GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(An UGC Autonomous Institution - Affiliated to JNTUH)
Ibrahimpatnam, Ranga Reddy (District), Hyderabad - 501 506.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Regulation – R 21

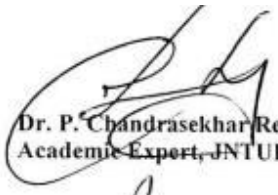
COURSE STRUCTURE

II YEAR I SEMESTER

Sl. No.	Code	Group	Subject	L	T	P	Contact hrs/ wk	C
1	21PC0EC01	PC	Electronic Devices and Circuits	3	0	0	3	3
2	21PC0EC02	PC	Digital System Design	3	0	0	3	3
3	21PC0EC03	PC	Signals and systems	3	1	0	4	4
4	21ES0EC03	ES	Network Theory	3	1	0	4	4
5	21BS0MA03	BS	Mathematics-III	3	1	0	4	4
6	21PC0EC04	PC	Electronic Devices Laboratory	0	0	2	2	1
7	21PC0EC05	PC	Digital System Design Laboratory	0	0	2	2	1
8	21PC0EC06	PC	Basic Simulation Laboratory	0	0	2	2	1
9	21MC0EN01	MC	Constitution of India	3	0	0	3	0
Total Credits								**21**

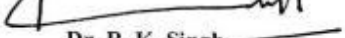
Dr. S. P. Yadav
HOD & BOS Chairman

Dr. K. Anitha Sheela
University Nominee, JNTUH

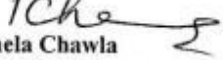


Dr. P. Chandrasekhar Reddy
Academic Expert, JNTUH

Mr. T. S. Rama Krishna
DDG (E), Dooradarshan, Hyd

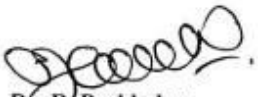


Dr. R. K. Singh
Prof. ECE & AD



Dr.Pamela Chawla
Dean ECE & Member

Dr.K. Chanthiresekaran
Dean Academics & Member



Dr. R. Prabhakar
Prof. ECE & Member

Dr. Binod Kumar Prasad
Assoc.Prof. ECE & Member

Mr. Sandeep Patil
Alumni (M. Tech)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Regulation – R 21

COURSE STRUCTURE

II YEAR II SEMESTER

Sl. No.	Code	Group	Subject	L	T	P	Contact hrs/wk	C
1	21PC0EC07	ES	Analog and Digital Communications	3	0	0	3	3
2	21PC0EC08	PC	Analog Circuits	3	0	0	3	3
3	21PC0EC09	PC	Probability Theory and Stochastic Processes	3	1	0	4	4
4	21ES0EE04	PE	Control systems	3	0	0	3	3
5	21BS0MA04	OE	Mathematics-IV	3	0	0	3	3
6	21SSMB02	PC	Economics for Engineers	3	0	0	3	3
7	21PC0EC10	PC	Analog and Digital Communications Laboratory	0	0	2	2	1
8	21PC0EC11	ES	Analog Circuits Laboratory	0	0	2	2	1
Total Credits								**21**

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Prof. ECE & Member

Dr. Binod Kumar Prasad
Assoc.Prof. ECE & Member

Mr. Sandeep Patil
Alumni (M. Tech)

II Year B.Tech. ECE I-Sem

L	T	P	C
3	0	0	3

(18PC0EC01) ELECTRONIC DEVICES AND CIRCUITS

Prerequisite: Nil

Course Objectives:

Understand the structure of basic electronic devices and IC fabrication.
Familiarize the operation, characteristics and applications of transistor like BJT and FET.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the principles of semiconductor Physics.
2. Understand various types of diodes, characteristics of diodes.
3. Understand the working of transistors like BJT, FETs, and MOSFETs.
4. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
5. Understand the Fabrication process.

Syllabus

UNIT I: Introduction to Semiconductor Physics

Introduction to Semiconductor Physics: Review of Quantum Mechanics, Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity. Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, Qualitative Theory of P-N Junction

UNIT II: Semiconductor Diodes

P-N Junction as a Diode, Diode Equation, Volt- Ampere Characteristics, Temperature dependence of VI characteristic, Ideal versus Practical–Resistance levels(Static and Dynamic), Transition and Diffusion Capacitances, Diode Equivalent Circuits, Load Line Analysis,
Breakdown Mechanisms in Semiconductor Diodes - Avalanche breakdown and Zener breakdown, Zener Diode Characteristics. **Special Purpose Diodes:** Tunnel diode, Varactor diode, Schottky diode, LED and photodiode

UNIT III:Transistor Characteristics

Bipolar Junction Transistor construction and operation , Transistor Current Components, , Ebers-Moll Model, Common Base, Common Emitter and Common Collector Configurations, Limits of Operation , BJT Specifications, Transistor as an Amplifier - Comparison of CB, CE and CC Configurations. Introduction to JFET - MOS construction , I-V characteristics.

UNIT IV: Biasing and Small Signal Model

Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias

stability, Small signal models of BJT and MOS transistor, BJT Hybrid Model - Determination of h-parameters.

UNIT V: Introduction to IC Fabrication Process

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, Etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Text Books:

1. Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit,2 Ed.,1998, TMH.
2. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson,2014.
3. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
4. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.

Reference Books:

1. C.T. Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc,
1991.
2. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford Univ.Press, 2011.
3.Integrated Electronics – J. Millman and Christos C. Halkias, 1991 Ed., 2008, TMH.
4. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9 Ed., 2006, PEI/PHI.

II Year B.Tech. ECE I-Sem

L	T	P	C
3	0	0	3

(18PC0EC02) DIGITAL SYSTEM DESIGN

Prerequisite: Nil

Course Objective:

Student will be able to Learn and apply logic in digital systems for design and analysis.

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Design and analyze combinational logic circuits
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder
3. Design & analyze synchronous sequential logic circuits
4. Use HDL & appropriate EDA tools for digital logic design and simulation

Syllabus

UNIT I: Boolean algebra and Logic Simplification

Review of Boolean Algebra and DeMorgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps, tabulation method - up to 6 variables, Code Conversion, Binary codes, Introduction to Logic Gates.

UNIT II: Combinational and Sequential Logic Design

Combinational Logic design :Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Comparators, Multiplexers, Encoder, Decoder, Implementation of Boolean function using Multiplexers, decoders and universal gates.

Sequential Logic design : Latches and Flip-Flops, S-R, JK, D, T and Master-Slave JK Flip-Flop, Edge triggered Flip-Flop, Ripple and Synchronous counters, Shift registers,

UNIT III: Sequential machine Design

Finite State Machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation.

UNIT IV: Logic Families and Semiconductor Memories

TTL NAND gate and Specifications: Noise margin, Propagation delay, fan-in, fan-out. Tristate TTL, ECL, CMOS families and their interfacing. Memory elements, Concept of Programmable logic devices: PAL, PLA, EPROM, FPGA. Logic implementation using Programmable Devices.

UNIT V: Introduction to HDL

HDL, different modeling styles in VHDL, Data types and objects, Dataflow. Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

Text Books:

1. Switching Theory And Logic Design-A. Anand Kumar PHI,2013
2. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill 2nd edition 2012
3. Digital Design-Third Edition ,M.Morris Mano,pearson Education/PHI

Reference Books:

1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, “VHDL”, Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, “Digital Electronics- An introduction to theory and practice”, PHI, 2nd edition ,2006.
4. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill, 1989

II Year B.Tech. ECE I-Sem

L	T	P	C
3	1	0	4

(18PC0EC03) SIGNALS AND SYSTEMS

Prerequisite: Mathematics

Course Objective:

This gives the basics of signals and systems for all Electrical Engineering related courses.

Course outcomes:

1. At the end of this course students will demonstrate the ability to
2. Analyze different types of signals.
3. Represent continuous and discrete systems in time and frequency domain using different Transforms.
4. Investigate whether the system is stable.
5. Sampling and reconstruction of a signal.
6. Analyze continues-time and discrete-time signals using Laplace and Z-transforms.

Syllabus

UNIT I: Introduction to Signals and Systems

Classification of Signals: Deterministic and Random Signals, Periodic and Non Periodic, Energy and power signals, Causal and Non-causal signals and Even and Odd signals, continuous and discrete time signals, Analog and Digital Signals. Classification of Systems, System properties: linearity: additively and homogeneity, shift-invariance, causality, stability, reliability, orthogonal signal space.

UNIT II: Fourier series and Fourier Transform

Fourier series representation, the Fourier Transform, properties of Fourier Transform, Fourier Transform of standard signals, 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 III: Signal transmission through Linear systems

Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input output, Behavior with a periodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations. Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response,

UNIT IV: Laplace Transform and Z-Transform

The Laplace Transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system
behavior. The z-Transform for discrete time signals and systems- Eigen functions, region of convergence, z-domain analysis.

UNIT V: State-space analysis and Sampling

State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. 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.

Text books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
3. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia)
Private Limited, c1998.
4. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
5. Signals and Systems- A.RamaKrishna Rao-2008, TMH.

Reference books:

1. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
2. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
3. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
4. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
5. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
6. Ashok Ambardar, "Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.
7. Signals and Systems- Iyer and K. Satya Prasad, Cengage Learning.
8. Signals and Systems- A. Anand Kumar-2016, PHI.

II Year B.Tech. ECE I-Sem

L	T	P	C
3	1	0	4

(18ES0EE03) Network Theory

Course Outcomes:

1. At the end of this course students will demonstrate the ability to
2. Understand basics electrical circuits with nodal and mesh analysis.
3. Appreciate electrical network theorems.
4. Apply Laplace Transform for steady state and transient analysis.
5. Determine different network functions.
6. Appreciate the frequency domain techniques

Syllabus

Unit I: Network Analysis:

Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality.

Unit II: Network Theorems:

Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem.

Unit III: Electrical Circuit Analysis Using Laplace Transforms

Analysis of RC, RL, and RLC networks with and without initial conditions for standard inputs. Poles and Zeros. Behaviors of series and parallel resonant circuits.

Unit IV: Transient Behavior

Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem .

Unit V: Two Port Network and Filters

Two port network and interconnections, Introduction to band pass, low pass, high pass and band reject filters.

Text Books:

1. Van, Valkenburg, “Network analysis”; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P. “Circuits and Network”; Tata McGraw-Hill New Delhi, 1994.

Reference Books:

1. A William Hayt, “Engineering Circuit Analysis” 8th Edition, McGraw-Hill Education, 2013.
2. G.K.Mittal, “Network Analysis”, Khanna Publications, 2010.

II Year B.Tech. ECE I-Sem

L	T	P	C
0	0	2	1

(18PC0EC04) ELECTRONICS DEVICES LABORATORY

Hands-on experiments related to the course contents of EC01

Course Objectives

1. To understand operation of semiconductor devices.
2. To identify the components and characteristics of various activedevices.

Course Outcomes:

1. Understand the current voltage characteristics of semiconductor devices.
2. Analyze dc circuits and relate ac models of semiconductor devices with their physical operation.
3. Design and analyze of electronic circuits.
4. Evaluate frequency response to understand behavior of Electronics circuits.

Part A: (Only for viva-voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 3 Laboratory sessions):

Identification, Specification, testing of R,L,C components (color codes), Potentiometers (SPDT, DPDT, and DIP),Coils, Gang Condensers, Relays, Bread Board, PCB's

Identification, Specification, testing of Active devices: Diodes, BJT, Low power JFET's, MOSFET's, Power

Transistors, LED's, LCD's, SCR,UJT.

Study and operation of:

1. Multimeters (Analog and Digital)
2. Function Generator
3. Regulated Power Supplies
4. CRO

Part B: (For Laboratoryoratory Examination – Minimum of 12 experiments)

1. Forward Bias V-I characteristics of PN junctionDiode
2. Reverse Bias V-I characteristics of PN junctionDiode.
3. Zener diode V-I characteristics .
4. Zener diode as voltageregulator.
5. Schottky diode V-I characteristics
6. Input and output Characteristics of a BJT in CE configuration.
7. Input and output Characteristics of a BJT in CB configuration.
8. Input and output Characteristics of a BJT in CC configuration.
9. FET characteristics in CS configuration.
10. FET characteristics in CDconfiguration.
11. FET characteristics in CGconfiguration.
12. N-MOSFET characteristics
13. P-MOSFET characteristics
14. Switching characteristics of photo diode

II Year B.Tech. ECE I-Sem

L	T	P	C
0	0	2	1

(18PC0EC05) DIGITAL SYSTEM DESIGN LABORATORY

1. To study and verify the truth table of logic gates.
2. To realize half and full adder
3. To realize half and full subtractor.
4. To study and verify the truth table of BCD to excess-3 code converter and vice versa.
5. To convert given binary numbers to gray codes and vice versa.
6. To verify the truth table of multiplexer using IC 74153 and de-multiplexer using IC 74139.
7. To verify the truth table of multiplexer and de-multiplexer using NAND gates.
8. To verify the truth table of one bit and two bit comparator using logic gates.
9. To verify the truth table of the following flip flop
    I. JK Master Slave
    II. D-type
    III. T-type

13. To store a set of data in a RAM using IC 2114
14. Design of basic Gates: AND, OR, NOT using Hardware Descriptive Language – (VHDL/Verilog/Equivalent)
15. Design of 2:1 Mix using basic gates using (VHDL/Verilog/Equivalent)
16. Design of Full Adder, Full Subtractor using 3 modeling styles in (VHDL/Verilog/Equivalent)
17.Design of all type of Flip-Flops using Sequential Constructs in (VHDL/Verilog/Equivalent)
18. Design counters (MOD 5, MOD 8) using (VHDL/Verilog/Equivalent)

Note: Minimum of 12 experiments to be conducted.

II Year B.Tech. ECE I-Sem

L	T	P	C
3	1	0	4

(18BS0MA03) MATHEMATICS-III

Course Objectives

1. To learn the Concepts & properties of Random variables and Probability distributions
2. To learn the concepts of correlations and regressions .
3. To understand Concepts & properties of the testing of hypothesis for large & small samples.
4. To provide basic concepts of Complex functions and Properties.
5. To learn the basics of Conformal & Bilinear Transformations.

Course Outcomes

At the end of the course, the student will be able to:

1. Identify the random variables involved in the probability models.
2. Calculate the Correlation and linear regression for a given data set.
3. Applying various statistical tests in testing of hypotheses on the given data.
4. Evaluation of integrals by using Cauchy's integral theorem & formula
5. Understanding the concepts of Conformal & Bilinear transformations.

Syllabus

UNIT-I: Random variables and probability distributions.

Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution. Mathematical Expectation, Moment generating function of probability distribution. Binomial, Poisson & normal distributions and their properties.

UNIT-II: Multiple Random variables, Correlation & Regression

Joint probability distributions- Joint probability mass / density function, Marginal probability mass / density functions, Covariance of two random variables, Correlation -Coefficient of correlation, The rank correlation, Regression- Regression Coefficient, The lines of regression.

UNIT-III: Sampling Distributions and Testing of Hypothesis

Sampling: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and variances, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variances.

Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, and Level of significance. One sided test, Two sided test,

Large sample tests: Test of Equality of means of two samples equality of sample mean and population mean.

UNIT-IV: Functions of Complex Variables

Complex functions and its representation on Argand plane, Concepts of limit Continuity, Differentiability, Analyticity, and Cauchy-Riemann conditions, Harmonic functions – Milne – Thompson method.

Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula

UNIT – V: Conformal mapping.

Power series expansions of complex functions : Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity. Residues– Residue theorem.

Conformal mapping: Transformation of z-plane to w-plane by a function, Conformal transformation. Standard transformations- Translation; Magnification and rotation; inversion and reflection, Transformations like e^z , log z, z^2, and Bilinear transformation. Properties of Bilinear transformation, determination of bilinear transformation when mappings of 3 points are given .

Suggested Text/Reference Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

II Year B.Tech. ECE I-Sem

L	T	P	C
0	0	2	1

(18PC0EC06) BASIC SIMULATION LABORATORY

1. Basic Operations on Matrices
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as UNIT Impulse, UNIT Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution for Signals and sequences.
6. Auto Correlation and Cross Correlation for Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete system
8. Computation of UNIT sample, UNIT step and Sinusoidal responses of the given LTI system and verifying its physical realiazability and stability properties.
9. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
10. Waveform Synthesis using Laplace Transform.
11. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
12. Sampling Theorem Verification.
13. Removal of noise by Autocorrelation / Cross correlation

Note: Minimum of 10 experiments to be conducted in the Laboratory

MATLAB, SkyLab or equivalent software to be used.

II Year B.Tech. ECE I-Sem

L	T	P	C
3	0	0	0

(18MC0EN01) CONSTITUTION OF INDIA

Course Objective:

The course is structured and taught to enable a non social science students to appreciate and understand the evolution of the institutions and dynamics of functioning of the institutions. This constitutes itself as political process and affects and effects the individual and the society in its life as a person and citizen and develops and forms an attitude towards the political system. The main aim is to help individuals develop into responsible, critical, reflective and productive citizens.

Course outcome:

It facilitates the understanding of various Government of Indian acts their provisions and reforms. It helps to know the salient features in making of Indian constitution and appreciate the constitutional principles and institutional arrangements and makes them learn about the fundamental rights and duties and the directive principle of state policy. It inculcates skills to evaluate the evolution, functioning and consequences of political parties in India and to identify how electoral rules and procedure in India effect election outcomes.

Syllabus:

Unit- I Evolution of Indian Constitution

1. Constitutionalism
2. 1909, 1919 and 1935 Acts
3. Constituent Assembly- Composition and Functions

UNIT-II Major features and Provisions

1. Salient features
2. Fundamental Rights and Duties
3 Directive Principles of State Policy

Unit-III Constitutional Institutions

1. Union Government-Executive (President, Prime Minister and Council of Ministers)
   - Legislature (Parliament-Loksabha, Rajyasabha)
   - Judiciary- Supreme Court and High Court
2. State Government-Executive (Governor, Chief Minister and Council of Ministers)
   - Legislature (Legislative Assembly and Legislative Council)

3. Panchayat Raj institutions and Urban local bodies

Unit- IV. Federalism

- Union – State relations(Legislative, Administrative and Financial)
- Politics of federal governance and Frictions in Federal polity

Unit-V- Political Process

1. Political Parties-National and Regional
2. Pressure groups
3. Civil Society and Popular movements
4. Election Commission of India

Reading List:

1. D. D. Basu (2015) Introduction to the Constitution of India, New Delhi: LexisNexis.
2. Peu Gosh(2018) Indian Government and Politics, Delhi, PHI Pvt Ltd
3. Granville Austin (1999), The Indian Constitution – Corner Stone of a Nation, NewDelhi: Oxford.
4. P.M.Bakshi (2018),The Constitution of Indi-LexisNexis ,Delhi