JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
ANANTAPUR

I YEAR B.Tech.(CCC) COURSE STRUCTURE

ELECTRONICS & COMMUNICATION ENGINEERING

SNO.	CODE No.	NAME OF THE SUBJECT	CREDITS
1.	C1 BSO1	Mathematics – I	
2.	C1 BSO2	Mathematics – II	
3.	C1 ECO1	Electronic Circuit Analysis & Design	
4.	C1 ECO2	Probability Theory, Signals & Systems	
5.	C1 CS10	C & Data Structures	
6.	C1 ECO3	Network Theory & Transmission Lines	
7.	C1 ECO4	Electronic Circuits Lab	
8	C1 EC11	Computer Programming Lab	

(C1 BS01) MATHEMATICS – I

(Common to CE, ME, EEE and ECE)

UNIT – I

Sequences – series convergence and divergence – Ratio test, Comparison test, Integral test, Cauchy's root test, Absolute and conditional convergence, Tracing of curves in Cartesian and Polar coordinates.

UNIT – II

Double and triple integrals. Taylor's and Maclaurin's series – Expansion of functions – Taylor's theorem for two variables – Maxima and Minima of functions of two variables with and without constraints.

UNIT – III

Partial differentiation – change of variables – change of order of integration. Rolle's Theorem – Mean value theorem – Lagrange's and Cauchy's form of remainders. Radius, Centre and Circle of curvatures – Evolutes and envelopes.

UNIT – IV

Laplace Transform of standard functions – Inverse transform – linearity – First Shifting theorem. Transformation of derivatives and integrals – Unit step function – second shifting Theorem – periodic function – Solution of ordinary differential equations by Laplace Transform.

UNIT – V

Differential equations of 1^{st} order and 1^{st} degree. Exact, linear and Bernoulli Equations – Applications to Geometry – Law of natural growth – Newton's law of cooling. – Linear non-homogeneous differential equations of second and higher order with constant coefficients. Method of variation of parameters – solutions to simultaneous differential equations.

UNIT –VI

Gradient, divergence, curl and their related properties – Line, surface, volume Integrals – Potential function – work done as line integral – Green's Stoke's, and Gauss's Divergence theorems and simple problems.

UNIT –VII

Matrices: Types of Matrices, Inverse – Elementary row transformations – Rank Solution to homogeneous and non-homogeneous system of linear equations. Eigen values – Eigen vectors. Verification and inverse by – Cayley Hamilton theorem – quadratic forms – Canonical forms – Diagonalisation – properties of Eigen Values of Hermitian, Skew-Hermition and unitary matrices.

UNIT – VIII

Periodic functions – Even and Odd functions – Fourier series – Change of interval – Half range Fourier sine and Cosine expansions.

Special functions: Beta, Gamma functions and their simple applications – Bessel and Legendre functions – Related Identities – Problems.

Recommended Text Books

1. Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill, Second Edition 2004.
2. Engineering Mathematics-I by Iyengar, Krishna Gandhi et.al, S. Chand, 2002.
3. Engineering Mathematics-I by C. Sankaraiah, Vijaya Publication 2002.

(C1 BS02) MATHEMATICS – II

(Common to CE, ME, EEE, ECE and CSE)

UNIT – I

Formation of Partial differential equations by elimination of arbitrary constants and arbitrary functions - solutions of standard first order equations of type I, II, III and IV. Solution of one-dimensional heat equation, one-dimensional wave equation and two-dimensional Laplace's equation by the method of separation of variables.

UNIT –II

Fourier integral theorem- Finite and infinite Fourier Transform – Inverse Transforms – Solution to initial boundary value problems. – Z – Transforms. – Inverse Z – Transforms. – Simple Properties – solution of differences equations.

UNIT –III

Complex functions – Continuity – differentiability – Analyticity – Cauchy – Reiman Equations in Cartesian and polar coordinates. Harmonic and Conjugate harmonic functions.

UNIT –IV

Elementary functions and their properties of Sin Z, Cos Z, e^z, log Z, Cosh Z, Sinh Z. Line integral – Cauchy's Integral Theorem – Cauchy's Integral formula – derivative of analytic functions – Taylor's and Laurent's Series. Zeroes and Poles,

UNIT –V

Residue- Residue theorem – Evaluation of standard real integrals – Argument principle – Rouche's theorem and Fundamental theorem of algebra.
Conformal mapping of function Z^n, Sin Z, Cos Z, e^z, log Z.
Bilinear Transformation.

UNIT –VI

Numerical Methods-I:
Iterative methods, bisection, Regula false position, Newton-Raphson. –successive approximation methods. Solution of linear simultaneous algebraic equations – Gauss – Jordan and Gauss – Seidel's methods.

UNIT –VII

Numerical Methods-II:

Interpolation. Forward differences – backward differences and central differences. Interpolation Methods. Least square approximation of functions – Linear regression – Polynomial regression.

UNIT –VIII

Numerical Methods-III:

Numerical interpolation by Trapezoidal and Simpson's 1/3 and $3/8^{th}$ rules – Numerical solution of differential equations by Euler's method – Runge – Kutta methods – Milne's predictor – Corrector methods.

Recommended Text Books

1. Engineering Mathematics by B.V,. Ramana, TMH, Second Edition – 2004.
2. Engineering Mathematics-I by Iyengar, Krishna Gandhi et.al, S. Chand, 2002.
3. Engineering Mathematics-II by C. Sankaraiah, Vijaya Publication 2002.
4. Numerical Methods by S.S.Sastry, Prentice-Hall.

(C1 EC01) ELECTRONIC CIRCUIT ANALYSIS & DESIGN

UNIT – I TRANSISTOR CHARACTERISTICS

Construction, principle of operation, V-I characteristics, symbol, equivalent circuit, parameter calculations, applications limitations and specifications of -BJT, FET, UJT and MOSFET's (different configurations of transistors are to be considered).

SCR, DIAC, TRIACs. Optoelectronic devices.

UNIT – II AMPLIFIERS

Biasing, DC equivalent model, criteria for fixing operating point and methods of Bias stabilization, Thermal run away and thermal stability. Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters: voltage gain, current gain, input impedance and Output impedance. Comparison of BJT and FET RC coupled amplifier - frequency response. Biasing of FET, MOSFET, FET amplifier – frequency response, FET Small signal model.

UNIT – III FEEDBACK AMPLIFIERS

Concepts of feedback. Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifiers characteristics, Simple problems.

UNIT – IV OSCILLATORS

Condition for oscillations. RC and LC type oscillators, crystal oscillators, Frequency and amplitude stability of oscillators. Generalized analysis of LC, oscillators, Quartz (Hartley, Colpitts), RC-phase shift and Wien-bridge oscillators.

UNIT – V: SINGLE STAGE AMPLIFIERS:

Classification of amplifiers – Design of single stage amplifiers, HF model of transistor, α and β cut off frequencies of transistor, calculation of BW and concept of Gain Bandwidth Product. Specifications of amplifiers.

UNIT – VI: MULTISTAGE AMPLIFIERS:

Cascaded amplifiers, analysis and design (all configurations of BJT and FET to be considered), BW of multistage of amplifiers.

UNIT- VII: POWER AMPLIFIERS:

Classification of power amplifiers, Class A, AB, B and C power amplifiers, pushpull and complimentary pushpull amplifiers – Design of heat sinks, power output, efficiency, cross-over distortion and harmonic distortion.

UNIT – VIII: TUNED AMPLIFIERS:

Single tuned, double tuned and stagger tuned voltage amplifiers, interstage design, stability considerations, Class B and Class C tuned power amplifiers.

TEXT BOOKS:

1. Electronic Devices and Circuits – by K.Lal Kishore, B.S.Publications
2. Electronic Devices and Circuits – by R.L. Boylestad and Louis Nashelsky, Pearson Ed. Asia. PHI.

REFERENCES:

1. Electronic Devices & Circuits – by Millman and Halkias , TMH
2. Microelectronics – by Millman and Grabel, TMH.

(C1 EC02) PROBABILITY THEORY, SIGNALS & SYSTEMS

UNIT - I

Concept of probability, Random Variables, Discrete and continuous. Probability distribution and density functions, Functions of random variables, Joint and conditional probability density functions, Examples of probability density functions - Gaussian and Rayleigh density functions.

UNIT - II

Statistical average - Mean, Variance. Characteristic function, Correlation between random variables, Sum of two random variables, Central limit theorem.

UNIT - III

Random Processes: Stationary random process, Ergodicity, power spectral density and auto correlation function of random processes. Transmission of random processes through networks.

UNIT - IV

Noise Sources, thermal noise, noise power spectral density, noise temperature, available noise power and available noise power spectral density, available noise bandwidth, noise figure, effective input noise temperature, noise figure of cascaded systems, narrow band noise, Quadrature representation of narrow band noise.

UNIT – V

Analogy between vectors and signals, orthogonal vector and signal spaces, approximation of a function by a set of mutually orthogonal functions, evaluation of mean square error, closed or complete set of orthogonal functions, orthogonality in complex functions, trigonometric and exponential fourier series, representation of periodic function by fourier series, complex fourier spectrum, representation of arbitrary function, concept of fourier transform (F.T), F.T. of simple functions, concept of impulse function, F.T. involving impulse functions properties of fourier

transforms, concept of convolution in time domain and frequency domain, graphical representation of convolution, sampling theorem and its proof, effect of under sampling.

UNIT – VI

Linear system, impulse response, response of a linear system, linear time invariant (LTI) system, Linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortionless transmission through a system, signals bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, causality and physical realization, relationship between bandwidth and rise time. Energy density spectrum Parseval's theorem, power density spectrum.

UNIT – VII

Cross correlation and auto correlation of functions, properties of correlation function, relation between auto correlation function and energy/power spectral density function.

UNIT – VIII

Review of Laplace transforms, partial fraction expansion, inverse Laplace transform, concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's relation between L.T. and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

TEXT BOOKS:

1. Probability, Random Variables and Random Signal Principles – by P.Z. Peebles.
2. Signals, Systems & Communications – by B.P. Lathi, BS Publ.

REFERENCE BOOKS:

1. Signals & Systems by Simon Haykin, Wiley Studen Ed

(C1 CS10) C & DATA STRUCTURES

UNIT - I

Algorithm, flowchart, program development steps, basic structures of C language, C tokens, data types, declaration of variables, assigning values, arithmetic, relational and logical operator, increment and decrement operators, control operator, bit-wise operator, expressions, evaluation, input-output operators,

UNIT - II

IF and SWITCH statement, WHILE, DO-WHILE and For statements, C Programs covering all the above aspects.

UNIT - III

One dimensional & two dimensional arrays, initialisation, string variables, declaration, reading, writing, string handle function, user-defined functions, variables & storage classes, example C Programs.

UNIT - IV

Structure definition, initialising, assigning values, passing of structures as arguments, unions, declaring & initialising of pointers, pointer based expressions, arrays, strings.

UNIT - V
functions and structures, C Program examples, file management in C, opening & Closing, I-O operations files.

UNIT – VI
Stacks, representing stacks in C, Infix, Postfix & Prefix Programs, recursion in C, Queue & its sequential representation, circular queue, sequence.

UNIT – VII
Single Linked List, Double linked list, Header. Circular List, applications, binary trees, representation, tree traversals graph representation, graph traversals spanning trees.

UNIT – VIII
Search techniques: linear and binary search methods, sorting methods Exchange sort, selection sort, quick sort tree sort.

TEXT BOOKS:

1. C & Data Structures - by E. Balaguru Swamy TMH 2002.

2. Data Structures using C - by A.S. Tanenbaum, PHI.

REFERENCE BOOK:

1. Fundamentals of Data Structures - by Horowitz & Sahani.

(C1 EC03) NETWORK THEORY & TRANSMISSION LINES

UNIT - I
Circuit Concept - RLC parameters – Voltage and Current sources – Source transformation - Voltage - Current relationship for Passive elements - Kirchhoff's laws – Network Reduction Techniques – Series, Parallel, Series – Parallel, Star-to-delta or delta-to-star transformations.
Magnetic circuits – Faraday's Laws of electromagnetic induction – Concept of self and mutual inductances – dot convention – coefficient of coupling .

UNIT - II
R.M.S. and Average values and Form factor of different periodic wave forms, Steady state analysis of R, L and C (in series - parallel and series parallel combinations) with sinusoidal excitation - Concept of Reactance, Impedance, Susceptance and Admittance - Phase and Phase difference - Concept of Power factor, Real and Reactive Powers - J-notation, Complex and Polar forms of representation, Complex Power – Locus diagrams. Series R-L, R-C, R-L-C and parallel combinations with variation of various parameters - Resonance - Series, Parallel Circuits, Concept of Bandwidth and Q-factor.

UNIT - III
Network topology: Definitions - Graph - Tree, Basic Cutset and Basic Tieset matrices for planar network - Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources. Duality & Dual networks.

UNIT -IV

Network theorems (without proof): Tellegen's, Superposition, Reciprocity, Thevenin's Norton's, Maximum Power Transfer, Millman's and Compensation theorems for dc and ac excitations.

UNIT - V

Transient response of RL, RC, RLC circuits (series and parallel combinations) for dc and Sinusoidal excitations - Initial conditions – Classical method and Laplace transform Methods of solutions – Response of RL, RC, RLC for step, ramp, pulse and impulse excitations using Laplace Transform Methods.

UNIT - VI

Two port network parameters – Z, Y, (ABCD) Transmission and Hybrid Parameters for Resistive Networks – concept of Transformed Network – 2-port network parameters using transformed variables.

Filters - Low pass - High pass and Band pass filters - Constant k and m- derived filters and composite filter design.

UNIT –VII

TRANSMISSION LINES: Primary & secondary constants, Transmission Line equations phase and group velocities, losslessness/low loss characterization, distortion and loading, expression for i/p impedance, SC & OC lines, UHF lines as Circuit Elements, $\lambda/8$, $\lambda/4$, $\lambda/2$ lines-impedance transforms. Smith chart – its configuration and applications, single and double stub matching techniques.

UNIT –VIII

Illustrative problems. (incl. Of Smith Chart Applications and Stub Matching).

TEXT BOOKS:

1. Engineering Circuit Analysis - by William Hayt and Jack E. Kemmerly, McGraw Hill Companies, 5th edition.
2. Transmission Lines and Networks - by Umesh Sinha, Satya Prakashan (Tech. India Publication), New Delhi.

REFERENCE BOOKS:

1. Network Theory – Sudhakar and Shyammohan, TMH Publications.
2. Electromagnetic Field Theory and Transmission Lines – by G.S.N. Raju, Pearson Education,

(C1 EC04) ELECTRONIC CIRCUITS LAB

Part A (6 experiments to be conducted)

1. FET characteristics.
2. UJT Characteristics.
3. Measurement of h parameters of transistor in CB, CE, CC configuration.
4. Single Stage RC coupled Amplifier
5. FET amplifier (Common Source)

6. Wien Bridge Oscillator

   RC Phase shift Oscillator
7. Feed back amplifier (current series)
8. Feed back amplifier (Voltage series)
9. Colpitts Oscillator

   Hartley Oscillator.

Part B (All 6 experiments to be conducted)

1. Two stage RC coupled amplifier.
2. Class A, Class AB Power amplifiers.
3. Class B. Push Pull amplifiers.
4. Class B Complementary Symmetry Configuration.
5. Class C Tuned Voltage amplifier.
6. Class C Power amplifier.

(C1 EC11) COMPUTER PROGRAMMING LAB

1. Write a C' program to obtain the product of two matrices A of size (3x3) and B of size (3x2). The resultant matrix C is to be printed out along with A and B. Assume suitable values for A & B.

2. Using switch-case statement, write a C' program that takes two operands and one operator from the user performs the operation and then print the answer. (Consider operators +, -, /, * and %).

3. Write C procedures to add, subtract, multiply and divide two complex numbers (x+y) and (a+b). Also write the main program that uses these procedures.

4. Given number, write C program using while loop to reverse the digits of the number. Example 1234 to be written as 4321.

5. The Fibonacci sequence of numbers is 1, 1 , 2 , 3 , 5 , 8 , …. based on the recurrence relation f(n) = f(n-1) + f(n-2) for n > 2.

   Write C program using do-while to calculate and print the first m Fibonacci numbers.

6. Write a C program to extract a portion of a character string and print the extracted string. Assume that m characters are extracted starting with the nth character.

7. Write a function that will scan a character string passed as an argument and convert all lower case characters into their upper case equivalents.

8. Implement the following data structures using Arrays
   i) Stacks ii) Linear queues
   iii) Circular queues iv) Dequeue

9. Implement binary search tree using linked list and perform the following operations.
   i) Insertion ii) Deletion iii) Inorder Traversal
   iv) Pre order Traversal v) Post Order Traversal

10. Singly linked list and doubly linked lists
    i) Insertion ii) Deletion iii) Lookup

11. i) Implement Stack using singly linked list
    ii) Implement queue using singly linked list

12. Implement the following sorting techniques
    i) Bubble sort ii) Insertion sort iii) Quick Sort iv) Heap Sort