

SESSION 2024-2028

SEMESTER III

Sl. No.	Course Code	Course Title	Hours Per Week			Total Credits	ESE	IA
			Lecture	Tutorial	Practical			
1.	104301	Electronic Devices and Circuit Theory	3	0	0	3	70	30
2.	104302	Object Oriented Programming	3	0	0	3	70	30
3.	104303	Network Theory	3	1	0	4	70	30
4.	104304	Signal & System	3	0	0	3	70	30
5.	104305	Engineering Mathematics-III (PDE, Prob/stat)	3	1	0	4	70	30
6.	104306	Universal Human Values	3	0	0	3	70	30
7.	104307	Indian Knowledge System	3	0	0	0	-	-
8.	104301P	Electronic Devices and Circuit Theory Lab	0	0	2	1	30	20
9.	104302P	Object Oriented Programming Lab	0	0	2	1	30	20
10.	104308	Internship-I	2 Weeks			2	30	20
TOTAL						24	750	

Semester-III**Course Code-104301****Electronic Devices and Circuit Theory 3 0 0 3****Unit- 1.0: Semiconductor physics, and carrier action:****8 hrs.**

Energy Bands and Charge Carriers in Semiconductors: E-k diagram, Charge carrier concentration; Intrinsic carrier concentration; Law of mass action; Carrier transportation: Drift, diffusion, surface effects; Continuity equation in steady state condition; Fermi level; quasi-Fermi energy level, Hall Effect

Unit- 2.0: Classical diodes:**6 hrs.**

Junction capacitance, Varactor diode; Tunnel diode; IMPATT diode; Gunn diode; Difference between rectifying contact and ohmic contact; Schottky Diode.

Unit- 3.0: Bipolar junction transistor:**8 hrs.**

Bipolar Junction Transistor- bipolar transistor action, minority carrier, distribution, non-ideal effects, equivalent circuits, Ebers-Moll Model, Hybrid-pi model, frequency limitations.

Unit- 4.0: Field effect transistors:**9 hrs.**

Field-Effect Transistors: JFET and its characteristics, pinch off voltage and drain saturation current. MOSFET: The MOS capacitor, n-channel enhancement-mode MOSFET: transistor structure, I-V characteristics, PMOS, MOSFET dc circuit analysis, basic MOSFET applications: switch, digital logic gate and amplifier. Biasing of FETs and MOSFETs. non-ideal effects, MOSFET scaling, threshold voltage modification due to short and narrow channel effects, avalanche breakdown, drain induced barrier effects. Basics of CMOS.

Unit- 5.0: Special semiconductor devices:**7 hrs.**

SCR, Triac and DIAC (Construction, Working, Characteristics and Application), UJT Relaxation Oscillator. Photo Diodes (Pin and Avalanche), Solar Cell, LED, Laser Diodes, LDR

Unit- 6.0: Introduction to VLSI technology:**4 hrs.**

VLSI Technology-An Overview-Wafer Processing, Oxidation, Epitaxial Deposition, Ion-implantation, and Diffusion

Text/ Reference:-

1. Robert L Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson, 2018, 11th Edition.
2. Adel S Sedra, K C Smith and A N Chandorkar, Microelectronic Circuits: Theory and Applications, Oxford University Press, 2017, 7th Edition.
3. Richard C Jaeger and Travis N Blalock, Microelectronic Circuit Design, McGraw Hill, 2016, 5th Edition.
4. Ben G. Streetman, S K Banerjee, Solid State Electronic Devices, Pearson, 2015, 7th Edition.
5. David A Bell, Electronic Devices and Circuits, Oxford University Press, 2008, 5th Edition.
6. Donald A Neeman and Dhrubus Biswas. Semiconductor physics and devices McGraw 4th edition

Course Code-104302

Object Oriented Programming

3 0 0 3

Unit- 1.0: Introduction to C++ :**6 hrs.**

Object Oriented Technology, Advantages of OOP, Input-output in C++, Tokens, Keywords, Identifiers, Data Types C++, Derives data types. The void data type, Type Modifiers, Typecasting, Constant, Operator, Precedence of Operators, Strings.

Unit- 2.0: Control Structure:**6 hrs.**

Control Structures: Decision making statements like if-else, Nested if-else, go to, break, continue, switch case, Loop statement like for loop, nested for loop, while loop, do-while loop

Unit- 3.0: Functions:**10 hrs.**

Parts of Function, User-defined Functions, Value-Returning Functions, void Functions, Value Parameters, Function overloading, Virtual Functions. Classes and Data Abstraction: Structure in C++, Class, Build-in Operations on Classes, Assignment Operator and Classes, Class Scope, Reference parameters and Class Objects (Variables), Member functions, Accessor and Mutator Functions, Constructors, default Constructor, Destructors

Unit- 4.0: Overloading and Templates:**8 hrs.**

Operator Overloading, Function Overloading, Function Templates, Class Templates. Inheritance: Single and Multiple Inheritance, virtual Base class, Abstract Class, Pointer and Inheritance, Overloading Member Function...

Unit- 5.0: Pointers and Arrays:**6 hrs.**

Void Pointers, Pointer to Class, Pointer to Object, This Pointer, Void Pointer, Arrays.

Unit- 6.0: Exception Handling:**6 hrs.**

The keywords try, throw, and catch. Creating own Exception Classes, Exception Handling Techniques (Terminate the Program, Fix the Error and Continue, Log the Error and continue), Stack Unwinding

Textbook/ Reference: -

1. "Thinking in C++", Volume 1 and 2 by Bruce Eckel, Chuck Allison, Pearson Education
- 2 "Mastering C++", 1/e by Venugopal, Tata McGraw Hill.
- 3 "Object Oriented Programming with C++", 3/e by E. Bala Guruswamy, Tata McGraw Hill.
- 4 "Starting Out with Object Oriented Programming in C++", by Tony Gaddis,

Course Code- 104303

Network Theory

3 1 0 4

Unit- 1.0: Node, mesh analysis & theorems:**8 hrs.**

Super Node and Super Mesh analysis, Superposition theorem, Thevenin theorem, Norton theorem, maximum power transfer theorem Reciprocity theorem, Substitution theorem, Tellegen's theorem, Millman's theorem, Duality principle

Unit- 2.0: Sinusoidal steady state analysis:**7 hrs.**

Sinusoidal Steady – State analysis, Characteristics of Sinusoids, The Complex Forcing Function, The Phasor, Phasor relationship for R, L, and C, impedance and Admittance, Phasor Diagrams, AC Circuit Power Analysis, Instantaneous Power, Average Power, apparent Power and Power Factor, Complex Power.

Unit- 3.0: Transients and resonance in RLC circuits:**8 hrs.**

Basic RL and RC Circuits, The Source- Free RL Circuit, The Source-Free RC Circuit, The Unit-Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits, Frequency Response, Parallel Resonance, Series Resonance, Quality Factor

Unit- 4.0: Topology & coupled circuits:**7 hrs.**

Graph of a network, Trees, Co-trees, Loops, Incidence matrix, Tie-set matrix, Cut-set matrix, Mutual Inductance, Coupling Coefficient, Series and Parallel connections of coupled inductors, Ideal transformers.

Unit- 5.0: Two port networks:**6 hrs.**

Z parameter, Y Parameter, ABCD Parameter, Inverse ABCD Parameter, Hybrid Parameter, Inverse Hybrid Parameter, Condition of Reciprocity and Symmetry, Interrelationship of different parameter, Interconnection of two-port network

Unit- 6.0: Network function:**6 hrs.**

Network functions, their properties and concept of transfer impedance, Hurwitz polynomial, Positive real function and synthesis of LC, RC, RL Networks in Foster's I and II, Cauer's I and II forms.

Text/ Reference: -

1. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education
2. M. E. Valkenburg.; "Network analysis"; Third edition, Pearson
3. Circuit Theory, By S Salivahanan, Vikas Publishing House 1st Edition, 2014
4. C. K. Alexander and M. N. O. Sadiku Fundamentals of Electric Circuits, McGraw-Hill Education
5. Networks and Systems, By D. R. Choudhary, New Age International, 1999

Unit- 1.0: Introduction to Signals and Systems**7 hrs**

Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

Unit- 2.0: Behavior of continuous and discrete-time LTI systems**6 hrs**

Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State space representation of systems. State-Space analysis, Multi-input multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

Unit- 3.0: Fourier series and Fourier Transform**8 hrs**

Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

Unit- 4.0: Laplace Transform**6 hrs**

Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior.

Unit- 5.0: Sampling and Reconstruction**8 hrs**

The Sampling theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

Unit- 6.0: Z-Transform**7 hrs**

The Z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, region of convergence, Z-domain analysis; Unilateral Laplace transform, difference equations, system representations: direct, cascade, parallel forms

Text/ Reference:-

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2006.
3. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
4. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.
5. A. V. Oppenheim and R. W. Schaffer, "Discrete-Time Signal Processing", Prentice Hall, 2009.
6. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
7. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

Course Code- 104305 Engineering Mathematics-III (PDE, Prob/stat)**3 1 0 4****Unit 1.0****7 hrs**

Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method.

Unit 2.0**8 hrs**

Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables

Unit 3.0**8 hrs**

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Unit 4.0**5 hrs**

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Unit 5.0 -**7hrs**

Basic Statistics, Measures of Central tendency: Moments, skewness and Kurtosis – Probability distributions: Binomial, Poisson and Normal – evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Unit 6.0-**7 hrs**

Test of significance: Large sample test for single proportion, difference of proportions, Tests for single mean, difference of means, and difference of standard deviations. Test for ratio of variances – Chi-square test for goodness of fit and independence of attributes.

Text/ Reference:-

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
4. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002

Unit- 1.0: Introduction to Value Education**5 hrs**

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education Sharing about Oneself, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Exploring Human Consciousness, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations,

Unit- 2.0: Harmony in the Human Being**4 hrs**

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

Unit- 3.0: Harmony in the Family and Society**5 hrs**

Harmony in the Family – the Basic Unit of Human Interaction, ‘Trust’ – the Foundational Value in Relationship, ‘Respect’ – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

Unit- 4.0: Harmony in the Nature/Existence**6 hrs**

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

Unit- 5.0: Implications of the Holistic Understanding – a Look at Professional**5 hrs**

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession .

Unit- 6.0:**3hrs**

Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

Text /Reference:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P

Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-8703447.

2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

4. The Story of Stuff (Book).

5. The Story of My Experiments with Truth – by Mohandas Karamchand Gandhi.

6. Small is Beautiful – E. F Schumacher.

7. Slow is Beautiful – Cecile Andrews.

8. Economy of Permanence – J C Kumarappa.

9. Bharat Mein Angreji Raj – Pandit Sunderlal.

10. Rediscovering India – by Dharampal.

11. Hind Swaraj or Indian Home Rule – by Mohandas K. Gandhi.

12. India Wins Freedom – Maulana Abdul Kalam Azad.

13. Vivekananda – Romain Rolland (English)

Course Code- 104307

Indian Knowledge System

3 0 0 0

Unit-1.0

7 hrs

Introduction to Indian Knowledge Systems

Overview of IKS, Organization of IKS , Conception and constitution of knowledge in indian tradition, The oral tradition, Models and Strategies of IKS.

Unit-2.0

5 hrs

Overview of IKS Domains

The vedas as the basis of IKS, Overview of all the six vedāṅgas.

Unit-3.0

8 hrs

Relevance in Current Technical Education System I

Relevance of following IKS domains in present technical education system: Arthashastra (Indian economics and political systems), Ganita and Jyāmiti (Indian mathematics, astronomy and geometry, Rasayana (Indian chemical Sciences).

Unit-4.0

8 hrs

Relevance in Current Technical Education System II

Ayurveda (Indian Biological Sciences / Diet & Nutrition), Jyotish Vidya (observational astronomy and calendar systems), Prakriti Vidya (Indian system of terrestrial/ material sciences/ecology and atmospheric sciences).

Unit-5.0

7 hrs

Relevance in Current Technical Education System III

Vastu Vidya (Indian system of aesthetics-iconography and built-environment /architecture), Nyaya Shastra (Indian systems of social ethics, logic and law).

Unit-6.0

7 hrs

Shilpa and Natya Shastra (Indian classical arts: performing and fine arts), Sankhya and Yoga Darshana (Indian psychology, yoga and consciousness studies), Vrikshayurveda (plant science/sustainable agriculture/food preservation methods).

Text/Reference:-

1. Introduction to Indian Knowledge System: Concepts and Applications, Archak, K.B. (2012)., Kaveri Books, New Delhi, ISBN-13:978-9391818203
2. Introduction To Indian Knowledge System: Concepts and Applications, Mahadevan, B.
Bhat, Vinayak Rajat, Nagendra Pavana R.N., PHI, ISBN: 9789391818203.
3. Glimpse into Kautilya's Arthashastra Ramachandrudu P. (2010) , Sanskrit Academy, Hyderabad, ISBN:9788380171074.
4. "Introduction" in Studies in Epics and Purāṇas, (Eds.), KM Munshi and N Chandrashekara Aiyer Bhartiya Vidya Bhavan.

1. Identify the type of semiconductor material and calculate the mobility, conductivity and carrier concentration of majority carrier using Hall Effect
2. Resistivity measurement of a semiconductor using four probe methods.
3. To study the characteristics of an n-channel JFET and determine pinch-off voltage and saturation current
4. To analyze the I-V characteristics and switching behavior of a MOSFET.
5. Measure the I-V characteristics of tunnel diode
6. Plot the I-V characteristics of a solar cell
7. Study of UJT Relaxation Oscillator
8. Study the characteristics of SCR.
9. To study the behavior of a BJT under CE configuration and determine key transistor parameters.
10. To examine the current flow and voltage behavior of a BJT in CB configuration.
11. Demonstrate the I-V characteristics of Zener diode.



1. Write a program to demonstrate use of variables, data types, constants, typecasting, and simple arithmetic operations.
2. Develop a program to check whether a number is prime, palindrome, or Armstrong using conditional and loop statements.
3. Create a menu-driven program using switch to perform basic arithmetic operations, and print patterns using nested for loops.
4. Write a program to demonstrate passing parameters to functions by value and by reference.
5. Develop a program with overloaded functions to calculate area of different shapes (circle, rectangle, triangle).
6. Write a program to define a structure and a class to store student details and display them.
7. Implement a class with constructors (default & parameterized) and destructor to manage object lifecycle.
8. Create a class Account with private data members and use getter/setter methods for data access and modification.
9. Overload binary + and unary - operators for a Complex class.
10. Develop a program that demonstrates single and multiple inheritance using base and derived classes.
11. Write a program to demonstrate runtime polymorphism using virtual functions.
12. Create a function template to sort an array of different data types and a class template for a stack.
13. Implement a program using pointers to objects and demonstrate the use of this pointer.
14. Write a program using try, catch, and throw to handle division by zero and invalid input exceptions.
15. Develop a program to read and write student records using file operations.

Internship I Guidelines:

Internship I is of a minimum duration of two weeks which can be completed in an Industry/Institute in consultation with concerned Engineering College/ Institute. After completion of internship a detailed report of the internship mentioning the training undertaken along with certificate should be submitted.

