Revised Scheme and Syllabus of B.Tech.

(Electronics and Communication Engineering)

(Implemented from Academic Year 2022-23)

Approved by 55th Senate, Dated: 20/09/2022

Department of Electronics Engineering

S.V. National Institute of Technology

Surat-Gujarat

Department of Electronics Engineering
B. Tech. Electronics and Communication Engineering

SEMESTER – I

Sr. No.	Subject	Code	Credit	Teaching Scheme		
				L	T	P
1.	Mathematics-I	MA 101 S1	04	3	1	0
2.	Semiconductor Physics and Devices	EC 101	03	3	0	0
3.	Fundamentals of Computer & Programming	CS 109 S1	04	3	0	2
4.	Basic Electrical Engineering	EE 101 S1	04	3	0	2
5.	Energy and Environmental Engineering	CEME 106	04	3	0	2
6.	Holistic Empowerment and Human Values*	HU 108	03	3	0	0
	Total		**22**	**18**	**1**	**6**

* Audit Course (attendance would be compulsory as per institute norms)

SEMESTER – II

Sr. No.	Subject	Code	Credit	Teaching Scheme		
				L	T	P
1.	Mathematics-II	MA 114 S2	04	3	1	0
2.	English & Professional Communication	HU 110 S2	03	3	0	0
3.	Electronic Circuits	EC 102	04	3	0	2
4.	Digital Logic Design	EC 104	04	3	0	2
5.	Python Programming	EC 106	04	3	0	2
6.	Network Analysis and Synthesis	EE 102	03	3	0	0
	Total		**22**	**18**	**1**	**6**

MATHEMATICS-I

L	T	P	Credit
3	1	0	04

MA101 S1 **Scheme**

1. Syllabus:

- **DIFFERENTIAL CALCULUS** **(10 Hours)**
  Differentiation of Hyperbolic and Inverse Hyperbolic functions. Successive Differentiation, standard forms, Leibnitz's theorem and applications, Power series, Expansion of functions, Taylor's and Maclaurin's series. Curvature, Radius of curvature for Cartesian curve with application.

- **PARTIAL DIFFERENTIATION** **(10 Hours)**
  Partial differentiation, Euler's theorem for homogeneous function, Modified Euler's theorem, Taylor's and Maclaurin's series for two variables. Tangent plane and Normal line, Error and Approximation, Jacobians with properties, Extreme values of function of two variables, Lagrange's methods of undetermined multipliers.

- **CURVE TRACING** **(05 Hours)**
  Cartesian, polar and parametric form of standard curves.

- **BETA AND GAMMA FUNCTION** **(04 Hours)**
  Beta and Gamma function with their properties and duplications formula without proof.

- **DOUBEL INTEGRALS** **(08 Hours)**
  Reorientation of concepts of integrals and Double integrals, evaluation techniques, change of order of Integration, change of variable, Application of double integrals for evaluation of area and volume.

- **TRIPLE INTEGRALS** **(05 Hours)**
  Triple integrals, evaluation techniques, Application of triple integrals for evaluation of volume.

- **TUTORIALS** **(14 Hours)**

(Total Contact Hours: 56)

2. Books Recommended:

1. James Steward De Calculas, Thomson Asia, Singapore, 2003.
2. O'Neil Peter, "Advanced Engg. Mathematics", Thompson, Singapore, Ind. Ed. 2002.
3. Kreyszing E., "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, Int. Student Ed. 2015.
4. Wiley C. R., "Advanced Engineering Mathematics", McGraw Hill Inc., New York Ed. 1993.
5. F. B. Hilderband, "Methods of Applied mathematics", PHI, New Delhi, 1968

3. Reference Books:

1. Ramana D. V., "Higher Engg. Mathematics", The MaGraw-Hill Inc., New Delhi, 2007.
2. Srimanta Pal, Subodh C. Bhunia, "Engineering Mathematics", Oxford University Press, New Delhi, 2015.
3. Bali and Iyengar. Engg. Mathematics, Laxmi Publications, New Delhi, 2004.

SEMICONDUCTOR PHYSICS AND DEVICES

L	T	P	Credit
3	0	0	03

EC 101 **Scheme**

1. Syllabus:

- **FUNDAMENTALS OF SEMICONDUCTOR PHYSICS (10 Hours)**
  General material properties & crystal structures, Classifications of semiconductors, energy band/bond model, Fermi-Dirac distribution function, density of state, equilibrium carrier concentration of holes/electrons in intrinsic/extrinsic semiconductors, drift, diffusion, generation/recombination, carrier lifetime, continuity equation, elements of quantum mechanics, E-K diagrams.

- **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 (06 Hours)**
  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 (10 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, Power MOSFETs

(Total Contact Hours: 42)

2. Books Recommended:

1. R. F. Pierret, Semiconductor Device Fundamentals, Pearson
2. Donald Neamen, Semiconductor Physics & Devices, TMH
3. B. G. Streetman and S. K. Banarjee, Solid State Electronic Devices, Pearson/PHI
4. S. M. Sze, Physics of Semiconductor Devices, Wiley
5. Y. Taur and H. Ning, Fundamentals of Modern VLSI Devices, Cambridge

3. Reference Books:

1. Nanohub Course on ECE 606: Principles of Semiconductor Devices (ECE 606) by M. A. Alam, Purdue University
2. NPTEL Course on Introduction to Solid State Devices by S. Karmalkar, IIT Madras

FUNDAMENTALS OF COMPUTER & PROGRAMMING

L	T	P	Credit
3	0	02	04

CS 109 S1 **Scheme**

1. 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, DATA STRUCTURES, POINTERS** **(06 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** **(05 Hours)**
  Include Graphics Library, Debugging, Linking, Compilation Option for Optimization, Make file

(Total Contact Hours: 42)

Practicals will be based on the coverage of the above topics. **(28 Hours)**

2. <u>Books Recommended:</u>

1. Introduction to Computer Science", ITL Education Solutions Limited, Pearson Education, Fourth Impression, 2009.
2. "Programming with C Schaum's outline Series", Gottfried B.S., Outline Series, 2/E, Tata McGraw-Hill, 2006.
3. "The C Programming language", Brian W. Kernighan, Dennis M. Ritchie, 2/E, Prentice Hall PTR publication, 1988.
4. "Programming in ANSI C", E. Balagurusamy, 6/E, Tata Mc-Graw Hill, 2012.
5. "Programming in C", Pradip Dey, 2/E, Oxford University Press, 2012.

BASIC ELECTRICAL ENGINEERING

L	T	P	Credit
3	0	02	04

EE 101 S1 **Scheme**

1. Syllabus:

- **MAGNETIC CIRCUIT AND ELECTROMAGNETIC INDUCTION (08 Hours)**
  Amperes circuital law, analogy between electric & magnetic circuits, fringing, leakage, series, parallel, series-parallel circuits, Faradays law, Lenz law, self-inductance, mutual inductance, coefficient of mutual inductance, coefficient of coupling, inductance in series, parallel, series-parallel, Analysis of coupled coils, dot rule, conductively coupled equivalent circuit.

- **SERIES AND PARALLEL AC CIRCUITS (06 Hours)**
  Complex algebra and its application to circuit analysis, R-L, R-C, R-L-C series and parallel circuits, series and parallel resonance.

- **ELECTRICAL NETWORKS ANALYSIS (10 Hours)**
  Kirchhoff's Voltage Law, Kirchhoff's Current Law, independent and dependent sources, Mesh current and Nodal Voltage analysis, Super position theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Maximum power transfer theorem

- **POLYPHASE CIRCUITS (06 Hours)**
  Balanced three phase systems, star and mesh connections, calculations for balanced and unbalanced three phase networks, polyphase vector diagram, and measurement of power in three phase circuits.

- **SINGLE PHASE TRANSFORMERS (04 Hours)**
  Principle of transformer, construction - shell type, core type, transformer on no-load, with load, phasor diagram for transformer under no-load and loaded condition (with unity, lagging power factor load) equivalent circuit, open circuit and short circuit test, losses in the transformer, efficiency, voltage regulation.

- **THREE-PHASE INDUCTION MOTORS (04 Hours)**
  Rotating magnetic field, types of induction motor, Principle of operation, slip, different power stages, and efficiency of the induction motor.

- **ELECTRIC WIRING AND ILLUMINATION (04 Hours)**
  Circuits in domestic wiring, simple control circuit in domestic installation, Types of lamps, fixtures & reflectors, illumination schemes for domestic, industrial & commercial premises, Lumen requirements for different categories, working principle of tube light (fluorescent tube), LED.

(Total Contact Hours: 42)

2. List of Practicals:

1. Power measurement in single phase R-L series circuit.
2. Power measurement in single phase R-C series circuit.
3. To study the working principle of tube light and fan.
4. Hysteresis loop on CRO.
5. Study the different types of wiring in electrical engineering.

6. Determination of single phase transformer equivalent circuit parameters using open-circuit and short circuit test.
7. Load test on single phase transformer.
8. Three phase power measurement using two wattmeter method.
9. Star- delta connection of three phase circuit.

3. Books Recommended:

1. V. N. Mittle and Arvind Mittal, “Basic Electrical Engineering”, 2nd edition, Tata McGraw-Hill Education 2005.
2. Edminister Joseph A., “Electrical circuits”, Schaum’s outline series, McGraw hill, 2nd edition, 1983
3. B. L. Theraja and A. K. Theraja, “A text book of Electrical Technology: Volume I: Basic Electrical Engineering”, S. Chand, 2013.
4. Kothari Nagrath, “Basic Electrical Engineering”, 2nd edition, Tata McGraw-Hill Education 2007.
5. A. chakrabarti, M. L. Soni, P.V. Gupta, U. S. Bhatnagar, “Power System Engineering”, Dhanpatrai & Co., Second edition, 2013.
6. A.Chakrabarti, “ Circuit Theory”, Dhanpat Rai & Co. , Sixth edition, 2012

ENERGY AND ENVIRONMENTAL ENGINEERING

L	T	P	Credit
3	0	02	04

CHME 106 **Scheme**

1. Syllabus:

- **ENVIRONMENT AND ECOSYSTEMS (12 Hours)**
  Introduction: Concept of an ecosystem- structure and functions of ecosystem. Components of ecosystem - producers, consumers, decomposers, Food chains, food webs, ecological pyramids, Energy flow in ecosystem. Bio-geo- chemical cycles, Hydrologic cycle
  Components of Environment and their relationship, Impact of technology on environment, Environmental degradation. Environmental planning of urban network services such as water supply, sewerage, solid waste management.

- **ENVIRONMENTAL POLLUTION (10 Hours)**
  Water, air, soil, noise, thermal and radioactive, marine pollution: sources, effects and engineering control strategies. Drinking water quality and standards, Ambient air and noise quality standards

- **GLOBAL ENVIRONMENTAL ISSUES AND ITS MANAGEMENT (08 Hours)**
  Engineering aspects of climate change. Acid rain, depletion of ozone layer.Concept of carbon credit. Concepts of Environmental impact assessment and Environmental audit. Environmental life cycle assessment

- **ENERGY FUNDAMENTALS (06 Hours)**
  Energy systems. Importance of energy. Quantifying energy, types of energy sources and end uses. Energy conversion processes. Conventional energy sources. Non-conventional energy sources.

- **ENERGY AND THE ENVIRONMENT (06 Hours)**
  Global and Indian energy demand and growth. Environmental impacts of energy production – air and water. Climate change and energy.Energy and environment policy.Transportation and energy. Built environment and energy

(Total Contact Hours: 42)

2. List of Practicals:

1. Study of different ecosystem and different Biochemical cycles.
2. Study of Water Treatment Plant.
3. Study of Water Distribution Network.
4. Study of Effluent Treatment Plant
5. Study of Solid Waste Management system for urban area.
6. Demonstration of air pollution and noise monitoring equipments
7. Exercise on life cycle Assessment
8. Exercise on EIA
9. Exercise on Quantifying energy and energy growth demand
10. Analysis of Carbon Credit
11. Tutorial on Energy in Built environment

3. Books Recommended:

1. Daniel B Botkin& Edward AKeller,Environmental Sciences, John Wiley & Sons.
2. R. Rajagopalan, Environmental Studies, Oxford UniversityPress.
3. Benny Joseph,Environmental Studies, TMHpublishers.
4. Dr. Suresh K Dhameja,Environmental Studies, S K Kataria& Sons, 2007.
5. U K Khare,Basics of Environmental Studies, Tata McGrawHill, 2011.

HOLISTIC EMPOWERMENT AND HUMAN VALUES

L	T	P	Credit
3	0	0	03

HU 108 **Scheme**

1. Syllabus:

- **INTRODUCTION** **(06 Hours)**
  Motivation behind the course, Holistic Empowerment, Mental, Spiritual and Social Health

- **HUMAN VALUES AND ETHICS** **(12 Hours)**
  Positive Attitude and Professional Ethics, Values through Literature, Sustainable Leadership for Professional and Personal Effectiveness, Social Media Pros and Cons.

- **HEALTH AND MEDICATION** **(12 Hours)**
  Awareness about life style diseases, Emotional Intelligence, Substance Abuse, Life Management Skills

- **PHYSICAL FITNESS AND MENTAL HEALTH** **(12 Hours)**
  Importance of games and exercises on Physical Fitness, Importance of Yoga and Meditation on Physical and Mental Health

(Total Contact Hours: 42)

2. Books Recommended:

1. Chakraborty, S. K. and Chakraborty, Debanshu, Human Values and Ethics: Achieving Holistic Excellence, The ICFAI University Press, Hyderabad, (2006).
2. Gaur, R.R., Sangal, R. and Bagaria, G.P.,A Foundation Course in Human Values and Professional Ethics
3. R. Subramanian, Professional Ethics, Oxford University Press, (2013).
4. Kalam, A P J Abdul, Ignited Minds: Unleashing the Power Within India, Penguin; Latest edition (12 November 2014), ISBN-13: 978-0143424123
5. Kalam, A P J Abdul, Wings of Fire: An Autobiography, Universities Press; 1st edition (1999), ISBN-10: 8173711461
6. Priestley, J. B., An Inspector Calls, Three Acts Play
7. http://livingvalues.net/Living Values Education Activities for Young Adults, Book 1: 2019
8. Living Values Education Activities for Young Adults, Book 2: 2019s

MATHEMATICS-II

L	T	P	Credit
3	1	0	04

MA 114 S2 **Scheme**

1. Syllabus:

- **ORDINARY DIFFERENTIAL EQUATION (10 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, 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.

- **APPLICATION OF DIFFERENTIAL EQUATION(Mathematical Modelling) (07 Hours)**
  Modeling of Real world problems particularly Engineering System, Electrical network models (LCR), spread of epidemic (SI, SIS, SIR), Newton's Law of cooling, Single compartment modelling, Bending of beam models.

- **SERIES SOLUTION AND SPECIAL FUNCTIONS (07 Hours)**
  Regular point, Singular point, series solution of ODE of 2nd order with variable coefficient with special emphasis to differential equation of Legendre's and Bessel's for different cases of roots of indicial equations.

- **INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATION (07 Hours)**
  Introduction to Partial differential equation, Formation of partial differential Equation, Partial differential Equation of first order, Linear partial differential equation of first order (Pp + Qq =R) and method of obtaining its general solution, Non-linear partial differential equation of first order f(p, q)=0, f(z, p, q)=0, f(x, p)= g(y, q), z= px + qy + f(p, q).

- **VECTOR CALCULUS (07 Hours)**
  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.

- **SYSTEM OF LINEAR ALGEBRIC EQUATION (04 Hours)**
  Linear systems, Elementary row and column transformation, rank of matrix, consistency of linear system of equations, Linear Independence and Dependence of vectors, Gauss Elimination method, Gauss-Jorden Method, Gauss-Jacobi Iteration Method.

- **TUTORIALS (14 Hours)**

(Total Contact Hours: 56)

2. Books Recommended:

1. Kreyszing E., "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, Int. Student Ed. 2015.
2. James Steward De, "Calculus", Thomson Asia, Singapore, 2003.
3. O'Neel Peter, "Advanced Engg. Mathematics", Thompson, Singapore, Ind. Ed. 2002.
4. F. B. Hilderband, "Methods of Applied mathematics", PHI, New Delhi, 1968

5. Wiley C. R., “Advanced Engineering Mathematics”, McGraw Hill Inc., New York Ed. 1993.

3. Reference Books:

1. Ramana D. V., “Higher Engg. Mathematics”, The MaGraw-Hill Inc., New Delhi, 2007.
2. Hay George E., “Vector and Tensor Analysis”. Dover Publications, 2012.
3. Srimanta Pal, Subodh C. Bhunia, “Engineering Mathematics”, Oxford University Press, New Delhi, 2015.
4. Mary L. Boas,Mathematical Methods in the Physical Sciences, John Wiley & Sons, Ed.2005.
5. J. N. Kapur, Mathematical Models in Biology and Medicine. East west Press, New Delhi 1985.

ENGLISH & PROFESSIONAL COMMUNICATION

L	T	P	Credit
3	0	0	03

HU 110 S2 **Scheme**

1. 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

- **COMMON ERRORS** **(02 Hours)**
  Common Errors, Indianisms through Goodbye Party for Miss Pushpa T.S. (Poem by Nissim Ezekiel)

- **LISTENING SKILLS** **(05 Hours)**
  Effective Listening – Process, Types- Appreciative, comprehensive, empathetic, analytical, Modes of Listening-Active and Passive, Listening and note taking practice, Listening for various purposes-Practice and activities

- **SPEAKINGSKILLS** **(12 Hours)**
  Effective Speaking- Informal Speech, JAM, Presentation Skills- types, preparation and practice Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice

- **READING SKILLS** **(05 Hours)**
  Reading Skills- Comprehension (unseen passage- literary /scientific / technical) Reading with fluency and speed, Skimming and scanning, identifying relevant information, isolating fact from opinion Understanding concepts and arguments, Identifying distinctive features of language

- **WRITING SKILLS** **(13 Hours)**
  Technical Writing- types and practice, Memo, Letter Writing- types and practice, Email etiquette and Netiquette, Résumé writing- types and practice, Report Writing -types and practice, Editing- practice

(Total Contact Hours: 42)

2. 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. Sharma R.C. & Mohan Krishna. Business Correspondence and Report Writing, 3rd Edition, Tata McGraw Hill, New Delhi, 2007.
4. Raymond V. Lesikar and Marie E Flatley. Basic Business Communication skills for Empowering the Internet generation. Tata McGraw Hill publishing company limited. New Delhi 2005.
5. Ezekiel, Nissim. Goodbye Party for Miss Pushpa T.S., http://www.english-forstudents.com/Goodbye-Party.html

3. Reference Books:

1. Bovee, Courtland L., Thill, John V., and Chaturvedi, Mukesh. Business Communication Today. 9th Edition. Pearson, 2009.
2. Farahthullah, T.M. Communication Skills for Technical Students, 5th Edition, Orient Blackswan, Kolkatta, 2009.
3. Leech, Geoffery& Svartvil. A Communicative Grammar of English, Longman Group UK Ltd. 2006.
4. Pfeiffer, William Sanborn and Padmaja, T.V.S., Technical Communication: A Practical Approach. 6th edition. Pearson books, 2007.

ELECTRONIC CIRCUITS

L	T	P	Credit
3	0	2	04

EC 102 **Scheme**

1. Course Outcomes (COs):

At the end of the course the students will be able to:

CO1	Describe single stage / multistage amplifiers and its frequency response characteristics.
CO2	Apply the concept of current sources / sinks in the differential amplifiers.
CO3	Analyze different amplifiers configurations by deploying negative feedback therein.
CO4	Evaluate the criterion for the stability of analog circuits.
CO5	Design Different types of Oscillators

2. Syllabus:

- **DIODE CIRCUIT** **(10 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** **(08 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** **(08 Hours)**
  BJT as an amplifier, small signal models of BJT (T and π), CE/CC/CB amplifiers, emitter degeneration, multistage amplifiers, cascade amplifier, cascode amplifier, Darlington Emitter pair, boot-strapping, low frequency analysis of amplifiers, distortion in amplifiers,Miller Theorem, 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** **(08 Hours)**
  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, Tuned Collector Oscillators, Ring Oscillator.

- **MULTIVIBRATORS &NON LINEAR CIRCUITS** **(08 Hours)**
  Astable Multivibrators, Monostable Multivibrators, Bistable Multivibrators, Schmitt Trigger, Blocking Oscillators, Relaxation Oscillator

(Total Contact Hours: 42)

3. List of Practicals:

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. Schilling Donald L. and Belove E., "Electronics Circuits- Discrete and Integrated", McGraw-Hill, 3rd Ed., 1989, Reprint 2008
2. Boylestad Robert L. and Nashlesky Louis, "Electronics Device & Circuits Theory", PHI, 10th Ed., 2009
3. Millman Jacob, Halkias Christos C. and Parikh C., "Integrated Electronics", McGraw-Hill, 2nd Ed., 2009
4. D. A. Neamen, Semiconductor Physics and Devices (IRWIN), Times Mirror High Education Group, Chicago) 1997
5. J. Milman and A. Grabel, Microelectronics, McGraw Hill, International, 1987. A.S. Sedra and
6. K.C. Smith, Microelectronic Circuits, Saunder’s College Publishing, 1991

DIGITAL LOGIC DESIGN

L	T	P	Credit
3	0	2	04

EC 104 **Scheme**

1. Course Outcomes (COs):

At the end of the course the students will be able to:

CO1	Describe combinational logic problems and solve using truth table. Optimize using K-map and other equivalent techniques.
CO2	Apply various options for implementing sequential synchronous logic.
CO3	Analyze operation of synchronous sequential circuit, counters, registers and memory.
CO4	Evaluate HDL (Hardware Description Language) statements to describe complex digital hardware. Derive or infer logic circuit from HDL Description.
CO5	Design circuits for ALU and Shifter. Design and investigate Hard-wired Control unit architecture to control and sequence hardware operations.

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** **(06 Hours)**
  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

(Total Contact Hours: 42)

3. List of Practicals:

(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”, 4th Ed., Pearson Education, 2006.
2. Anand Kumar, “Fundamentals of Digital Circuits”, 4th Ed., PHI, 2016.
3. Jain R. P. and Anand M. H. S., “Digital Electronics Practices using Integrated Circuits”, 1st Ed., TMH, 2004.
4. Lee Samual, “Digital Circuits and Logic Design”, 1st Ed., PHI, 1998.
5. Floyed Thomas L. and Jain R. P., “Digital Fundamentals”, 8th Ed., Pearson Education, 2006.

5. Reference Books:

1. Brown S. and ZvonkoVranesic, “Fundamental of Logic with Verilog Design”, 1st Ed., Tata McGraw Hill, 2003.

PYTHON PROGRAMMING

L	T	P	Credit
3	0	2	04

EC 106 **Scheme**

1. Course Outcomes (COs):

At the end of the course the students will be able to:

CO1	Describe the basic framework of Python programming language and associated concepts of programming in high level language
CO2	Explain about various Python distributions, open-source IDEs, and open source python packages
CO3	Solve the logical programming problems using python
CO4	Compare files with read-modify-write operations using Python
CO5	Evaluate various mathematical expressions and logic-statement using Python
CO6	Design applications with command line and graphical user interface using Python

2. Syllabus:

- **INTRODUCTION** **(06 Hours)**

  Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

- **DATA TYPES AND STRUCTURES** **(08 Hours)**

  Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

- **CONTROL ROUTINES** **(06 Hours)**

  Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop. Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

- **FILE OPERATIONS** **(06 Hours)**

  File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

- **FUNCTIONS, LIST, DICTIONARIES, MODULES** **(10 Hours)**

  Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

  List and Dictionaries: Lists, Defining Simple Functions, Dictionaries.

  Modules: Modules, Standard Modules, Packages, NumPy (Matrices, vectors, linear algebra), SciPy (Package for numerical computations), Matplotlib (Plotting)

- **GRAPHICAL USER INTERFACE** **(06 Hours)**

  The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources, “PyQt” for creating graphical user interfaces for interactive programs

(Total Contact Hours: 42)

3. List of Practicals:

1. Setting up command line Python Distribution on Linux and Package installation
2. Setting up Anaconda Python Distribution
3. Setting ATOM IDE
4. Setting up PyDev (Python IDE for Eclipse)
5. Getting familiar with Python
6. Reading files
7. Using NumPy for numeric
8. Using more advanced data structures
9. Using Matplotlib
10. Creating a library
11. Creating classes
12. Interactive programs
13. Creating a GUI with PyQt
14. Creating classes with multiple inheritance

4. Books Recommended:

1. Learning Python: Crash Course Tutorial, by Guido Van Rossum
2. Python: For Beginners A Crash Course Guide, by Timothy C Needham
3. Python Cookbook, 3rd Edition: Recipes for Mastering Python 3, by David Beazley and Brian K. Jones, on O’Reilly Atlas
4. Programming Computer Vision with Python” by Jan Erik Solem “The Definitive Guide to Pylons” by James Gardner
5. Python Cook Book Start Here: Python Programming for Beginners

5. Reference Material:

1. https://www.python.org/about/gettingstarted/
2. https://www.geeksforgeeks.org/introduction-to-python/
3. https://www.w3schools.com/python/python_intro.asp

NETWORK ANALYSIS AND SYNTHESIS

L	T	P	Credit
3	0	0	03

EE 102 **Scheme**

1. Course Outcomes (COs):

At the end of the course the students will be able to:

CO1	**Identify** a mathematical model (differential equations) of a given electric circuit and solve it using technique of domain transformation.
CO2	Solve AC and DC Transients Analysis.
CO3	Analyze various parameters of two-port network and inter relationship between them.
CO4	Evaluate filter circuits for given specifications.
CO5	Create the electrical network from 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 inter relationships of incidence, tie set and cut set matrices, complete circuit analysis using tie set and cut set techniques

- **LAPLACE TRANSFORMATION** **(06 Hours)**
  Laplace transform properties and theorems, Laplace transform of standard functions, Laplace transforms for periodic functions, initial and final value theorems, Inverse Laplace transform using partial fraction expansion, Waveform synthesis.

- **AC AND DC TRANSIENTS** **(06 Hours)**
  Initial and final conditions of networks and their S-domain equivalent circuits , R-L, R-C and R-L-C DC transients, two mesh transients, R-L, R-C and R-L-C sinusoidal transient analysis using Laplace transform methods, two mesh AC transients, complete response of RL, RC and RLC circuits to step, sinusoidal, exponential, ramp, impulse and the combinations of these excitations.

- **TWO PORT NETWORK ANALYSIS** **(06 Hours)**
  Two port network concepts, impedance, admittance, hybrid and transmission line parameters for two port networks and their interrelationship. Bridged T, Parallel T and Lattice network.

- **TWO TERMINAL PAIR REACTIVE NETWORKS (FILTERS)** **(06 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 in symmetrical Tee and Pie networks, constant K-filters, m-derived filters, problems of terminations

- **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 finding network functions for general two terminal pair network

- **NETWORK SYNTHESIS** **(06 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.

(Total Contact Hours: 42)

3. Books Recommended:

1. M.E.Van Valkenburg, “Network Analysis”, 3rd Ed., Prentice Hall, India, 2002.
2. Charles K. Alaxander, Matthew N.O. Sadiku, “Fundamentals of electric circuits”, 5th Ed., Tata McGraw Hill, 2013.
3. Edminister Joseph A., “Electrical circuits”, Schaum’s outline series, 2nd Ed., McGraw hill, 1983.
4. Hayt W. H., Kemmerly J. E, Durbin S. M., “Engineering Circuit Analysis”, 6th Ed., Tata McGraw Hill, 2006.
5. Raymond A. Decarlo, Pen-Min Lin, “Linear Circuit Analysis”, 2nd Ed., Oxford University Press, 2003.

4. Reference Books:

1. J. David Irwin, Robert M. Nelms., “Engineering Circuit Analysis”, 10th Ed., Wiley India, 2013.
2. A.Chakrabarti, “Circuit Theory”, 6th Ed., Dhanpat Rai & Co., 2012.
3. Wadhwa C.L., “Network Analysis & Synthesis”, 3rd Ed., New Age International, Revised 2007.