

**COURSE STRUCTURE (R20)****O - SEMESTER**

Induction Program

3 Weeks

**I - SEMESTER**

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
1	20CS01	Programming for Problem Solving using C	3	0	0	3	30	70	100
2	20EE02	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
3	20FE01	Professional Communication-I	2	0	0	2	30	70	100
4	20FE03	Differential Equations	2	1	0	3	30	70	100
5	20FE07	Applied Physics	2	1	0	3	30	70	100
<b>Laboratory Courses</b>									
6	20CS51	Programming for Problem Solving using C Lab	0	0	3	1.5	15	35	50
7	20FE51	Professional Communication Skills Lab	0	0	2	1	15	35	50
8	20FE54	Applied Physics Lab	0	0	3	1.5	15	35	50
9	20IT51	IT Workshop	0	0	3	1.5	15	35	50
<b>Total</b>			<b>12</b>	<b>2</b>	<b>11</b>	<b>19.5</b>	<b>210</b>	<b>490</b>	<b>700</b>

**II - SEMESTER**

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
<b>Theory Courses</b>									
1	20CS03	Data Structures	3	0	0	3	30	70	100
2	20CS05	Python Programming	3	0	0	3	30	70	100
3	20FE02	Professional Communication-II	2	0	0	2	30	70	100
4	20FE04	Linear Algebra and Transformation Techniques	2	1	0	3	30	70	100
5	20FE06	Engineering Chemistry	3	0	0	3	30	70	100
6	20MC01	Constitution of India	2	0	0	0	30	70	100
<b>Laboratory Courses</b>									
7	20CS53	Data Structures Lab	0	0	3	1.5	15	35	50
8	20CS54	Python Programming Lab	0	0	3	1.5	15	35	50
9	20CS55	Shell Scripting	0	0	2	1	15	35	50
10	20FE53	Engineering Chemistry Lab	0	0	3	1.5	15	35	50
<b>Total</b>			<b>15</b>	<b>1</b>	<b>11</b>	<b>19.5</b>	<b>240</b>	<b>560</b>	<b>800</b>

B.Tech. (I Sem.)

**20CS01 - PROGRAMMING FOR PROBLEM SOLVING USING C**

L	T	P	Cr.
3	0	0	3

Pre-requisite : Nil

**Course Educational Objective:** The Objective of the course is to make learn the basic elements of C programming, control structures, derived data types, Modular programming, user defined structures, basics of files and its I/O operations.

**Course Outcomes:** At the end of this course, the student will be able to

- CO1:** Familiar with syntax and semantics of the basic programming language constructs. **(Understand - L2)**
- CO2:** Construct derived data types like arrays in solving problem. **(Apply - L3)**
- CO3:** Decompose a problem into modules and reconstruct it using various ways of user-defined functions. **(Apply - L3)**
- CO4:** Use user-defined data types like structures and unions and its applications to solve problems. **(Apply- L3)**
- CO5:** Discuss various file I/O operations and its application. **(Understand - L2)**

#### UNIT – I

**Introduction to Problem solving through C-Programming:** Problem Specification, Algorithm / pseudo code, flowchart, examples.

**C-Programming:** Structure of C program, identifiers, basic data types and sizes, Constants, variables, Input-output statements, A sample c program, operators, expressions, type conversions, conditional expressions, precedence of operators and order of evaluation.

**Control statements:** if, if else, else if ladder and switch statements, while, do-while and for statements, break, continue, go to and labels.

#### UNIT – II

**Arrays-** concept, declaration, definition, accessing elements, storing elements, two dimensional and multi-dimensional arrays.

**Character Arrays:** declaration, initialization, reading, writing strings, string handling functions, pre-processor Directives, and macros.

**Applications of Arrays:** Linear search, Binary search, Bubble Sort.

#### UNIT – III

**Pointers-** concepts, declaring & initialization of pointer variables, pointer expressions, pointer arithmetic, pointers and arrays, pointers and character arrays, pointers to pointers.

**Functions:** basics, category of functions, parameter passing techniques, recursive functions-comparison with Iteration, Functions with arrays, Standard library functions, dynamic memory management functions, command line arguments.

**Storage classes -** auto, register, static and extern.

#### UNIT – IV

**Derived types-** structures- declaration, definition, and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef.

**UNIT – V**

**Files** – concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations, error handling.

**Textbook:**

1. Reema Thareja, Programming in C, Oxford University Press, 2nd Edition, 2015

**Reference books:**

1. Jeri R.Hanly, Elliot B.Koffman, Problem Solving and Program Design in C, Pearson Publishers, 7th Edition, 2013
2. E Balagurusamy, Computer Programming, McGraw Hill Education, 8th Edition.
3. C: The Complete Reference, McGraw Hall Education, 4<sup>th</sup> Edition.
4. PradeepDey, Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition, 2011.
5. Stephen G.Kochan, Programming in C, Pearson Education, 3rd Edition, 2005.

**20EE02 - BASIC ELECTRICAL AND ELECTRONICS  
ENGINEERING**

**B.Tech. (I Sem.)**

L	T	P	Cr.
3	0	0	3

**Prerequisite:** Physics

**Course Educational Objective:** This course enables student to illustrate the basics of applied electricity and electronics.

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

CO1: Apply network reduction techniques to simplify electrical circuits (**Apply – L3**).

CO2: Illustrate the working principle of DC machines and transformers (**Understand – L2**).

CO3: Understand V-I characteristics of semiconductor devices (**Understand – L2**).

CO4: Illustrate the configuration of Transistors and their applications (**Understand – L2**).

**UNIT – I: Electrical Circuit Fundamentals**

Basic definitions, Types of elements-active and passive, Ohm's Law, Kirchhoff's Laws-Network reduction techniques- series, parallel, star to delta, delta to star transformations, source transformation (for resistive networks), mesh analysis, nodal analysis (Basic problems).

**UNIT – II: DC Network Theorems and AC Fundamentals**

Theorems-Superposition, Thevenin's, Norton's and Maximum Power Transfer (Basic problems in DC excitation only)

Peak, R.M.S, average, instantaneous values, form factor and peak factor– periodic waveforms – Phase and Phase difference –concepts of reactance, impedance, susceptance and admittance, real, reactive and apparent powers, Power Factor- resonance-bandwidth-quality factor.

**UNIT – III: DC Machine Fundamentals and Single-Phase Transformers**

DC generator principle, constructional details, emf equation, types of generators (Theory only).

DC motor principle, Back emf, types of motor (Theory only).

Construction and Principle of operation of single-phase transformers-Emf equation

**UNIT-IV: P-N Junction Diode and Zener Diode**

**P-N Junction Diode:** Operation and V-I characteristics of PN junction diode, Rectifiers-Half Wave Rectifier, Full Wave Rectifier-Bridge type, Zener Diode-Voltage Regulator.

**UNIT – V: Transistors**

Construction, Principle of Operation, Symbol, CB, CE configurations, JFET, MOSFET and application of transistor as an amplifier (Theory only).

**TEXTBOOKS:**

1. A.Sudhakar and Shyammohan S Palli, "Electrical Circuits" Tata McGraw-Hill, 3<sup>rd</sup> Edition.2017
2. M.S.Sukhija, T.K.Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford University Press, 2016 Edition.

**REFERENCE:**

1. Kothari and Nagarath, "Basic Electrical Engineering", TMH Publications, 3<sup>rd</sup> Edition.2013
2. G.S.N.Raju, "Electronic Devices and Circuits", I.K.International.2006

B.Tech. (I Sem.) 20FE01 - PROFESSIONAL COMMUNICATION - I

L	T	P	Cr.
2	0	0	2

**Pre-requisites:** Nil

**Course Educational Objective:** To improve English language proficiency of the students on various aspects like vocabulary, grammar, communication skills, listening skills, Reading & Writing skills.

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

- CO1** : Write sentences and paragraphs using proper grammatical structures and word forms (**Remember – L1**).
- CO2** : Comprehend the given text by employing suitable strategies for skimming and scanning and draw inferences (**Understand –L2**).
- CO3** : Write summaries of reading texts using correct tense forms & appropriate structures (**Remember – L1**).
- CO4** : Write Formal Letters; Memos & E-Mails (**Apply – L3**).
- CO5** : Edit the sentences/short texts by identifying basic errors of grammar / vocabulary/ syntax (**Understand – L2**).

### Unit - I

**Exploration** - ‘A Proposal to Girdle the Earth – Nellie Bly’; Reading: Skimming for main idea; Scanning for specific information; Grammar & Vocabulary: Content Words; Function Words; Word Forms: verbs, nouns, adjectives and adverbs; Nouns: Countable and Uncountable, Singular and Plural forms; Wh - Questions; Word Order in Sentences; Writing: Paragraph Analysis; Paragraph Writing; Punctuation and Capital Letters

### Unit – II

**On Campus-** ‘The District School as it Was by One Who Went to it – Warren Burton’; Reading: Identifying Sequence of Ideas; Grammar & Vocabulary: Cohesive Devices: Linkers/signposts/Transition signals, Synonyms, Meanings of Words/Phrases in the context; Writing: Memo Drafting.

### Unit – III

**Working Together-** ‘The Future of Work’

Reading: Making basic inferences; Strategies to use text clues for comprehension; Summarizing; Grammar & Vocabulary: Verbs: Tenses; Reporting Verbs for Academic Purpose; Writing: Rephrasing what is read; Avoiding redundancies and repetitions Abstract Writing/ Summarizing.

### Unit – IV

‘A.P.J.AbdulKalam’; Grammar & Vocabulary: Direct & Indirect Speech; articles and their Omission; Writing: E-Mail Drafting.

### Unit – V

‘C.V.Raman’; Grammar & Vocabulary: Subject-Verb Agreement; Prepositions; Writing: Formal Letter Writing.

**TEXTBOOKS:**

1. Prabhavati. Y & et al, “English All Round – Communication Skills for Undergraduate Learners”, Orient Black Swan, Hyderabad, 2019.
2. “Panorama – A Course on Reading”, A collection of prose selections, Oxford University Press, New Delhi, 2016.

**Reference Books:**

1. Swan,M., “Practical English Usage”, Oxford University Press, 2016.
2. Kumar,S and Latha, P, “Communication Skills”, Oxford University Press, 2018.
3. Rizvi Ashraf M., “Effective Technical Communication”, Tata Mc Graw Hill, New Delhi, 2008.
4. BaradwajKumkum, “Professional Communication”, I.K.International Publishing House Pvt.Lt., New Delhi, 2008.
5. Wood,F.T., “Remedial English Grammar”, Macmillan, 2007.

B.Tech. (I Sem.)

20FE03 - DIFFERENTIAL EQUATIONS

L	T	P	Cr.
2	1	0	3

**Pre-requisites:** Nil

**Course Educational Objective:** The objective of this course is to introduce the first order and higher order differential equations, functions of several variables. The students also learn solving of first order partial differential equations.

**Course Outcomes:** At the end of this course, the student will be able to

- CO1:** Apply first order and first-degree differential equations to find orthogonal trajectories (**Apply – L3**).
- CO2:** Distinguish between the structure and methodology of solving higher order differential equations with constant coefficients (**Understand – L2**).
- CO3:** Apply various Numerical methods to solve initial value problem (**Apply – L3**).
- CO4:** Generate the infinite series for continuous functions and investigate the functional dependence (**Understand – L2**).
- CO5:** Solve partial differential equations using Lagrange's method. (**Apply – L3**).

**UNIT –I****Differential Equations of First Order and First Degree**

Differential equations of first order and first degree –Exact and Non-Exact differential Equations, Applications of differential equations – Orthogonal Trajectories.

**UNIT –II****Linear Differential Equations of Higher Order**

Homogeneous and Non-Homogeneous Linear differential equations of second and higher order with constant coefficients with R.H.S. functions  $e^{ax}$ ,  $\sin(ax+b)$ ,  $\cos(ax+b)$ ,  $x^m$ ,  $e^{ax}V(x)$ ,  $xV(x)$ , Method of variation of parameters.

**UNIT – III****Numerical solution of Ordinary Differential Equations**

Numerical solution of Ordinary Differential equations, Solution by Taylor's series - Picard's Method of successive approximations.  
Euler's Method - Runge- Kutta Methods.

**UNIT –IV****Functions of several variables**

Generalized Mean Value Theorem (without proof), Maclaurin's series, Functions of several variables, Jacobians (Cartesian and polar coordinates), Functional dependence. Maxima and Minima of function with two variables.

**UNIT – V**

**Partial Differential Equations**

Formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions. Solution of first order and first degree linear partial differential equation – Lagrange's method.

**TEXTBOOKS:**

1. B.S. Grewal, "*Higher Engineering Mathematics*", 42<sup>nd</sup> Edition, Khanna Publishers, New Delhi, 2012.
2. B. V. Ramana, "*Higher Engineering Mathematics*", 1<sup>st</sup> Edition, TMH Publications, New Delhi, 2010

**Reference Books:**

1. M. D. Greenberg, "*Advanced Engineering Mathematics*", 2<sup>nd</sup> Edition, TMH Publications, New Delhi, 2011.
2. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 8<sup>th</sup> Edition, John Wiley & sons, New Delhi, 2011.
3. W.E. Boyce and R. C. DiPrima, "*Elementary Differential Equations*", 7<sup>th</sup> Edition, John Wiley & sons, New Delhi, 2011.
4. S. S. Sastry, "*Introductory Methods of Numerical Analysis*", 5<sup>th</sup> Edition, PHI Learning Private Limited, New Delhi, 2012.



L	T	P	Cr.
2	1	0	3

B.Tech. (I Sem.)

20FE07 - APPLIED PHYSICS

**Pre-requisites:** Nil

**Course Educational Objectives:** It enables the students to understand the fundamental concepts of optics, quantum mechanics, free electron theory of metals, semiconductors, dielectrics and their applications.

**Course Outcomes:** At the end of this course, the student will be able to

**CO1:** Define the nature of interference and diffraction (**Remember – L1**).

**CO2:** Apply the lasers and optical fibers in different fields (**Apply – L3**).

**CO3:** Estimate the electrical conductivity of metals (**Understand – L2**).

**CO4:** Analyze the properties of semiconducting materials (**Understand – L2**).

**CO5:** Classify the different types of magnetic and dielectric materials (**Understand – L2**).

**UNIT – I****Wave Optics**

**Interference:** Principle of super position, Conditions for Interference, Interference in thin parallel film by reflection, Newton's rings (reflection), working principle of Interferometer.

**Diffraction:** Introduction, Fraunhofer diffraction at single slit- Diffraction due to circular aperture, Diffraction Grating- Resolving power of Grating.

**UNIT – II****Lasers and optical fibers**

**Lasers:** Introduction - Principle of laser (absorption, spontaneous and stimulated emission of radiation), Einstein Coefficients – Nd-YAG laser, Helium Neon laser- applications.

**Optical Fibers:** Optical Fiber principle, Structure of optical fiber, numerical aperture and acceptance angle, types of optical fibers - applications.

**UNIT – III****Principles of Quantum Mechanics & Free electron theory**

**Principles of quantum mechanics:** de Broglie Hypothesis, Davisson - Germer experiment, Schrodinger time independent and dependent wave equations, physical significance of the wave function – particle in a box.

Free electron theory

Classical free electron theory- Postulates, Advantages and Draw backs, Fermi-Dirac distribution function-Temperature dependence of Fermi- Dirac distribution function, Classification of Solids on the basis of Band theory.

**UNIT – IV****Semiconductor physics**

Conductivity of Intrinsic and Extrinsic semiconductors, Drift and Diffusion Current, Einstein relation, Hall Effect, Differences between direct and indirect Band Gap semiconductors, Solar Cell, Applications of Solar Cells.

**UNIT – V:**

**Magnetic & Dielectric materials**

Magnetic parameters, Classification of magnetic materials-Diamagnetic, paramagnetic and ferromagnetic materials, Hysteresis loop, soft and hard magnetic materials, Applications of Ferro magnetic materials

Dielectrics: polarization - Electronic and ionic polarization, orientation polarization (Qualitative), Local field, Claussius Mosotti equation, Applications of dielectric materials.

**TEXTBOOKS:**

1. V. Rajendran, “*Engineering Physics*”, TMH, New Delhi, 6<sup>th</sup> Edition, 2014.
2. M.N. Avadhanulu, P.G. Kshirsagar, “*Engineering Physics*”, S. Chand & Co., 2<sup>nd</sup> Edition, 2014.

**Reference books:**

1. M.N. Avadhanulu, TVS Arun Murthy, “*Applied Physics*”, S. Chand & Co., 2<sup>nd</sup> Edition, 2007.
2. P.K. Palani Samy, “*Applied Physics*”, Sci. Publ. Chennai, 4<sup>th</sup> Edition, 2016.
3. P. Sreenivasa Rao, K Muralidhar, “*Applied Physics*”, Him. Publi. Mumbai, 1<sup>st</sup> Edition, 2016.
4. Hitendra K Mallik , AK Singh “ *Engineering Physics*”, TMH, New Delhi, 1<sup>st</sup> Edition, 2009.

B.Tech. (I Sem.)

**20CS51 - PROGRAMMING FOR PROBLEM SOLVING USING C LAB**

L	T	P	Cr.
0	0	3	1.5

**Pre-requisite** : NIL

**Course Educational Objective:** The objective of the course is to learn the basic elements of C Programming Structures like Data Types, Expressions, Control Statements, and Various I/O Functions and to solve simple mathematical problems using control structures. Design and implementation of various software components, which solve real world problems.

**Course Outcomes (CO):** *At the end of this course, the student will be able to:*

- CO1:** Apply control structures of C in solving computational problems. (**Apply - L3**)
- CO2:** Implement derived data types & use modular programming in problem solving (**Apply- L3**)
- CO3:** Implement user defined data types and perform file operations. (**Apply- L3**)
- CO 4:** Improve individual / teamwork skills, communication & report writing skills with ethical values.

**# of modules at most 10 can be taught and all the modules should be in line with theory.**

Module 1: Introduction to Raptor Tool.

Module 2: Problem solving using Raptor Tool.

Module 3: Exercise Programs on Basics of C-Program.

Module 4: Exercise Programs on Control Structures.

Module 5: Exercise Programs on Loops & nesting of Loops.

Module 6: Exercise Programs on Arrays & Strings.

Module 7: Exercise Programs on Pointers.

Module 8: Exercise Programs on Functions.

Module 9: Exercise Programs on user defined data types.

Module 10: Exercise Programs on Files.

B.Tech. (I Sem.)

**20FE51 - PROFESSIONAL COMMUNICATION  
SKILLS LAB**

L	T	P	Cr.
0	0	2	1

**Pre-requisites** : Nil

**Course Educational Objective:** To improve the proficiency of students in English with an emphasis on better communication in formal and informal situations; Develop speaking skills required for expressing their knowledge and abilities and to face interviews with confidence.

**Course Outcomes:** At the end of this course, the student will be able to

- CO1:** Introduce oneself and others using appropriate language and details (**Understand– L2**).
- CO2:** Comprehend short talks and speak clearly on a specific topic using error free English (**Understand– L2**).
- CO3:** Report effectively after participating in informal discussions ethically (**Remember– L1**).
- CO4:** Interpret data aptly, ethically & make oral presentations (**Apply –L3**).

**Syllabus: Professional Communication Lab (PCS) shall have two parts:**

- **Computer Assisted Language Learning (CALL) Lab** for 60 students with 60 systems, LAN facility and English language software for self- study by learners.
- **Interactive Communication Skills (ICS) Lab.** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo – audio & video system and camcorder etc.

**Exercise – I**

**CALL Lab: Understand -** Sentence structure.

**ICS Lab: Practice -** Listening: Identifying the topic, the context and specific information  
Speaking: Introducing oneself and others.

**Exercise – II**

**CALL Lab: Understand -** Framing questions.

**ICS Lab: Practice -** Listening: Answering a series of questions about main idea and supporting ideas after listening to audio text.  
Speaking: Discussing in pairs/small groups on specific topics; Delivering short structured talks using suitable cohesive devices (JAM)

**Exercise – III**

**CALL Lab: Understand -** Comprehension practice – Strategies for Effective Communication

**ICS Lab: Practice -** Listening: Listening for global comprehension and summarizing  
Speaking: Discussing specific topics in pairs/small groups, reporting what is discussed

**Exercise – IV**

**CALL Lab: Understand-** Features of Good Conversation – Strategies for Effective Communication.

**ICS Lab: Practice** -Listening: making predictions while listening to conversations/transactional dialogues with/without video Speaking: Role – plays – formal & informal – asking for and giving information/directions/instructions/suggestions

**Exercise – V**

**CALL Lab: Understand** - Features of Good Presentation, Methodology of Group Discussion

**ICS Lab:Practice** - Introduction to Group Discussions.

Listening: Answering questions identifying key terms and understanding concepts.

Speaking: Formal Oral & Poster presentations on topics from academic contexts without the use of PPT.

**Lab Manual:**

1. Prabhavati. Y & et al, “English All Round – Communication Skills for Undergraduate Learners”, Orient Black Swan, Hyderabad, 2019.

**Suggested Software:**

1. Digital Mentor: Globarena, Hyderabad, 2005
2. Sky Pronunciation Suite: Young India Films, Chennai, 2009
3. Mastering English in Vocabulary, Grammar, Spelling, Composition, Dorling Kindersley,USA,2001
4. Dorling Kindersley Series of Grammar, Punctuation, Composition, USA, 2001
5. Oxford Talking Dictionary, The Learning Company, USA, 2002
6. Learning to Speak English - 4 CDs. The Learning Company,USA,2002
7. Cambridge Advanced Learners English Dictionary (CD). Cambridge University Press, New Delhi,2008.

B.Tech. (I Sem.)

20FE54 - APPLIED PHYSICS LAB

L	T	P	Cr.
0	0	3	1.5

**Pre-requisites** : Nil

**Course Educational Objective:** This course enables the students to acquire theoretical ideas, analytical techniques, and graphical analysis, by completing a host of experiments with the procedures and observational skills for appropriate use of simple and complex apparatus.

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

- CO1:** Analyze the wave characteristics of light (**Understand – L2**).
- CO2:** Estimate the magnetic field using Stewart's and Gee's apparatus (**Understand – L2**).
- CO3:** Verify the characteristics of semiconductor diodes (**Apply – L3**).
- CO4:** Determine the acceptance angle and numerical aperture of optical fiber (**Apply – L3**).
- CO5:** Improve report writing skills and individual teamwork with ethical values (**Understand – L2**).

### List of Experiments

(Any of the 10 experiments are required to be conducted)

#### GENERAL EXPERIMENTS:

1. Determine the energy band gap of a semiconductor Diode.
2. Study the characteristics of Zener Diode.
3. Study the magnetic field along the axis of a current carrying circular coil using Stewart's & Gee's apparatus and to verify Biot - Savart's law.
4. Study the characteristics of Solar cell
5. Determination of dielectric constant by charging and discharging method.
6. Study the characteristics of Photo diode.
7. Determination of resistivity of semiconductor by four probe method.

#### OPTICS LAB EXPERIMENTS:

8. Determine the wavelength of a laser radiation.
9. Determine the width of a single slit by forming diffraction pattern.
10. Determine the Radius of Curvature of a Plano - Convex lens by forming Newton's Rings.
11. Determine the Wavelengths of various spectral lines by using diffraction grating.
12. Resolving power of grating.
13. Determine the acceptance angle and numerical aperture of a fiber.
14. Measure the bending losses in the optical fiber cable at different wavelengths.

L	T	P	Cr.
0	0	3	1.5

B.Tech. (I Sem.)

20IT51 - IT WORKSHOP

Pre-requisite : NIL

**Course Educational Objective:**

The objective of the course is to impart knowledge about the components of PC, Assembling PC, Installation of OS, softwares like MS-Office, LaTeX and concepts related to Networking, Internet as well as antivirus.

**COURSE OUTCOMES (COs):** At the end of this course, the student will be able to:

- CO1:** Identify the basic hardware components, keyboard shortcuts, assembling and disassembling of the system (PC). (**Understand- L2**)
- CO2:** Demonstrate Operating System installation, apply various commands of Linux operating system, and networking. (**Apply - L3**)
- CO3:** Create web pages using HTML, documents using applications like LaTeX, Google forms and use application software packages: MS-Word, MS-Excel, MS-Power Point to create documents and presentation. (**Apply- L3**)
- CO4:** Improve individual / teamwork skills, communication & report writing skills with ethical values.

**PC Hardware****Week 1**

Task: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**PC Assembling****Week 2**

Task: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. In addition, students need to go through the video, which shows the process of assembling a PC. A video would be given as part of the course content.

## Operating System Installation

### Week 3

**Task 1:** Every student should individually install MS windows and Linux/ Ubuntu OS on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 2: Linux Operating System commands:**

- General command syntax
- Basic help commands
- Basic File system commands
- Date and Time
- Basic Filters and Text processing
- Basic File compression commands
- Miscellaneous: apt-get, vi editor

## Network & Internet

### Week 4

Task 1: Networking Commands:

ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget, route

### Week 5

Task 1 :Internet Services:

- WebBrowserusageandadvancedsettingslikeLAN,proxy,content,privacy,security,cookies, extensions/ plugins
- Malicious Software : Virus,Worm,Logic Bomb,Trojan Horse
- Antivirusinstallation,configuringa firewall,blockingpop-ups
- mailcreationandusage,CreatingaDigitalProfileonLinkedIn

## Productivity Tools

### Week 6

Task 1: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3andits properties. Preparation of a simple website/ homepage

Every student should develop your home page using HTML Consisting of your photo, name, address and education details as table and your skill set as a list.

## Office Tools

### Week 7

Task-1: DemonstrationandPracticeonTextEditorslikeNotepad++,SublimeText,Atom,Brackets, Visual code, etc



**Week 8**

Task-1: Demonstration and practice on Microsoft Word, PowerPoint, Microsoft Excel

**Week 9**

Task-1: Demonstration and practice on LaTeX and produce professional pdf documents.

**Week 10**

Task-1: Creating online documents using Google docs- Create and share Bio-data form.

**References:**

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
2. Introduction to Information Technology, IITL Education Solutions limited, Pearson Education.
3. Computer Fundamentals, Anita Goel, Pearson Education, 2017
4. PC Hardware Troubleshooting Made Easy, TMH
5. <https://www.google.com/docs/about/>
6. <https://support.google.com/sites/answer/6372878?hl=en>

B.Tech. (II Sem.)

20CS03 - DATA STRUCTURES

L	T	P	Cr.
3	0	0	3

Pre-requisite : Programming Language

### Course Educational Objectives:

The objective of the course is to make students familiar with writing algorithms to implement different data structures like stacks, queues, trees and graphs, and various sorting techniques.

**Course Outcomes (COs):** *At the end of this course, the student will be able to*

- CO 1: Write the algorithms for various operations on list using arrays and linked list and analyze the time complexity of its operations. (**Understand - L2**)
- CO 2: Apply linear data structures like stack and queue in problem solving. (**Apply - L3**)
- CO 3: Demonstrate various searching and sorting techniques and compare their computational complexities in terms of space and time. (**Understand - L2**)
- CO 4: Write the algorithms for various operations on binary trees, binary search trees and AVL trees. (**Understand - L2**)
- CO 5: Demonstrate graph traversal techniques and hashing techniques. (**Understand - L2**)

### UNIT - I

#### Algorithm Analysis:

Introduction to Algorithm, Algorithm Analysis, Asymptotic Notations.

#### Introduction to arrays and Abstract Data Type (ADT)

**Lists:** List using arrays and linked list- Singly Linked List, Doubly Linked List, Circular LinkedList.

### UNIT – II

**Stacks:** Stack ADT, Implementation using arrays and linked list.

Applications of stacks: Infix to postfix expression conversion, Evaluation of Postfix expressions and balancing the symbols.

#### Queues:

Queue: Queue ADT, Implementation of Queue using arrays and linked list, circular queue, DEQUE

### UNIT - III

**Sorting:** Bubble sort, Insertion Sort, Selection sort, Merge Sort, Quick Sort & Heap Sort

### UNIT - IV

**Trees:** Introduction, Tree traversals, Binary Trees, Binary Search Trees, Balanced Binary search tree - AVL Trees and its operations.

**UNIT - V**

Graphs: Fundamentals, Representation of graphs, Graph Traversals: BFS, DFS.

Hashing: Hash Table, Hash Function, Collision resolution Techniques- separate Chaining, Open addressing, rehashing.

**TEXTBOOKS:**

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education, 2<sup>nd</sup> edition [1,2,3 units].
2. ReemaThareja, Data Structures using c, Oxford Publications [3,4,5].

**REFERENCES:**

1. Langson, Augenstein & Tenenbaum, ‘Data Structures using C and C++’, 2nd Ed, PHI.
2. RobertL.Kruse, Leung and Tando, ‘Data Structures and Program Design in C’, 2nd edition, PHI.

B.Tech. (II Sem.)

20CS05 - PYTHON PROGRAMMING

L	T	P	Cr.
3	0	0	3

Pre-requisite : Problem Solving Skills

**Course Educational Objective:** The objective of the course is to provide basic knowledge of python. python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language for Problem solving and programming capability.

**Course Outcomes: At the end of this course, the student will be able to**

- CO1:** Identify basic building blocks of python to solve mathematical problems. (**Understand-L2**)
- CO2:** Apply the in-built data structures like list, tuple, set and dictionary for solving problems. (**Apply - L3**)
- CO3:** Use exception-handling mechanism to catch run-time errors (**Apply - L3**)
- CO4:** Demonstrate compelling concepts about string manipulation, regular expressions, and file handling. (**Understand - L2**)
- CO5:** Demonstrate object-oriented programming principles of python. (**Understand - L2**)

#### UNIT-I

**Introduction to Python:** History of Python, Usage of Python interpreter, Python Shell, Indentation, Python Built-in types, Variables, Assignment, Input-Output Statements, Simple Programs, Identifiers and keywords, Literals. **Operators:** Arithmetic operators, Relational operators, Logical operators, Assignment operators, Bit-wise operators, Python Membership Operators (in & not in), Python Identity Operators (is & is not), Operator precedence.

**Control Structures:** Conditional Statements - if, if-else, Nested if-else. Jumping Statements - continue, break, and pass. Python Loops - while, for, Nested loops with Programming Examples, Mathematical Functions and Constants (import math), Random Number Functions.

#### UNIT-II

**Lists:** Concept, Creating and Accessing Elements, Updating & Deleting Lists, basic List Operations, Reverse, Indexing, Slicing and Matrices, Built-in List Functions.

**Tuples:** Introduction, Creating & Deleting Tuples, Accessing values in a Tuple, Updating tuples, Delete Tuple Elements, basic Tuple Operations, Indexing, Slicing and Matrices, built- in tuple Functions.

**Sets:** Concept, Operations.

**Dictionaries:** Introduction, Accessing values in dictionaries, working with dictionaries, Properties, Functions.

#### UNIT-III

**Functions:** Defining a Function, Calling a Function, Types of Functions, Function Arguments, Anonymous functions, Global and Local Variables, Recursion

**Modular Design:** Creating modules, import statement, from, Date and Time Module.

**Exception Handling:** Exception, Exception Handling, except clause, Try, finally clause, User Defined Exceptions.

#### UNIT-IV

**Python strings:** Concept, Slicing, Escape characters, String Special Operations, String formatting Operator, Triple Quotes, Raw String, Unicode Strings, and Built-in String methods.

**Regular Expression Operations:** Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with glob Module.

**Files:** Introduction to files, file operations- Read, write, and search

#### UNIT-V

**Object Oriented Programming OOP in Python:** Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, and Data hiding.

#### TEXTBOOKS:

1. Reema Thareja, “Python Programming Using Problem Solving Approach”, Oxford Publications
2. Python for Everybody: Exploring Data In Python 3 by [Dr. Charles Russell Severance](#), [Sue Blumberg](#)

#### Reference books:

1. Gowrishankar S and Veena A, “Introduction to Python Programming”, CRC Press, Taylor, and Francis Group – A CHAPMAN & HALLBOOK.
2. R. Nageswara Rao, “Core python programming”, Dreamtech, 2017.
3. Y. Daniel Liang, “Revel for Introduction to Python Programming and Data Structures”, Pearson Publications.

L	T	P	Cr.
2	0	0	2

B.Tech.(II-Sem.)

20FE02 - PROFESSIONAL COMMUNICATION - II

**Pre-requisites: Nil**

**Course Educational Objective:** To improve English language proficiency of the students on various aspects like vocabulary, grammar, communication skills, listening skills, Reading & Writing skills.

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

- CO1:** Produce a coherent paragraph interpreting a figure/graph/chart/table. (**Understand – L2**)
- CO2:** Comprehend the given texts thoroughly by guessing the meanings of the words contextually (**Understand – L2**).
- CO3:** Use language appropriately for describing/comparing/contrasting/giving directions & suggestions (**Remember – L1**).
- CO4:** Write formal/informal dialogues with an understanding of verbal/non-verbal features of communication. Guess meanings of the words from the context (**Understand – L2**).
- CO5:** Write well-structured essays; Reports & Résumé (**Apply – L3**).

**UNIT - I**

**Fabric of Change-** ‘H.G. Wells and the Uncertainties of Progress – Peter J. Bowler’; Reading: Studying the use of Graphic elements in texts; Grammar & Vocabulary: Quantifying Expressions; Adjectives and adverbs; Comparing and Contrasting; Degrees of Comparison  
Writing: Information Transfer

**UNIT - II**

**Tools for Life -** ‘Leaves from the Mental Portfolio of a Eurasian – Sui Sin Far’; Reading: Global Comprehension; Detailed Comprehension; Grammar & Vocabulary: Active & Passive Voice; Idioms & Phrases; Writing: Structured Essays using suitable claims and evidence

**UNIT - III**

**‘Homi Jahangir Bhabha’;**  
Grammar & Vocabulary: Words often confused; Common Errors; Writing: Incident & Investigation Reports.

**UNIT - IV**

**‘Jagadish Chandra Bose’;** Grammar & Vocabulary: Use of antonyms; Correction of Sentences; Writing: Dialogue Writing.

**UNIT - V**

**‘Prafulla Chandra Ray’;** Grammar & Vocabulary: Analogy; Sentence Completion; Writing: Writing a Résumé

**TEXTBOOKS:**

1. Prabhavati. Y & et al, “English All Round – Communication Skills for Undergraduate Learners”, Orient Black Swan, Hyderabad, 2019.
- 2 “The Great Indian Scientists” published by Cengage Learning India Pvt. Ltd., Delhi, 2017

**REFERENCE BOOKS:**

1. Swan,M., “Practical English Usage”, Oxford University Press, 2016.
2. Kumar,S and Latha, P, “Communication Skills”, Oxford University Press, 2018.
3. Rizvi Ashraf M., “Effective Technical Communication”, Tata Mc Graw Hill, New Delhi, 2008.
4. BaradwajKumkum, “Professional Communication”, I.K.International Publishing House Pvt.Lt., New Delhi, 2008.
5. Wood,F.T., “Remedial English Grammar”, Macmillan, 2007.

B.Tech. (II Sem.)

**20FE04 - LINEAR ALGEBRA AND  
TRANSFORMATION TECHNIQUES**

L	T	P	Cr.
2	1	0	3

**Pre-requisites: Nil**

**Course Educational Objective:** In this course, students learn Matrix Algebra and introduced with transformation techniques such as Laplace Transforms and Z – Transforms.

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

**CO1:** Investigate the consistency of the system of equations and solve them (**Apply – L3**).

**CO2:** Determine the eigen vectors and inverse, powers of a matrix using Cayley – Hamilton theorem (**Apply – L3**).

**CO3:** Use the concepts of Laplace Transforms to various forms of functions (**Understand – L2**).

**CO4:** Solve ordinary differential equations by using Laplace Transforms (**Apply – L3**).

**CO5:** Apply Z - Transforms to solve difference equations (**Apply – L3**).

**UNIT – I****System of Linear Equations**

Matrices - Rank- Echelon form, Normal form, PAQ form– Solution of Linear Systems – Homogeneous system of equations and Non-Homogeneous system of equations.

**UNIT – II****Eigen Values and Eigen Vectors**

Eigen values – Eigen Vectors – Properties – Cayley-Hamilton Theorem – Inverse and Powers of a matrix by using Cayley-Hamilton Theorem.

**UNIT – III****Laplace Transforms**

Laplace transforms of standard functions –Linear Property - Shifting Theorems, Change of Scale Property

Multiplication and Division by ‘t’ - Transforms of derivatives and integrals – Unit step function – Dirac’s delta function.

**UNIT – IV****Inverse Laplace Transforms**

Inverse Laplace transforms– Linear Property - Shifting Properties - Convolution theorem, Applications of Laplace transforms to ordinary differential equations.

**UNIT – V****Z-Transforms**

Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems - Inverse Z –transform - Convolution theorem – Solution of difference equation by Z-transforms.



**TEXTBOOKS:**

1. B.S. Grewal, “*Higher Engineering Mathematics*”, 42<sup>nd</sup> Edition, Khanna Publishers, New Delhi, 2012.
2. B. V. Ramana, “*Higher Engineering Mathematics*”, 1<sup>st</sup> Edition, TMH Publications, New Delhi, 2010.

**Reference Books:**

1. M. D. Greenberg, “*Advanced Engineering Mathematics*”, 2<sup>nd</sup> Edition, TMH Publications, New Delhi, 2011.
2. Erwin Kreyszig, “*Advanced Engineering Mathematics*”, 8<sup>th</sup> Edition, John Wiley & sons, New Delhi, 2011.
3. W.E. Boyce and R. C. DiPrima, “*Elementary Differential Equations*”, 7<sup>th</sup> Edition, John Wiley & sons, New Delhi, 2011.

L	T	P	Cr.
3	0	0	3

B.Tech (II Sem)

**20FE06 - ENGINEERING CHEMISTRY****Pre-requisites:** Nil

**Course Educational Objectives:** It enables the students to understand the fundamental concepts of chemistry and to provide them with the knowledge of industrial problems and finding the solutions. It helps to strengthen the basic concepts of electrochemistry, corrosion, nanotechnology, polymers, liquid crystals and analytical techniques.

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

**CO1:** Apply Nernst Equation for calculating electrode cell potentials and compare batteries for different applications (**Apply – L3**).

**CO2:** Apply principles of corrosion for design and effective maintenance of various equipment (**Apply – L3**).

**CO3:** Analyse the suitability of advanced materials like nano materials in electronics and medicine (**Understand – L2**).

**CO4:** Identify the importance of liquid crystals, polymers in advanced technologies (**Understand – L2**).

**CO5:** Apply the principles of analytical techniques in chemical analysis (**Apply – L3**).

**UNIT – I****Electro Chemistry & Batteries**

Types of Electrodes - Calomel Electrode, Glass Electrode, Calculation of EMF of Cell, Applications of Nernst Equation & Electro chemical Series, Batteries - Lead-acid Battery, Lithium-ion Battery, H<sub>2</sub> – O<sub>2</sub> Fuel Cell, Mg - Cu reserve battery.

**UNIT – II****Science of Corrosion**

Dry Corrosion (Direct Chemical corrosion) - Types of dry corrosion-oxidative corrosion, Pilling Bed worth rule, corrosion by other gases and liquid metal corrosion; Wet Corrosion (Electro Chemical corrosion) - Mechanism- oxygen absorption, hydrogen evolution, types of wet corrosion, Galvanic Corrosion, Concentration Cell Corrosion, passivity and Galvanic series; Factors Influencing Corrosion - Nature of metal (Purity, position in galvanic series, relative area of cathode & anode, nature of surface film) and nature of environment (temperature, humidity, atmospheric pollution and nature of ions in the medium); Control of Corrosion: Cathodic Protection - Sacrificial anode and impressed current methods, electro plating and metal cladding.

**UNIT – III****Chemistry of Engineering Materials**

Nano Materials - Extraordinary changes observed at nano size of materials and reasons, types of nano-materials, Gas-Phase Synthesis of nanomaterials, Applications; Materials in Electronic devices: Very brief note on raw materials that make IC units of CPU, GPU, RAM, PCBs, hard disks and other electronic devices with special reference to polymers;

Molecular Switches - Characteristics of Molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, molecular elevator, automated light-powered molecular motor.

**UNIT – IV****Liquid Crystals & Polymers**

Liquid crystals - Identification and structural aspects of molecules to form liquid crystals; Classification of liquid crystals - Thermo tropic liquid crystals and types, lyotropic liquid crystals. Mechanism of working of liquid crystals and applications; Polymers - Differences between thermoplasts and thermosets, Types of polymerization with examples; Plastics - Preparation properties and engineering applications of P.M.M.A, Teflon, Polycarbonate; Rubbers - Structure of raw rubber and vulcanized rubber, Preparation properties and engineering applications of Polyurethane, Buna-S, conducting polymers; Bio-degradable polymers - PLA & PGA (Polylactic Acid and Polyglycolic Acid).

**UNIT – V****Analytical Techniques**

Types of analysis; Physical analysis: Analysis of physical characteristics; Chemical analysis: Gravimetric and volumetric analysis (basic concept only); Instrumental analysis: Electro analytical techniques – Introduction; Conductometric techniques: strong acid-strong base and strong acid-weak base, weak acid -strong base and weak acid -weak base & advantages; Potentiometric techniques: Acid-base and oxidation-reduction titrations-advantages; Colorimetric techniques: Principle and determination of iron by using thiocyanate as a reagent.

**TEXTBOOKS**

1. Shikha Agarwal, “A Text book of Engineering Chemistry”, Cambridge University Press, New Delhi, 1<sup>st</sup> Edition, 2015.
2. Jain, Jain, “A textbook of Engineering Chemistry”, Dhanpat Rai Publishing Company, New Delhi, 16<sup>th</sup> Edition, 2015.

**REFERENCE BOOKS**

1. Shashi Chawla, “A Text book of Engineering Chemistry”, Dhanpat Rai Publishing Company, New Delhi, 3<sup>rd</sup> Edition, 2003.
2. S.S. Dara, S.S. Umare, “A Text book of Engineering Chemistry”, S. Chand Publications, New Delhi, 12<sup>th</sup> Edition, 2010.
3. Prasanta Rath, B. Rama Devi, Ch. Venkata Ramana Reddy, Subhendu Chakroborty, “Engineering Chemistry”, Cengage Learning India, 1<sup>st</sup> Edition, 2019.

B.Tech. (II Sem.)

20MC01 - CONSTITUTION OF INDIA

L	T	P	Cr.
2	0	0	0

**Pre-requisites:** Nil**Course Educational Objectives**

- To enable the student to understand the importance of constitution.
- To understand the structure of Executive, Legislature and Judiciary.
- To understand Philosophy of fundamental rights and duties.
- To understand the autonomous nature of constitution bodies like Supreme Court and High Court Controller and Auditor General of India and Election Commission of India.
- To understand the Central and State relation, financial and administrative.

*Course Outcomes: At the end of the course, the student shall be able to*

CO1: Understand history and philosophy of constitution with reference to Preamble, Fundamental Rights and Duties (**Understand – L2**).

CO2: Understand the concept of Unitary and Federal Government along with the role of President, Prime Minister and Judicial System (**Understand – L2**).

CO3: Understand the structure of the state government, Secretariat, Governor and Chief Minister and their functions (**Understand – L2**).

CO4: learn local administration viz. Panchayat, Block, Municipality and Corporation (**Understand – L2**).

CO5: learn about Election Commission and the process and about SC, ST, OBC and women (**Understand – L2**).

**UNIT – I:**

Introduction to Indian Constitution: ‘Constitution’ meaning of the term, Indian Constitution – Sources and Constitutional History, Features – Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

**UNIT – II:**

Union Government and its Administration Structure of the Indian Union: Federalism Centre – State relationship, President: Role, Power and Position. Prime Minister (PM) and Council of Ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha. The Supreme Court and High Court: Powers and Functions.

**UNIT – III:**

State Government and its Administration Governor – Role and Position – Chief Minister (CM) and Council of Ministers. State Secretariat: Organization, Structure and Functions.

**UNIT – IV:**

A Local Administration -- Role and Importance, Municipalities – Mayor and Role of Elected Representative, Panchayati Raj: Functions of Panchayati Raj Institution, Zilla Panchayat, Elected Officials and their roles, Village level – Role of Elected and Appointed officials.

**UNIT – V:**

Election Commission: Election Commission – Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions and Commissions for the welfare of SC/ST/OBC and Women.

**Reference Books**

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd., New Delhi.
2. Subash Kashyap, Indian Constitution, National Book Trust.
3. J.A. Siwach, Dynamics of Indian Government and Politics.
4. D.C. Gupta, Indian Government and Politics.
5. H.M.Sreevai. Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication).
6. J.C. Johari, Indian Government and Politics Hans.
7. J.Raj, Indian Government and Politics.
8. M.V. Pylee, Indian Constitution, Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd., New Delhi.
9. Noorani, A.G. (South Asia Human Rights Documentation Centre), Challenges to Civil Right). Challenges to Civil Rights Guarantees in India, Oxford University Press 2012.

**E-Resources:**

1. [nptel.ac.in/courses/109104074/8](https://nptel.ac.in/courses/109104074/8).
2. [nptel.ac.in/courses/109104045](https://nptel.ac.in/courses/109104045).
3. [nptel.ac.in/courses/101104065](https://nptel.ac.in/courses/101104065).
4. [www.hss.iitb.ac.in/en/lecture-details](http://www.hss.iitb.ac.in/en/lecture-details).
5. [www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indianconstitution](http://www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indianconstitution)

B.Tech. (II Sem.)

20CS53 - DATA STRUCTURES LAB

L	T	P	Cr.
0	0	3	1.5

Pre-requisite : Programming Language

### Course Educational Objectives:

The objective of this course is to make students familiar with writing algorithms to implement different data structures like stacks, queues, trees and graphs, and various sorting techniques.

**Course Outcomes (COs):** *At the end of this course, the student will be able to*

- CO 1: Implement Linear Data Structures using array and Linked list. (**Apply - L3**)
- CO 2: Implement Various Sorting Techniques. (**Apply - L3**)
- CO 3: Implement Non-Linear Data Structure such as Trees & Graphs. (**Apply - L3**)
- CO 4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

### I) Exercise Programs on List ADT

- a) Implementation of List using Arrays.
- b) Implementation of List using Linked List.

### II) Exercise Programs on Stacks & Queue ADT

- a) Implementation of Stack Operations using Arrays.
- b) Implementation of Stack Operations using Linked List.
- c) Implementation of Queue Operations using Arrays.
- d) Implementation of Queue Operations using Linked List.

### III) Exercise Programs on Stack Applications

- a) Conversion of Infix Expression to postfix Expression.
- b) Conversion of Infix Expression to prefix Expression.
- c) Evaluation of Postfix Expression
- d) Implementation of Balancing Symbols.

**IV) Exercise Programs on Types of Queues**

- a) Implementation of Circular Queues Linked List.
- b) Implementation of Double Ended Queue using Arrays.
- c) Implementation of Double Ended Queue using Linked List.

**V) Exercise Programs on Sorting Techniques.**

- a) Implementation of Insertion Sort and
- b) Implementation of Selection Sort.
- c) Implementation of Merge Sort.
- d) Implementation of Quick Sort.
- e) Implementation of Bubble Sort.
- f) Implementation of Heap Sort.

**VI) Exercise Programs on Trees**

- a) Implementation of Binary Tree Traversals.
- b) Implementation of Binary Search Tree Operations.

**VII) Exercise Programs on Graph Traversal Techniques.**

- a) Breadth First Search (BFS)
- b) Depth First Search (DFS)

B.Tech. (II Sem.)

20CS54 - PYTHON PROGRAMMING LAB

L	T	P	Cr.
0	0	3	1.5

Pre-requisite: Basic Knowledge of Programming.

### Course Educational Objective:

The Objective of Python course is to lead the students from the basics of writing and running Python scripts in problem solving and to design and implement the modules and understands the working of classes and objects in python.

**Course Outcomes:** *At the end of the course, the student shall be able to*

- CO 1:** Apply building blocks of Python in solving computational problems. (**Apply - L3**)
- CO 2:** Implement in-built data structures available in Python to solve computational problems. (**Apply - L3**)
- CO 3:** Implement modular programming, string manipulations and Object-oriented programming in python. (**Apply - L3**)
- CO 4:** Improve individual / teamwork skills, communication & report writing skills with ethical values.

### Introduction: Language basics and example problems ( Two weeks)

- a) Implement Python Script for checking the given year is leap year or not.
- b) Implement Python Script for finding biggest number among 3 numbers.
- c) Implement Python Script for displaying reversal of a number.
- d) Implement Python Script to check given number is Armstrong or not.
- e) Implement Python Script to print sum of N natural numbers.
- f) Implement Python Script to check given number is palindrome or not.
- g) Implement Python script to print factorial of a number.
- h) Implement Python Script to print all prime numbers within the given range.
- i) Implement Python Script to calculate the series:  $S=1+x+x^2+x^3+\dots+x^n$
- j) Implement Python Script to print the following pattern:

```

      *
     * *
    * * *
  
```



**Module 1: Exercise Programs on Lists.**

- a) Write a Python script to display elements of list in reverse order.
- b) Write a Python script to find the minimum and maximum elements without using built-in operations in the lists.
- c) Write a Python script to remove duplicates from a list.
- d) Write a Python script to append a list to the second list.
- e) Write a Python script to count the number of strings in a list where the string length is 2 or more.

**Module 2: Exercise Programs on Tuples.**

- a) Write a Python script to create a tuple with different data types.
- b) Write a Python script to find the repeated items of a tuple.
- c) Write a Python script to replace last value of tuples in a list.  
Sample list: [(10, 20, 40), (40, 50, 60), (70, 80, 90)]  
Expected Output: [(10, 20, 100), (40, 50, 100), (70, 80, 100)]
- d) Write a Python script to sort a tuple by its float element.  
Sample data: [('item1', '12.20'), ('item2', '15.10'), ('item3', '24.5')]  
Expected Output: [('item3', '24.5'), ('item2', '15.10'), ('item1', '12.20')]

**Module 3: Exercise Programs on Sets and Dictionaries.**

- a) Write a Python script to add member(s) in a set.
- b) Write a Python script to perform Union, Intersection, difference and symmetric difference of given two sets.
- c) Write Python script to test whether every element in S is in T and every element in T is in S.
- d) Write a Python script to sort (ascending and descending) a dictionary by value.
- e) Write a Python script to check whether a given key already exists or not in a dictionary.
- f) Write a Python script to concatenate following dictionaries to create a new one.
- g) Sample Dictionary : dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60}  
Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}
- h) Write a Python script to print a dictionary where the keys are numbers between 1 and 15 (both included) and the values are square of keys.
- i) Write a Python program to map two lists into a dictionary.

**Module 4: Exercise Programs on functions and recursion.**

- a) Define a function max\_of\_three() that takes three numbers as arguments and returns the largest of them.
- b) Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between given range X and Y.
- c) Define functions to find mean, median, mode for the given numbers in a list.
- d) Define a function which generates Fibonacci series up to n numbers.
- e) Implement a python script for factorial of number by using recursion.
- f) Implement a python script to find GCD of given two numbers using recursion.

**Module 5: Exercise programs on Date and Time Modules.**

- a) Write a Python script to get the current time in Python.
- b) Write a Python script to get current time in milliseconds in Python
- c) Write a Python script to print next 5 days starting from today.

**Module 6: Exercise programs on Exception Handling.**

- a) Write a Python script to handle simple errors by using exception handling mechanism.
- b) Write a Python script to handle multiple errors with one except statement.

**Module 7: Exercise programs on Strings**

- a) Implement Python Script to perform various operations on string using string libraries.
- b) Implement Python Script to check given string is palindrome or not.
- c) Implement python script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it.
- d) Implement python script that takes a list of words and returns the length of the longest one.

**Module 8: Exercise programs on Regular Expressions**

- a) Write a Python script to check that a string contains only a certain set of characters (in this case a-z, A-Z and 0-9).
- b) Write a Python script to check whether password is valid or not.

Conditions for a valid password are:

Should have at least one number.

Should have at least one uppercase and one lowercase character.

Should have at least one special symbol.

Should be between 6 to 20 characters long.

**Module 9: Exercise programs on Object Oriented Programming**

- a) Write a Python script to create and access class variables and methods.
- b) Write a Python script to implement method overloading.
- c) Write a Python script to implement single inheritance.
- d) Write a Python script to implement method overriding.

**Module 10: Exercise programs on Python Libraries – Numpy , Pandas , Matplotlib**

- a) Write a NumPy program to generate a matrix product of two arrays.
- b) Write a NumPy program to create a random array with 1000 elements and compute the average, variance, standard deviation of the array elements.
- c) Demonstrate how to download dataset and how to create DataFrame
  - i. Write a Pandas program to get the first 3 rows of a DataFrame
  - ii. Write a Pandas program to select the specified columns and rows from a given data frame.
  - iii. Write a Pandas program to select the rows where the score is missing, i.e. is NaN.
  - iv. Write a Pandas program to insert a new column in existing DataFrame.
- d) Write a Python programming to display a bar chart using different color for each bar.
- e) Write a Python programming to create a pie chart with a title.

L	T	P	Cr.
0	0	2	1

**Pre-requisites** : Nil

**Course Educational Objective:** The main objective of this course is to familiarize with the Unix/Linux command line and running simple commands and concept of environment variables and with the simple use of environment variables.

**Course Outcomes (COs):** *At the end of this course, the student will be able to*

CO 1: Understand the basic Unix/Linux commands. (**Understand - L2**)

CO 2: Learn importance of shell scripting. (**Understand - L2**)

CO 3: Apply shell programming to various files. (**Apply - L3**)

CO 4: Improve individual / teamwork skills, communication & report writing skills with ethical values.

### **Module – I: Basic Linux Commands**

Study of Unix/Linux general purpose utility command list obtained from (man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown) commands, study of vi editor, study of Unix/Linux file system

### **Module – II: Introduction to Shell**

Introduction to Shell, Shell responsibilities, running a shell script. Variables, passing arguments, Basic Operators, Basic String Operations, Decision Making, Loops, Arrays, Arrays – Comparison, Shell functions.

### **Module – III: Advanced Shell**

Special Variables, Bash trap command, File Testing, Input Parameter Parsing, Pipelines, Process Substitution, Regular Expressions, **Special Commands:** sed, awk, grep, sort

### **Example Programs:**

1. Use of Basic UNIX Shell Commands: ls, mkdir, rmdir, cd, cat, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit
2. Commands related to inode, I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script exercises based on following:
  - (i) Interactive shell scripts (ii) Positional parameters (iii) Arithmetic (iv) if-then-fi, if-then- else-fi, nested if-else (v) Logical operators (vi) else + if equals elif,

case structure (vii) while, until, for loops, use of break

4. Write a shell script to create a file. Follow the instructions

- (i) Input a page profile to yourself, copy it into other existing file
- (ii) Start printing file at certain line
- (iii) Print all the difference between two file, copy the two files.
- (iv) Print lines matching certain word pattern.

5. Write shell script for-

- (i) Showing the count of users logged in,
- (ii) Printing Column list of files in your home directory
- (iii) Listing your job with below normal priority
- (IV) Continue running your job after logging out.

6. Write a shell script to change data format. Show the time taken in execution of this script.

7. Write a shell script to print files names in a directory showing date of creation & serialnumber of the file.

8. Write a shell script to count lines, words, and characters in its input (do not use wc).

**Reference books:**

- 1. Learning the bash Shell, 3rd Edition by Cameron Newham, Publisher(s): O'Reilly Media, Inc., ISBN: 9780596009656
- 2. UNIX and Shell Programming by Behrouz A. Forouzan, Richard F. GilbergPublisher: Thomson Press (India) Ltd, ISBN: 9788131503256, 9788131503256
- 3. Shell Scripting: Expert Recipes for Linux, Bash, and More by Steve Parker

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**Pre-requisites:** Nil

**Course Educational Objectives:** This course enables the students to analyze water samples and perform different types of volumetric titrations. It provides them with an overview of preparation of polymers and analytical techniques.

**Course Outcomes:** At the end of the course, the student shall be able to

- CO1:** Assess alkalinity of water based on the procedure given (**Understand – L2**).
- CO2:** Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus (**Understand – L2**).
- CO3:** Acquire practical knowledge related to preparation of polymers (**Understand – L2**).
- CO4:** Exhibit skills in performing experiments based on theoretical fundamentals (**Understand – L2**).

### List of Experiments

(Any of the 10 experiments are required to be conducted)

#### Model Experiment

1. Determination of HCl using standard Na<sub>2</sub>CO<sub>3</sub> solution.

#### Water Analysis

2. Determination of alkalinity of water sample.

#### Complexometric Titrations

3. Estimation of Mg<sup>+2</sup>/Zn<sup>+2</sup>/Ca<sup>+2</sup> in given solution by using standard EDTA solution.

#### Preparation of Polymers (only demonstration)

4. Nylon Fibers
5. Bakelite

#### Redox Titrations

6. Estimation of Mohr's salt by using potassium permanganate.
7. Estimation of Mohr's salt by using potassium dichromate.
8. Estimation of copper (II) ion using standard hypo solution.

#### Conductometric Measurements

9. Estimation of amount of HCl conductometrically using standard NaOH solution.
10. Estimation of amount of HCl conductometrically using NH<sub>4</sub>OH solution.

#### Potentiometric Measurements

11. Estimation of amount of HCl potentiometrically using NaOH solution.

#### Estimations

12. Measuring pH of the given sample solution using pH meter (demonstration only).
13. Estimation of Vitamin C in a given sample.

#### Colorimetric Analysis

14. Determination of Iron (III) by colorimetric method.

#### REFERENCES

Lab manual