

B.Tech
I Year II Semester

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
AK20-REGULATIONS**

B. Tech I Year II Semester

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9906	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS	3	0	0	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: Apply the mathematical concepts of ordinary differential equations of higher order.

CO2: Solve the differential equations related to various engineering fields.

CO3: Identify solution methods for partial differential equations that model physical processes.

CO4: Interpret the physical meaning of different operators such as gradient, curl and divergence

CO5: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT I:

LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral (e^{ax} , $\sin ax$ (or) $\cos ax$, X^k , $e^{ax}v$, $x v(x)$), method of variation of parameters, simultaneous linear equations with constant coefficients.

UNIT II:

EQUATIONS REDUCIBLE TO LINEAR DIFFERENTIAL EQUATIONS AND APPLICATIONS

Cauchy's and Legendre's linear equations, Applications to simple pendulum, oscillations of a spring, L-C-R Circuit problems and Mass spring system.

UNIT III:

PARTIAL DIFFERENTIAL EQUATIONS – FIRST ORDER

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

UNIT IV:

VECTOR DIFFERENTIATION

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities

UNIT V:

VECTOR INTEGRATION

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Text Books :

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.

References:

1. Dr.T.K.V.Iyengar, Engineering Mathematics-I,S.Chand publishers
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi publication,2008
4. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO2:Analyse complex engineering problems	2.1	2.1.3
CO3	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO4	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO5	PO2:Analyse complex engineering problems	2.1	2.1.3

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9904	CHEMISTRY	3	0	0	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: Understand the behaviour of, and interactions between matter and energy at both the atomic and molecular levels.

CO2: Compare the materials of construction for battery and electrochemical sensors.

CO3: Understand the preparation, properties, and applications of thermoplastics & thermo settings, elastomers & conducting polymers.

CO4: HPLC and GC methods used for separation of gaseous and liquid mixtures

CO5: Understand the disadvantages of using hard water and select suitable treatments domestically and industrially.

UNIT 1:

STRUCTURE AND BONDING MODELS

Planck's quantum theory, Schrodinger wave equation, significance of Ψ^1 and Ψ^2 , applications to hydrogen, particle in a box and their applications for conjugated molecules, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting of orbital's in tetrahedral and octahedral complexes, magnetic properties, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 , N_2 and CO, calculation of bond order.

UNIT 2:

ELECTROCHEMISTRY AND APPLICATIONS

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, alkali metal sulphide batteries, Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button cells,

UNIT 3:

POLYMER CHEMISTRY

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea- formaldehyde, Nylon-66, carbon fibres, Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

UNIT 4:

INSTRUMENTAL METHODS AND APPLICATIONS

Principle and applications of Colorimetry, AAS, AES, UV-Visible spectrophotometry (Beer-Lambert's law, Instrumentation), Principles and applications of Chromatographic techniques (GC & HPLC), separation of gaseous mixtures and liquid mixtures (GC & HPLC methods).

UNIT 5: WATER TECHNOLOGY

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

Text books:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference books:

1. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011.
4. Willard Merritt Dean Settle, 7 th Edition Instrumental methods for analysis

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 2	PO 1: Apply the knowledge of basic science	1.4	1.4.1
CO: 3	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 4	PO 4: Analyse complex engineering problems	2.4	2.4.4
CO: 5	PO 1: Apply the knowledge of Basic science	1.2	1.2.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0201	NETWORK THEORY	3	0	0	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: Solve network problems using mesh and nodal analysis techniques.

CO2: Analyze networks using Thevenin, Norton, Maximum power transfer, Superposition, Miller and Millman theorems.

CO3: Compute responses of first order and second order networks using time & frequency domain analysis.

CO4: Design resonant circuits for given bandwidth

CO5: Utilize z, y, ABCD and h parameters for analyzing two port circuit behavior.

UNIT I:

INTRODUCTION TO ELECTRICAL CIRCUITS

Passive components and their V-I relations, Energy sources - Ideal, Non-ideal, Independent and dependent sources, Source transformation Kirchoff's laws, Star-to-Delta or Delta-to-Star Transformations, Mesh analysis and Nodal analysis problem solving, Super node and Super mesh for DC Excitations

UNIT II:

NETWORK THEOREMS

Superposition theorem, Thevenin & Norton theorems, Maximum power transfer theorem, Reciprocity theorem, Millman theorem, Miller Theorem, Tellegan's Theorem, Compensation theorem - problem solving using dependent sources also, Duality and dual networks.

UNIT III:

TRANSIENTS

First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC (sinusoidal) excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.

UNIT IV:

RESONANCE AND COUPLED CIRCUITS

Self inductance, Mutual inductance, dot rule, coefficient of coupling, Analysis of multi-winding coupled circuits, series & parallel connection of coupled inductors.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case resistance present in both branches, anti resonance at all frequencies.

UNIT V:

TWO PORT NETWORKS & NETWORK FUNCTIONS

Two Port Networks, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters, hybrid and inverse hybrid parameters, relationship between parameters, interconnection of two port networks.

Concept of complex frequency, driving point and transfer functions for one port and two port network, poles & zeros of network functions, Restriction on Pole and Zero locations of network function

Text Books:

1. W. H. Hayt and J. E. Kemmerly, —Engineering Circuit Analysis, McGraw Hill Education, 2013.
2. M. E. Van Valkenburg, —Network Analysis, Prentice Hall, 2006.

References:

1. D. Roy Choudhury, —Networks and Systems, New Age International Publications, 1998.
2. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
3. Bhise, Chadda, Kulshreshtha, —Engineering network analysis and filter design, Umesh Publication, 2000.
4. Joseph Edminister and Mahmood Nahvi, —Electric Circuits, Schaum's Outline Series, Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO-1 –engineering knowledge	1.3	1.3.1
CO2	PO-2-problem analysis	2.2	2.2.2 & 2.2.3
CO3	PO-4-conduct investigations of complex problems	4.1	4.1.1
CO4	PO-4- conduct investigations of complex problems	4.3	4.3.1
CO5	PO-1- engineering knowledge	1.4	1.4.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0502	DATA STRUCTURES	3	0	0	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: To teach the representation of solution to the problem using algorithm.

CO2: To explain the approach to algorithm analysis.

CO3: To introduce different data structures for solving the problems.

CO4: To demonstrate modeling of the given problem as a graph

CO5: To elucidate the existing hashing techniques.

UNIT 1:

INTRODUCTION

Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

UNIT 2:

STACK, QUEUE AND LINKED LISTS

Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

UNIT 3:

TREES

Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: B- Trees, B + Trees.

UNIT 4 :

GRAPHS AND HASHING

The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

UNIT 5:

FILES AND ADVANCED SORTING

File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization. Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, —Fundamentals of Data Structures in C++, 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, —File Organization and Processing, Wiley and Sons, 1988.

Reference Books:

1. D. Samanta, —Classic Data Structures, 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, —Advanced Data Structures, Cambridge University Press, 2016
3. Richard F. Gilberg, Behrouz A. Forouzan, —Data Structures A Pseudo code Approach with C, Second Edition, Cengage Learning 2005.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO1	PO1: Engineering Knowledge	1.4	1.4.1
CO2	PO4: Conduct investigations of complex problems	4.1	4.1.4
CO3	PO1: Engineering Knowledge	1.3	1.3.1
CO4	PO2: Problem analysis	2.1	2.1.2
CO5	PO2: Problem analysis	2.3	2.3.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0301	ENGINEERING GRAPHICS	1	0	4	3

Course Outcomes: At the end of the course, the learners will be able to

CO1: Draw various curves applied in engineering.

CO2: Show projections of solids and sections graphically.

CO3: Draw the development of surfaces of solids.

CO4: Use computers as a drafting tool

CO5: Draw isometric and orthographic.

UNIT I:

INTRODUCTION TO ENGINEERING GRAPHICS: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.

- a) Conic sections including the rectangular hyperbola- general method only,
- b) Cycloid, epicycloids and hypocycloid
- c) Involute

UNIT II:

PROJECTION OF POINTS, LINES: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line.

UNIT III:

PROJECTIONS OF PLANES: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

Projections of Solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

UNIT IV:

SECTIONS OF SOLIDS: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

UNIT V:

ORTHOGRAPHIC PROJECTIONS: Systems of projections, conventions and application to orthographic projections.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

Text Books and Reference Books:

1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers
3. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill
4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill

Additional Sources

YouTube: [http://sewor,Carleton.ca,kardos/88403/drawings.html](http://sewor.Carleton.ca/kardos/88403/drawings.html) conic sections-online, red woods.edu

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 5: Problem analysis	5.1	5.1.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0203	NETWORK THEORY LABORATORY	0	0	3	1.5

Course Outcomes: At the end of the course, the learners will be able to

CO1: Verify Kirchoff's laws and network theorems.

CO2: Measure time constants of RL & RC circuits.

CO3: Analyze behavior of RLC circuit for different cases.

CO4: Design resonant circuit for given specifications

CO5: Characterize and model the network in terms of all network parameters.

List of Experiments:

Any 10 of the following experiments are to be conducted in Hardware & Simulation

(Multisim/Open source software):

1. Verification of Kirchoff's Laws
2. Apply Mesh & Nodal Analysis techniques for solving electrical circuits (problems with dependent sources also)
3. Verification of Superposition & Reciprocity Theorem
4. Verification of Thevenin's and Norton's Theorem
5. Verification of Maximum Power Transfer Theorem
6. Verification of Millman and Miller Theorem
7. Measure and calculate RC time constant for a given RC circuit
8. Measure and calculate RL time constant for a given RL circuit
9. Measure and analyze (settling time, overshoot, undershoot, etc.) step response of for a given series RLC circuit for following cases:
 - a) $\zeta = 1$ (critically damped system)
 - b) $\zeta > 1$ (over damped system)
 - c) $\zeta < 1$ (under damped system)
10. Choose appropriate values of R, L, and C to obtain each of above cases one at a time.
11. Design a series RLC resonance circuit. Plot frequency response and find resonance frequency , Bandwidth , Q – factor.
12. Design a parallel RLC resonance circuit. Plot frequency response and find resonance frequency , Bandwidth , Q – factor.
13. Measure and calculate Z, Y parameters of two-port network.
14. Measure and calculate ABCD & h parameters of two-port network.

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CO1	PO-1 –engineering knowledge	1.3	1.3.1
CO2	PO-2-problem analysis	2.2	2.2.2 & 2.2.3
CO3	PO-4-conduct investigations of complex problems	4.1	4.1.1
CO4	PO-4- conduct investigations of complex problems	4.3	4.3.1
CO5	PO-1- engineering knowledge	1.4	1.4.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20ABS9909	CHEMISTRY LABORATORY	0	0	3	1.5

Course Outcomes: At the end of the course, the learners will be able to

CO1: To familiarize the students with the basic concepts of chemistry of materials.

CO2: Prepare advanced polymer materials.

CO3: Measure the strength of an acid present in secondary batteries.

CO4: To familiarize with digital and instrumental methods of analysis

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
3. Determination of pH metric titration of strong acid vs. strong base,
4. Conductometric titration of strong acid vs. strong base
5. Determination of Fe(II) in Mohr's salt by potentiometric method.
6. Determination of percentage of Iron in Cement sample by colorimetry
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of phenol-formaldehyde resin
9. Preparation of TiO₂/ZnO nano particles
10. Estimation of Calcium in port land Cement
11. Adsorption of acetic acid by charcoal
12. Thin layer chromatography

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO:1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO:2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:4	PO 4: Analysis and interpretation of data	4.3	4.3.2

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AES0504	DATA STRUCTURES LABORATORY	0	0	3	1.5

Course Outcomes: At the end of the course, the learners will be able to

CO1: To introduce to the different data structures.

CO2: To elucidate how the data structure selection influences the algorithm complexity.

CO3: To explain the different operations that can be performed on different data structures.

CO4: To introduce to the different search and sorting algorithms

Laboratory Experiments

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.
8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using ‘Ladies first’ principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a Laboratoryel. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table datatype and support different operations on it.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering Knowledge	1.4	1.4.1
CO2	PO 2: Problem analysis	2.2	2.2.4
CO3	PO1: Engineering Knowledge	1.3	1.3.1
CO4	PO1: Engineering Knowledge	1.4	1.4.1
CO5	PO1: Engineering Knowledge	1.4	1.4.1

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
20AMC9902	CONSTITUTION OF INDIA	2	0	0	0

Course Outcomes: At the end of the course, the learners will be able to

CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3: Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO4: Discuss the Powers and functions of Governor, President, Judiciary

CO5: Discuss the functions of local administration bodies.

UNIT:1

History of Making of the Indian Constitution - History Drafting Committee, (Composition & Working)

UNIT:2

Philosophy of the Indian Constitution - Preamble Salient Features

UNIT:3

Contours of Constitutional Rights & Duties - Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

UNIT:4

Organs of Governance - Parliament – Composition - Qualifications and Disqualifications - Powers and Functions - Executive, President, Governor - Council of Ministers -Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions.

UNIT:5

Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZillaPachayat - Elected officials and their roles, CEO Zilla Panchayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

Suggested books for reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO 1	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 2	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 3	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 4	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2.	6.2.1
CO 5	PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice	6.2	6.1.1