design of Arithmetic Logic Unit (ALU), Control Unit Organization, Hard-Wired Control – One Flip Flop per State Method	
	INTRODUCTION TO VHDL	**(04 Hours)**
	Introduction, Data Type, Operators and Operands, Signal Assignment Statements (Concurrent, Conditional and Selected), Structural Modeling, Process Statement and Behavioral Modeling, HDL code for Registers, Flip-flop, Multiplexer, Adder/Subtracters and Tri-State Buffers	
	Tutorials will be based on the coverage of the above topics separately	**(14 Hours)**
	Practical will be based on the coverage of the above topics separately	**(28 Hours)**
	Total Contact Time: (42 Hours + 14 Hours + 28 Hours) = 84 Hours	

3.	**Practical**
(Following practicals are to be performed using discrete components)	
1	Introduction to variety of logic gates and digital ICs
2	Flip-flops using NAND/ NOR Gate.
3	Half-Adder/ Half-subtarctor Circuits using a serial Input.
4	Full-Adder/ Full-subtarctor Circuits using a serial Input.
5	Parity checker and parity generator circuit
6	4-Bit Gray To Binary/ Binary To Gray Code convertor using Select input.
(Following Practicals are to be performed on CPLD/FPGA kit using VHDL)	
7	(a) 1-Bit Full adder (b) 4-bit Ripple carry adder using structural modeling
8	4x1 MUX implementation using concurrent signal assignment statements
9	D and JK Flip flops with synchronous reset.
10	4-Bit Shift Left/Right Register.
11	4-bit Ripple counter with Asynchronous Reset.

4.	**Books Recommended**
1	Mano Morris, “Digital Logic and Computer Design”, Pearson Education, 1st Edition, 2016.
2	Anand Kumar, “Fundamentals of Digital Circuits”, 4th Edition, PHI, 2016.
3	Jain R. P. and Anand M. H. S., “Digital Electronics Practices using Integrated Circuits”, 1st Edition, TMH, 2004.
4	Ciletti D. M., Mano Morris, “Digital Design”, 6th Edition, Pearson Education, 2018.
5	Floyed Thomas L. and Jain R. P., “Digital Fundamentals”, 8th Edition, Pearson Education, 2006.

Sardar Vallabhbhai National Institute of Technology (SVNIT) Surat
Department of Electronics Engineering
B.Tech. Electronics and VLSI Engineering

B.Tech. I (ECE) Semester – II NETWORK ANALYSIS AND SYNTHESIS EE104	Scheme	L	T	P	Credit
		3	1	0	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	develop a mathematical model (differential equations) of a given electric circuit andsolve it using the technique of domain transformation.
CO2	apply concept of graph theory for solution of ac and dc circuits.
CO3	analyze various parameters of a two-port network and interrelationship between them.
CO4	design filter circuits for given specifications.
CO5	synthesize electrical network for the given transfer function.

2.	Syllabus	
	GRAPH THEORY AND ITS APPLICATIONS	**(06 Hours)**
	Fundamental concepts, definitions of a graph and various related terms, cut sets and tie sets,matrices of oriented graphs, properties and interrelationships of incidence, tie set and cut setmatrices, complete circuit analysis using tie set and cut set techniques	
	LAPLACE TRANSFORMATION	**(06 Hours)**
	Laplace transform properties and theorems, Laplace transform of standard functions, Laplacetransforms for periodic functions, initial and final value theorems, Inverse Laplace transformusing partial fraction expansion, Waveform synthesis.	
	AC AND DC TRANSIENTS	**(06Hours)**
	Initial and final conditions of networks and their S-domain equivalent circuits , R-L, R-C andR-L-C DC transients, two mesh transients, R-L, R-C and R-L-C sinusoidal transient analysisusing Laplace transform methods, two mesh AC transients, complete response of RL, RCand RLC circuits to step, sinusoidal, exponential, ramp, impulse and the combinations ofthese excitations.	
	TWO PORT NETWORK ANALYSIS	**(07 Hours)**
	Two port network concepts, impedance, admittance, hybrid and transmission line parametersfor two-port networks and their interrelationship. Bridged T, Parallel T and Lattice network.	
	NETWORK FUNCTIONS	**(06 Hours)**
	Poles and zeros of a function, physical and analytical concepts, terminals and terminal pairs,driving point immittances, transfer functions, restrictions on locations of poles and zeros in S-plane. time domain behavior from pole-zero locations in the S plane, procedure for findingnetwork functions for general two-terminal pair network	
	TWO TERMINAL PAIR REACTIVE NETWORKS (FILTERS)	**(07 Hours)**
	Ladder network and its decomposition into tee, pie, and L sections, image impedance,image transfer function and applications to LC networks, attenuation and phase shift insymmetrical Tee and Pie	

	networks, constant K-filters, m-derived filters, problems ofterminations	
	NETWORK SYNTHESIS	**(07 Hours)**
	Two-terminal network synthesis. Properties of Hurwitz polynomial and Positive real function.Synthesis of LC, RC and RL Networks, Foster Forms and Cauer Forms.	
	Tutorials will be based on the coverage of the above topics separately	**(14 Hours)**
	(Total Contact Time: 45 Hours + 15Hours = 60 Hours)	

3.	**Tutorials**
1	Based on graph theory
2	Based on Laplace transformation and ac-dc transients
3	Based on Network functions and two-port networks
4	Based on reactive network filters
5	Based on network synthesis

4.	**Books Recommended**
1	Hayt W. H., Kemmerly J. E, Durbin S. M., "Engineering Circuit Analysis", 9th Edition, Tata McGraw Hill, 2020.
2	M.E. Van Valkenburg, "Network Analysis", 3rd Edition, Pearson Education, 2019.
3	Edminister Joseph A., "Electrical circuits", Schaum's outline series, 6th Edition, McGraw Hill, 2013.
4	Charles K. Alaxander, Matthew N.O. Sadiku, "Fundamentals of electric circuits", 6th Edition, Tata McGraw Hill, 2019.
5	Raymond A. Decarlo, Pen-Min Lin, "Linear Circuit Analysis", 2nd Edition, Oxford University Press, 2003.

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B.Tech. Electronics and VLSI Engineering

B.Tech. I (ECE) Semester – II ENERGY AND ENVIRONMENTAL ENGINEERING EG110	Scheme	L	T	P	Credit
		3	0	2	04

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	explain the components of ecosystems, various biogeochemical cycles and importance of different urban network services
CO2	differentiate between various types of environmental pollution along with their impacts and regulatory standards
CO3	examine various global environmental issues and their management
CO4	discuss the fundamental principles of energy, including classification, conservation and related policy frameworks and regulations**.**
CO5	get acquainted with the concept of energy systems and their components

2.	Syllabus	
	ENVIRONMENT AND ECOSYSTEMS	**(10 Hours)**
	Introduction: Concept of an ecosystem - structure and functions of ecosystem;Components ofecosystem - producers, consumers, decomposers; Food chains, food webs, ecological pyramids,energyflowin ecosystem;Bio-geochemicalcycles,hydrologic cycle Componentsofenvironmentandtheirrelationship,impactoftechnologyonenvironment,environmental degradation, environmental planning of urban network services such as watersupply,sewerage, solid waste management; closed loop cycle, concepts of sustainability	
	ENVIRONMENTAL POLLUTION	**(10 Hours)**
	Water, air, soil, noise, thermal and radioactive, marine pollution - sources, effects and engineeringcontrolstrategies; Centralized and decentralized treatment system, Drinkingwaterqualityandstandards,ambient airandnoisestandards	
	GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT	**(10 Hours)**
	Engineering aspects of climate change, concept of carbon credit, CO2 sequestration, concepts of environmental impact assessment and environmental audit, life cycle assessment	
	BASICS OF ENERGY AND ITS CONSERVATION	**(07 Hours)**
	Classification of energy sources, Global and national energy scenario, Fossil and alternate fuels and its characterization. General aspects of energy conservation and management; Energy conservation act, Energy policy of company; Need for energy standards and labelling; Energy building codes.	
	INTRODUCTION TO ENERGY CONSERVATION SYSTEMS	**(08 Hours)**
	Energy conversion systems: Working principle, Basic components, General functioning and normal rating specifications of various energy conversion systems like Power plant, Pump, Refrigerator, Air-conditioner, Internal combustion engine, Solar PV cell, Solar water heating system, Biogas plant. Wind turbine, Fuel cells.	

	Practical will be based on the coverage of the above topics separately	**(30 Hours)**
	(Total Contact Time: 45 Hours + 30 Hours = 75 Hours)	

3.	**Practical**
11	Determination of I-V Characteristics of solar PV Panel.
10	Study of electricity and or gas bill
11	Study of pollutants from diesel Engine
10	Study of pollutants from petrol Engine
11	Comparison of pollutants from SI and CI Engines.
11	Determination of I-V Characteristics of solar PV Panel.
10	Study of electricity and or gas bill
11	Study of pollutants from diesel Engine
10	Study of pollutants from petrol Engine

4.	**Books Recommended**
1	Daniel B Botkin & Edward A Keller, “Environmental Sciences”, John Wiley & Sons, 8th Edition, 2010.
2	R. Rajagopalan, “Environmental Studies”, Oxford University Press, 3rd Edition, 2015.
3	Benny Joseph, “Environmental Studies”, Mc Graw Hill publishers, 3rd Edition, 2017.
4	Suresh Dhameja, “Environmental Studies”, S K Kataria & Sons, 3rd Edition, 2009.
5	U. K. Khare, “Basics of Environmental Studies”, Tata McGraw Hill, 2011.
6	C. S. Rao, Environmental Pollution Control Engineering, New Age International Publishers, 3rd Edition, 2018.

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B.Tech.1 /M.Sc. 1 Semester I/ II INDIAN VALUE SYSTEM AND SOCIAL CONSCIOUSNESS HS120	Scheme	L	T	P	Credit
		2	0	0	02

1.	Course Outcomes (COs): At the end of the course, the students will be able to
CO1	interpret the important values that need to be cultivated
CO2	analyse the cultures depicted in Ramayana, Mahabharata, Jainism and Buddhism
CO3	review the structure of Indian knowledge system
CO4	discuss the significance of constitution of India
CO5	demonstrate social responsibility

2.	Syllabus	
	HUMAN VALUES AND CONSCIOUSNESS	**(08 Hours)**
	Human Values Definition and Classification of Values; The Problem of Hierarchy of Values and their Choice; Self-Exploration; 'Basic Human Aspirations; Right understanding, Relationship and Physical Facility; fulfilment of aspirations; Understanding Happiness and Prosperity, Harmony at various levels. What Is Consciousness? ; Can We Build A Conscious Machine?; Levels Of Consciousness; Mind, Matter And Beyond; Holistic Lifestyle; Dealing With Anxiety; Connecting Mind To Brain; Minds, Brains, And Programs.	
	INDIAN CULTURE AND HERITAGE	**(07 Hours)**
	Culture and its salient features: The Vedic – Upanishadic Culture and society, Human aspirations in those societies; Culture in Ramayana and Mahabharata: The Ideal Man and Woman, Concepts Maitri, Karuna, Seela, Vinaya, Kshama, Santi, Anuraga – as exemplified in the stories and anecdotes of the Epics; The Culture of Jainism: Jaina conception of Soul, Karma and liberation, Buddhism as a Humanistic culture; The four Noble truths of Buddhism; Vedanta and Indian Culture;	
	INDIAN KNOWLEDGE SYSTEM	**(08 Hours)**
	Indian knowledge as a unique system, Place of Indian knowledge in mankind's evolution, Relevance of Indian knowledge to present day and future of mankind, Nature of Indian Knowledge; Structure of Indian Knowledge: Types of knowledge (para, apara), The scientific and the unscientific, Instruments for gaining and verifying knowledge, Knowledge traditions: Lineages, Instruments - debate, epistemology and pedagogy, The inverted tree – axiomatic, deductive, empirical knowledge, and evolution of knowledge; Disciplines of Study: A brief outline of the subjects, the major contributions and theories along with timelines where relevant: Mathematics; Astronomy; Physical Sciences; Cosmogony; Language studies; Astrology; Moral studies/righteousness; Statecraft and political philosophy	
	INDIAN CONSTITUTION	**(04 hours)**
	History of Making of the Indian Constitution; Philosophy of the Indian Constitution: Preamble; Salient Features; Contours of Constitutional Rights & Duties; Organs of Governance: Parliament; Composition; Qualifications and Disqualifications; Powers and Functions	

	SOCIAL RESPONSIBILITY	**(03 Hours)**
	Social Responsibility: Meaning and Importance, Different Approaches of Social Responsibility. Social Responsibility of Business towards different Stakeholders. Evolution and Legislation of CSR in India.	
	(Total Contact Time: 30 Hours)	

3.	**Books Recommended**
1	D. K. Chaturvedi, "Professional Ethics Values and Consciousness", Ane Books Pvt. Ltd., 2023.
2	R.R. Gaur, R Sangal, G. P. Bagaria, "Human Values and Professional Ethics", Excel Books, New Delhi, 2010.
3	A.N. Tripathi, "Human Values", 3rd Edition, New Age Intl. Publishers, New Delhi, 2019.
4	Keay John, "Indi: A History", Harper Press, 2010.
5	Agrawal P. K., "Indian Culture art and Heritage", Prabhat Prakashan, 2020.
6	Sri Prashant Pole, "Treasure Trove of Indian knowledge", Prabhat Prakashan, 2021.
7	Sri Suresh Soni, "Sources of our cultural heritage", Prabhat Prakashan, 2018.
8	D.D. Basu, "Introduction to the Constitution of India", 26th Edition, Lexis Nexis, 2022.