COURSE STRUCTURE

AND

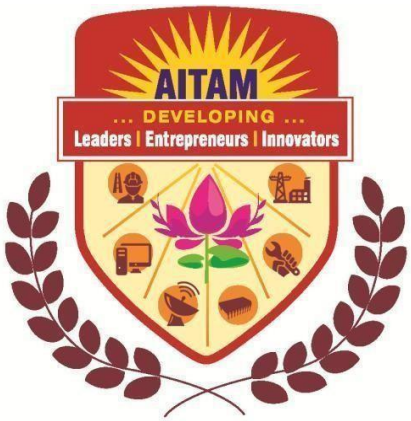
DETAILED SYLLABUS

INFORMATION TECHNOLOGY

For

B.TECH. FOUR YEAR DEGREE PROGRAMME

(Applicable for the batches admitted from 2023-2024)



ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

TEKKALI-532201, ANDHRA PRADESH

(An Autonomous Institution)

Approved by AICTE, New Delhi

Affiliated to JNTUGV-Vizianagaram

Accredited by NBA (UG: IT, CSE, ECE, EEE, ME, &CE)

Accredited by NAAC (UGC) with A^+ Grade

Recognized by UGC under 2(f) & 12(B)

TEQIP Participated College

Recognized by Scientific &Industrial Research Organization (SIRO)

NIRF Rank – 2024 (Band 201 - 300)

I YEAR I SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
MC	23MCS101	Induction Program	3weeks			0
BH	23BHT101	Communicative English	3	0	0	3
BH	23BHT102	Linear Algebra and Calculus	2	1	0	3
BH	23BHT105	Chemistry	3	0	0	3
ES	23EST105	Introduction to Programming	3	0	0	3
ES	23ESL106	IT Workshop	1	0	4	3
BH	23BHL101	Communicative English Lab	0	0	3	1.5
BH	23BHL104	Chemistry Lab	0	0	3	1.5
ES	23ESL105	Computer Programming Lab	0	0	3	1.5
MC	23MCS103	Health and Wellness, Yoga and Sports	0	0	1	0.5
Total			**12**	**1**	**14**	**20**

I YEAR II SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
BH	23BHT103	Differential Equations and Vector Calculus	2	1	0	3
BH	23BHT104	Engineering Physics	3	0	0	3
PC	23CST101	Data Structures	3	0	0	3
ES	23EST102	Basic Electrical and Electronics Engineering	3	0	0	3
ES	23ESL103	Engineering Drawing	1	0	4	3
BH	23BHL102	Engineering Physics Lab	0	0	3	1.5
PC	23CSL101	Data Structures Lab	0	0	3	1.5
PC	23ESL102	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
MC	23MCS102	NSS/NCC/Scouts &Guides/Community Service	0	0	1	0.5
Total			**12**	**1**	**14**	**20**

II YEAR I SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
BH	23BHT207	Universal Human Values	2	0	0	2
ES	23EST206	Python Programming	3	0	0	3
PC	23CST202	Mathematical Foundation in Computer Science	3	0	0	3
PC	23ITT201	Data Base Management System	3	0	0	3
PC	23CST204	Design Analysis and Algorithms	3	0	0	3
ES	23ESL207	Python Programming Lab	0	0	3	1.5
PC	23CSL201	Design Analysis and Algorithms Lab	0	0	3	1.5
PC	23ITL201	Data Base Management System Lab	0	0	3	1.5
SC	23ITS204	Skill Enhancement Course–I	1	0	1	1.5
Total			**15**	**0**	**10**	**20**

II YEAR II SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
BH	23BHT212	Statistical Methods	3	0	0	3
PC	23ITT202	Principles of Operating Systems	3	0	0	3
PC	23ITT203	Computer Organization &Architecture	3	0	0	3
PC	23CST207	Object Oriented Programming	3	0	0	3
PC	23ITT204	Artificial Intelligence	3	0	0	3
ES	23ESL209	Advanced Coding Lab–I	0	0	3	1.5
PC	23CSL203	Object Oriented Programming Lab	0	0	3	1.5
PC	23ITL202	Principles of Operating Systems Lab	0	0	3	1.5
SC	23ITS205	Skill Enhancement Course–II	1	0	1	1.5
BH	23BHT208	Design Thinking	1	0	2	2
MC	23MCT204	Environmental Studies	2	0	0	0
Total			**18**	**0**	**12**	**22**

III YEAR I SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
PC	23ITT305	Data Communication and Computer Networks	3	0	0	3
PC	23ITT306	Theory of Computation	3	0	0	3
PC	23ITT307	Advanced Java and Web Technologies	3	0	0	3
PC	23ITT308	Data Mining	3	0	0	3
PE	23ITE31X	Professional Elective–I	3	0	0	3
PC	23ITL303	Data Communication and Networks Lab	0	0	3	1.5
PC	23ITL304	Advanced Java and Web Technologies Lab	0	0	3	1.5
ES	23ESL312	Advanced Coding Lab–II	0	0	3	1.5
BH	23BHL306	Tinkering Lab	0	0	3	1.5
IP	23ITP301	Community Service Internship	-	-	-	1
Total			**15**	**0**	**12**	**22**

Professional Elective–I		
S.No	**Code**	**Theory/Lab**
1.	23ITE311	Object Oriented Software Engineering
2.	23ITE312	DevOps
3.	23ITE313	Human Computer Interaction
4.	23ITE314	UNIX Programming

III YEAR II SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
BH	23BHT314	Managerial Economics and Management Science	3	0	0	3
PC	23ITT309	Principles of Compiler Design	3	0	0	3
OE	23OET31X	Open Elective-I	3	0	0	3
PE	23ITE32X	Professional Elective–II	3	0	0	3
PE	23ITE33X	Professional Elective– III	3	0	0	3
SC	23SSS306	Employability Skills	3	0	0	3
BH	23BHL305	Professional Communication Skills Lab	0	0	3	1.5
PC	23ITL305	Data Science with Python Lab	0	0	3	1.5
MC	23MCT305	Constitution of India	2	0	0	0
Total			**20**	**0**	**6**	**21**
Mandatory Industry Internship of 4 weeks duration during summer vacation						

Open Elective-I	
Code	**Theory/Lab**
23OET311	Human Resource Development and Organizational Behavior
23OET312	Business Plan and Presentation for Entrepreneurs
23OET313	E-Waste Management
23OET314	Blockchain Technologies
23OET315	Optimization Techniques
23OET316	Ethics in AI

Professional Elective – II		
S.No	**Code**	**Theory/Lab**
1.	23ITE321	Cyber Security
2.	23ITE322	Fundamentals of Digital Image Processing
3.	23ITE323	Software Testing Methodologies
4.	23ITE324	Advanced Computer Networks

Professional Elective–III		
S.No	**Code**	**Theory/Lab**
1.	23ITE331	Advanced Computer Architecture
2.	23ITE332	Data Science
3.	23ITE333	Soft Computing
4.	23ITE334	Cloud Based Computing

IV YEAR I SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
PC	23ITT410	Information Security	3	0	0	3
PC	23ITT411	IoT Systems	3	0	0	3
PC	23ITT412	Machine Learning	3	0	0	3
OE	23OET42X	Open Elective–II	3	0	0	3
PE	23ITE44X	Professional Elective– IV	3	0	0	3
PE	23ITE45X	Professional Elective–V	3	0	0	3
PC	23ITL406	IoT Systems Lab	0	0	3	1.5
PC	23ITL407	Machine Learning with Python Lab	0	0	3	1.5
IP	23ITP402	Industry Internship	-	-	-	2
MC	23MCT406	Technical Paper Writing and Intellectual Property Rights	2	0	0	0
Total			**20**	**0**	**6**	**23**

Open Elective-II	
Code	**Theory/Lab**
23OET421	Entrepreneurial Development
23OET422	Digital Marketing
23OET423	Renewable Energy Sources
23OET424	IT Systems Management
23OET425	Environmental Impact Assessment
23OET426	Cyber Crime and Law Protection

Professional Elective– IV		
S. No	**Code**	**Theory/Lab**
1.	23ITE441	Wireless Ad-hoc Network
2.	23ITE442	Parallel Computing and Algorithms
3.	23ITE443	MERN Stack Technologies
4.	23ITE444	Ethical Hacking

Professional Elective–V		
S. No	**Code**	**Theory/Lab**
1.	23ITE451	NoSQL Database
2.	23ITE452	Artificial Neural Networks
3.	23ITE453	Mobile Computing
4.	23ITE454	Big Data Analytics

IV YEAR II SEMESTER						
Category	**Code**	**Theory/Lab**	**L**	**T**	**P**	**C**
PC	23ITP403	Full semester Internship (or) Project Work	0	0	24	12
Total			0	0	24	12

INDUCTION PROGRAMME

S.No.	Course Name	Category	L	T	P	C
1.	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	**0**	**0**	**6**	**0**
2.	Career Counselling	MC	**2**	**0**	**2**	**0**
3.	Orientation to all branches -- career options, tools, etc.	MC	**3**	**0**	**0**	**0**
4.	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	**2**	**0**	**3**	**0**
5.	Proficiency Modules & Productivity Tools	ES	**2**	**1**	**2**	**0**
6.	Assessment on basic aptitude and mathematical skills	MC	**2**	**0**	**3**	**0**
7.	Remedial Training in Foundation Courses	MC	**2**	**1**	**2**	**0**
8.	Human Values & Professional Ethics	MC	**3**	**0**	**0**	**0**
9.	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	**2**	**1**	**2**	**0**
10.	Concepts of Programming	ES	**2**	**0**	**2**	**0**

Subject Code: 23BHT101

Communicative English
(Common to all Branches)

L	T	P	C
3	0	0	3

Course Objectives

- To enable students to build vocabulary appropriate to their levels and to make students understand printed texts of different genres
- To enhance basic writing skills of the students in different forms of written communication
- To assist students implicitly synthesize the rules of grammar for the production of accurate sentences
- To aid students to acquire appropriate and adequate letter writing skills
- To get students enhance their essay writing skills and develop reading skills

Course Outcomes

1. Students will be able to comprehend printed texts of different genres easily and they will be able to make appropriate word choice for writing.
2. Students will be able to write short texts efficiently.
3. Students will be able to construct grammatically correct sentences.
4. Students will be able to communicate through letters effectively.
5. Students will be able to write essays and comprehend unfamiliar passages.

Unit – 1

A Power of a Plate of Rice by Ifeoma Okoye-
Skimming and Scanning — Capital letters and Punctuation — Spellings — Parts of speech — Root words — Prefixes and Suffixes — Synonyms and Antonyms

Unit – II

Night of the Scorpion by Nissim Ezekiel
Sequencing — Paragraph writing — Cohesive devices — Articles — Prepositions — Homonyms, Homographs, homophones

Unit – III

Biography of Steve Jobs
Drawing inferences — Paraphrasing, Summarizing, Note-making — Verbs and Tenses, Subject-verb agreement — Compound words — Collocations

Unit – IV

The Toys of Peace by Saki
Data interpretation — Official letters and Résumé — Direct and Indirect speech — Academic reporting verbs — Active and passive voice — Words often confused — Jargon

Unit – V

The Power of Intrapersonal Communication (An Essay)
Reading comprehension — Essay writing — Correcting errors — Technical Jargon

Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient BlackSwan, 2023 (Units 1, 2 & 3)
2. Empowering English by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Reference Links:

Grammar

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

Vocabulary

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

Linear Algebra and Calculus
(Common to all Branches)

Subject Code: 23BHT102

L	T	P	C
2	1	0	3

Course Objectives

To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications as follows.

- Develop proficiency in fundamental algebraic techniques. Apply algebraic concepts to solve engineering problems and practical applications.
- Understand the principles of linear transformations. Explore the concept of orthogonal transformations. Apply these transformations in engineering contexts and problem-solving.
- Gain a deep understanding of calculus concepts. Apply calculus to analyze and solve real-world problems. Explore the applications of calculus in engineering and related fields.
- Understand the concept of functions with multiple variables. Explore optimization techniques using functions of several variables. Apply these concepts in engineering optimization problems
- Learn the concepts of double integrals in two dimensions. Understand triple integrals in three dimensions. Apply integration techniques for calculating areas and volumes in engineering applications.

Course Outcomes

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

CO1: Apply matrix operations to determine the rank and inverse of matrices using echelon, normal forms, and Gauss-Jordan method; solve systems of linear equations using Gauss elimination and Gauss-Seidel iteration methods. (level 3)

CO2: Compute eigen values, eigen vectors, and analyze their properties; apply Cayley-Hamilton Theorem to find matrix powers and inverses; reduce quadratic form to canonical forms using orthogonal transformations.(level3)

CO3: Apply Rolle's, Lagrange's, Cauchy's mean value theorems, Taylor's and Maclaurin's theorems for function approximations.(level3)

CO4: Apply Taylor/Maclaurin expansions for multivariable functions; compute maxima and minima for two variable functions and constrained maxima/minima using Lagrange multipliers. (level 3)

CO5: Solve double and triple integrals in Cartesian and Polar coordinates, perform change of variables/order, and apply double and triple integrals to calculate areas and volumes. (level 3)

Unit – 1

Matrices

Rank of a matrix by echelon form, normal form. Inverseof Non- singular matrices by Gauss-Jordan method.

System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

Unit – 2

Linear Transformation and Orthogonal Transformation:

Eigen values, Eigen vectors and their properties (without Proof), Diagonalization of a matrix, Cayley Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Unit – 3

Calculus:

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

Unit- 4

Partial differentiation and Applications (Multi variable calculus) :

Partial derivatives, total derivatives, chain rule, change of variables, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit – 5

Multiple Integrals (Multi variable Calculus):

Duble integrals - change of variables (Cartesian and Polar coordinates), Change of order of integration, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Text books:

1. B.S.Grewal,HigherEngineeringMathematics,44/e,Khanna Publishers,2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e,John Wiley & Sons, 2018.

Reference Books:

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 5/e, Alpha ScienceInternational Ltd.,2021 (9th reprint).
2. George B. Thomas, Maurice D.Weir and Joel Hass, Thomas Calculus,14/e, PearsonPublishers, 2018.
3. Glyn James, Advanced Modern Engineering Mathematics, 5/e, Pearson publishers, 2018.
4. Michael Greenberg, Advanced Engineering Mathematics, 9thedition, Pearson edn
5. H. K Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand,2021.

Chemistry
(Common to CSE/IT/CSM/CSD/ECE/EEE)

L	T	P	C
3	0	0	3

Subject Code: 23BHT105

Course Objectives

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods and spectroscopic techniques.

Course Outcomes

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

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Summarize the concepts of Instrumental methods and distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
3. Compare the materials of construction for battery and electrochemical sensors.
4. Demonstrate the preparation, properties, and applications of thermoplastics, thermosetting, elastomers, conducting polymers and bio-degradable polymers.
5. Apply the principle of Band diagrams in the application of conductors and semiconductors.

Unit – 1 Structure and Bonding Models:

Types of Hybridisations - valency shell electron pair repulsion theory (VSEPR), molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of N_2, O_2, CO and NO. π-molecular orbitals of butadiene and benzene, calculation of bond order.

Unit - 2 Instrumental Methods and Applications:

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, Instrumentation, electronic transition, Definition of Chromophore – Definition of Auxochrome – Absorption and Intensity Shifts, IR spectroscopies, Instrumentation fundamental modes and Fingerprint Region. NMR – Principle - Equivalent and Non-Equivalent Protons - Chemical Shift- Splitting – Coupling Constant.

Unit – 3 Electrochemistry and Applications:

Electrochemical cell, Nernst equation, cell potential (EMF) calculations and numerical problems (EMF), potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations). Electrochemical sensors (definition and working principle), reference electrodes – calomel electrode – NHE (or) SHE.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

Unit – 4 Polymer Chemistry:

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of addition polymerization.

Plastics –Thermoplastics and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, Polyester resin(PET).

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

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

Bio-Degradable polymers - Polyhydroxy alkanoates (PHA), Polyl Lactic Acid (PLA).

Unit – 5 Modern Engineering materials:

Semiconductors – Introduction**,** Basic concepts (Salient features of band theory- Definition semiconductor- Elemental semiconductors **-**intrinsic semiconductor and extrinsic semiconductors), applications.

Super conductors – Introduction- Basic Concept (Preparation of $YBa_2Cu_3O_{7-y}$ by ceramic method), Properties- applications.

Supercapacitors: Introduction, Principle & Mechanism of Supercapacitors - Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

Text Books:

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

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

Introduction to Programming
(Common to all Branches)

L	T	P	C
3	0	0	3

Subject Code: 23EST105

Course Objectives

- To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.

Course Outcomes

1. Understand the fundamentals of Computers and C programming
2. Develop programs using control structures and Arrays to store and manipulate data
3. Design modular programs using functions and storage classes
4. Use structures and pointers to manipulate record based data
5. Implement and manipulate files on secondary storage media

Unit – I

Introduction to Programming: Introduction to components of Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Data Types, Operator precedence and associativitiy, Structure of C program, simple programs using Basic I/O statements.

Unit – II

Control Structures: Decision statements: if, if-else, nested if, if-else-if ladder, and switch

Iterative statements: while loop, do-while loop, for loop, nested loops

Branching: Break, continue

Arrays: Definition, Types: Single Dimensional arrays, Multi-Dimensional arrays, declaration, initialization, accessing elements, Matrix operations and String Handling

Unit – III

Functions: Definition, Declaration, Types of Functions, Parameter passing, Call byvalue and call by reference, Passing Arrays to functions, Recursion, Scope and lifetime of variables, Command line arguments, Storage classes.

Pointers: Definition, Declaration, Initialization, Pointer arithmetic, functions and pointers, Pointer to pointer, Uses of Pointers, arrays and pointers.

Unit – IV

Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays with in structures, pointer to structure, Self-referential structure, passing structure to function, nested structures and unions, Dynamic memory allocation.

Unit–V

File Handling: Introduction, Types of files, Defining and Opening a File, Closing a File, Input/Output operations on Files, Error Handling during I/O operations, Random Access to Files.

Text Books

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2nd Edition, PHI.
2. Behrouz A. Forouzan, "A Structured Approach Using C" Richard F. Gilberg 3rd Edition

References

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Web Links:

1. https://www.tutorialspoint.com › C programming › C – Home
2. https://www.programiz.com/c-programming

IT Workshop
(Common to CSE/IT/CSM/CSD)

Subject Code: 23ESL106

L	T	P	C
1	0	4	3

Course Objectives:
The objective of this course is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables.
- Demonstrate basic command line interface commands on Linux.
- Teach the usage of Internet for productivity and self-paced lifelong learning.
- Demonstrate the web page creation.
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools.

Course Outcomes: Students should be able to:
- Gain knowledge of computer systems such as system units, input devices, and Output devices connected to the computer. Students gain knowledge to understand the booting process that includes switching on the system and being familiar with all the commands of an operating system.
- Able to explain and execute basic Linux commands.
- Gain knowledge to understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers and search engines etc.
- Create a static webpage using HTML.
- Get familiarized with parts office tools like Ms-Word, Excel, and PowerPoint.

Computer Hardware:

Experiment 1:
Identification of peripherals of a PC: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports, and interfaces. A practice on disassembling the components of a PC and assembling them to working condition (optional task).

Operating Systems:

.**Experiment 2:** Operating System installation:
Installing an Operating System Windowson a PC

Experiment 3: Operating System installation:
Installing an Operating System Linux operating system on a PC.

Experiment 4: Linux Operating System commands:
Basic Linux commands like mkdir, rmdir, cat, touch, mv, cp, rm, cd, pwd, echo, date, cal, bc, and ls.

Experiment 5:Networking and Internet:
Networking Commands:Introduction of network models (TCP/IP protocol suite) and basic vocabulary and protocols useful in working with the internet.

Experiment 6: Internet Services:
- Web Browser usage and advanced settings like security, cookies, extensions/ plugins
- Email creation and usage.
- ChatGPT

Experiment 7:Basic Webpage Creation:

Basic HTML tags,Introduction to HTML5 and its tags, Introduction to CSS3 and its properties.
Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Experiment 8: MS – Word

Word Orientation: Describe the Importance of MS- Word

Task 1: Using MS Word to create a project certificate. Features to be covered:-Formatting Fonts in Word, Drop Cap in Word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time options in Word.

Task 2: Creating project abstract for using MS-WORD: Abstract Features to be covered:- Formatting Styles, Inserting table, Bullets, and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, and Paragraphs.

Task 3: Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, and Paragraphs.

Task 4: Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Experiment 9: MS-Excel

Excel Orientation: The mentor needs to tell the importance of MS/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel –Accessing, overview of toolbars, saving excel files, Using help and resources

Task 1: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task 2: Creating Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

Task 3: Calculating GPA - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

Task4: Creating Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation.

Experiment 10: MS-PowerPoint

Task 1: Students will be working on basic PowerPoint utilities and tools which help them create a basic PowerPoint presentation.
Topic covered during this week includes:- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables, and Charts in PowerPoint.

Task 2: Concentrating on the in and out of Microsoft PowerPoint, helping them learn the best Practices in designing and preparing PowerPoint presentations. Topic covered during this week Includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation,

slide slotter, notes,etc), and Inserting – Background, textures, Design Templates, Hidden slides.

Text Books:

1. Vikas Gupta ,"Comdex Information Technology course tool kit" , WILEY Dreamtech
2. Cheryl A Schmidt ,"The Complete Computer upgrade and repair book", 3rd edition, WILEY Dreamtech
3. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.
4. Kate J. Chase ,"PC Hardware and A+ Handbook" –PHI (Microsoft)
5. Grannell, Craig, Victor Sumner, and DionysiosSynodinos. The essential guide to HTML5 and CSS3 web design. Friends of ED, 2012.

Reference Books:

1 Scott. Mueller, 2008, Upgrading and Repairing PCs, 22/e, QUE,
2 Cheryl A Schmidt ,The Complete Computer upgrade and repair book,3/e , Dreamtech

Communicative English Lab
(Common to all Branches)

Subject Code: 23BHL101

L	T	P	C
0	0	3	1.5

Course Objectives

- To enable students to cultivate proper speech habits
- To enhance the ability of students to make extempore speeches
- To help students master techniques of being successful in debates and group discussions
- To assist students to acquire effective and adequate presentation skills
- To prepare students to face interviews in an assertive manner

Course Outcomes

1. Students will be able to pronounce words accurately.
2. Students will be able to speak spontaneously.
3. Students will be able to participate in debates and group discussions and contribute proactively.
4. Students will be able to present data on select topics using pre-existing slides.
5. Students will be able to face interviews confidently.

Unit – 1

Phonetics — Neutral English Accent

Unit – 2

JAM session — Role play

Unit- 3

Debate — Group Discussion

Unit – 4

Poster Presentation — PPT Presentations

Unit – 5

Cover letter — Résumé — Interview Skills

Suggested Software:

- Walden InfoTech
- Young India Films

Reference Books:

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press. 2018.
2. Samson T : Innovate with English, Foundations
3. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016.
4. Jayashree, M Let's Hear them Speak: Developing Listening-Speaking skills in English. Sage Publications.
5. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
6. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students, (3rd Ed.) Trinity Press.

Reference Links

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw
12. https://www.linguahouse.com/en-GB
13. https://www.ted.com/watch/ted-ed

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Chemistry Lab
(Common to CSE/IT/CSM/CSD/ECE/EEE)

Subject Code: 23BHL104

L	T	P	C
0	0	3	1.5

Course Objectives

- Verify the fundamental concepts with experiments.

Course Outcomes

At the end of the course, the students will be able to

1. Determine the cell constant, conductance and potential of solutions.
2. Prepare advanced polymer Bakelite materials.
3. Measure the strength of an acid present in secondary batteries by pH metry.
4. Analyse the sample using spectroscopic techniques.
5. Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, of surface tension and viscosity etc

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method.
2. Conduct metric titration of strong acid vs. strong base.
3. Conduct metric titration of weak acid vs. strong base.
4. Determination of cell constant and conductance of solutions.
5. Potentiometer - determination of redox potentials and emfs.
6. Determination of Strength of an acid in Pb-Acid battery. (pH metry)
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law. (Colorimetric estimation of iron)
9. Wavelength measurement of sample through UV-Visible Spectroscopy.
10. Identification of simple organic compounds by IR.
11. Preparation of nanomaterials by precipitation method.
12. Estimation of Ferrous Iron by Dichrometry.
13. Determination of surface tension and viscosity.
14. Determination of Hardness of water sample by EDTA Method
15. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method.
16. Determination of Chloride content present in given water sample

Text Books

1. "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

Computer Programming Lab
(Common to all Branches)

Subject Code: 23ESL105

L	T	P	C
0	0	3	1.5

Course Objectives

- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

Course Outcomes

1. Solve the given problem using the syntactical structures of C language.
2. Design programs involving decision structures and loops.
3. Apply programming to solve different operations on arrays and strings.
4. Develop modularity concept using functions and write programs for allocating memory dynamically.
5. Construct C program that uses structures and unions and implement file operations on given application.

List of Experiments

1. Write the C programs to calculate the following
   a) Area of triangle when sides are given.
   b) Program for Type Casting.
   c) Interchanging values of two variables.

2. Write the C programs to perform the following
   a) Conversion of Fahrenheit to Celsius and vice versa
   b) Simple interest calculation
   c) Square root of a given number

3. Write the C programs to perform the following
   a) Read lower case character and convert into upper case.
   b) Find maximum of 3 values using conditional operator.
   c) Calculate area and perimeter of circle.

4. Write C programs for the following using decision making statements
   a) Find roots of quadratic equation.
   b) Find the max and min of three numbers using if-else.
   c) Calculate the grades of a student.
   d) Find the given year is a leap year or not.

5. Write the C programs to perform the following
   a) Arithmetical operations using switch-case.
   b) Read a number and display in reverse.
   c) Check for Armstrong number property

6. Write the C programs to perform the following
   a) Find factorial of given number
   b) Check a number is palindrome property
   c) Generate Fibonacci series.
   d) Generate Prime numbers between two numbers.

7. Implement the following using arrays
    a) Largest and smallest from a list of elements.
    b) Program for Linear Search.
    c) Program for Bubble Sort.

8. Implement the following using arrays
    a) Matrix addition.
    b) Matrix Multiplication.
    c) Transpose of a matrix.
    d) Program using string handling functions.

9. Write the C programs to perform the following
    a) Factorial using recursion and non recursion.
    b) GCD using recursion and non recursion.

10. Write the C programs to perform the following
    a) Find the sum and average of list of elements using DMA Functions
    b) Implementation of call by value and call by reference.

11. Write the C programs to perform the following
    a) Implementation of array of structure.
    b) Demonstration of Union.

12. Write the C programs to perform the following
    a) Write a C program to write and read text into a binary file using fread() and fwrite()
    b) Copy the contents of one file into another.
    c) Count the number of characters, words and lines in a file.

Text Books:

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2 nd Edition, PHI.
2. Behrouz A. Forouzan, “A Structured Approach Using C” Richard F. Gilberg 3rd Edition

Reference Books:

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Web References:

1. https://www.tutorialspoint.com › C programming › C – Home
2. https://www.programiz.com/c-programming

Health and Wellness, Yoga and Sports
(Common to all Branches)

Subject : 23MCS103

L	T	P	C
0	0	1	0.5

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes: After completion of the course the student will be able to

1. Understand the importance of yoga and sports for Physical fitness and sound health.
2. Demonstrate an understanding of health-related fitness components.
3. Compare and contrast various activities that help enhance their health.
4. Assess current personal fitness levels.
5. Develop Positive Personality

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups.

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar.

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball,

Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.

Practicing general and specific warm up, aerobics

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping andrunning.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning,2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as manyas Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

Differential Equations and Vector Calculus
(Common to all Branches)

L	T	P	C
2	1	0	3

Subject Code: 23BHT103

Course Objectives:

- To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications as follows.
- To furnish the learners in the concept of first order and first degree differential equations and multivariable calculus.
- To enlighten the learners in the concept of higher order differential equations with constant coefficients.
- To furnish the learners with solution methods for partial differential equations that model physical processes
- To equip knowledge with basic concepts and techniques to interpret the physical meaning of different operators such as gradient, curl and divergence by handling various real-world applications
- To furnish the learners with basic concepts and techniques the work done against a field, circulation and flux using vector calculus by handling various real-world applications.

Course Outcomes:

CO-1: Solve the first-order differential equations and apply to real-life concepts such as law of growth (decay), basic electrical circuits.(level 3)

CO-2: Solve linear differential equations of higher order with constant coefficients using complementary functions and particular integrals, including variation of parameters, and interpret their applications in L-C-R electrical circuits. (level 3)

CO-3: Apply Lagrange's method to solve first-order linear partial differential equations and solve 2^{nd} and higher order homogeneous partial differential equations. (level 3)

CO-4: Compute gradient, divergence and curl of scalar and vector point functions and show the vector identities. (level 3)

CO-5: Solve line, surface and volume integrals; verify and apply vector integral theorems- Green's, Stoke's and Divergence theorems. (level 3)

Unit – 1

Differential equations of first order and first degree Exact equations and equations reducible to exact form. Linear differential equations – Bernoulli's equations. Newton's Law of cooling – Law of natural growth and decay- Electrical circuits

Unit – 2

Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general particular integral, method of variation of parameters. L-C-R Circuit problems.

Unit – 3

Partial Differential Equations Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

Unit – 4

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 – 5

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 problems on these theorems.

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e,John Wiley & Sons, 2018.
2. B.S.Grewal,HigherEngineeringMathematics,44/e,Khanna publishers,2017.

Reference Books:

1. Dennis G.Zill and Warren S.Wright, Advanced Engineering Mathematics, Jones andBartlett, 2018.
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).
5. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2017

Engineering Physics
(Common to all Branches)

Subject Code: 23BHT104

L	T	P	C
3	0	0	3

Course Objectives

- Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses.
- To identify the importance of the optical phenomenon. interference, diffraction and polarization related to its Engineering applications
- Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law
- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
- Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of de Broglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals.
- To Understand the Physics of Semiconductors and their working mechanism, Concept utilization of transport phenomenon of charge carriers in semiconductors.

Course Outcomes

1. **Explain** the need of coherent sources and the conditions for sustained interference (L2). **Identify** the applications of interference in engineering (L3). **Analyze** the differences between interference and diffraction with applications (L4). **Illustrate** the concept of polarization of light and its applications (L2).
2. **Classify** various crystal systems (L2). **Identify** different planes in the crystal structure (L3). **Analyze** the crystalline structure by Bragg's X-ray diffractometer (L4).
3. **Explain** the concept of dielectric constant and polarization in dielectric materials (L2). **Summarize** various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2).
4. **Describe** the dual nature of matter (L1). **Explain** the significance of wave function (L2). **Identify** the role of Schrodinger's time independent wave equation in studying particle in one- dimensional infinite potential well (L3). **Identify** the role of classical and quantum free electron theory in the study of electrical conductivity (L3).
5. **Classify** the crystalline solids (L2). **Outline** the properties of charge carriers in semiconductors(L2). **Identify** the type of semiconductor using Hall effect (L2). **Apply** the concept of effective mass of electron (L3).

Unit – 1

WAVE OPTICS Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & Diffraction Grating (Qualitative).

Polarization: Introduction -Types of polarization - Polarization by reflection, and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes

The students will be able to

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)

- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit – 2

CRYSTALLOGRAPHY Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (h k l) planes. Bragg's law - X-ray Diffractometer – crystal structure determination by Laue method and Powder method.

Unit Outcomes

The students will be able to

- **Classify** various crystal systems (L2)
- **Identify** different planes in the crystal structure (L3)
- **Analyze** the crystalline structure by Bragg's X-ray diffractometer (L4)

Unit – 3

DIELECTRIC AND MAGNETIC MATERIALS Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius-Mossotti equation.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Classification of magnetic materials: Dia, Para, Ferro, Antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism (Qualitative) - Hysteresis - soft and hard magnetic materials.

Unit Outcomes

The students will be able to

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence(L2)

Unit – 4

Qantum Mechanics and Free electron theory Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution and its temperature dependence.

Unit Outcomes

The students will be able to

- **Explain** the concept of dual nature of matter (L2)
- **Understand** the significance of wave function (L2)
- **Interpret** the concepts of classical and quantum free electron theories (L2)

Unit – 5: Semiconductors **10 hrs**

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Extrinsic semiconductors: density of charge carriers - Drift and diffusion currents – Einstein's equation - Hall effect and its Applications.

Unit Outcomes

The students will be able to

- **Outline** the properties of charge carriers in semiconductors (L2)
- **Understand** the carrier transportation in semiconductors (L2)
- **Identify** the type of semiconductor using Hall effect (L2)

Text Books

1. "A Text book of Engineering Physics" - M. N. Avadhanulu, P.G.Kshirsagar & TVS ArunMurthy, S.Chand Publications, 11th Edition 2019.
2. "Engineering Physics" - D. K. Bhattacharya and Poonam Tandon, Oxford press (2015).
3. "Engineering Physics" - P. K. Palanisamy SciTech publications.

Reference Books

1. "Fundamentals of Physics" - Halliday, Resnick and Walker, John Wiley &Sons.
2. "Engineering Physics" - M.R. Srinivasan, New Age international publishers (2009).
3. "Engineering Physics" - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
4. "Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
5. "Semiconductor physics and devices:Basic principle" - A. Donald, Neamen, Mc GrawHill.
6. "Engineering Physics" - B.K. Pandey and S. Chaturvedi, Cengage Learning
7. "Solid state physics" – A.J.Dekker ,Pan Macmillan publishers
8. "Introduction to Solid State Physics" - Charles Kittel ,Wiley

Data Structures
(Common to CSE/IT/CSM/CSD)

Subject Code: 23CST101

L	T	P	C
3	0	0	3

Course Objectives

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Course Outcomes

1. Compute the time and space complexities and calibrate the performance of a given algorithm.
2. Compare the performances of various Searching and Sorting techniques.
3. Demonstrate the advantages of dynamic memory allocation via linked lists.
4. Illustrate the applications of Stacks and Queues.
5. Implement the basic operations, search and traversals on Trees and Graphs.

Unit – I

Introduction: Basic Concepts of Data Structures; Notations of Time & Space Complexity: Performance Analysis of algorithms: Iterative & Recursive Algorithms; Asymptotic Notations (O, Ω, θ, o, ω).

Unit – II

Searching: Linear Search, Binary Search: Algorithm & Analysis;

Hashing: Hash functions, Collision Resolution techniques;

Sorting: Methodology & Performance Analysis: Selection, Bubble, Insertion, Quick, Merge, Heap Sort.

Unit – III

Single Linked List: Comparison with Arrays; Efficient Operations: Creation, Insertion, Deletion, Traversing, Searching;

Doubly and Circular Linked Lists: Efficient Representation Operations: Creation, Insertion, Deletion, Traversing; Applications: Polynomial expressions.

Unit – IV

Stacks: Definition & Efficient operations: Push & Pop; Applications of Stacks: Conversion & Evaluation of expressions.

Queues: Types of Queues: Simple Queue; Circular Queue: Efficient Operations on Queues; Implementation of Stack and Queue using Linked Lists.

Unit–V

Trees: Basic Terminology; Binary Tree Traversals; Binary Search Tree Operations;

Graph: Basic Terminologies and Representations; Traversal algorithms: BFS, DFS; Dijkstra's Algorithm.

Text Books

1. **"Data Structures and Algorithm Analysis",** Mark Allen Weiss , Fourth Edition , Pearson.
2. "**Fundamentals of Data Structures**", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

Reference Books:

1. **"Data Structures and Algorithm Analysis",** Michel T. Goodrich, Roberto Tamassia, David Mount, 2nd Edition, John Wiley & Sons, Inc.
2. **"Data Structure And Algorithms In C++",** Adam. Drozdek , 4th edition, Cengage.

Refrerence Links:

1. https://www.tutorialspoint.com › C programming › C – Home
2. https://www.programiz.com/c-programming

Basic Electrical and Electronics Engineering
(Common to CSE-IT-CSM-CSD-Mech-CE)

Subject Code: 23EST102

L	T	P	C
3	0	0	3

Course Objectives

- To introduce the basic knowledge of electric circuits
- To analyze AC circuits.
- To provide knowledge on Magnetic circuits.
- To understand the working, characteristics of PN Junction diode, Zener diode
- To explain the working, characteristics of transistor (BJT) in different configurations, JFET and MOSFET.

Course Outcomes

1. Able to summarize different electrical circuits.
2. Able to outline the basics of AC circuits.
3. Able to examine DC Generator & DC Motor.
4. Able Describe the working principle of PN Junction diode, Zener diode
5. Able to Describe the working and behavior of transistor (BJT) in different configurations, JFET and MOSFET.

Unit – 1

Introduction to Electric Circuits Basic definitions, Electrical circuit elements (R, L and C), Voltage and current sources Independent and dependent sources, Ohm's Law, Series & Parallel circuits, Source transformation, Kirchhoff's Laws, Faraday's laws of electromagnetic induction, Lenz's law, simple problems.

Unit – 2

AC Circuits Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series only), real power, reactive power, apparent power, power factor, simple problems.

Unit – 3

DC Machines DC Generator Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and externalcharacteristics of shunt generator, Applications.
DC Motor Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 pointstarter, Applications.

Unit – 4

Diode Characteristics Formation of PN junction diode, V-I Characteristics of Diode, Diode as a switch, ZenerDiode Characteristics, Zener Diode as Voltage Regulator.

Unit – 5

Transistor Characteristics: Bipolar Junction Transistors (BJT) - input & output Characteristics of transistor in CB, CE, CC configurations, Relationship between α, β and γ. Field effect transistors (FET) -Characteristics of JFET, MOSFET (Enhancement and depletion)

Text Books:

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Integrated Electronics – Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill,2009.

Reference Books:

1. Basic Electrical Engineering Dr.K.B.MadhuSahuscitech publications (india) pvt.ltd.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9thEdition,2006.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.

Engineering Drawing
(Common to CSE/IT/CSM/CSD/ECE/EEE)

Subject Code: 23ESL103

L	T	P	C
1	0	4	3

Course Objectives

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes

On completion of course, student should be able to

1. To draw general constructions and conic sections
2. To draw the projection of points and lines with respect to HP & VP
3. To project and draw straight lines, and project plane surfaces with respective to one reference plane
4. Develop the projections for a simple solids and their inclinations with respect to one reference plane.
5. Convert orthographic views into isometric projections and vice-versa.

List of Exercises:

Geometrical Constructions

Drawing Instruments and their uses, Types of Lines and Dimensioning, Line bisecting, Angle bisecting, Line divided into equal number of parts, Construction of Regular Polygons (Pentagon and Hexagon).

Construction of Conics: General method**,** Oblong method and Concentric circles method.

Simple Projections

Introduction to Orthographic Projections (First Angle Projection only).

Projections of Points: A point situated in I,II,III & IV quadrants.

Projections of Straight Lines: Line parallel to one or both the of the planes, Line contained by one or both the planes, Line perpendicular to one of the planes, Line inclined one plane and parallel to other.

Projections of Planes: Types of planes, Traces of planes, planes parallel to one of the planes and plane inclined to one reference plane.

Projections of Solids

Polyhedra: Types of Solids, Projections of Solids in simple positions, Projections of Solids axis inclined to the V.P. and parallel to the H.P. Projections of Solids axis inclined to the H.P. and parallel to the V.P.

Solids of Revolution: Projections of Solids axis inclined to the V.P. and parallel to the H.P. Projections of Solids axis inclined to the H.P. and parallel to the V.P.

Orthographic-Isometric Projections

Conversion of pictorial view (Isometric views) into orthographic views.

Isometric Projections: Isometric axes, lines & planes. Isometric scale, Isometric drawing, Isometric drawing of plane figures, prisms and pyramids. Conversion of orthographic views into Isometric views.

Text Books:

1. Engineering Drawing, N. D. Bhatt, V. M. Panchal, Charotar Pub.
2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Pub.

Reference Books:

1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Pub.
2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Pub.

Engineering Physics Lab
(Common to all Branches)

L	T	P	C
0	0	3	1.5

Subject Code: 23BHL102

Course Objectives:

- To study the concepts of optical phenomenon like interference, diffraction etc., recognize theimportance of energy gap in the study of conductivity and Hall effect in semiconductors andstudy the parameters and applications of dielectric and magnetic materials by conducting experiment.

Course Outcomes: The students will be able to

1. Operate optical instruments like travelling microscope and spectrometer.
2. Estimate the wavelengths of different colours using diffraction ngrating.
3. Discuss the magnetic, electrical and electronic properties of materials.
4. Analyze the mechanical and thermal properties of materials.
5. Calculate the band gap of a given semiconductor.

List of Experiments

1. Determination of radius of curvature of a given Plano-convexlens by Newton'srings.
2. Determination of wavelengths of different spectrallines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Determination of width of a slit using diffraction phenomenon.
4. Determination of wavelength of Laser light using diffractiongrating.
5. Estimation of Planck's constant using photo cell.
6. To study V-I characteristics of a PN junction diode in forward and reverse biasing conditions.
7. Magnetic field along the axis of a current carrying circularcoilby StewartGee'sMethod.
8. Determination of Hall voltage and Hall coefficient of a given semiconductor using Halleffect.
9. Determination of temperature coefficients of a thermistor.
10. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
11. Determination of rigidity modulus of the material of the given wire using Torsionalpendulum.
12. Sonometer : Verification of laws of stretched string.
13. Determination of Frequency of electrically maintained tuning for k by Melde'sexperiment.
14. Determination of energy bandgap of a given semiconductor
15. Determination of thickness of a thin object using wedge shaped film.
16. Determination of crystal structure and lattice parameter of a given crystal using powder diffraction data.
17. Determination of Young's modulus of the given beam by non-uniform bending.
18. Determination of dielectric constant using resonance method.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experimentsmay be conducted in virtual mode.

References Books

- A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

Reference Links

- www.vlab.co.in
- https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

Data Structures Lab
(Common to CSE/IT/CSM/CSD)

Subject Code: 23CSL101

L	T	P	C
0	0	3	1.5

Course Objectives

Develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures

Course Outcomes

1. Develop Programs as recursive solutions for common searching and sorting algorithms.
2. Illustrate the use of dynamic memory allocation through linked list operations.
3. Design programs for linear data structures such as Stacks, and Queues.
4. Develop Programs for implementing various operations on Binary Trees and Binary Search Trees.
5. Apply the fundamental graph algorithms to solve problems using Depth-First and Breadth-First Search.

List of Experiments

1. a) Write a C program to Print 1 to 'n' numbers without using any loops.
   b) Write a C program to reverse the digits of a number using recursive function.
   c) Write a C program to solve the Towers of Hanoi problem using recursive function.

2. a) Design & Develop a C program to perform linear search for a key value in a given list.
   b) Design & Develop a C program to perform Binary search for a key value in a given list.

3. Given a File of **N** employee records with a set **K** of Keys(6-digit) which uniquely determine the records in file **F**. Assume that file **F** is maintained in memory by a Hash Table(HT) of **m** memory locations with **L** as the set of memory addresses (2-digit) of locations in HT. Let the keys in **K** and addresses in **L** are Integers.

   Design and develop a Program in C that uses Hash function **H: K→L** as H(**K**)=**K** mod **m** **(remainder** method), and implement hashing technique to map a given key **K** to the address space **L.** Resolve the collision (if any) using **linear probing**.

4. a) Design, Develop and Implement a C program that implement Selection Sort to sort a given list of integers.
   b) Design, Develop and Implement a C program that implement Bubble Sort to sort a given list of integers.

5. a) Design, Develop and Implement C program that implement Quick Sort to sort a given list of integers.
   b) Design, Develop and Implement C program that implement Heap Sort to sort a given list of integers.

6. Design, Develop and Implement a menu driven Program in C to represent polynomials using a single linked list and implement functions Polynomials. Each Node: *[Coefficient, Exponent, Next]*

a. Create Polynomials using **Last Insertion** of nodes, in a decreasing order of exponents.
Example: Polynomial P: "$7x^3 + 3x^2 + 9x + 6$" has 4 nodes. 7,3→3,2→9,1→6,0→Null
b. Perform Addition of 2 polynomials. (coeff.s of 2 nodes are added only if exp.s match)
Example: Let Polynomials P: "$7x^3 + 3x^2 + 9x + 6$" & Q: "$5x^4 + 4x^2 + 6x$".
Then P+Q = $5x^4 + 7x^3 + 7x^2 + 15x + 6$".
c. Perform Subtraction of 2 polynomials.
d. Display the Polynomial (nodes) in it.
e. Exit

7. Design, Develop and Implement a menu driven Program in C for the following operations on **STACK** of Integers (Array Implementation of Stack with maximum size **MAX**)
a. ***Push*** an Element onto Stack.
b. ***Pop*** an Element from Stack.
c. Demonstrate how Stack can be used to check ***Palindrome.***
d. Display the status (No. of elements, Empty/Full/not) of Stack.
e. Exit
Support the program with appropriate functions for each of the above operations

8. Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: **+, -, *, /, %(Remainder), ^(Power)** and **alphanumeric** operands**.**

9. Design, Develop and Implement a menu driven Program in C for the following operations on **QUEUE** of Characters (Array Implementation of Queue with maximum size **MAX**)
a. Insert an Element into QUEUE
b. Delete an Element from QUEUE
c. Display the status (No. of elements, Empty/Full/not) of QUEUE
d. Exit
Support the program with appropriate functions for each of the above operations

10. a) Design, Develop and Implement a C program to implement Binary tree traversals using iterative functions.
b) Design, Develop and Implement a C program to implement Binary tree traversals using recursive functions.

11. Design, Develop and Implement a menu driven Program in C for the following operations on **Binary Search Tree (BST)** of Integers
a. Create a BST of **N** Integers: 89, 38, 24, 40, 95, 76, 57, 11, 59, 18
b. Traverse the BST in In-order, Pre-order and Post-Order
c. Search the BST for a given element (**Key**) and report the appropriate message
e. Exit

12. Design & Develop a Program in C for the following operations on **Graph (G)** of Cities
a. Create a Graph of **N** cities using Adjacency Matrix.
b. Print all the nodes **reachable** from a given starting node in a digraph using **DFS or BFS** method.
c. Find the shortest paths to all Cities from a given City using Dijkstra's Algorithm.

Text Books:

1. "Data Structures and Algorithm Analysis", Mark Allen Weiss , Fourth Edition , Pearson.
2. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, and Computer Science Press.

ReferenceBooks:

1. **"Data Structures and Algorithm Analysis",** Michel T. Goodrich, Roberto Tamassia, David Mount, 2nd Edition, John Wiley & Sons, Inc.
2. **"Classic Data Structures",** Second Edition, Debasis Samanta, PHI, 2012, New Delhi, India.
3. **"Computer science, A structured programming approach using C",** Third edition, B.A. Forouzan and R.F. Gilberg, 2011, Thomson, New Delhi, India.

Reference Links:

1. https://www.geeksforgeeks.org/data-structures/

Basic Electrical and Electronics Engineering Lab
(Common to CSE-IT-CSM-CSD-Mech-CE)

L	T	P	C
0	0	3	1.5

Subject Code: 23ESL102

Course Objective:

To introduce the student to study different electrical & electronics components and to verify the basic laws related to electrical engineering, analyze the V-I characteristics of P-N diode and transistor characteristics.

Course Outcomes:

Students will be able to

1. Label various types of electrical & electronics components.
2. Demonstrate various basic electrical laws.
3. Determine resistance of the series and parallel connected circuits.
4. Analyze the V-I characteristics of P-N diode.
5. Analyze the Transistor characteristics.

List of Experiments:

1. Study of electrical components.
2. To verify Ohm's law.
3. To verify Kirchhoff's current law
4. To verify Kirchhoff's voltage law.
5. To verify the total resistance of the series and parallel connected circuits.
6. Study of electronics components.
7. PN Junction diode forward and reverse bias characteristics
8. Zener diode characteristics.
9. Transistor CB characteristics (Input and Output)
10. Transistor CE characteristics (Input and Output)

Additional Experiments:

11. Half wave rectifier
12. To find voltage current relationship for series RL circuit and determine power & power factor.

NSS/NCC/Scouts &Guides/Community Service
(Common to all Branches)

L	T	P	C
0	0	1	0.5

Subject Code: 23MCS102

Course Objective

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcome

After completion of the course the students will be able to

1. Understand the importance of discipline, character and service motto.
2. Solve some societal issues by applying acquired knowledge, facts, and techniques.
3. Explore human relationships by analyzing social problems.
4. Determine to extend their help for the fellow beings and downtrodden people.
5. Develop leadership skills and civic responsibilities.

Unit – 1 Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

Unit – 2 Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

Unit – 3 Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme
2. Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
3. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
4. Davis M. L. and Cornwell D. A., ―Introduction to Environmental Engineering‖, McGraw Hill, New York 4/e 2008
5. Masters G. M., Joseph K. and Nagendran R. ―Introduction to Environmental Engineering and Science‖, Pearson Education, New Delhi. 2/e 2007
6. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

UNIVERSAL HUMAN VALUES
(COMMON TO ALL B.TECH BRANCHES)

L	T	P	C
2	0	0	2

Subject Code: 23BHT207

Course Objectives:

- To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.
- To Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcomes:

1. Upon completion of this course students can aware of ethical behavior in the work place
2. To shapes the students by the end of this curriculum being harmony himself
3. To understand the human relationship and values
4. To understand the Nature and its existence of connectivity
5. Learn the importance of Human values and universal order

UNIT-I

Introduction: Understanding the need, basic guidelines, content and process for Value Education- Self Exploration - what is it?- Continuous Happiness and Prosperity Morals, Values and Ethics – Integrity – Work Ethics – Service Learning- Respect for others- Caring – Sharing – Honesty – Courage – Value time – Co-operation – Commitment Self-confidence – Spirituality.

UNIT-II

Understanding Harmony in the Human Being: Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'- Understanding the needs of Self ('I') and 'Body'- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

UNIT-III

Understanding Harmony in the Family and Society: Harmony in Human-Human Relationship- Understanding harmony in the Family- the basic unit of human interaction Understanding values in human-human relationship- Trust (Vishwas) and Respect (Samman) as the foundational values of relationship- Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship

UNIT- IV

Understanding Harmony in the Nature and Existence: Whole existence as Co-existence- Understanding the harmony in the Nature- Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature- Holistic perception of harmony at all levels of existence

UNIT-V

Implications of the Holistic Understanding of Harmony: Natural acceptance of human values - Definitiveness of Ethical Human Conduct- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

Reference Books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics
2. "Professional Ethics and Human Values" by Prof. D.R. Kiran.
3. "Engineering Ethics & Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
4. A N Tripathy, 2003, Human Values, New Age International Publishers
5. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press
6. M Govindrajan, S Natrajan& V. S Senthilkumar, Engineering Ethics (including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Python Programming
(Common to all Branches)

Subject Code:23EST206

L	T	P	C
3	0	0	3

Course Objectives:

- Python programming course aims to empower students with the knowledge, skills, and practical experience essential for becoming proficient Python programmers.
- By mastering Python fundamentals, exploring its rich ecosystem, and learning software development best practices, students develop problem-solving abilities and gain the confidence to tackle real-world challenges.

Course Outcomes:

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

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Implement file handling functions and user defined functions in python.
5. Interpret the concepts of Object-Oriented Programming as used in Python and Regular Expressions.

Unit – I

Introduction to Python: History, Features, Installing Python, Running Python, Operators, Statements and Expressions.

Control Structures: Conditional Statements, Loops

Unit – II

Data Types: Mutable vs immutable data type, Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules. Sequences - Strings, Lists, and Tuples, Dictionaries and Set Types

Unit – III

Functions: Definitions, Declaration, Parameter passing, calling functions

File Handling: creating a file, opening a file, I/O with file (read, write, append), closing a file

Unit – IV

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

Unit – V

Classes in Python: Principles of Object Orientation, Creating Classes, Instance Methods, Special Methods, class Variables and Inheritance, Data base connectivity.

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Textbooks:

1. Wesley J .C hun "Core Python Applications Programming", 3rd Edition, 2012, Prentice Hall.
2. Brian jones, David Beazley "Python Cookbook ", 3rd Edition.

Reference Books:

1. Mark Lutz "Programming Python, 4th Edition" O'Reilly Media.
2. Think Python, Allen Downey, Green Tea Press

Reference Links:

1. https://docs.python.org/3/tutorial/index.html
2. https://pythonprogramminglanguage.com

Mathematical Foundation in Computer Science

Subject Code: 23CST202

L	T	P	C
3	0	0	3

Course Objectives

- Apply the knowledge in equivalence formulas, tautological implications in finding normal forms, and theory of inference in Statement Calculus and predicates, and explain Mathematical Induction principle and apply the same
- Develop the skill in equivalences and inference theory in Predicate Calculus
- Learn the properties of relations, POSETS, LATTICES, functions and to apply in problem solving skills
- Acquire the knowledge and skill to draw graphs and related structures and to apply the knowledge skill in solving problem
- Enhance skill and knowledge to draw of trees and solve minimum cost spanning tree problems and solve and formulate, generating functions and recurrence relations.

Course outcomes

1. Apply equivalence formulas, tautological implications in finding normal forms, and theory of Inference in Statement Calculus and predicates, and explain Mathematical Induction Principle and apply the same.
2. Apply skill in equivalences and inference theory in Predicate Calculus.
3. Explain the properties of relations, POSETS, LATTICES, functions and apply the same in solving the problems.
4. Identify the properties of graphs and related structures and solve the related problems
5. Identify the properties of Trees and solve minimum cost spanning tree problems and solve Generating functions and recurrence relations

Unit – I

Mathematical logic: Fundamentals (statements and notations, connectives, Truth tables), Tautologies, Equivalence of formulas, Tautological implications, Normal forms, Theory of Inference .

Unit – II

Predicate Calculus: Predicate logic, statement functions, variables and quantifiers, free and bound variables. Inference Theory of the Predicate Calculus: Logical implication involving quantifiers, Statements with more than one variable.

Unit – III

Relations : Relations, Properties of Relations, Equivalence relations, partial orders, Lattices, properties of Lattices, Special types of Lattices (Proofs not required).

Unit – IV

Graph Theory: Basic Concepts of Graphs, Matrix representation of graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerin & Hamiltonian graphs, Planar Graphs, Graph coloring.

Unit – V

Trees: Introduction, Spanning Trees, Minimum cost spanning trees (Prim's & Kruskal's), **Recurrence relations**: Generating Function of Sequences, calculating coefficient of Generating function, Partial Fractions. First order and second order Linear Homogeneous and Non- Homogeneous recurrence relations, method of generating functions.

Text Books:

1. Trembly J.P. and Manohar.P, "Discrete Mathematical Structures with applications to computer science," Tata McGraw Hill, New Delhi, 2017
2. Kolman B, Busoy R.C, Ross S.C, Discrete MathematicalStructures, 5thEdition,Prentice Hall, 2004.
3. D.S.Chandrasekharaiah, "Mathematical Foundation of Computer Science" Prism Publications 2009.

Reference Books:

1. J.L. Mott, A. Kandel, T.P Baker, "Discrete Mathematics for Computer Scientists and Mathematicians," Prentice Hall India, 2nd Edition 2015
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications," Tata McGraw Hill, New Delhi, 7th edition, 2017
3. V. Krishnamurthy, "Combinatories:Theory and Applications", East-West Press. Seymour Lipschutz, M.Lipson, "Discrete Mathemataics" Tata Mc Graw Hill, 2005.

Data Base Management System
(Common to IT, CSM & CSD)

Subject Code: 23ITT201

L	T	P	C
3	0	0	3

Course objectives:

- Databases form the backbone of all major applications today – tightly or loosely coupled, intranet or internet based, financial, social, administrative, and so on.
- Structured Database Management Systems (DBMS) based on relational and other models have long formed the basis for such databases.
- Consequently, Oracle, Microsoft SQL Server, Sybase etc. have emerged as leading commercial systems while MySQL, PostgreSQL etc. lead in open source and free domain.

Course outcomes:

1. Describe the fundamental elements of relational database management systems and SQL.
2. Explain the basic concepts of relational data model, relational database design, relational algebra, constraints and functions of SQL.
3. Design ER-models to represent simple database application scenarios and formulate SQL queries on data
4. Improve the database design by normalization and applies transaction management concepts.
5. Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing

Unit- I

Introduction: Database Systems versus file Systems, Database System Applications, Purpose of Database Systems, View of Data, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators. ***(Korth)***

SQL: Overview of the SQL Query Language, Data Types, Data Definition Language, Data Manipulation Language.

Unit- II

Relational Model: Structure of Relational Database, Database Schema, Keys, Schema Diagrams.

Relational Algebra: Select Operation, Project Operation, Composition of Relational Operations, Cartesian-Product Operation, Join Operation, Set Operations, ***(Korth)***

SQL: Integrity Constraints, Set Operations, Groupby and Having, Aggregate Functions, Null values

Unit- III

Database Design Using the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Complex Attributes, Mapping Cardinalities. ***(Korth)***

SQL: Nested Queries, Join Operations, Views, Data Control Language, Transaction Control Language, Triggers

Case Study: Converting E-R Diagrams to Relational Schemas

Unit- IV

Schema refinement and Normal forms: Problems Caused by Redundancy, Decompositions, Problem related to Decomposition, Functional Dependencies, Reasoning about FDS, FIRST, SECOND, THIRD Normal Forms, BCNF, Fourth, Fifth Normal Forms, Properties of Decompositions: Lossless join Decomposition, Dependency preserving Decomposition, Schema refinement in Database Design. ***(Rama krishnan)***

Unit- V

Transaction Concept: ACID Properties, Transaction State, Concurrent Executions, Serializability, Recoverability, Lock–Based Protocols: Locks, Granting of locks, 2PL, implementation of locking, Timestamp Based Protocols***.(Korth)***

Data on External Storage: File Organization and Indexing: Cluster Indexes, Primary and Secondary Indexes; Index Data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, B+ Trees, A Dynamic Index Structure **(Rama krishnan)**

Text Books:

1. Silberschatz, A., Korth, H. F., and Sudarshan, S. Database System Concepts, McGraw-Hill, 7th Edition. 2019.
2. Raghurama Krishnan, Johannes Gehrke: Database Management Systems.TATA McGrawHill ,3rd Edition

Reference Books:

1. Silberschatz, Korth :Database System Concepts. McGraw hill,5th Edition – 2006.
2. Peter Rob ,Carlos Coronel: Data base Systems design Implementation and Management. Cengage Learning, 7th Edition

Links:

1. https://archive.nptel.ac.in/courses/106/105/106105175/

Design Analysis and Algorithms

L	T	P	C
3	0	0	3

Subject Code: 23CST204

Course Objectives:

- To analyze the asymptotic performance of algorithms
- Write rigorous correctness proofs for algorithms, demonstrate a familiarity with major algorithms
- Apply important algorithmic design paradigms and methods of analysis
- Synthesize efficient algorithms in common engineering design situations

Course Outcomes*:*

1. Measure the performance and calculate the Time & Space complexities of algorithms.
2. Design effective algorithms based on Divide and Conquer and Greedy methods.
3. Discuss various problems suitable to Dynamic programming.
4. Find an optimal solution by applying different Branch and Bound techniques.
5. Construct a state space tree to solve different problems using Backtracking technique.

Unit – I

Introduction: Algorithm Definition, Algorithm Specification, Performance Analysis Measurement, Asymptotic Notations, Randomized Algorithms.

Unit – II

Divide and Conquer: General Method, Binary Search, Merge sort, Quick sort, Strassen's Matrix Multiplication.

The Greedy Method: The general Method, knapsack problem, minimum-cost spanning Trees, Job sequencing within deadlines, Single Source Shortest Path Algorithm.

Unit – III

Dynamic Programming: The general method, All pairs-shortest paths, Optimal Binary search tree, 0/1 knapsack, Traveling salesperson problem.

Unit – IV

Graph Algorithms: DFS, BFS, Topological Sorting, Articulation point and Bi-Connected components.

Branch and Bound: General method: LC Search Algorithm. Applications –Travelling sales person problem, 0/1 knapsack problem.

Unit – V

Backtracking: The General Method, The n-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, 0/1 Knapsack Problem.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, India, 2021.
2. Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", Pearson Education, Fourth Edition, India, 2019

Reference Books:

1. Anany Levitin, "Introduction to Design & Analysis of Algorithms", Second Edition,Pearson Education, India, 2018.
2. Jon Kleinberg & Eva Tardos, "Algorithm Design", Second Edition, Pearson Education, India, 2017.

Reference Link:

1. http://nptel.ac.in/courses/106101060/

Python Programming Lab
(Common to all branches)

L	T	P	C
0	0	3	1.5

Subject Code:23ESL207

Course Objectives:

- This course will enable students with a comprehensive understanding of Python programming language, including its history, features, and fundamental concepts, enabling them to write Python programs proficiently.

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

1. Able to implement conditional statements and loops to control the flow of their Python programs effectively.
2. To manipulate strings, lists, tuples, dictionaries, and sets using appropriate Python syntax and built-in functions.
3. To perform basic file operations such as creating, opening, reading, writing, appending, and closing files using Python.
4. To import specific attributes from modules, utilize built-in functions provided by modules, and organize modules into packages effectively.
5. Apply OOP concepts and regular expressions in Python to search, match, and manipulate textual data effectively.

Exercise Questions: 1

Ex 1: Write the python programs to implement all Number type operations.
Ex 2: Write the python programs to perform all String operations.

Exercise Questions: 2

Ex 3: Write the python programs to calculate the List datatype operations.
Ex 4: Write the python programs to perform the Dictionary operations.

Exercise Questions: 3

Ex 5: Write the python programs to implement the recursive function.
Ex 6: Write the python programs to perform the file operations.

Exercise Questions: 4

Ex 7: Write the python programs to implement modules and packages.

Exercise Questions: 5

Ex 8: Write the python program to create class, object and its concepts of OOP.
Ex 9: Write a Python program that uses regular expressions to find all occurrences of a specific pattern in a given text and validations.

Text Books:

1. Wesley J .C hun "Core Python Applications Programming", 3rd Edition, 2012, Prentice Hall.
2. Brian jones, David Beazley “Python Cookbook ”, 3rd Edition.

References Books:

1. Mark Lutz "Programming Python, 4th Edition" O'Reilly Media.
2. Think Python, Allen Downey, Green Tea Press

Links:

1. https://docs.python.org/3/tutorial/index.html
2. https://pythonprogramminglanguage.com

Design Analysis and Algorithms Lab

L	T	P	C
0	0	3	1.5

Subject Code: 23CSL201

Course Objectives:

- The main objective of this course is to design, develop and execute programs for solving common engineering design problems by apply important algorithmic design paradigms and methods of analysis.

Course Outcomes*:*

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

1. Design effective programs based on Divide and Conquer method.
2. Develop effective programs to solve problems based on Greedy method.
3. Implement various problems suitable to Dynamic programming.
4. Illustrate an optimal solution by applying different Branch and Bound techniques.
5. Execute programs to solve different problems using Backtracking technique.

List of Programs

1. Write a program to implement binary search using divide-and-conquer strategy.
2. Write a Program to implement Strassen's Matrix Multiplication using divide-and-conquer strategy.
3. (a) Write a program to find minimum cost spanning tree using Prim's Algorithm.
   (b) Write a program to find minimum cost spanning tree using Kruskal's Algorithm.
4. Write a program to find solution for Job Sequencing Within Deadlines problem.
5. Write a C-program to Implement All-Pairs Shortest Paths problem using Floyd's algorithm.
6. Write a C-program to find solution for Optimal Binary Search Tree problem using Dynamic programming method.
7. Write a C-program to find a Topological Ordering of a Directed Graph.
8. Write a C-program to find all Articulation Points in a Graph.
9. Write a program to Implement Travelling Sales Person problem using Branch and Bounding.
10. Write a C-program to find solution for 0/1 knapsack problem using Branch and Bounding method.
11. Write a program to solve n-QUEENS problem using Backtracking.
12. Write a program to solve Sum of subsets problem for a given set of distinct numbers using Backtracking.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, India, 2021.
2. Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", Pearson Education, Fourth Edition, India, 2019

Reference Books:

1. Anany Levitin, "Introduction to Design & Analysis of Algorithms", Second Edition, Pearson Education, India, 2018
2. Jon Kleinberg & Eva Tardos, "Algorithm Design", Second Edition, Pearson Education, India, 2017.

Links:

1. http://nptel.ac.in/courses/106101060/

Data Base Management System Lab
(Common to IT, CSM & CSD)

Subject Code:23ITL201

L	T	P	C
0	0	3	1.5

Course Objectives:

- This lab enables the students to practice the concepts learnt in the subject DBMS by developing a database.
- The student is expected to practice the designing, developing and querying a database. Students are expected to use "Mysql/Oracle" database.

Course Outcomes:

- Ability to design and implement a database schema for given problem.
- Ability to formulate queries using SQL commands.
- Apply the normalization techniques for development of application software to realistic problems.
- Apply the PL/SQL for development of applications
- Design and implement a project with support of databases

List of Experiments:

1. Implementation of DDL Commands
2. Implementation of DML Commands
3. Implementation of Integrity Constraints
4. **Sample data:** Consider the bank database, where the primary keys are underlined.

   Construct the following SQL queries for this relational database.

   Branch (branch name, branch city, assets)
   customer (ID, customer name, customer street, customer city) loan (loan number, branch name, amount)
   borrower (ID, loan number)
   account (account number, branch name, balance)
   depositor (ID, account number)

5. Implementation of different Nested Queries
6. Implementation of Aggregate Functions
7. Implementation of DCL and TCL Commands
8. Write a PL/SQL program to find the factorial of a given integer and store the integer with it's factorial in a table.
9. Write a PL/SQL program to display the reverse of given number.
10. Implementation of String functions using PL/SQL

11. Write a PL/SQL program to accept the customer id from the user and display the corresponding customer name and address from customer table. Raise user defined exception "invalid- id" when customer id is <=0 and catch built in exceptions "no data found "and display suitable messages for each exception.
12. Write a PL/SQL program that uses a cursor to select the five highest paid employees from the EMP table.
13. Write a code in PL/SQL to create a trigger that prevents updates on a certain column during specific hours of the day.

Text Books:

1. Silberschatz, A., Korth, H. F., and Sudarshan, S. Database System Concepts, McGraw-Hill, 7th Edition. 2019.

Reference Books:

1. Peter Rob ,Carlos Coronel: Data base Systems design Implementation and Management. Cengage Learning, 7th Edition

Links:

1. https://archive.nptel.ac.in/courses/106/105/106105175/

STATISTICAL METHODS
(COMMON TO CSE, CSM, CSD & IT)

Subject Code: 23BHT212

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce and describe Binomial, Poison, Normal distribution.
- To perform sampling theory and estimation.
- To perform large samples tests – test of means and proportion.
- To perform the small sample tests - t-test, F-test and Chi-square test and ANOVA for the give data.
- To determine correlation and regression coefficients for given data**.**

Course Outcomes:

On completion of this course, students will be able to

1. Obtain the probability of a random variable using Binomial, Poison and Normal distribution.
2. Obtain sampling distribution of means for the given data also obtain the probability of sample mean using central limit theorem and to estimate the parameters using point estimation and interval estimation.
3. Perform the large sample tests – test of means and proportions.
4. Perform the small sample tests - t- test, F-test, Chi-Square and analyze ANOVA for the given data.
5. Determine correlation and regression for given data.

UNIT I: Probability Distributions:
Introduction- Random Variables-Discrete distributions: Binomial, Poisson distributions. Continuous distribution: Normal distributions.

UNIT II: Sampling theory and Estimation:
Introduction - Population and sample- Sampling distribution of means (σ known)-Central limit theorem - Point estimation- Maximum error of estimate - Interval estimation

UNIT III: Tests of Hypothesis (Large samples):
Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors –Level of significance - One tail and two-tail tests- Tests concerning single mean and single proportion-Tests concerning difference of means and difference of proportions.

UNIT – IV: Test of Hypothesis (Small Samples):
Introduction - student's - t – test, F-test, Chi-square Test -ANOVA for one-way and two-way classified data.

UNIT V: Correlation and Regression:
Introduction - Concept of correlation–types of Correlation-Karl-Pearson correlation coefficient method and its properties-Rank Correlation Coefficient - Regression-Linear regression and its properties.

Text Books:

1. Richards A Johnson, Irvin Miller and Johnson E Freund. Probability and Statistics for Engineering, 9th Edition, PHI.
2. G. Jay Kerns, Introduction to Probability and Statistics Using R, First Edition ISBN: 978-0-557-24979-4. (Free e-book from R software website)
3. T.K.V. Iyengar, Dr. B. Krishna Gandhi, S, Ranganatham and Dr. M.V.S.S.N. Prasad, Probability and Statistics, S Chand Publications

Reference Books:

1. Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. William Menden Hall, Robert J. Bever and Barbara Bever, Introduction to probability and statistics, Cengage learning.2009
3. Sheldon, M. Rosss, Introduction to probability and statistics Engineers and the Scientists, 4th edition, Academic Foundation,2011
4. Johannes Ledolter and Robert V.Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson,2010
5. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Principles of Operating Systems

Subject Code: 23ITT202

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the structures and functions of operating systems.
- Learn about Processes, Threads, and Scheduling algorithms.
- Understand the principles of concurrency.
- Understand Deadlock Management.
- Learn various memory management schemes.
- Study File systems and Mass-storage devices.

Course Outcomes:

By the end of this course, the student will be able to

1. Explain different types of operating systems and implement various process management concepts for maximization of CPU throughput
2. Analyze the mechanisms used for process synchronization
3. Implement deadlock handling methods and Compare and contrast various memory management schemes
4. Design and Implement file systems
5. Familiarize with disk organization and device drivers

Unit-I

Operating System structures: Overview of Operating System, Operating systems services, types of operating systems, system calls, types of system calls.

Process Management: Process concept, process scheduling, operations on processes, scheduling criteria, scheduling algorithms, and their evaluation.

Unit-II

Concurrency: Process synchronization, the critical-section problem, Peterson's Solution, synchronization Hardware, semaphores, monitors and classic problems of synchronization: Bounded-Buffer problem, Readers-Writers Problem, Dining Philosophers Problem.

Unit-III

Principles of deadlock: System model, deadlock characterization, deadlock prevention, deadlock detection, deadlock avoidance, recovery form deadlock

Main Memory Management: Swapping, Contiguous memory allocation, paging, structure of the page table, segmentation, segmentation with paging.

Virtual Memory Management: Virtual memory, demand paging, page replacement algorithms: FIFO, optimal page replacement and LRU, Allocation of frames, Thrashing.

Unit-IV

File System Interface: The concept of a file, file attributes, file types, access methods: sequential access, direct access and indexed access, directory structure, files sharing, protection.

File System Implementation: File system structure, file system implementation, directory implementation, allocation methods: contiguous allocation, linked allocation and indexed allocation, free-space management.

Unit-V

Mass-storage structure: Overview of Mass-storage structure, Disk structure, disk attachment, Disk Scheduling: (FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK), block and character devices.

Text Books:

1. A. Silberschatz, P. B Galvin, and G Gagne, Operating Systems Principles,9th Edition, Wiley India, 2019.
2. William Stallings, "Operating Systems Internals & Design Principles", 9th Edition, Pearson Education, 2018.

Reference Books:

1. http://nptel.iitm.ac.in/courses/Webcourse contents-IISc-BANG/Operating%20Systems New_index1.html
2. D.M. Dhamdhere Operating systems-A concept based approach-, 2nd Edition, TMH
3. Crowley Operating System A Design Approach-, TMH.
4. Andrew S Tanenbaum Modern Operating Systems, 2nd edition Pearson/PHI

Computer Organization & Architecture

Subject Code : 23ITT203

L	T	P	C
3	0	0	3

Course Objectives:

- This course is intended to teach the basics involved in data representation and digital logic circuits used in the computer system.
- This includes the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design.
- This course will also expose students to the basic architecture of processing, memory and i/o organization in a computer system.

Course Outcomes:

1. After the successful completion of this course, students will be able to
2. Understand various components of computer and their interconnection and Describe hardware algorithms for fixed-point and floating-point arithmetic.
3. Design different arithmetic logic gates and various types of adder circuits using combinational circuits.
4. Identify basic components and design of the CPU: the ALU and control unit.
5. Classify and design different memory organization and Illustrate data transfer between central computer and I/O devices and Multiprocessors Concept.

UNIT-I

Structure of computers: Computer types, Functional units, Basic operational concepts, Von-Neumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Data representation, Fixed and Floating point, Error detection and correction codes.
Computer arithmetic: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic Operations, Decimal arithmetic operations.

UNIT-II

Logic Gates and Boolean Algebra: Basic Gates: NOT, AND, OR, Boolean Theorems, Universal Gates, Ex-OR and Ex-NOR Gates, Compliment and dual of logic functions.
Combinational logic circuits-I: Design of half adder, full adder, half subtractor, full subtractor, applications of full adders,4-bit binary adder,4-bit binary subtractor, BCD adder, excess–3 adder, carry look ahead adder

UNIT-III

Central Processing Unit: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU registers, instruction execution cycle, addressing modes, instruction set.

UNIT-IV

Memory system: Memory Hierarchy, Semiconductor Memories, RAM (Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging.

UNIT V

Input output: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA.
Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence.

Text Books:

1. Computer Organization and Design: The Hardware/Software Interface 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. M.Morris Mano,Michael DCiletti,Digital Design,4/e,PEA
3. ”Computer System Architecture”,Revised 3rd Edition by M.Morris Mano and Rajiv Mall,Pearson Edition.

Reference Books:

1. “Computer Architecture and Organization” 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
2. “Computer Organization and Architecture: Designing for Performance ” 10th Edition by William Stallings, Pearson Education.
3. Leach, Malvino, Saha,DigitalLogic Design, TMH 3. Jaya Bhaskar, Verilog HDL primer,PEA.
4. “Computer System Design and Architecture”, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.
5. “Computer Organization and Embedded Systems”, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Links:

1. https://nptel.ac.in/courses/106103180
2. https://nptel.ac.in/courses/117105080

Object Oriented Programming

Subject Code: 23CST207

L	T	P	C
3	0	0	3

Course Objectives:

- The objective of the course is to teach the basic concepts and techniques which form the object oriented programming paradigm
- Well equipped with Java SDK environment to create, debug and run simple Java programs

Course Outcomes:

By the end of this course the student will be able to
1. Developing to Write Simple Java Programs
2. Understanding Object-Oriented Principles
3. Implementation of Inheritance and Polymorphism
4. Illustrate different techniques on creating and accessing packages
5. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes

Unit – I

Introduction To Java: Evolution of Java, Java Buzzwords, The Java Virtual Machine, An overview of Java- Simple Java Program, Naming Conventions in Java, Data types, Variables, Expressions, Automatic type Conversion, Operators, Control Statements , Arrays, Strings

Unit – II

Classes & Objects: Class fundamentals, Declaring Objects, Initializing the instance variables, Access Control, Constructors, Methods in Java, Overloading Methods and constructors, Static Methods, Recursion, final keyword, this keyword, garbage collection, finalize() method

Unit – III

Inheritance: Inheritance Basics, Types of Inheritance, The Keyword 'super', Final with inheritance. Polymorphism: Method Overriding, Dynamic Method Dispatch, Abstract Classes.

Unit – IV

Interfaces: Interface, Multiple Inheritance using Interface, Abstract Classes vs. Interfaces
Packages: Packages, Different Types of Packages, Access Protection, Importing Packages.

Unit – V

Exception Handling: Exception-handling fundamentals, throw Clause, throws Clause. Types of **Exceptions:** Built-in Exception, User Defined Exception.
Threads: Java Thread Model, Main Thread, Creating a Thread and Running it, terminating the Thread, Creating Multiple Threads, Thread Synchronization, and Thread Priorities.

Text Books:

1. Herbert Schildt, "Java The complete reference", 12thEdition, McGraw-Hill, 2022.
2. Timothy budd, "An introduction to object-oriented programming", 3rdEdition, Pearson Education, 2009.

Reference Books:

1. E.Balaguruswamy, "Programming with Java A Primer", 5th Edition, Tata McGraw-Hill, 2017.
2. Y. Daniel Liang, "Introduction to Java programming", 9thEdition, Pearson education, 2015

Links:

1. http://en.wikibooks.org/wiki/Java_Programming - Java Learning Wiki Book
2. http://www.javabeginner.com - Java Beginner Tutorial

Artificial Intelligence

Subject Code: 22ITT204

L	T	P	C
3	0	0	3

Course Objectives:

- The primary objective of this course is to introduce the fundamental principles, techniques, and applications of Artificial Intelligence. In addition to this, student will understand the building blocks of AI such as search, and game playing using search strategies and will have basic knowledge on expert system.

Course Outcomes: On completion of this course student will be able to –

1. Understand fundamentals of Artificial Intelligence (AI) methods.
2. Understanding the various search strategies.
3. Apply algorithm techniques for game playing.
4. Represent the knowledge using various structured approaches and developing reasoning mechanism.
5. Illustrate the architecture of an expert system

UNIT-I

Introduction of Artificial Intelligence: Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents.

UNIT-II

Solving Problems by Searching- Search Strategies: State-space problem, Problem Solving by Intelligent search: BFS, DFS, Iterative Deepening Search, Hill Climbing, Simulated Annealing, heuristic Search: A*, AO*.

UNIT-III

Adversarial Search- Game Playing: MIN-MAX Algorithm, Alpha-Beta pruning algorithm, Constraint Satisfaction Problems -Backtrack, 8-queens, coloring problem.

UNIT-IV

Knowledge & Reasoning: Rule-based knowledge representation, procedural and declarative knowledge. Probabilistic Reasoning, Review of Probability Theory, Probabilistic Inference Rules, Bayes Theorem, examples of Bayes theorem, Introduction to Learning, Taxonomy of Learning Systems, Concept Learning, Find-S algorithm, Candidate Elimination Algorithm.

UNIT-V

Expert System: Expert System: Architecture of expert system,Roles of expert systems- Knowledge Acquisition, Meta Knowledge Heuristics, Typical expert system- MYCIN,DART,XOON: Expert system shells.

Text Books:

1. Stuart Russell and Peter Norvig – Artificial Intelligence A Modern Approach, PEARSON Education.
2. Patterson, "Introduction to Artificial Intelligence & Expert Systems", Pearson, 1st ed. 2015.

Reference Books:

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, "Artificial Intelligence", McGraw Hill, 3rd ed.,2017.
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Joseph C. Giarratano,Gary D. Riley, "Expert Systems: Principles and Programming", 4th Edition, 2007.

Links:

1. https://nptel.ac.in/courses/106102220
2. https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/

Advanced Coding Lab – I

Subject code: 23ESL209

L	T	P	C
0	0	3	1.5

Course Objectives:

- This course aim to enhance student proficiency in a particular programming language C++.
- Acknowledge in the value of mathematics and problem solving techniques in programming
- Learning about the optimized solution in solving problems

Course Outcomes:

After completion of the course, the students will be able to

1. Use programming to find solution of the problems.
2. create solution based on OOPS concept
3. Choose the right container to arrange data in order to solve problems.
4. Provide problem Solving strategies employing Recursion.
5. Apply mathematics to the problem Analysis

Lab Module – I
CPP Essentials: Basic Syntax, Variables, Data types, Operators, Input and output, Conditional Statements ,loops.

Data Type-Conditions: https://codeforces.com/group/MWSDmqGsZm/contest/219158
Loops: https://codeforces.com/group/MWSDmqGsZm/contest/219432

Lab Module – II
Arrays, Functions and Strings
Arrays: https://codeforces.com/group/MWSDmqGsZm/contest/219774
Functions: https://codeforces.com/group/MWSDmqGsZm/contest/223205
Strings: https://codeforces.com/group/MWSDmqGsZm/contest/219856

Lab Module – III
OOPS-I: Implementation of OOP principles
Class: https://www.hackerrank.com/challenges/c-tutorial-class/problem
Classes and Objects: https://www.hackerrank.com/challenges/classes-objects/problem
https://www.hackerrank.com/challenges/box-it/problem

Lab Module – IV
OOPS – II: Implementation of OOP principles
Inheritance:
https://www.hackerrank.com/domains/cpp?filters%5Bsubdomains%5D%5B%5D=inheritance
Virtual Functions: https://www.hackerrank.com/challenges/virtual-functions/problem
Abstract Classes:-
Polymorphism: https://www.hackerrank.com/challenges/abstract-classes-polymorphism/problem

Lab Module – V

STL 1: Containers, Container Classes, Vectors, Lists, Iterators,set

Vector: https://www.geeksforgeeks.org/problems/c-stl-set-1-vector/1
https://www.hackerrank.com/challenges/vector-erase/problem?isFullScreen=true

Intersection of Two Arrays:-
https://leetcode.com/problems/intersection-of-two-arrays/description

Set: - https://www.hackerrank.com/challenges/cpp-sets/problem?isFullScreen=true

Stack:-

Next Greater Element I: https://leetcode.com/problems/next-greater-element-i/description/

Valid Parentheses: https://leetcode.com/problems/valid-parentheses/description/

Largest Rectangle in Histogram:
https://leetcode.com/problems/largest-rectangle-in-istogram/description/

Lab Module – VI

STL -2: Maps, Bit set, Stack, Queue, De queue, Priority queue

https://www.hackerrank.com/challenges/cpp-maps/problem?isFullScreen=true

Twice Counter: https://www.geeksforgeeks.org/problems/twice-counter4236/1

Frequency Game: https://www.geeksforgeeks.org/problems/frequency-game/1

Check if a string is repetition of its substring of k-length:-

https://www.geeksforgeeks.org/problems/check-if-a-string-is-repetition-of-its-substring-of-k-length3302/1

Dequeue: https://www.hackerrank.com/challenges/deque-stl/problem?isFullScreen=true

Lab Module – VII

Problem solving approaches: precomputation, Two pointer

Two Sum II :https://leetcode.com/problems/two-sum-ii-input-array-is-sorted/description/

Rotate Array: https://leetcode.com/problems/rotate-array/description/

Container With Most Water:
https://leetcode.com/problems/container-with-most-water/description/

Remove Duplicates from Sorted Array:
https://leetcode.com/problems/remove-duplicates-from-sorted-array/description/

Product of Array Except Self:
https://leetcode.com/problems/product-of-array-except-self/description/

Reverse Words in a String II:
https://leetcode.com/problems/reverse-words-in-a-string-ii/description/

Lab Module – VIII

Problem solving approaches: Sliding Window approach, fixed window approach and varying window approaches

Max Consecutive Ones I:
https://leetcode.com/problems/max-consecutive-ones/description/

Max Consecutive Ones II:

Longest Substring with At Most Two Distinct Characters:

https://leetcode.com/problems/longest-substring-with-at-most-two-distinct-characters/description/

Longest Substring Without Repeating Characters:

https://leetcode.com/problems/longest-substring-without-repeating-characters/description/

Find All Anagrams in a String:

https://leetcode.com/problems/find-all-anagrams-in-a-string/description/

https://leetcode.com/problems/max-consecutive-ones-ii/description/

Lab Module – IX

Number Theory

ClassTest:
https://www.geeksforgeeks.org/batch/cp-mathematics/track/cp-mathprimeFactorization/problem/class-test

Largest prime factor:
https://www.geeksforgeeks.org/problems/largest-prime-factor2601/1

Integer to Roman:
https://leetcode.com/problems/integer-to-roman/description/

Total Chocolates II:
https://www.geeksforgeeks.org/batch/cp-mathematics/track/cp-math-primeFactorization/problem/total-chocolates-ii

Count Primes:
https://leetcode.com/problems/count-primes/description/

Make them Co-prime:
https://www.geeksforgeeks.org/batch/cp-mathematics/track/cp-math-primeFactorization/problem/make-them-co-prime

Lab Module – X

Bit Manipulation:

Number of 1 Bits: https://www.geeksforgeeks.org/problems/set-bits0143/1

Bit Difference: https://www.geeksforgeeks.org/problems/bit-difference-1587115620/1

Power of 2: https://www.geeksforgeeks.org/problems/power-of-2-1587115620/1

Find position of set bit: https://www.geeksforgeeks.org/problems/find-position-of-set-bit3706/1

Missing Number: https://leetcode.com/problems/missing-number/description/

Non Repeating Numbers: https://www.geeksforgeeks.org/problems/finding-the-numbers0215/1

Text Books:

1. The Complete Reference C++ by Herbert Schildt ,4th Edition
2. E. Horowitz. et.al., Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition.

Reference Books:

1. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006
2. Competitive Programming 3: The New Lower Bound of Programming Contests Book by Felix Halim and Steven Halim, 423 pages
3. Programming Pearls Book by Jon Bentley, 258 pages.T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005
4. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.

Links:

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106145/
3. https://www.spoj.com/problem

Object Oriented Programming Lab

Subject code: 23CSL203

L	T	P	C
0	0	3	1.5

Course Objectives:

To develop skills to design and analyze the applications with respect to java programming
- To strengthen the ability to identify and apply the suitable object oriented concept for the
- Given Real world problem

Course Outcomes:

By the end of this course the student will be able to
1. Able to write, compile and execute simple java programs
2. Explain the concept of class and objects with access control to represent real world entities
3. Use overloading methodology on methods and constructors to develop application programs
4. Describe the concept of interface and abstract classes to define generic classes
5. Able to create user defined packages and handle exceptions at run time and Apply Threading concept based on application requirement and design Applet programming

List of Experiments:

1. A) Write a java program that displays welcome to follow by user name. Accept user name from the user.
   B) Write a java program that prompts the user for an integer and then prints out all the prime numbers up to that integer.
2. A) Write a java program to create a class Rectangle. The class has attributes Length and Width. It should have methods that calculate Area and Perimeter of the Rectangle. It should have read Attributes () method to read Length and Width from the user.
   B) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are1 and 1. Every subsequent value is the sum of the two values preceding it.
3. A) Write a java program that uses both Recursive and Non-Recursive functions to find the factorial of a given number.
   B) Write a java program that checks whether the given string is Palindrome or not. Ex: MALAYALAM is a Palindrome.
4. A) Write a java program to illustrate method overloading and method overriding.
   B) Writ a java program that illustrates how java achieved Run Time Polymorphism.
5. A) Write a java program to demonstrate the use of subclass.
   B) Write a java program for abstract class to find areas of different shapes
6. Write a Java program to implement the concept of importing classes from user defined package and creating packages.
7. Write a java program to implement the concept of Exception Handling by using predefined and user defined exceptions.
8. Write a java program to implement the concept of Threading by Extending Thread class and by Implementing Runnable Interface.
9. Write a program using Applet to display a message in the Applet and for configuring Applets by passing parameters.
10. Write a java program to implement thread priorities

Text Books:

1. Herbert Schildt, "Java The complete reference", 12thEdition, McGraw-Hill, 2022.
2. Timothy budd, "An introduction to object-oriented programming", 3rdEdition, Pearson Education, 2009.

Reference Books:

1. Cay S. Horstmann, Core Java Volume I–Fundamentals, 11th Edition, Pearson 2019
2. Y. Daniel Liang Introduction to Java Programming Comprehensive Version, 10th Edition, Pearson, 2015.

Principals of Operating Systems Lab

Subject Code: 23ITL202

L	T	P	C
0	0	3	1.5

Course Objectives:

- To learn basic Unix commands and shell programming.
- To implement Process Creation and Inter-Process Communication.
- To learn various process management schemes in operating systems.
- To practice the important memory management mechanisms in the operating system.
- To learn about file management and different types of permission setup.

Course Outcomes:

1. Experiment with Unix commands and shell programming.
2. Able to build a shell program for process and file system management with system calls.
3. Able to analyze various CPU scheduling algorithms, memory management strategies with its allocation policies and page replacement algorithms.
4. Develop an algorithm for deadlock avoidance and detection.
5. Design and implement file allocation techniques.

List of Experiments:

1. Practice with UNIX commands (General commands, Directory commands, and File Commands).
2. Basics of Shell Scripting, Conditional Blocks and Loop.
3. Process Creation using Fork and exec.
4. Inter-process Communication using Named Pipe.
5. Simulation of CPU Scheduling Algorithms (FCFS, SJF, RR).
6. Process Synchronization Using Semaphore.
7. Simulation of Deadlock Prevention Algorithms (Banker's Algorithm).
8. Simulate MVT and MFT.
9. Implementation of the Paging Technique of Memory Management.
10. Simulation of Page Replacement Algorithms (FIFO, LRU).
11. Implementation of the following File Allocation Strategies (Sequential, Indexed).
12. Simulation of Disk Scheduling Algorithms (FCFS, SSTF).

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne Operating System Principles- 7th Edition, John Wiley.
2. Stallings, 2005, Operating Systems – Internal and Design Principles Sixth Edition, Pearson education.

Reference Books:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents-IISc- BANG/Operating%20Systems New_index1.html
2. D.M. Dhamdhere Operating systems-A concept based approach-, 2nd Edition, TMH
3. Crowley Operating System A Design Approach-, TMH.
4. Andrew S Tanenbaum Modern Operating Systems, 2nd edition Pearson/PHI

DESIGN THINKING

(COMMON TO ALL B. TECH BRANCHES)

L	T	P	C
1	0	2	2

Subject Code: 23BHT208

Course Objectives:

1. Understand the significance of Design Thinking in engineering disciplines and develop empathy-building skills.
2. Explore various ideation techniques to generate innovative design solutions.
3. Learn to incorporate user feedback into design iterations for continuous improvement.
4. Apply Design Thinking principles to real-world engineering problems.
5. Collaborate in teams to solve complex engineering problems using Design Thinking principles.

Course Outcomes:

1. Students will be able to explain the importance of Design Thinking in engineering contexts and use empathy-building techniques
2. Students will be able to generate a diverse range of design ideas using creative ideation techniques.
3. Students will demonstrate the ability to iteratively refine design solutions based on user feedback.
4. Students will be able to apply Design Thinking methodologies to solve engineering challenges effectively.
5. Students will effectively collaborate in teams to develop innovative solutions to engineering challenges during workshop activities.

Unit-I: Introduction to Design Thinking

Entrepreneurship Challenges and prospects, Design Thinking- definition and Importance, Core principles of Design Thinking, Techniques for empathy building, User research methods.

Unit-II: Ideate and Prototype

Creative ideation techniques (Brainstorming, Mind Mapping, SCAMPER, etc.), Prototyping fundamentals and materials, Rapid Prototyping Methods, Iterative Design Processes

Unit-III: Test and Iterate

User testing principles and methodologies, Iterative design cycles, Evaluation criteria for design solutions.

Unit-IV: Design Thinking in Engineering Applications

Case studies of Design Thinking in engineering projects, Applying Design Thinking to product design, process improvement, and problem-solving, Challenges and opportunities in integrating Design Thinking into engineering practice

Unit-V: Workshop: Application of Design Thinking

Hands-on workshop sessions to practice empathy building, ideation, prototyping, and iteration, Presentation of workshop outcomes and reflections on the Design Thinking process

Reference Books :

1. Lockwood, T. (2010). Design Thinking: Integrating Innovation, Customer Experience, and Brand Value. Allworth Press.
2. Brown, T. (2009). Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. HarperBusiness.
3. Norman, D. (2013). The Design of Everyday Things (Revised and Expanded Edition). Basic Books.
4. Knapp, J., Zeratsky, J., &Kowitz, B. (2016). Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days. Simon & Schuster.
5. Cross, B. (2018). Design Thinking for Engineers and Technologists. Wiley.
6. Kumar, V. (2012). 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization. Wiley.
7. Kelley, T., & Kelley, D. (2013). Creative Confidence: Unleashing the Creative Potential Within Us All. Crown Business.
8. Mootee, I. (2013). Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School. Wiley.
9. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business.
10. Polaine, A., Løvlie, L., & Reason, B. (2013). Service Design: From Insight to Implementation. Rosenfeld Media.

AR – 23: B.Tech. – IT **II Year II Semester**

Environmental Studies
(Common to all Branches)

Subject Code: 23MCT204

L	T	P	C
2	0	0	0

Course Objectives:

- Memorize the knowledge of environment and status of different resources on earth.
- Identify the significance, arrangement, causes of annihilation and conservation of ecosystems and biodiversity.
- Discriminate causes, effects of a variety of pollutions and suitable control methods.
- Identify the hurdles of sustainable development; evaluate the different environmental management and legal issues.
- Describe the population growths, health problems and evaluate the environmental assets.

Course Outcomes:

1. Recognize and speaks well again on the general issues of environment and know how to conserve resources for better usage.
2. Explain and demonstrate the ecosystems setup, assess. Recognize and conserving of diversity to upkeep.
3. Examine a range of pollution problems along with control and their eco-friendly disposal methods.
4. Translate the sustainable development practice through clean development mechanisms.
5. Evaluate the changing trends of world population and compile the information in order to document the environmental assets.

Unit – I

Importance of Environmental Studies and Natural Resources: Definition of Environment – Importance - Need for Public Awareness
Forest Resources - Use and over exploitation - deforestation – consequences – case study
Water Resources - Use and over utilization - dams - benefits and problems on Tribes and Environment
Food Resources – Food security concept - changes caused by agriculture and overgrazing -effects of modern agriculture – fertilizer - pesticide problems - water logging - salinity – concept of sustainable agricultural methods - case study
Energy Resources - Non-renewable energy resources – coal – crude oil - natural gas - use of renewable and alternate energy sources

Unit – II

Ecosystems and Biodiversity and its conservation: Definition – Structure of ecosystem: producers - consumers – decomposers. Functions of ecosystem: Food chains - food webs ecological pyramids - Energy flow – Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession.

Definition of Biodiversity - Values of biodiversity - Bio-geographical classification of India - Hot Spots of India - Endangered and endemic species of India –Threats to biodiversity - Conservation of biodiversity

Unit – III

Environmental Pollution: Definition – causes - effects - control measures of Air pollution -Water pollution - Noise pollution – Marine Pollution - Nuclear hazards.
Solid waste Management: Causes - effects - disposal methods of urban waste – biomedical wastes - case studies
Disaster management: floods – earthquakes – cyclones

Unit – IV

Social Issues and the Environment: Concept of Unsustainable and Sustainable development – Water conservation: Rain water harvesting- Watershed management – Global environmental challenges: climate change - global warming – acid rains - ozone layer depletion -World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act -Forest (Conservation) Act

Unit – V

Human Population and the Environment: Population growth patterns - variation among nations - Population problems - control -Environment and human health - Role of information Technology in Environment and human health

Text Books:

1. Shashi Chawla. 2015, A Text book of Environmental Studies, Revised edition, TMH, New Delhi
2. Bharucha, E. 2005, Text book of Environmental Studies, First edition, Universities Press (India) Pvt. Ltd., Hyderabad
3. Suresh K. Dhameja. 2006-07, Environmental Studies, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi
4. Benny Joseph. 2015, Environmental Studies, Revised edition, TMH, New Delhi

Reference Books:

1. Odum, E.P, Fundamentals of Ecology, Third edition, W.B. Saunders & Co (P) Ltd., Philadelphia.
2. P. D. Sharma, Ecology and Environment, Revised edition, Rastogi Publications (P) Ltd.
3. Cunningham, W.P., Cunningham, M.A., Principles of Environmental Science, TMH, New Delhi.
4. Peavy, Rowe and Tchobanoglous, Environmental Engineering, Mc Graw – Hill Internationaledition.
5. Graedel, T.E., Allenby, B.R., Industrial Ecology and Sustainable Engineering, PearsonPublications.

Data Communication and Computer Networks

Subject Code: 23ITT305

L	T	P	C
3	0	0	3

Course Objectives:

- Introduce the Fundamentals of data communication networks
- Explain the Functions of various protocols of Data link layer.
- Discuss the Functioning of various Routing protocols.
- Demonstrate the Functions of various Transport layer protocols.
- Understand the significance of application layer protocols

Course Outcomes:

1. Describe the components of a data communication system and compare the OSI and TCP/IP reference models.
2. Demonstrate error detection and correction methods in data link layer.
3. Analyze different routing algorithms and congestion control algorithms.
4. Explain the functionalities of TCP and UDP protocols in transport layer.
5. Illustrate application layer protocols.

Unit-I

Introduction to Data Communications: Network Components, Data Representation, Data Flow, Network Topologies, Categories of Networks, Multiplexing: FDM, TDM, Applications of Networks. **Reference Models:** The OSI Model, The TCP/IP Model and Comparison of the OSI and TCP/IP reference model. **Physical Layer**: Guided Media, Unguided Media (wireless).

Unit-II

Data Link Layer: Design issues, Error Detection & Correction, Elementary Data Link Layer Protocols, and Sliding window protocols. **Multiple Access Protocols** - ALOHA, CSMA, CSMA/CD, CSMA/CA, Collision free protocols, Ethernet Physical Layer, Ethernet Mac Sub layer.

Unit-III

The Network Layer: Network Layer Design issues, Routing algorithms: optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Link State Routing, Hierarchical Routing, Congestion control algorithms.

Internet protocols: IP addresses, CIDR, Sub netting, Super Netting, IPv4, Packet Fragmentation, IPv6 Protocol, Transition from IPv4 to IPv6.

Unit-IV

Transport Layer: Design issues of transport layer, addressing, connection establishment, Connection release, Error Control & Flow Control, Introduction to UDP and TCP, TCP Service Model, TCP Segment Header, Connection Establishment, TCP Connection Release, UDP Segment Header.

Unit-V

Application Layer: Introduction to Application Layer, services, Applications layer paradigms: Client-server model, HTTP, E-mail, WWW, TELNET, FTP, SMTP, and DNS.

Text Books:

1. Kurose James F, Keith W, "Computer Networking a Top-Down Approach", Pearson, 8th Edition, 2021.
2. Behrouz A. Forouzan," Data Communications and Networking with TCP/IP Protocol Suite", McGraw-Hill Education, 6th Edition,2022.
3. Andrew S Tanenbaum, Nick Feamster, David J.Wetherel, "Computer Networks", Pearson Education, 6th Edition, 2021.

Reference Books:

1. Bhusan Trivedi," Data communication and Networks", Oxford University Press, 2016
2. W.A. Shay," Understanding Communications and Networks", Cengage Learning, 3rd Edition, 2015.

Reference Links:

1. http://nptel.ac.in/courses/Webcourse-contents/ IIT% 20Kharagpur /Computer%20networks / New_index1.html

Theory of Computation

Subject Code: 23ITT306

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the language hierarchy.
- Construct automata for any given pattern and find its equivalent regular expressions.
- Design a context free grammar for any given language.
- Understand Turing machines and their capability.
- Understand un-decidable problems.

Course Outcomes:

1. Design the Finite Automata (F.A) for solving simple computational problems.
2. Convert from finite automata into regular expression and vice versa.
3. Design Grammars for Regular and Context free languages.
4. Illustrate the Pushdown Automata to represent and process context-free languages.
5. Explore Turing machines and their role in solving computational problems

Unit-I

Finite Automata (FA): Strings, Alphabet, Language, Operations, Deterministic Finite Automata (DFA) -Formal Definition, Simpler Notations (State Transition Diagram, Transition Table), Language of A DFA. Nondeterministic Finite Automata (NFA)- Definition of NFA, Language of An NFA, Equivalence Of Deterministic And Nondeterministic Finite Automata, Applications Of Finite Automata, Finite Automata With Epsilon Transitions, Eliminating Epsilon Transitions, Minimization Of Deterministic Finite Automata, Finite Automata With Output (Moore And Mealy Machines) And Inter Conversion.

Unit-II

Regular Expressions (RE): Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, Applications of Regular Expressions.

Regular Grammars: Definition, Regular Grammars and FA, FA for Regular Grammar, Regular Grammar for FA. Proving Languages to Be Non-Regular -Pumping Lemma, Applications, and Closure Properties of Regular Languages.

Unit-III

Context Free Grammar (CFG): Derivation Trees, Sentential Forms. Right Most and Left Most Derivation of Strings, Ambiguity in Context Free Grammars.

Minimization of Context Free Grammars: Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Enumeration Properties of CFL.

Unit-IV

Pushdown Automata: Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty Stack and Its Equivalence, Equivalence of CFG and PDA.

Turing Machines (TM): Formal Definition and Behaviour, Languages of A TM, TM as Accepters and TM as a Computer of Integer Functions, Types of TMs.

Unit-V

Recursive and Recursively Enumerable Languages (REL): Properties of Recursive and Recursively Enumerable Languages, Universal Turing Machine.

The Halting Problem: Undecidable Problems about Tms. Context Sensitive Language and Linear Bounded Automata (Lba), Chomsky Hierarchy, Decidability, Post's Correspondence Problem (PCP), Undecidability of PCP.

Text Books:

1. Hopcroft, J. E. Motwani, R., and Ullman, J. D, "Introduction to Automata Theory, Languages, and Computation", Pearson, 3rd Edition, 2020.
2. Daniel I.A. Cohen, John Wiley "Introduction to Computer Theory", 2nd edition, 2014.

Reference Books:

1. John C Martin, "Introduction to languages and the Theory of Computation", TMH,4th Edition,2010
2. Mishra and Chandra Shekaran, Theory of Computer Science – Automata languages and computation", PHI, 3rd Edition, 2006.
3. Michael Sipser," Introduction to Theory of Computation", Thomson, 3rd Edition, 2014.

Reference Links:

1. http://nptel.iitm.ac.in/courses/webcourse-contents/IIT-%20Guwahati/ afl/ index.htm
2. https://fall14cs.wordpress.com/wp-content/uploads/2017/04/an-introduction-to-formal-languages-and-automata-5th-edition-2011.pdf.

Advanced Java and Web Technologies

Subject Code: 23ITT307

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the need of web applications and available technologies.
- Create structured web pages using HTML and enhance interactivity through JavaScript validations.
- Understand the role of XML in Web Technologies and Data Interchange.
- Understand the data base connectivity and server-side programming.
- Implement an interactive web page by using the java server pages.

Course Outcomes:

1. Create web pages using HTML and CSS, analyze a web page and identify its elements and attributes.
2. Develop interactive web pages using JavaScript for form Validation, and pattern matching using regular expressions.
3. Create structured XML documents and distinguish between DTD and XML Schema while parsing XML using DOM and SAX.
4. Connect to a database using JDBC and perform a simple query and create dynamic web pages using Servlet
5. Design dynamic web pages using JSP Elements.

Unit-I

HTML: Basic Syntax, Standard HTML Document Structure, Images, Hypertext Links, Lists, Tables, Forms, GET and POST method, Frames, HTML5.

CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, the Box Model, Conflict Resolution.

Unit-II

JavaScript: Introduction to JavaScript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Form Validations, Pattern Matching using Regular Expressions.

Unit-III

XML: Introduction, HTML vs XML, Document type Definition (DTD), XML schemas, Parsers - DOM and SAX.

Unit-IV

JDBC: Introduction, JDBC Architecture, JDBC Drivers, JDBC API: JDBC Process with java.sql package.

Servlets: Introduction to Servlets, Servlet life cycle, Servlet API, Reading Parameters (ServletConfig, Servlet Context)

Unit-V

JSP: Introduction, JSP life cycle, JSP Implicit Objects, JSP Directives, JSP Scripting Elements, JSP Actions, JSTL.

Text Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2012.
2. Robert W Sebesta, "Programming the World Wide Web", Pearson, 8th Edition, 2021.
3. Uttam K Roy, "Web Technologies", Oxford, 1st Edition 7th impression, 2012.
4. David McFarland, "Java Script & JQuery the missing manual", O'Reilly, 2nd Edition, 2011.
5. Peter Pollock,"Web Hosting for Dummies", John Wiley & Sons, 1st Edition, 2013.

Reference Books:

1. Diane Zak, Don Gosselin, Michael Ekedahl, "The Web Warrior Guide to Web Programming", Course Technology Inc, 2003.
2. Paul S Wang, Sanda S Katila, "An Introduction to Web Design and Programming", Cengage Learning, 2003

Reference Links:

1. https://www.mooc-list.com/course/introduction-web-development-courseera
2. https://www.edx.org/course/introduction-html-javascript-microsoft-dev211-1x-0
3. http://infolab.stanford.edu/~ullman/fcdb/oracle/or-web.html

Data Mining

Subject Code: 23ITT308

L	T	P	C
3	0	0	3

Course Objectives:

- Introduce basic concepts, principles, major techniques and algorithms in Data Warehousing and Data Mining.
- Understanding concepts and techniques for data preprocessing, OLAP, association rule mining, data classification, and data clustering.
- Discuss applications, Emerging Areas in Data Mining.

Course Outcomes:

1. Recognize types of Data, Data Quality, need of preprocessing and different measures of similarity and dissimilarity.
2. Differentiate between methods for modeling multidimensional data, design and implement Data Warehouse.
3. Explain in detail major techniques and algorithms involved in data mining, including techniques and algorithms for association rule mining, data classification, and data clustering.
4. Evaluate and increase the performance of a classifier.
5. Compare and contrast Partitioning and Hierarchical Clustering Algorithms and Evaluate Outlier Analysis.

Unit-I

Introduction to Data Mining: Definition, motivating challenges, origins of data mining, data mining tasks, Types of Data, Data Quality, Data Preprocessing, Measures of similarity and Dissimilarity.

Unit-II

Data Warehouse and OLAP Technology: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining, Concept Description - Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discrimination between different classes.

Unit-III

Mining Frequent Patterns, Associations: Basic Concepts, Market Basket Analysis, requent Itemsets, Closed Item sets, and Association Rules, Frequent Itemset Mining methods: Apriori Algorithm, Generating Association Rules from Frequent Itemsets, Improving the efficiency of Apriori, FP–Growth algorithm.

Unit-IV

Classification and Prediction: Classification, Prediction, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule- Based

Unit-IV

Classification and Prediction: Classification, Prediction, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule- Based Classification, Classification by Back propagation, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Increasing the Accuracy, Model Selection

Unit-V

Cluster Analysis: Types of Data in Cluster Analysis, Interval-Scaled Variables, Binary, Categorical, Ordinal, and Ratio-Scaled Variables, Variables of Mixed Types, Categorization of Major Clustering Methods, Partitioning Methods: k-Means and k-Medoids, Hierarchical Methods: Agglomerative and Divisive Hierarchical Clustering. Outlier Analysis-Statistical Distribution-Based Outlier Detection, Distance-Based Outlier Detection, Density-Based Local Outlier Detection, Deviation-Based Outlier Detection.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson education, 2nd Edition, 2018.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.

Reference Books:

1. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.
2. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, 13th Reprint 2008.

Reference Links:

1. https://onlinecourses.nptel.ac.in/noc21_cs06/preview
2. https://www.coursera.org/specializations/data-mining
3. https://nptel.ac.in/courses/106105174

Object Oriented Software Engineering
(Professional Elective-I)

Subject Code: 23ITE311

L	T	P	C
3	0	0	3

Course Objectives:

- Explain the principles, practices, and techniques of software development using object-oriented programming.
- Use Unified Modeling Language (UML) to visualize software designs through use case, class, sequence, and activity diagrams.
- Develop detailed software requirement specifications and apply object-oriented principles to solve real-world problems and case studies.

Course Outcomes:

1. Understand and Apply core OOP principles and basic UML concepts to develop software solutions.
2. Analyze requirements, create use cases, and apply OOAD principles.
3. Familiar with the concept of test-driven development (TDD) and its practical implementation
4. Analyze and Evaluate Software Maintenance and Evolution Strategies
5. Apply Advanced Object-Oriented Software Engineering Concepts

Unit-I

Introduction to Object-Oriented Programming: Overview of software engineering principles, Introduction to Object-Oriented Programming (OOP) concepts (classes, objects, inheritance, polymorphism), Unified Modeling Language (UML) basics, Introduction to software development process and software development life cycle (SDLC).

Unit-II

Requirements Analysis and Design: Requirements analysis and specification, Use cases and scenarios, Object-oriented analysis and design (OOAD), Design patterns, UML modelling techniques (class diagrams, sequence diagrams, state machine diagrams, activity diagrams).

Unit-III

Software Construction and Testing: Software construction basics, Object-oriented design principles, Object-oriented programming languages,

Software testing basics: unit testing, integration testing, system testing, Test-driven development (TDD)

Unit-IV

Software Reliability: Basic concepts in software reliability, reliability measures, reliability growth modeling, Quality SEI CMM, **Software Maintenance and Evolution**: Software maintenance basics, refactoring techniques Software version control, Code review and inspection, Software evolution and reengineering.

Unit-V

Advanced Topics in Object-Oriented Software Engineering: Model-driven engineering (MDE), Aspect-oriented programming (AOP), Component-based software engineering (CBSE), Service-oriented architecture (SOA).

Text Books:

1. Ivar Jacobson, Object-oriented Software EngineeringA Use Case Driven Approach, Pearson Education, Addison-Wesley, Third edition, 2012.
2. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw-Hill Education, 9th Edition, 2019.
3. Bertrand Meye, "Object-Oriented Software Construction", Prentice Hall, 2nd Edition, 2000.
4. Ivar Jacobson, Magnus Christerson, PatrikJonsson, and Gunnar Overgaard, "Aspect-Oriented Software Development", Addison-Wesley, 1st edition, 2001.

Reference Books:

1. Roger Y. Lee,"Object-Oriented Software Engineering with UML: A Hands-On Approach", **Nova Science Publishers**, 1st edition, 2019.
2. Nilesh Magar, Deepali N Bhoskar, "Object-oriented Software Engineering", Nirali Prakashan 1st Edition, 2021.
3. J. Rumbaugh, I. Jacobson and G. Booch," The Unified Modeling Language Reference Manual", Addison Wesley, 2 nd Edition, 2004.

Reference Links:

1. https://edutechlearners.com/oose-notes/?form=MG0AV3
2. https://highered.mheducation.com/sites/0077097610/?form=MG0AV3

DevOps
(Professional Elective-I)

Subject Code: 23ITE312

L	T	P	C
3	0	0	3

Course Objectives:

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in DevOps
- Discuss methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle

Course Outcomes:

1. Identify components of DevOps environment and describing Software development models.
2. Apply different project management, integration, testing and code deployment tool.
3. Investigate different DevOps Software development models.
4. Assess various DevOps practices.
5. Collaborate and adopt DevOps in real-time application.

Unit-I

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.

DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

Unit-II

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. **DevOps influence on Architecture:** Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

Unit-III

Introduction to Project Management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

Unit-IV

Integrating the system: Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

Unit-V

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

Text Books:

1. Joakim Verona,"Practical Devops", Packt Publishing; 2nd Edition, 2018
2. Deepak Gaikwad, Viral Thakkar, "DevOps Tools from Practitioner's Viewpoint", Wiley publications,2nd Edition, 2020.

Reference Books:

1. Len Bass, Ingo Weber, Liming Zhu, "DevOps: A Software Architect's Perspective", Addison Wesley**,** 1st Edition, 2015.

Reference Links:

1. https://www.udemy.com/topic/devops/free/?utm_source
2. https://www.coursera.org/courses?query=devops&utm_source

Human Computer Interaction
(Professional Elective-I)

Subject Code: 23ITE313

L	T	P	C
3	0	0	3

Course Objectives:

- Introduce user interface design on graphical and web-based interfaces.
- Design principles for user-friendly interfaces
- Evaluate navigation schemes and controls using multimedia elements
- Improve engineering techniques and design standards
- Design interfaces in emerging domains such as ubiquitous computing, augmented reality and data visualization

Course Outcomes:

1. Understand the significance, principles, and evolution of user interface design, including graphical and web-based interfaces.
2. Apply HCI design processes to create user-friendly interfaces by considering human factors, business needs, and screen design principles.
3. Design and assess navigation schemes and controls using multimedia, icons, text, and colors effectively.
4. Utilize usability engineering, iterative design, and evaluation techniques to enhance user experience following design standards.
5. Analyze models and technologies to design interfaces for ubiquitous computing, augmented reality, and data visualization.

Unit-I

Introduction to User Interface Design: Importance of User Interface (UI) - Definition and significance of UI, Evolution of Screen Design - A brief history of screen design, Graphical User Interface (GUI) - Popularity of graphics, Concept of direct manipulation, Characteristics of graphical systems, Web User Interface - Popularity and characteristics, Principles of User Interface Design.

Unit-II

Design Process and Human Considerations: Human interaction with computers, importance of human characteristics in design, Human interaction speeds and business junctions. Screen Designing: Design goals – Screen planning, purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

Unit-III

Interface Components and Visual Design: Windows and Navigation schemes - Selection of windows and navigation schemes, Controls - selection of devices based and screen based controls. Interface components – text and messages, Icons and images – Multimedia in interfaces, colors - Problems with color usage, choosing colors.

Unit-IV

HCI in the software process: The software life cycle, Usability engineering, Iterative design and prototyping, Design Focus - Prototyping in practice, Design rationale and rules, Principles to support usability – Standards, Golden rules and heuristics, HCI patterns, Evaluation techniques - Goals of evaluation, Evaluation through user participation, Choosing an evaluation method, Universal design- principles and multi-modal interaction.

Unit-V

Cognitive models: Goal and task hierarchies, Design Focus – GOMS (Goals, Operators, Methods, and Selection rules), Linguistic models - challenges of display-based systems, Cognitive architectures, Ubiquitous computing and augmented reality, Information and data visualization.

Text Books:

1. Wilbert O Galitz, "The essential guide to user interface design", Wiley Dream Tech, 2nd Edition, 2022.
2. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, "Human – Computer Interaction", Pearson Education, 3rd Edition, 2004.

Reference Books:

1. Ben Shneidermann, "Designing the user interface", Pearson Education Asia, 5th Edition,2009.
2. Rogers, Sharps. "Interaction Design Prece", Wiley Dreamtech,5th Edition, 2019.
3. Soren Lauesen, "User Interface Design", Pearson Education.
4. D. R. Olsen, "Human –Computer Interaction", Cengage Learning,1st Edition, 2009.
5. Smith – Atakan," Human –Computer Interaction", Cengage Learning,1st Edition, 2010.

Reference Links:

1. http://learnlinky.com/2018/01/introduction-human-computer-interaction/
2. http://hci.liacs.nl/tutorials

UNIX Programming
(Professional Elective-I)

Subject Code: 23ITE314

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the architecture of the UNIX and explore UNIX commands.
- Explore the concepts on Shell Programming.
- Describe library functions and system calls for handling file and directory.
- Apply the commands for process management in UNIX.
- Explain the concepts of Process and Signals functions for handling a process and Inter- Process Communication (IPC) mechanisms.

Course Outcomes:

1. Understand the UNIX architecture and awareness on basic UNIX commands.
2. Design interactive shell scripts to read, write and debug for solving specified computational problems.
3. Evaluate system calls related to standard I/O files and directory handling.
4. Apply system calls for process management.
5. Classify the signals and handling signals using system calls and familiar with Inter Process Communication (IPC).

Unit-I

Introduction to UNIX: GNU project, Linux distributions, UNIX architecture, Features of UNIX, vi editor, **UNIX commands**: Basic Commands, file system, file permissions, file utilities, process utilities, text processing utilities, disk utilities, backup utilities, Security by file permissions.

Unit-II

Shell programming: Shell, functions of the shell, Meta characters, redirection operators, pipes, here document, shell responsibilities, shell variables, predefined local variables, predefined environment variables, Built-in Shell commands and shell as programming language, conditional statements, loops, command line arguments and shell programs.

Unit-III

File System Structure and System Calls: Library functions, file related system calls: open, create, read, write, lseek, close, mknod, dup, dup2, link, unlink, symlink, stat, chown, chmod, umask, ioctl, sync, truncate.

Standard I/O, stream errors, directory handling system calls: mkdir, chdir, getcwd, opendir, readdir, telldir, rewinddir, closeddir.

Unit-IV

Process Management: Process basics, creating a new process: fork, vfork, orphan processes, zombie processes, wait: waiting a process, exit: terminating a process, exec: differentiating a process, ps: status of process, handling jobs: fg, bg, scheduling of process: cron, modifying priority: nice, killing a process: kill.

Unit-V

Signals: Classes of signals, reliable and unreliable signals, sending signals: kill and raise, requesting on alarm signal - alarm, handling signals: signal, interrupted system calls, pause, abort, system, sleep functions. **Inter-process communication (IPC):** pipes, messages, sockets, shared memory, synchronization and semaphores.

Text Books:

1. B.M. Harwani," UNIX and Shell programming", Oxford University Press,2013.
2. Sumitabha Das, "Your UNIX The Ultimate Guide", TMH,3rd edition,2018.
3. W. Richard Stevens, Stephen A. Rago," Advanced programming in the UNIX environment", Pearson education,3rd Edition, 2013.

Reference Books

1. Dr. N. B. Venkateswarlu, "Advanced UNIX Programming", B.S Publications, 2nd Edition, 2010.
2. Marc J. Rochkind, "Advanced UNIX programming", Pearson Education2nd Edition,2004.
3. W.R.Stevens, "UNIX Network Programming, Inter Process Communication", PHI/Pearson, 2nd Edition, 1999.
4. U. Vahalia," UNIX Internals the New Frontiers",Pearson education,1st Edition,1996.

Reference Links:

1. https://archive.nptel.ac.in/courses/117/106/117106113/
2. https://www.udemy.com/course/start-practical-UNIX-or-linux-command-line-for-everyone

Data Communication and Computer Networks Lab

Subject Code: 23ITL303

L	T	P	C
0	0	3	1.5

Course Objectives:

- Build and understanding of the fundamental concepts of computer networking.
- Analyze the different layers in networks and define, use, and differentiate such concepts as OSI-ISO, TCP/IP.
- To be familiar with contemporary issues in networking technologies and allow the student to gain expertise in maintenance of individual networks.
- To know that how the routing algorithms worked out in network layer.

Course Outcomes:

1. Knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.
2. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
3. Understand and building the skills of routing mechanisms during packet delivery.
4. Apply the congestion control algorithms and understand how a packet is routed.
5. Familiar with network tools and network programming.

LIST OF EXPERIMENTS:

1) Exploration of Various Networking Components
2) Implementation of Data Link Layer Framing Methods
3) Development and Testing of Error Detection Mechanisms
4) Implementation of routing algorithms
5) Implementation of Congestion Control Mechanisms
6) Implementation of IP Address Subnetting and Masking

Text Books:

1. Andrew S Tanenbaum, "Computer Networks", Pearson Education,5th Edition, 2016.
2. Behrouz A Forouzan, "Data Communications and Networking", McGraw-Hill, 4th Edition, 2006

Reference Books:

1. Bhusan Trivedi," Data communication and Networks", Oxford University Press, 2016
2. W.A.Shay,"Understanding Communications and Networks", Cengage Learning, 3rd Edition, 2015.

Advanced Java and Web Technologies Lab

Subject Code: 23ITL304

L	T	P	C
0	0	3	1.5

Course Objectives:

1. Create web pages with navigation and forms for an online bookstore using HTML and CSS
2. Implement JavaScript form validations to ensure user input meets specified criteria for registration
3. Create XML documents to represent structured data and write DTDs to validate the XML content
4. Create database tables using JDBC and build servlet programs handle requests, manage cookies, and track user sessions.
5. Create database tables and develop JSP programs to retrieve and display data from the database

Course Outcomes:

1. Design and develop a complete static web page using HTML and CSS.
2. Implement client-side form validations using **JavaScript** to ensure correct user input during Registration.
3. Implement XML for efficiently storing, transporting and displaying data.
4. Design and manage relational database tables using **JDBC** and Servlet applications for creating websites.
5. Develop dynamic web pages using **JSP** to retrieve and display data from databases.

1. Design the following static web pages required for an online book store web site.

Home Page:

The static home page must contain three divisions (using div tag & styles).

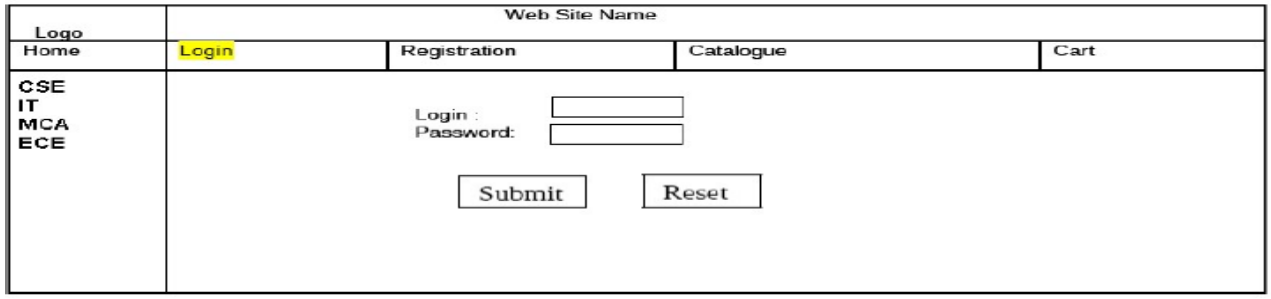
Top division: Logo and the store name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left division: At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link "IT" the catalogue for IT Books should be displayed in the Right frame.

Right division: The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site.

<table>
<tr><td>Logo</td><td colspan="4">Web Site Name</td></tr>
<tr><td>Home</td><td>Login</td><td>Registration</td><td>Catalogue</td><td>Cart</td></tr>
<tr><td>CSE
IT
MCA
ECE</td><td colspan="4">Description of the Web Site</td></tr>
</table>

2. Develop a Login Page:



3. Develop a Registration Page with the following fields:

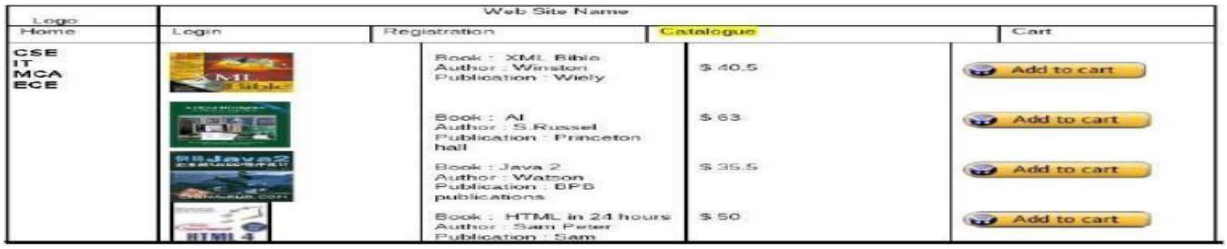
Create a registration page with the following fields

a. Name (Text field)
b. Password (password field)
c. E-mail id (text field)
d. Phone number (text field)
e. Sex (radio button)
f. Date of birth (3 select boxes)
g. Languages known (check boxes – English, Telugu, Hindi, Tamil)
h. Address (text area)

4. CATALOGUE PAGE

The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

a. Snap shot of Cover Page.
b. Author Name.
c. Publisher.
d. Price.
e. Add to cart button.



5. Design a web page using CSS (Cascading Style Sheets) which includes the following:
Use different font, styles: In the style definition, define how each selector should work (font, color etc.). Then, in the body of web pages, activate the styles if you refer these selectors.

6. Write a JavaScript to validate the following fields of the above registration page.

a. Name (Name should contains alphabets and the length should not be less than (characters).
b. Password (Password should not be less than 6 characters length).
c. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
d. Phone number (Phone number should contain 10 digits only). Note: You can also validate the login page with these parameters.

7. Write an XML file which will display the Book information which includes the following:

a. Title of the book
b. Author Name
c. ISBN number
d. Publisher name
e. Edition
f. Price

Write a Document Type Definition (DTD) to validate the above XML file.

8. Create tables in the database which contain the details of items (books in our case like Book name, Price, Quantity, Amount) of each category and display book information using JDBC.

9. Write servlet program to read parameters from web.xml.

10. Write a servlet program using cookie management.

11. Write servlet program to illustrate Http Session.

12. Create a table (Book which contains Title of the book, Author Name, ISBN number, Publisher name, Edition, Price) in the database and develop a JSP program to retrieve the book data from the database.

Text Books:

1. "Web Technologies Black Book", Kogent Learning Solutions Inc, Dreamtech Press, 1st edition, 2009.
2. Dietel and Nieto,"Internet World Wide Web - How to Program", PHI/Pearson education Asia, 4th Edition, 2009.

Reference Books:

1. Chris Bates "Web programming, building Internet applications", Wiley India Pvt. Limited 3rd edition, 2012
2. Herbert Schildt, Dr.Coward, Danny "Java: The Complete Reference", TMH,13thedition, 2024
3. Hans Bergsten,"Java Server pages ", SPD O'Reilly,3rd Edition,2004.

Advanced Coding Lab-II

Subject Code: 23ESL312

L	T	P	C
0	0	3	1.5

Course Objectives:

- The course emphasizes the significance of mathematics and problem-solving approaches in programming and the importance of optimizing solutions for effective problem-solving.

Course Outcomes:

After completion of the course, the students will be able to

1. Select appropriate Sorting /Searching technique to solve the Problem
2. Develop solutions using Back tracking
3. Develop Solution to problems using Heap and Greedy approach
4. Develop Solution to problems using Dynamic Programming
5. Develop solutions using Non-Linear Data Structures

Lab Module – I

Searching: Linear and Binary Search

Find First and Last Position of Element in Sorted Array:	https://leetcode.com/problems/find-first-and-last-position-of-element-in-sorted-array/description/
Search in Rotated Sorted Array	https://leetcode.com/problems/search-in-rotated-sorted-array/description/
Find Peak Element	https://leetcode.com/problems/find-peak-element/description/
Single Element in a Sorted Array	https://leetcode.com/problems/single-element-in-a-sorted-array/description/
Search a 2D Matrix	https://leetcode.com/problems/search-a-2d-matrix/description/
Capacity to Ship Packages Within D Days	https://leetcode.com/problems/capacity-to-ship-packages-within-d-days/description/

Lab Module – II

Sorting: Bubble Sort, insertion Sort, Quick Sort, Merge Sort, Counting Sort

Minimum Moves to Equal Array Elements:	https://leetcode.com/problems/minimum-moves-to-equal-array-elements/description/
Minimum Absolute Difference:	https://leetcode.com/problems/minimum-absolute-difference/description/
Sort Array By Parity:	https://leetcode.com/problems/sort-array-by-parity/description/
Max Chunks To Make Sorted:	https://leetcode.com/problems/max-chunks-to-make-sorted/description/
Kth Largest Element in an Array:	https://leetcode.com/problems/kth-largest-element-in-an-array/description/

Boats to Save People: https://leetcode.com/problems/boats-to-save-people/description/?envType=problem-list-v2&envId=sorting

Lab Module – III

Recursion and Backtracking

Subsets: https://leetcode.com/problems/subsets/description/
Permutations: https://leetcode.com/problems/permutations/description/
Permutations II: https://leetcode.com/problems/permutations-ii/description/
Subsets II: https://leetcode.com/problems/subsets-ii/description/
Palindrome Partitioning: https://leetcode.com/problems/palindrome-partitioning/description/
N-Queens: https://leetcode.com/problems/n-queens/description/

Lab Module – IV

Linked List Part 1: Singly Liked List, Doubly Linked List, Circular Linked List

Middle of the Linked List: https://leetcode.com/problems/middle-of-the-linked-list/description/
Delete Node in a Linked List https://leetcode.com/problems/delete-node-in-a-linked-list/description/
Reverse Linked List: https://leetcode.com/problems/reverse-linked-list/description/
Convert Binary Number in a Linked List to Integer: https://leetcode.com/problems/convert-binary-number-in-a-linked-list-to-integer/description/
Palindrome Linked List https://leetcode.com/problems/palindrome-linked-list/description/
Remove Linked List Elements: https://leetcode.com/problems/remove-linked-list-elements/description/

Lab Module – V

Linked List part 2:

Sort List: https://leetcode.com/problems/sort-list/description/
Remove Duplicates from Sorted List: https://leetcode.com/problems/remove-duplicates-from-sorted-list/description/
Merge Two Sorted Lists: https://leetcode.com/problems/merge-two-sorted-lists/description/
Intersection of Two Linked Lists: https://leetcode.com/problems/intersection-of-two-linked-lists/description/
Linked List Cycle: https://leetcode.com/problems/linked-list-cycle/description/
Linked List Cycle II: https://leetcode.com/problems/linked-list-cycle-ii/description/

Lab Module – VI

Stack & Queue

Evaluate Reverse Polish Notation:	https://leetcode.com/problems/evaluate-reverse-polish-notation/description/
Min Stack	https://leetcode.com/problems/min-stack/description/
Daily Temperatures:	https://leetcode.com/problems/daily-temperatures/description/
Largest Rectangle in Histogram:	https://leetcode.com/problems/largest-rectangle-in-histogram/description/
Implement Stack using Queues:	https://leetcode.com/problems/implement-stack-using-queues/description/
Implement Queue using Stacks:	https://leetcode.com/problems/implement-queue-using-stacks/description/
Gas Station:	https://leetcode.com/problems/gas-station/description/
Sliding Window Maximum:	https://leetcode.com/problems/sliding-window-maximum/description/

Lab Module – VII

Hashing

Find Common Elements Between Two Arrays:	https://leetcode.com/problems/find-common-elements-between-two-arrays/description/
Contains Duplicate:	https://leetcode.com/problems/contains-duplicate/description/
Find All Duplicates in an Array:	https://leetcode.com/problems/find-all-duplicates-in-an-array/description/
Sort Characters By Frequency:	https://leetcode.com/problems/sort-characters-by-frequency/description/
Group Anagrams:	https://leetcode.com/problems/group-anagrams/description/
Isomorphic Strings:	https://leetcode.com/problems/isomorphic-strings/description/

Lab Module – VIII

Heap (Priority Queue)

Last Stone Weight:	https://leetcode.com/problems/last-stone-weight/description/
Relative Ranks:	https://leetcode.com/problems/relative-ranks/description/
Take Gifts From the Richest Pile:	https://leetcode.com/problems/take-gifts-from-the-richest-pile/description/
Seat Reservation Manager:	https://leetcode.com/problems/seat-reservation-manager/description/
Minimum Amount of Time to Fill Cups:	https://leetcode.com/problems/minimum-amount-of-time-to-fill-cups/description/
Reduce Array Size to The Half:	https://leetcode.com/problems/reduce-array-size-to-the-half/description/

Lab Module – IX

Greedy Approach to solve problems

Maximum Sum With Exactly K Elements:	https://leetcode.com/problems/maximum-sum-with-exactly-k-elements/description/
Minimum Operations to Make the Array Increasing:	https://leetcode.com/problems/minimum-operations-to-make-the-array-increasing/description/
Assign Cookies:	https://leetcode.com/problems/assign-cookies/description/
Non-overlapping Intervals:	https://leetcode.com/problems/non-overlapping-intervals/description/
Boats to Save People:	https://leetcode.com/problems/boats-to-save-people/description/
Lexicographically Smallest String after Substring Operation	https://leetcode.com/problems/lexicographically-smallest-string-after-substring-operation/description/

Lab Module – X

DP: Linear DP,2 Dimensional DP, DP on Grids,

Climbing Stairs:	https://leetcode.com/problems/climbing-stairs/description/
Decode Ways	https://leetcode.com/problems/decode-ways/description/
House Robber:	https://leetcode.com/problems/house-robber/description/
Partition Equal Subset Sum:	https://leetcode.com/problems/partition-equal-subset-sum/description/
Frog Jump:	https://leetcode.com/problems/frog-jump/description/
Unique Paths:	https://leetcode.com/problems/unique-paths/description/
Minimum Path Sum:	https://leetcode.com/problems/minimum-path-sum/description/
Knapsack 1:	https://atcoder.jp/contests/dp/tasks/dp_d
Longest Increasing Subsequence:	https://leetcode.com/problems/longest-increasing-subsequence/description/
Largest Divisible Subset:	https://leetcode.com/problems/largest-divisible-subset/description/

Lab Module – XI

Tree:

Binary Tree Preorder Traversal:	https://leetcode.com/problems/binary-tree-preorder-traversal/description/
Binary Tree Inorder Traversal:	https://leetcode.com/problems/binary-tree-inorder-traversal/description/
Binary Tree Postorder Traversal:	https://leetcode.com/problems/binary-tree-postorder-traversal/description/
Maximum Depth of Binary Tree:	https://leetcode.com/problems/maximum-depth-of-binary-tree/description/
Diameter of Binary Tree:	https://leetcode.com/problems/diameter-of-binary-tree/description/

Binary Tree Right Side View:	https://leetcode.com/problems/binary-tree-right-side-view/description/
Path Sum:	https://leetcode.com/problems/path-sum/description/

Lab Module – XII

Graph: DFS and BFS on Graphs, Topological Sort, Flood Fill

DFS Traversal:	https://www.naukri.com/code360/problems/dfs-traversal_630462
Find if Path Exists in Graph:	https://leetcode.com/problems/find-if-path-exists-in-graph/description/
Keys and Rooms:	https://leetcode.com/problems/keys-and-rooms/description/
Open the Lock:	https://leetcode.com/problems/open-the-lock/description/
Jump Game III:	https://leetcode.com/problems/jump-game-iii/description/
Course Schedule:	https://leetcode.com/problems/course-schedule/description/

Text Book:

1. T.H. Cormen et.al.," Introduction to Algorithms ", PHI, New Delhi, 2005.

Reference Books:

1. J.Kleinberg & E. Tardos, "Algorithm Design", Pearson Education, New Delhi, 2006.
2. G.Brassard & P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 2005.
3. S.Dasgupta et.al. –Algorithms, TMH, New Delhi – 2007.
4. E.Horowitz.et.al. ,Fundamentals of Computer Algorithms, Universities Press, 2nd Edition, 2008.

Reference Links

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106131/
3. https://www.spoj.com/problems

Tinkering Lab

Subject Code: 23BHL306

L	T	P	C
0	0	3	1.5

Course Objectives:

- The Tinkering Lab course aims to foster an environment where students can explore, experiment, and innovate through hands-on learning.
- The lab encourages creativity, problem-solving, prototyping, and teamwork.
- It provides interdisciplinary exposure to mechanical, electronic, and digital fabrication tools, sensors, IoT, coding, and product design.

Course Outcomes:

1. Apply knowledge from various engineering disciplines to build and test prototypes.
2. Use tools, equipment, and software for basic mechanical, electronic, and digital fabrication.
3. Understand the basics of product design, prototyping, and iteration.
4. Work collaboratively on real-world problem statements and interdisciplinary projects.
5. Develop problem-solving skills through tinkering and experimentation.

MODULE - I

Introduction to Tinkering: The principles of creativity, innovation, and tinkering. What is tinkering? Importance of creativity and experimentation in engineering, Overview of Tinkering Labs: Spaces, tools, and possibilities, Safety and best practices in the lab.

Lab Work:

Simple individual projects using hand tools (e.g., wood/metal cutting, joining, etc.). Demonstrations of sample projects from different engineering streams.

MODULE - II

Introduction to Mechanical Prototyping: Basic mechanical fabrication tools and techniques: 3D modeling and CAD tools (Introduction to software like Solid Works, AutoCAD), Introduction to 3D printing and laser cutting, Using hand tools, drills, and mechanical prototyping kits.

Lab Work:

Create simple mechanical prototypes using 3D printing and basic fabrication tools.
Build and test basic structural models using wood, plastic, and metal materials.

Introduction to Electronics Prototyping: Basic electronics and circuit design. Introduction to bread boarding, resistors, capacitors, transistors, and ICs., Use of Arduino/Raspberry Pi or similar microcontrollers, Working with sensors and actuators, Introduction to simple programming for hardware integration.

Lab Work:

Build a simple electronic project like an automatic light sensor or basic robot.
Implement hands-on projects using Arduino, basic wiring, and circuit design.

Digital Fabrication and IoT: Digital tools for fabrication and integrate IoT-based systems, Introduction to IoT: Sensors, communication protocols (Bluetooth, Wi-Fi, etc.), Working with

embedded systems, IoT platforms, and cloud-based services, Introduction to digital fabrication techniques (Laser cutting, CNC machines).

Lab Work:

Build a basic IoT project (e.g., smart home device or weather station using sensors).
Fabricate components of IoT projects using 3D printers or laser cutters.

MODULE - III

Design Thinking and Ideation: Process of design thinking for problem-solving, Steps of design thinking: Empathize, Define, Ideate, Prototype, and Test, Case studies of successful product design and innovation, Understanding user needs and translating them into tangible solutions.

Lab Work:

Brainstorm ideas for final projects.
Work in teams to develop multiple solutions to a given challenge.

MODULE - IV

Rapid Prototyping and Iteration: Prototype and test ideas iteratively, Concepts of rapid prototyping: fail-fast, iterate often, Tools for prototyping across disciplines (CAD, electronics simulation, 3D printing), Testing and evaluating prototypes for functionality, usability, and cost.

Lab Work:

Create initial prototypes for the final project.
Conduct iterative testing and modifications.

MODULE - V

Collaborative Final Project: Application of interdisciplinary knowledge to solve real-world problems, Work in interdisciplinary teams (mix of mechanical, electronics, computer science, etc.), Solving real-world problems by building a functional prototype, Document project progress, design decisions, and iterations.

Lab Work:

Develop and finalize a working prototype that addresses a selected challenge.
Present the project to peers and faculty for evaluation.

Text Books:

1. Jeanne Liedtka and Tim Ogilvie," Designing for Growth: A Design Thinking Tool Kit for Managers".
2. Karen Wilkinson and Mike Petrich," The Art of Tinkering ".
3. Charles Platt ,"Make: Electronics: Learning by Discovery".

Online Resources:

- Arduino, Raspberry Pi, and IoT tutorial platforms.
- 3D modeling and CAD tutorials on platforms like Tinkercad or Fusion360.
- MIT's Fab Lab and Fab Academy resources.

Tools and Equipment:

- 3D printers, laser cutters, CNC machines.
- Arduino and Raspberry Pi kits.
- Basic electronic components: sensors, LEDs, motors, breadboards.
- Mechanical tools: drills, saws, hand tools, etc.

Managerial Economics and Management Science

Subject Code: 23BHT314

L	T	P	C
3	0	0	3

Course Objectives:

- To understand Managerial Economics
- To understand Law of demand, Elasticity of demand and Demand forecasting techniques
- To understand theory of production cost analysis and its application in business
- To understand market structure different types of competition and pricing strategies
- To understand Principles of management. Leadership styles and social responsibility of an organization
- To understand the concept of marketing and human resources management.

Course Outcomes:

1. Recognize managerial Economics skills to the solution of engineering problems.
2. Explain the cost and production theories in engineering problems
3. Explore and develop the management qualities
4. Enhance the problem solving skills in various business areas
5. Evaluate the future threats and application theories.

Unit- I

Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its Exceptions, Elasticity of Demand, Demand Forecasting, Factors Governing Demand Forecasting, Methods of Demand Forecasting Viz. Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach to Demand Forecasting.

Unit-II

Theory of Production and Cost Analysis: Production Function in Isoquants and Isocosts, MRTS, Least cost Combination of Inputs, Production Function Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost Concepts, Opportunity cost, Fixed &Variable costs explicit costs &Implicit costs, Out of pocket costs & Imputed costs, Break-Even Analysis (BEA), Determination of Break-Even Point (simple problems), Managerial Significance and Limitations of BEA.

Unit-III

Introduction to Markets and Pricing Strategies: Market Structure, Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, Price-Output Determination in Case of Perfect Competition and Monopoly, Concept on different Pricing Strategies.

Unit-IV

Introduction to Management: Concept of Management and Organization: Nature, Importance and Functions of Management, Taylor‘s Scientific Management Theory, Fayal‘s Principles of Management, Mayo‘s Hawthorne Experiments , Maslow‘s Theory of Human Needs, Douglas McGregor‘s Theory X and Y, Hertzberg‘s Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

Unit-V

Introduction to Marketing and Human Resources Management (HRM): Function of Marketing, Marketing Mix, Marketing Strategi es based on Product Lifecycle, Channels of Distribution. Human Resources Management (HRM): Concept of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic Functions of HR Manager; Manpower Planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

Text Books:

1. Varshney and Maheswari, “Managerial Economics”, Sultan and Chand, New Delhi, 2003
2. Ramaswamy.T,” Principles of Management”, Himalaya Publishing House, Mumbai, 2008.
3. Phillip Kotler and Kevin Lane Keller, “Marketing Management”, PHI Learning Private Limited, 12/e,2006.
4. P.Subba Rao, “Personnel and Human Resource Management: Text and Cases”, Himalaya Publishing Houses, Mumbai.

Reference Books:

1. Dwivedi, “Managerial Economics”, Vikas Publications, 2009, 6/e.
2. Koonz, Weihrich and Aryasri, “Principles of Management”, Tata McGraw Hill, 2004.
3. Tapan K. Panda, “Marketing Management: Texts and Cases”,Excel Books, 2008, 2/e.
4. Rajan Saxena, “Marketing Management “, Tata Mc Graw Hill, 2009, 4/e.
5. Aswathappa, “Human Resource Management”,Mc Graw Hill, 2009.
6. Edwin B.Flippo, “Personnel Management”, Mc Graw Hill, 2003.

Principles of Compiler Design

Subject Code: 23ITT309

L	T	P	C
3	0	0	3

Course Objectives:

- To teach concepts of the language translations and phases of compiler design
- To describe the common forms of parsers
- To inculcate knowledge of parser by parsing LL parser and LR parser
- To demonstrate intermediate code using technique of syntax directed translation
- To illustrate the various optimization techniques for designing various optimizing compilers

Course Outcomes:

1. Use Compiler construction tools and describes the Functionality of each stage of compilation process.
2. Construct Grammars for Natural Languages and find the Syntactical Errors/Semantic errors during the compilations using parsing techniques.
3. Demonstrate different representations of intermediate code.
4. Analyze type checking and run time environments.
5. Construct new compiler for new languages.

Unit-I

Introduction to Compilers: Definition of compiler, interpreter and its differences, the phases of a compiler, role of lexical analyzer, regular expressions, finite automata, from regular expressions to finite automata, pass and phases of translation, bootstrapping, LEX-lexical analyzer generator.
Parsing: Parsing, role of parser, context free grammar, derivations, parse trees, ambiguity, elimination of left recursion, left factoring, eliminating ambiguity from dangling-else grammar, classes of parsing.

Unit-II

Top Down Parsing: Definition of top down parsing backtracking, recursive descent parsing, predictive parsers, LL (1) grammars.
Bottom Up Parsing: Definition of bottom up parsing, handles, handle pruning, stack implementation of shift-reduce parsing, conflicts during shift-reduce parsing, LR grammars, LR parsers- simple LR, canonical LR(CLR) and Look Ahead LR (LALR) parsers, error recovery in parsing, parsing ambiguous grammars, YACC-automatic parser generator.

Unit-III

Syntax Directed Translation: Syntax directed definition, construction of syntax trees, S-attributed and L-attributed definitions, translation schemes, emitting a translation.
Intermediate Code Generation: intermediate forms of source programs– abstract syntax tree, polish notation and three address code, types of three address statements and its implementation, syntax directed translation into three-address code, translation of simple statements, Boolean expressions and flow-of-control statements.

Unit-IV

Type Checking: Definition of type checking, type expressions, type systems, static and dynamic checking of types, specification of a simple type checker, equivalence of type expressions, type conversions, overloading of functions and operators.

Run Time Environments: Source language issues, Storage organization, storage-allocation strategies, access to non-local names, parameter passing, symbol tables and language facilities for dynamic storage allocation.

Unit-V

Code Optimization: Organization of code optimizer, basic blocks and flow graphs, optimization of basic blocks, the principal sources of optimization, the directed acyclic graph (DAG) representation of basic block, global data flow analysis.

Code Generation: Object code forms, the target machine, a simple code generator, register allocation and assignment, peephole optimization.

Text Books:

1. Alfred V.Aho, Ravi Sethi, Jeffrey D.Ullman," Compilers Principles, Techniques and Tools", Pearson Education, 2nd Edition, 2007.
2. Douglas Thain," Introduction to Compilers and Language Design", 2nd Edition,2021

Reference Books:

1. Michael Sipser," Introduction to Theory of Computation", Thomson,3rd Edition,2014.
2. Kenneth C.Louden, "Compiler Construction–Principles and Practice", PWS Publishing, 1st Edition, 1997.
3. K.L. P Mishra, N.Chandra Shekaran, "Theory of computer science- Automata Languages and Computation", Prentice Hall of India, 3rd Edition, 2006
4. Andrew W. Appel, "Modern Compiler Implementation C", Cambridge University Press, 3rd edition, 2004.

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Human Resource Development and Organizational Behavior
(Open Elective-I)

Subject Code: 23OET311

L	T	P	C
3	0	0	3

Course Objectives:

- To gain insights into the fundamental concepts, processes, and significance of HRD.
- To learn the importance and methodologies of performance appraisal, both traditional and modern.
- To comprehend the principles, concepts, and influencing factors of compensation management.
- To understand the meaning, scope, challenges, and opportunities in organizational behaviour.
- To learn theories of motivation and also deals with individual behaviour, their personality and perception of individuals.

Course Outcomes:

1. To familiarize the various aspects of HR, to deal effectively with people resourcing and talent management and HR functions in an organization.
2. To understand the concepts of HRD, its role and importance in the success of organization.
3. To develop an understanding towards compensation management and industrial relations. course outcomes
4. To define and explain the basic concepts of organizational behaviour and motivation.
5. To explain the essential concepts of organisational conflicts, resolution of conflicts through negotiation, change management and organisational development.

Unit-I

Human Resource Development: Introduction to Human Resource Development: Concepts - Training and Development - methods of training -Concept and Importance -Assessing Training Needs- Designing and Evaluating T&D Programmes - Role, Responsibilities and challenges to Training Managers

Unit-II

Performance Appraisal: Importance of Performance Appraisal, Traditional and Modern methods of performance appraisal, Job Evaluation - Methods of Job Evaluation.

Unit-III

Compensation Management, Industrial Relations and Emerging HR Practices: Compensation – Concepts and Principles, Influencing Factors, Emerging Trends in Compensation – Methods of Payment – Incentives and Rewards, Managing Industrial Relations – Emerging trends and practices in human resource management

Unit-IV

Introduction to Organizational Behavior: Meaning and scope of organizational behavior - Challenges and Opportunities – Foundations of Individual behavior, Motivation - Theories (Maslow, ERG, Douglas McGregor two-factor theory), Group dynamics, Leaderships styles

Unit-V

Organizational Conflict and Change: Organizational Conflict - causes and consequences - conflict and negotiation, Organizational change, change management process, resistance to change, flexibility and crisis management Organizational Development – concept and significance.

Text Books:

1. Rocco, T. S., Morris, M. L., & Poell, R. F. (Eds.), "The Sage handbook of human resource development", SAGE Publications Ltd., 2024. Available at SAGE Publications
2. Bierema, L. L., Callahan, J. L., Elliott, C. J., Greer, T. W., & Collins, J. C., "Human resource development: Critical perspectives and practices". Routledge, (2023). Available at Taylor & Francis
3. Noe, R. A., Hollenbeck, J. R., Gerhart, B., & Wright, P. M.,"Fundamentals of human resource management". McGraw Hill, 2024.Available at McGraw Hill

Reference Books:

1. K. Aswathappa (2016), Organizational Behaviour, 12th edition, Himalaya.
2. Edwin B. Flippo(2013), Personnel Management, TMH, 6th Edition.
3. Robbins, S. P., & Judge, T. A. (2021). Organizational behaviour (18th ed.). Pearson.
4. P. Subba Rao (2014), Management & Organizational Behaviour, 2nd edition, Himalaya.
5. C.B. Mamoria& VSP Rao (2015), Personnel Management, Himalaya, 20th edition.
6. Stephen P. Robins, Organisational Behaviour, PHI Learning / Pearson Education, 11th edition.
7. Rustum S. Davar (2009), Personnel Management & Industrial Relations, Vikas Publishers, 10th edition.
8. K.Venkataratnam(2011), Human Resource Management, Seven hills Book Publications, 1st edition.

Business Plan and Presentation for Entrepreneurs
(Open Elective-I)

Subject Code: 23OET312

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the essential components of a business plan and how to structure it.
- Develop a clear and concise elevator pitch for a business idea.
- Learn to create a persuasive, visually engaging presentation that captures the interest of the audience.
- Master public speaking and storytelling techniques tailored for business pitches.
- Gain practical experience through pitching and receiving feedback.

Course Outcomes:

1. Demonstrate the ability to identify and structure the essential components of a business plan, including problem identification, market analysis, solution development, and financial planning.
2. Develop concise and impactful elevator pitches that effectively communicate business ideas, ensuring clarity, relevance, and engagement.
3. Create visually engaging and persuasive business presentations that utilize appropriate tools, techniques, and strategies to capture audience attention and interest.
4. Master storytelling and public speaking techniques tailored to business contexts, effectively using tone, pace, and gestures to enhance communication.
5. Gain hands-on experience in delivering business pitches, integrating feedback to refine ideas and improve presentation skills for real-world application.

Unit-I

Introduction to Business Planning and Audience Analysis: Overview of business planning and the purpose of business pitches, Types of pitches: elevator, investor, and product, Understanding target audiences and stakeholders, Basics of market research and competitor analysis.

Unit-II

Building the Business Model and Value Proposition: Crafting a clear business model (Business Model Canvas), Defining a unique value proposition, Outlining the essential elements of a business plan: executive summary, market analysis, and key sections.

Unit-III

Financial Planning and Pitch Deck Design: Basics of financial projections- income statement, cash flow, and balance sheet. Understanding key metrics for startups, Creating an effective pitch deck- structure, essential slides, and visual design principles.

Unit-IV

Presentation Skills and Storytelling: Public speaking fundamentals: managing anxiety, body language, voice modulation, and eye contact. Storytelling techniques for business pitches: narrative structure and emotional appeal. Visual storytelling and design elements (color, typography, layout).

Unit-V

Pitch Rehearsal, Q&A, and Final Presentation: Rehearsing for the final pitch: timing, delivery, and handling anxiety. Preparing for questions and objections from potential investors. Conducting a Q&A session with confidence.

Text Books:

1. Klaff, O, *"*Pitch anything: An innovative method for presenting, persuading, and winning the deal", McGra*w*-Hill Education,2011.
2. Osterwalder, A., &Pigneur, Y., "Business model generation: A handbook for visionaries, game changers, and challengers", Wiley, 2010.
3. Duarte, N., "HBR guide to persuasive presentations", Harvard Business Review Press,2012.
4. Berry, T., "Hurdle: The Book on Business Planning", Palo Alto Software,2022.
5. Budhale, P, "The Golden Book of Business Presentation Skills: Quick and Easy Tips to Make Powerful Presentations", Bloomsbury Prime,2021.

E-Waste Management
(Open Elective-I)

Subject Code: 23OET313

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the concept, generation, and environmental impacts of e-waste in India and globally.
- Analyze global trade practices, e-waste recycling, and its economy in India's organized and unorganized sectors.
- Learn e-waste control measures, including health safeguards, EPR, and effective regulatory mechanisms.
- Examine the salient features and implications of India's e-waste management rules of 2011 and 2016.
- Explore international conventions and directives for managing e-waste and restricting hazardous substances.

Course Outcomes:

1. Explain the concept of e-waste, its composition, and environmental and health impacts at national and global levels.
2. Identify and compare factors influencing e-waste trade and recycling practices in India and globally.
3. Apply principles of e-waste management, including EPR and reduction at source, to develop effective control measures.
4. Evaluate the implications of India's E-Waste (Management) Rules of 2011 and 2016 for sustainable e-waste management.
5. Assess the effectiveness of international conventions and directives in addressing e-waste hazards and restrictions on hazardous substances.

Unit-I

Introduction: What is E-Waste, Indian and global scenario of e-Waste, Growth of Electrical and Electronics industry in India, E-waste generation in India, Composition of e-waste, Possible hazardous substances present in e-waste, Environmental and Health implications.

Unit-II

E-Waste Hazardous On Global Trade: Essential factors in global waste trade economy, Waste trading as a quint essential part of electronic recycling, Free trade agreements as a means of waste trading. Import of hazardous e-waste in India; India's stand on liberalizing import rules, E-waste economy in the organized and unorganized sector. Estimation and recycling of e-waste in metro cities of India.

Unit-III

E-Waste Control Measures: Need for stringent health safeguards and environmental protection laws in India, Extended Producers Responsibility (EPR), Import of e-waste permissions, Producer-Public-Government cooperation, Administrative Controls & Engineering controls, monitoring of compliance of Rules, Effective regulatory mechanism strengthened by manpower and technical expertise, Reduction of waste at source.

Unit-IV

E-Waste (Management and Handling) Rules: E-waste (Management and Handling) Rules, 2011 and E-Waste (Management) Rules, 2016 - Salient Features and its likely implication. Government assistance for TSDFs.

Unit-V

The international legislation: The Basel Convention; The Bamako Convention. The Rotterdam Convention. Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union, Restrictions of Hazardous Substances (RoHS) Directive

Text Books:

1. Johri R., "E-waste: implications, regulations, and management in India and current global best practices", TERI Press, New Delhi.

Reference Books:

1. Fowler B, "Electronic Waste (Toxicology and Public Health Issues)", Elsevier, 1st Edition, 2017.
2. Hester R.E and Harrison R.M," Electronic Waste Management. Science", 2009

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2. https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/e-waste-management
3. https://www.who.int/news-room/fact-sheets/detail/electronic-waste-%28e-waste%29

Blockchain Technologies
(Open Elective-I)

Subject Code: 23OET314

L	T	P	C
3	0	0	3

Course Objectives:

- To give students the understanding of emerging abstract models for Blockchain Technology and to familiarize with the functional/operational aspects of crypto currency eco-system, this course covers the technological underpinning of Block Chain operations in both theoretical and practical implementation of solutions using Ethereum.

Course Outcomes:

1. Understand the basics of block chain and its applications.
2. Analyze the Consensus agreement methods & Mining.
3. Understand the Cryptocurrency and Bitcoin.
4. Deploy Ethereum and Open Source Hyper Ledger Architecture.
5. Apply various technologies to Integrate Block Chain.

Unit-I

Basics of Blockchain: Introduction, History, Definition of Block chain, Fundamentals of Block chain, Characteristics, Public, Private, and Hybrid Block chains, Distributed Ledger Technologies, Architecture of Block chain**.**

Blockchain Applications: Smart Contracts, Wallet, Digital Currency, Digital Ledgers.

Unit-II

Consensus: Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods, Consensus in Trust-Building Exercise.

Mining: Introduction, Mining Nodes, Mining the block, Validating a New Block, Blockchain Forks, Mining Hardware and Software

Unit-III

Crypto currency and Wallet: Introduction to cryptocurrency,Types of Wallet-Desktop Wallet, App based Wallet, Browser based wallet, Metamask, Creating a account in Metamask, Use of faucet to fund wallet, transfer of cryptocurrency in metamask.

Bitcoin basics: Introduction to Bitcoin block chain, Challenges and solutions, Bitcoin scripting language and their use.

Unit-IV

Understanding Ethereum: Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Key Pairs, Addresses, Wallets, Transactions, Development Tools.

Understanding Hyperledger Fabric: Overview of Open source Hyperledger project, Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric.

Unit-V

Blokchain Allied Technologies: Cloud Computing, Artificial Intelligence, IoT, Machine Learning, Robotic Process Automation.

Challenges: Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations.

Text Books:

1. Sourabh, A. Sexena,"Blockhain Technology: Concepts and Applications", Wiley, 2019.
2. Melanie Swan, "Blockhain", O'Reilly, 2nd Ed, 2018

Reference Books:

1. Andreas M. Antonopoulos, "Mastering Bitcoin", O'Reilly, 2nd Edition, 2017.
2. Manav Gupta, "Blockchain for Dummies", John Wiley & Sons, 2nd Edition, 2018
3. Imran Bashier, "Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks".

Reference Links:

1. https://www.cybrary.it/blog/blockchain-technology-in-information-security/
2. https://archive.nptel.ac.in/courses/106/105/106105184/

Optimization Techniques
(Open Elective-I)

Subject Code: 23OET315

L	T	P	C
3	0	0	3

Course Objectives:

- Develop the ability to formulate and solve linear programming problems
- Equip students with the skills to solve transportation and assignment problems
- Provide students with a deep understanding of nonlinear programming problems.

Course Outcomes:

1. Formulate, solve linear programming problem using graphical and simplex method along with its Big-M and 2-Phase variations
2. Solve both balanced and unbalanced transportation and assignment problems
3. Students should able to apply the concept of non-linear programming
4. Compute queue performance characteristics for various queuing models
5. Solve problems of decision making under certainty, uncertainty and risk

Unit-I

Linear Programming: Introduction to linear programming problem formulation, Graphical solution, Simplex method, Artificial variables techniques.

Unit-II

Transportation Problem: Formulation, Optimal solution, unbalanced transportation problems.

Assignment Problem: Formulation, Optimal solution, Traveling salesman problem.

Unit-III

Nonlinear Programming Problems: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem.

Unit-IV

Queuing Theory: Characteristics of Queuing models, Classification, (M/M/1) :(FCFS/∞/∞), (M/M/1) :(FCFS/N/∞), (M/M/C): (FCFS/∞/∞) models.

Unit-V

Decision Theory: Introduction, Classification of decisions, decision making under certainty, decision making under risk, decision making under uncertainty.

Text Books:

1. Operations Research by P. Rama Murthy
2. Operations Research by D.S. Hira and Prem Kumar gupta

Reference Books:

1. Operations Research, J.K. Sharma, MacMilan Pub.
2. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers
3. Optimization theory & Applications / S. S. Rao / New Age International

Ethics in AI
(Open Elective-I)

Subject Code: 23OET316

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the ethical considerations and moral implications in the development and deployment of AI systems.
- Explore the impact of AI on society, privacy, autonomy, and fairness.
- Evaluate ethical frameworks, principles, and regulations relevant to AI development and usage.
- Analyze ethical dilemmas in AI systems, including bias, transparency, accountability, and AI's impact on employment.
- Discuss global perspectives and the role of policymakers, developers, and the public in shaping ethical AI governance.

Course Outcomes:

1. Demonstrate an understanding of key ethical challenges related to artificial intelligence.
2. Apply ethical theories and principles to real-world AI applications and dilemmas.
3. Critically assess AI systems in terms of fairness, transparency, accountability, and privacy.
4. Communicate ethical concerns effectively and propose strategies to mitigate negative AI impacts.
5. Advocate for the responsible design and implementation of AI systems through ethical practices and regulations.

Unit-I

Introduction to Ethics in AI: Overview of AI: History and current landscape**,** Introduction to ethics and its significance in AI**,** Moral reasoning, ethical theories (utilitarianism, deontology, virtue ethics)**,** Case studies of AI-related ethical issues

Unit-II

Bias and Fairness in AI Systems: Types of bias in AI: Data, algorithmic, and human biases**,** Approaches to reducing bias in AI systems**,** Ethical implications of biased AI decisions**,** Case studies: Discrimination in facial recognition, biased predictive algorithms

Unit-III

Privacy, Surveillance, and Data Ethics: Importance of data privacy in AI**,** Ethical issues in data collection, storage, and use**,** Surveillance technologies and their social implications**,** Privacy-preserving AI techniques.

Unit-IV

Accountability, Transparency, and Explainability: Defining accountability and transparency in AI systems**,** Challenges of "black-box" AI models**,** Methods for explainable AI (XAI)**,** Regulatory and industry efforts for transparency.

Unit-V

Ethical AI Governance and Regulation: Role of governments, industry standards, and international bodies in AI regulation**,** Human-centered AI principles, Ethical challenges in autonomous systems (e.g., self-driving cars, military AI)**,** Future trends and challenges in AI ethics

Text Books:

1. Boddington, Paula, "Towards a Code of Ethics for Artificial Intelligence", Springer, 2017.
2. Russell, Stuart," Human Compatible: Artificial Intelligence and the Problem of Control", Viking, 2019.
3. Floridi, Luciano," The Ethics of Artificial Intelligence", Oxford University Press, 2021.

Reference Books:

1. O'Neil, Cathy, "Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy", Crown Publishing, 2016.
2. Muller, Vincent C, "Ethics of Artificial Intelligence and Robotics", Routledge, 2020.
3. Dignum, Virginia,"Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way", Springer, 2019.

Cyber Security
(Professional Elective-II)

Subject Code: 23ITE321

L	T	P	C
3	0	0	3

Course Objectives:

- Learning the basic concepts and techniques of Cyber Security.
- Understanding of the main issues related to security in modern networked computer systems
- Concepts and foundations of computer security,
- Basic knowledge about security-relevant decisions in designing IT infrastructures.

Course Outcomes:

1. Understand key terms and concepts in cyber security fundamentals.
2. Gain knowledge about attacker techniques and motivations.
3. Examine different kinds of security exploitations.
4. Understand principles of malicious code.
5. Obtain comprehensive knowledge on Defense and Analysis Techniques.

Unit-I

Cyber Security Fundamentals: Information Assurance Fundamentals, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System (DNS), Firewalls, Microsoft Windows Security Principles: Windows Tokens, Window Messaging, Windows Program Execution

Unit-II

Attacker Techniques and Motivations: How Hackers Cover Their Tracks: How and Why Attackers Use Proxies, Tunneling Techniques, Fraud Techniques: Phishing, Smishing, Vishing, and Mobile Malicious Code, Rogue Antivirus, Click Fraud, Threat Infrastructure

Unit-III

Exploitation: Shellcode, Integer Overflow Vulnerabilities, Stack-Based Buffer Overflows, Format String Vulnerabilities, SQL Injection, Malicious PDF Files, Race Conditions, Web Exploit Tools, DoS Conditions, Brute Force and Dictionary Attacks, Cross-Site Scripting (XSS).

Unit-IV

Malicious Code: Self-Replicating Malicious Code, Evading Detection and Elevating Privileges, Stealing Information and Exploitation.

Unit-V

Defense and Analysis Techniques: Memory Forensics, Honeypots, Malicious Code Naming, Automated Malicious Code Analysis Systems, Intrusion Detection Systems.

Text Books:

1. Yuri Diogenes and Erdal Ozkaya "Cyber security– Attack and Defense Strategies", Packt Publishing, 3rd Edition, 2022.
2. Christopher Grow , Philip Craig , Donald Short, "Cyber-security Essentials", John Wiley & Sons, 1st Edition,2019.

Reference Books:

1. Donaldson, S., Siegel, S., Williams, C.K., and Aslam, A.,"Enterprise Cyber security -How to Build a Successful Cyber defense Program against Advanced Threats", Apress publication, 1st Edition, 2015.
2. Don Franke, "Cyber Security Basics: Protect your organization", Create Space Indepenndent Publication, 2016.
3. William Stallings, Lawrie Brown," Computer Security: Principles & Practice", Pearson Education,2nd Edition ,2013.

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Fundamentals of Digital Image Processing
(Professional Elective-II)

Subject Code: 23ITE322

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the Fundamentals of Digital Image Processing and its basic principles.
- Master Image Enhancement Techniques
- Study Image Compression Methods.
- Explore Image Morphology.
- Understand and Apply Image Segmentation Techniques.

Course Outcomes:

1. Understand the basics of display devices, image acquisition and applications.
2. Apply geometric and gray-level transformations for preprocessing and enhancement of digital images.
3. Illustrate different compression models and methods.
4. Analyze various morphological extraction techniques on digital images.
5. Understand the meaning, classification and significance of segmentation techniques.

Unit-I

Introduction : Types of display devices: Random & Raster Scan Systems; Pixels and frame buffers; Image Sensing and Acquisition, Image Sampling & quantization, Color Image Processing**:** Color models, pseudo color image processing.

Unit-II

Transformations: Basic Geometric Transformations: Translation, Scaling, Rotation; Intensity transformations: Basic Gray-level functions, histogram Processing, fundamentals of Spatial Filtering- Smoothing filters, Sharpening filters.

Unit-III

Image Compression: Redundancy- Coding, Inter Pixel, Psycho-Visual, Fidelity Criteria; Image Compression Models-The Source Encoder and Decoder, The Channel Encoder and Decoder; Variable Length Coding, LZW Coding, Bit-Plane Coding, Image Compression Standard – JPEG.

Unit-IV

Image Morphology: Preliminaries- Basic Concepts from Set Theory, Logical Operations: Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

Basic Morphological algorithms- Boundary Extraction, Region Filling, Extraction of Connected Components, Thinning, Thickening, Pruning.

Unit-V

Image Segmentation: Detection of discontinuities-Point, Line, Edge Detection filters; Thresholding-Basic Global Thresholding, Basic Adaptive Thresholding; Region- Based Segmentation-Basic Formulation, Region growing, Region Splitting and Merging.

Text Books:

1. Donald Hearn, Pauline Baker, "Computer Graphics with OPENGL - C Version", Pearson Education, 4th Edition, 2017.
2. R.C. Gonzalez & R.E. Woods,"Digital Image Processing", Addison Wesley / Pearson Education, 4th Edition, 2018.

Reference Books:

1. Digital Image Processing using MATLAB, 3rd edition - Rafael C. Gonzalez, University of Tennessee; Richard E. Woods, Steven L. Eddins, MathWorks -2020.
2. A Practical Approach for Image Processing & Computer Vision in MATLAB: by Prof. Neeraj Bhargava, Dr. Ritu Bhargava, Abhishek Pandey, Create Space Independent Publishing Platform, ISBN: 978-1-5412-8602-3, 2016.

Reference Links:

1. https://onlinecourses.nptel.ac.in/noc21_ee78/
2. https://github.com/FlagArihant2000/dip-notes

Software Testing Methodologies
(Professional Elective-II)

Subject Code: 23ITE323

L	T	P	C
3	0	0	3

Course Objectives:

- To discuss the distinctions between testing and debugging.
- To describe the principles of Transaction Flow Testing.
- To describe strategies for generating test cases.
- To understand the essential tools used for test automation.
- To understand the state graphs and decision tables used for logic based testing

Course Outcomes:

1. Understand the process of testing and various methodologies in testing for developed software
2. Apply best approach for transaction flow or data flow testing
3. Write test cases for given software to test the domain before delivery to the customer.
4. Identify the states of a product whether good or bad.
5. Design optimal graph with node reduction procedure.

Unit-I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs, Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

Unit-II

Transaction Flow Testing: Transaction flows, transaction flow testing techniques. Dataflow testing: - Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Unit-III

Domain Testing: Domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domains and testability. Paths, Path products and Regular expressions: Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Unit-IV

Logic Based Testing: Overview, decision tables, path expressions, kv charts, specifications. State Graphs and Transition testing: State graphs, good & bad state graphs, state testing, Testability tips.

Unit-V

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. Usage of JMeter and Selenium tools for functional / Regression testing, creation of test script for unattended testing, synchronization of test case, Rapid testing, Performance testing of a data base application and HTTP connection for website access.

Text Books:

1. Naresh Chauhan ,"Software Testing, Principles and Practices", Oxford HED, 2nd Edition,2016
2. Yogesh Singh, "Software Testing", Cambridge University Press, 2nd Edition,2011.

Reference Books:

1. Glenford J. Myers," The Art of Software Testing", Wiley, 3rd Edition, 2011.
2. Paul C. Jorgensen," Software Testing: A Craftsman's Approach", CRC, 4th Edition, 2013.
3. Aditya P. Mathur," Foundations of Software Testing", Pearson Education, 2nd Edition, 2013.

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2. https://www.coursera.org/specializations/software-testing-automation
3. https://www.coursera.org/learn/introduction-software-testing
4. https://www.tutorialspoint.com/software_testing_dictionary/test_tools.html

Advanced Computer Networks
(Professional Elective-II)

Subject Code: 23ITE324

L	T	P	C
3	0	0	3

Course Objectives:

- The objective of this course is to provide a comprehensive understanding of computer networks, including networking devices, network edge/core, access networks, ISPs, and internet backbones.
- Students will learn routing concepts such as RIP, EIGRP, OSPF, LAN switching, VLANs, and WAN technologies like PPP and Frame Relay.
- The course also aims to explore Mobile Ad Hoc Networks (MANETs) and sensor networks, focusing on their properties, challenges, and routing algorithms.

Course Outcomes:

1. Demonstrate an understanding of computer network architectures and models (OSI, TCP/IP, ATM, and Novell NetWare).
2. Comprehend the structure of routers and the concepts of static/dynamic routing protocols (RIP, EIGRP, and OSPF).
3. Apply knowledge of LAN switching, VLANs, VTP, Inter-VLAN routing, and WAN technologies.
4. Analyze the characteristics, challenges, and routing methods of Mobile Ad Hoc Networks (MANETs).
5. Understand the applications, challenges, and architectures of sensor networks.

Unit-I

Computer Networks and the Internet: Networking Devices, The Network edge, The Network core, Access Networks and Physical media, ISPs and Internet Backbones, Networking Models: OSI model, TCP/IP model, ATM model and Novel Netware model.

Unit-II

Network Routing Concepts: Structure of a Router, Basic Router Configuration, Building a Routing Table, Static Routing- Shortest Path Routing-Dynamic Routing Distance Vector Routing Protocol (RIPv1, RIPv2, EIGRP), Link State Routing Protocols (OSPF).

Unit-III

LAN Switching concepts: Structure of Switch configuration, Virtual LANs (VLANs), VLAN Trunking Protocol (VTP), Spanning Tree Protocol (STP), and Inter VLAN Routing. **Wide Area Networks (WANs):** Introduction to WANs, Point-to-Point Protocol (PPP), Frame Relay, DHCP, NAT.

Unit-IV

Mobile Ad hoc Networks (MANETs): Introduction of MANET's, advantages, properties, challenges, applications of MANET, Routing algorithms in MANETs.

Unit-V

Sensor Networks: Introduction to Sensor Networks, Applications of Sensor Networks, Issues and Challenges in designing a Sensor Network, Sensor Network Architecture: Layered architecture, Clustered architecture.

Text Books:

1. Dr. Rahenaaz," Advanced Computer Network", Notion Press, 1st Edition, 2022.
2. James F. Kurose and Keith W.Ross,"Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education, 8th Edition, 2021.
3. Pawan Singh, Sudesh Kumar, Sachin Kumar Gupta, Abhay Kumar Rai, Abdu Saif, "Wireless Ad-hoc and Sensor Networks: Architecture, Protocols, and Applications", CRC Press, 2024
4. Mark Dye, Rick McDonald, and Antoon W. Rufi," Network Fundamentals: CCNA Exploration Companion Guide", Cisco Press,3rd Edition, 2015.

Reference Books:

1. Andrew S. Tanenbaum and David J. Wetherall," Computer Networks", Pearson, 6th Edition,2021.
2. Carlos De Morais Cordeiro and Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2nd Edition, 2011.

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Advanced Computer Architecture
(Professional Elective-III)

Subject Code: 23ITE331

L	T	P	C
3	0	0	3

Course Objectives:

- Classify parallel processors based on Flynn's classification and discuss their attributes.
- Explain the basic structure of memory hierarchy in modern computing systems.
- Explore pipeline processors.
- Compare synchronous and asynchronous pipeline models and evaluate their advantages and limitations.
- Explore cache coherence issues and message-passing mechanisms.

Course Outcomes:

1. Understand parallel computing and performance factors.
2. Design memory hierarchies for optimized performance.
3. Analyze and design pipeline processors.
4. Elaborate multistage network routing and its application in optimizing multiprocessor performance.
5. Implement cache coherence and message-passing challenges.

Unit-I

Parallel Computer Models: State of computing, Elements of modern computer, Flynn's classification of parallel processors, System attributes to performance, Multiprocessors and Multicomputer, shared memory multiprocessors, Distributed memory multiprocessors.

Unit-II

Memory Hierarchy Design: Basic memory hierarchy, Optimization of cache performance, Small and simple first level cache to reduce hit time and power, Way prediction to reduce hit time, Pipelined cache access to increase cache band width.

Unit-III

Linear and Non-Linear Pipeline Processors: Asynchronous and synchronous models, Clocking and timing control, Speedup, Efficiency and Throughput.

Non-Linear Pipeline Processors: Reservation and latency analysis problems, Collision free scheduling problems, Instruction execution phases.

Unit-IV

Multiprocessors and Multi Vector Computers: Inter connection Structure-Crossbar switch and multiport memory, Multistage and combining network routing Multi vector Computers-Vector processing principles, Vector instruction types, Vector access Memory schemes.

Unit-V

Cache coherence and Message Passing Mechanisms: Cache coherence Problems-Two protocol approach, Snoopy protocol, Directory based protocol, Message Passing Mechanisms-Message routing schemes, Deadlock virtual channels, Flow control strategies, Multicast routing algorithm.

Text Books:

1. Kai Hwang and Naresh Jotwani, "Advanced Computer Architecture-parallelism, Scalability, Programmability", McGraw-Hill Publications, 3rd Edition, 2016.
2. Kai Hwang and Faye Briggs, "Computer Architecture and Parallel Processing", McGraw -Hill International, 1st Edition, 2000.

Reference Books:

1. John L Hennessey and David A Patterson, "Computer Architecture A Quantitative Approach", Morgan Kaufmann/ Elsevier, 6th Edition, 2012.

Reference Links:

1. https://www.coursera.org/learn/comparch.
2. https://www.geeksforgeeks.org/advanced-computer-subjects-tutorials.

Data Science
(Professional Elective-III)

Subject Code: 23ITE332

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the fundamentals of Data Science life cycle
- Develop Array Manipulation using NumPy
- Introduce Data Structures in Pandas
- Develop Data Cleaning and Transformation with Pandas
- Master Data Visualization Techniques

Course Outcomes:

1. Explore Data Science Lifecycle and Python for Data Science.
2. Compute data manipulation with NumPy arrays and basic statistical tools.
3. Apply data manipulation with Pandas Series and Pandas DataFrame.
4. Analyze data cleaning, preparation, data transformation and data wrangling with Pandas.
5. Develop data visualizations with matplotlib and seaborn.

Unit-I

Introduction to Data Science: Python for Data Science, Data Science Application Domains, Data Science Life Cycle, Data Science Components, Challenges in Data Science projects, Future Trends in Data Science.

Unit-II

NumPy Basics: The NumPy ndarray: NumPy Data Types, Arithmetic with NumPy Arrays, Array Manipulation, Indexing and Slicing, Boolean Indexing, Fancy Indexing, Broadcasting, Universal Functions, Statistical and Mathematical Methods, Sorting, Unique and Other SetLogic.

Unit-III

Introduction to Pandas Data Structures: Series, DataFrame, Essential Functionality: Reindexing, Dropping, Indexing, Selection,and Filtering, Function Application and Mapping, Sorting and Ranking.

Summarizing and Computing Descriptive Statistics-Correlation and Covariance, Unique Values, Value Counts, and Membership, Reading and Writing Data from various Files.

Unit-IV

Data Cleaning and Preparation: Handling Missing Data, Data Transformation: Transforming Data using a Function or Mapping, Discretization and Binning, Detecting and Filtering Outliers, Vectorized String Functions in pandas.

Data Wrangling: Hierarchical Indexing, Combining and Merging Datasets: merge, join, concatenate, combine, reshape and pivot.

Unit-V

Plotting and Visualization: Data Visualization Tools, Plotting with Pandas and seaborn: Line Plots, Bar Plots, Pie Chart, Histograms and Density Plots, Scatter or Point Plots, Box Plot.

Text Books:

1. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 3rd Edition, 2022.
2. Dr. Ossama Embarak, "Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems", Apress, 2018.
3. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.
4. Fabio Nelli, "Python Data Analytics"-Data Analysis and Science using Pandas, Matplotlib, and the Python programming language, 2015.

Reference Books:

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Shelter Island, "Introducing Data Science - Big Data, Machine Learning, and more, using Python Tools", 2016
2. Joel Grus, "Data Science from Scratch - First Principles with Python", O'Reilly, 2nd edition, 2019.

Reference Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs08/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs32/preview

Soft Computing
(Professional Elective-III)

L	T	P	C
3	0	0	3

Subject Code: 23ITE333

Course Objectives:

- Provide an understanding of the soft computing field and its applications.
- Familiarize students with neural networks, learning methods, and Fuzzy set theory and inference.
- Introduce the basics of genetic algorithms and their use in optimization and planning.
- Develop a thorough understanding of both the theoretical and practical aspects of soft computing.

Course Outcomes:

1. Identify and describe soft computing techniques and their roles in developing intelligent machines.
2. Assess the feasibility of applying neural network methodologies to specific problems.
3. Apply fuzzy logic and reasoning to address uncertainty and solve engineering challenges.
4. Utilize genetic algorithms for combinatorial optimization and real-world problem solving.
5. Evaluate and compare solutions using various hybrid approaches for a given problem.

Unit-I

Soft Computing: Introduction to the concept of soft computing, Difference between soft and hard computing, components of soft computing, Applications of soft computing, AI Search Algorithm, Predicate Calculus, Rules of Interference, Semantic Networks, Frames, Objects, Hybrid Models.

Unit-II

Neural Networks: Introduction to Neural Networks, Basic building block of an artificial neuron, The perceptron, learning rules, and various activation functions, McCulloch & Pitts model, Single layer and Multilayer Perceptrons, Back Propagation networks, Architecture of Back propagation Networks, Applications of NN.

Unit-III

Fuzzy Logic: Fuzzy Introduction, Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Membership Functions, Fuzzy Rules and Fuzzy Reasoning.

Fuzzification: Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule-based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

Unit-IV

Genetic Algorithms: Fundamentals of genetic algorithms: Encoding, Fitness functions, Reproduction. Genetic Modeling: Encoding, Crossover, Selection, Mutation, Convergence of GA, Bit-wise operators, Bitwise operators used in GA. Convergence of Genetic algorithm.

Unit-V

Swarm Algorithms and Hybrid Systems: Introduction to Swarm algorithms, Types of Swarm Algorithms-Particle swarm optimization, Applications of PSO, Ant Colony Optimization.

Hybrid Systems: Genetic Algorithm based Backpropagation Networks, Fuzzy Back Propagation Networks, Support Vector Machines for classification, Bidirectional Associative Memory, Probabilistic Neural Network, Applications.

Text Books:

1. S. Rajasekaran, G. A. Vijayalakshmi Pai, "Soft Computing: Integrating Evolutionary, Neural, and Fuzzy Systems", Prentice Hall India, 3rd Edition,2018.
2. Fakhreddine Karray, Clarence DeSilva," Soft Computing and Intelligent Systems Design", Pearson,2nd Edition, 2020.
3. N.P. Padhy and S.P. Simon, ''Soft Computing: With Matlab Programming'', Oxford Universi, ty Press2015.
4. S.N.Sivanandam & S. N. Deepa, 'Principles of Soft Computing", John Wiley & Sons, 2008.

Reference Books:

1. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Wiley,4th Editio,2016.
2. S. Haykins, "Neural networks: a comprehensive foundation", Pearson Education,.2005.
3. David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning", Pearson Education India, 2013.

Reference Links:

1. http://nptel.ac.in/courses/117105084/
2. http://nptel.ac.in/courses/108104049/

Cloud Based Computing
(Professional Elective-III)

Subject Code: 23ITE334

L	T	P	C
3	0	0	3

Course Objectives:

- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

Course Outcomes:

1. Understand cloud computing concepts and history.
2. Proficiency in cloud technologies such as virtualization and load balancing.
3. Analyzing cloud computing architectures.
4. Understand Cloud Services and Platforms
5. Familiarity in Healthcare, Energy, Industry and Education cloud applications.

Unit-I

Introduction to Cloud Computing: Brief on different computing paradigms, definition of cloud computing, the 3-4-5 Rule. 3 services/ delivery models: IaaS, PaaS, SaaS, 4 Cloud deployment models: private, public, community and hybrid models, 5 characteristics of cloud computing, Cloud service examples.

Unit-II

Cloud Concepts and Technologies: Virtualization: Introduction; Characteristics of virtualized environments; Taxonomy of virtualization techniques; Virtualization and cloud computing; Pros and cons of virtualization; Technology examples. Load balancing, Scalability and Elasticity.

Unit-III

Cloud Computing Architecture: Introduction; The cloud reference model; Types of clouds; Economics of cloud; Open challenges Cloud Platforms in Industry: Amazon web services; Google App Engine; Microsoft Azure.

Unit-IV

Cloud Services: Compute services, Storage services, Database services, Application services, and Content delivery services, Analytics services, Deployment and management services; Open-source private cloud software: Cloud Stack, Eucalyptus and OpenStack.

Unit-V

Applications of Cloud Computing: Healthcare, Energy, Industry and Education.

Text Books:

1. Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, "Mastering Cloud Computing: Foundations and Applications Programming", Morgan Kaufmann, 2013
2. K. Chandrasekaran," Essentials of cloud computing", CRC Press,1st Edition, 2014.

Reference Books:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishing, 2011
2. Tim Mather, Subra Kumaraswamy and Shahed Latif, "Cloud Security and Privacy", O'Reilly, 2009.

Reference Links:

1. https://nptel.ac.in/courses/106/105/106105167/
2. NPTEL Course on Cloud Computing by Prof. Soumya Kanti Ghosh, IIT Kharagpur, Prof. Rajiv Mishra, IIT Patna, Prof. Bidisha Chaudhuri, Prof. Amit Prakash, IIIT Bangalore.

Employability Skills

Subject Code: 23SSS306

L	T	P	C
3	0	0	3

Course Objectives:

- To perform a wide range of mathematical and aptitude problems commonly encountered in diverse disciplines, including science, engineering, and banking management.
- To enhance students' understanding of data problems through the effective interpretation of data presented in various formats, including tables, bar graphs, pie charts, and line graphs.
- To empower students with logical and critical thinking skills, enabling them to objectively analyze data, form evidence-based conclusions, and distinguish facts from assumptions and personal biases.
- To develop the ability to effectively analyze and interpret diverse types of data, including numerical, verbal, and visual information.
- To equip learners with a comprehensive command of the English language, focusing on vocabulary enhancement, grammatical accuracy, and effective reading and comprehension skills.

Course Outcomes:

1. Students apply mathematical proficiency by effectively communicating ideas, solving quantitative problems, and mastering financial calculations, including interest and taxes.
2. Students know how to use various data visualization tools, such as charts, graphs, and tables, to represent data effectively.
3. Students understand various reasoning techniques, including Logical and Critical reasoning, Analogical reasoning, and Causal reasoning.
4. Students learn various non-verbal reasoning techniques, including Diagrammatic reasoning, Spatial reasoning, and Visual logic.
5. Students develop the English language competencies necessary for success in academic, professional, and personal endeavors through effective application of vocabulary, grammar, and reading comprehension skills.

Unit-I

General Mathematical Structures, Quantitative Aptitude and Business Computations: Coordinate Geometry, Time, Work, Speed, and Distance, Allegation and Mixtures, Mensuration, Geometry, Permutations and Combinations, Probability and Statistics.

Unit-II

Data Interpretation: Interpretation of Data Tables, Bar Diagrams, Pie Charts, and Graphs.

Unit-III

Logical Reasoning and Critical Reasoning: Series, Analogy and Classification, Alphabet, Ranking and Direction Tests, Discrete, Mathematical, and Logical Puzzles.

Unit-IV

Analytical Reasoning and Non-Verbal Reasoning: Syllogisms, Statements and Assumptions, Conclusions, Arguments, Cause and Effect, Analytical Decision Making, Coded Relations and Coded Inequalities, Cubes and Dice, Mirror and Water Images, Paper Folding and Cutting.

Unit-V

English Language Essentials: Synonyms & Antonyms, One Word Substitutions, Idioms & Phrases, Spotting Errors, Sentence Completion, Sentence Improvement, Reading Comprehension, Para jumbles, Cloze Test, Inferred Meaning

Reference Books:

1. R. S. Aggarwal, "Modern Approach to Verbal and Non-verbal Reasoning", S. Chand & Company LTD, New Delhi.
2. S.L.Gulati, "Test of Reasoning (Verbal and Non-verbal)" Cosmos Bookhive's (P) LTD, Delhi.
3. Arun Sharma,"Quantitative Aptitude for the CAT", Tata Mc Graw-Hill Publishing Company New Delhi.
4. Sharon Weiner Green, "BARRON'S GRE The leader in Test Preparation", Ira K. Wolf
5. Arun Sharma, Meenakshi Upadyay, "How to Prepare for VERBAL ABILITY & READING COMPREHENSION for CAT".
6. SP Bakshi,"Arihant's Objective General English".

Professional Communication Skills Lab
(Common to CSE, IT, CSM, CSD)

Subject Code: 23BHL305

L	T	P	C
0	0	3	1.5

Course Objectives:

- Equip students with a diverse vocabulary to excel in language tests for academic and professional pursuits.
- Enhance active listening, comprehension, and recall by engaging with various audio materials and practicing structured retelling exercises.
- Cultivate effective writing techniques through structured essay composition, refine email communication skills, and develop the ability to assess personality.
- Improve presentation skills through professional slides and to develop negotiation and collaboration skills in group settings.
- Prepare students with tailored resume-building skills for specific job roles and the confidence to perform well in job interviews.

Course Outcomes:

1. Students will be able to use synonyms, antonyms, analogies, idioms, phrases, one-word substitutes, word roots, prefixes and suffixes appropriately
2. Students will enhance their auditory processing skills, including active listening, comprehension, and recall, through exposure to varied audio content and targeted retelling exercises.
3. Students will cultivate effective writing techniques through practice structured essay composition, refine their email communication skills, and acquire a practical understanding of personality traits through personality assessments.
4. Students will refine their presentation skills by creating professional-grade slides and cultivate effective negotiation and collaboration strategies in team-based activities**.**
5. Students will develop job-specific resume-building skills and buildconfidence to perform well in interviews.

The modules comprise a combination of mandatory and optional activities.

Lab Module 1: Vocabulary

Activities:

- Online vocabulary development activities, including quizzes and vocabulary-building exercises.
- Language assessment exercises, comprising word classification exercises and Word Association Test (WAT).

Lab Module 2: Effective Listening Comprehension and Retelling Stories

Activities:

- Engage in activities such as listening to podcasts and TED talks, followed by answering comprehension questions

- Listen to short stories, read articles, and retell them followed by peer evaluation using rubrics designed for the purpose.

Lab Module 3: Effective Written Communication

Activities:

- Compose essays on given topics, improving grammar and sentence structure through writing exercises, and practicing time-bound essay writing.
- Understand the importance of email etiquette and compose emails for different occasions, such as job inquiries, follow-ups, and professional correspondence.
- Engage in activities like career-related self-assessment, and Thematic Association Test
- Picture perception and description test (optional)

Lab Module 4: Developing PowerPoint Presentation and Group Discussion Strategies

Activities:

- Prepare and deliver PowerPoint presentations on current topics, followed by peer and teacher feedback on content, design, and delivery
- Participate in formal group discussions on current topics, followed by peer and teacher feedback on group behavior and decision-making.

Lab Module 5: Resume Writing and Preparation for Interviews

Activities:

- Learn to draft a resume.
- Participate in one-on-one mock interviews, both in-person and virtual, followed by feedback on body language and response structure
- Role-play as interviewer and interviewee (optional)

References:

1. Advanced Communication Skills Lab. Version 1.0 (Software). K-VAN Solutions Pvt. Ltd.
2. Sanjay Kumar and Pushpa Lata, "Communication Skills", Oxford University Press,2018.
3. K. Nirupa Rani, "Speak Well", Orient Blackswan, Hyderabad, 2012.
4. M. Hari Prasad,"Strengthen Your Communication Skills",Maruthi Publications,Hyd. 2014.
5. M. Hari Prasad,"Strengthen Your Steps", Maruthi Publications, Hyderabad. 2012.
6. Meenakshi and Sangeetha," Technical Communication", OUP. New Delhi. 2013
7. Duolingo Language Learning Application
8. Instacks E Learning Platform for LSRW practice
9. https://www.cambridgeenglish.org/learning-english/activities-for-learners/

Data Science with Python Lab

Subject Code: 23ITL305

L	T	P	C
0	0	3	1.5

Course Objectives:

- Understand Array Manipulation and analysis using NumPy
- Learn Data Handling and Manipulation with Pandas
- Develop Data Cleaning and Transformation in Pandas
- Master Data Wrangling Operations in Pandas
- Create Data Visualizations using matplotlib and seaborn

Course Outcomes:

1. Compute array manipulation with NumPy arrays and basic statistical tools.
2. Apply data manipulation with Pandas Series and Pandas DataFrames.
3. Analyze data cleaning, preparation, data transformation with Pandas.
4. Implement data wrangling with join, merge, concatenate, combine, reshape and pivot.
5. Develop data visualizations with matplotlib and seaborn.

Practical Components

Numpy Arrays and Vectorized Computation

1. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions.
2. NumPy Array manipulation - Indexing, Slicing, Reshaping, Joining, Splitting, Fancy Indexing and Broadcasting.
3. Implement Universal Functions using NumPy arrays.
4. Compute Statistical and Mathematical methods such as sorting, unique and set Logic operations.
5. Load an image file and do crop and flip operation using NumPy Indexing.

Data Manipulation with Pandas

1. Create Series and DataFrame from Pandas Data Structures with various operations
2. Data manipulation with Pandas - Reindexing, Dropping, Indexing, Selection, and Filtering, Arithmetic and Data Alignment.
3. Import any sample dataset in Pandas and perform the following:
   a) Display the top and bottom rows, select/delete the rows/columns based on conditions
   b) Compute Function Application and Mapping.
   c) Compute Sorting and Ranking.
   d) Compute descriptive and summary statistics including correlation and covariance
   e) Compute Unique Values, Value counts, and Membership

Data Cleaning and Preparation

1. Import any sample dataset in Pandas and perform the following:
   a) Handle missing data by filtering, dropping, filling missing values.
   b) Remove Duplicates, Replace Values, Rename single / multiple columns
   c) Transform data using a Function or Mapping to handle missing data
   d) Discretization and Binning
   e) Detecting and Filtering Outliers.
   f) Perform Vectorized String Functions in Pandas.

Data Wrangling

1. Perform merge, join, concatenate, combine and reshape in the context of data wrangling.
2. Read DataFrame to create a pivot table.
3. Read DataFrame to create a cross table.

Plotting and Visualization

1. Implement Data visualizations for the following with matplotlib and seaborn on any sample dataset:
   a) Line Plots, Bar Plots, Pie Chart
   b) Histogram and Density Plots
   c) Scatter Plots or Point Plots and Box Plot

Text Books:

1. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 3rd Edition, 2022.
2. Dr. Ossama Embarak, "Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems", Apress, 2018.
3. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.
4. Fabio Nelli, "Python Data Analytics"-Data Analysis and Science using Pandas, Matplotlib, and the Python programming language, 2015.

Reference Books:

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Shelter Island, "Introducing Data Science - Big Data, Machine Learning, and more, using Python Tools", 2016
2. Joel Grus, "Data Science from Scratch - First Principles with Python", O'Reilly, 2nd edition, 2019.

Reference Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs08/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs32/preview

Constitution of India
(Common to all branches)

Subject Code: 23MCT305

L	T	P	C
2	0	0	0

Course Objectives:

- To help Students regulate their behavior in a social environment as Engineering Professionals.
- To make students aware of the impact of taking social, legal and Administrative decisions about their profession.
- To understand the political and constitutional parameters in work environment.
- To understand the need and strengths of our nation and adopt their knowledge for future career.

Course Outcomes:

1. Realize the rigidness of our Indian Politics and Administrative aspects.
2. A Student can understand our nation federalism.
3. Can assess different types of risk involved in misadministration.
4. Summarizes the legal and Administrative establishments.
5. A student can infer financial aspects for betterment of the National Building.

Unit-I

Introduction: Historical perspective of the constitution of India - Salient features of The Indian Constitution - Amendment Procedure of The Indian Constitution.42nd amendment (Mini Constitution) - 44th amendment (1978 – Janatha Govt.)

Unit-II

Important features of Constitution: Fundamental Rights (Article 12 to 35), Duties (51 A – 1976 emergency) and Directive principles (Article 36 to 51) of State Policy - Articles 14 to 18 - Articles 19 - Article 21

Unit-III

Parliamentary form of Govt. in India: President of India - Emergency provisions -National Emergency – Article 352 President Rules – Article 356- Financial Emergency – Article 360Prime Minister and Cabinet - Supreme Court of India (Indian Judiciary)

Unit-IV

Indian Federalism: Union – State relations; - Legislative, Administrative and Financial relations. Local self Govt.-Constitutional Schemes in India (73 & 74 Constitutional amendments)

Unit – V

Parliamentary Committees: Public Accounts Committee - Estimates Committee - Committee on Public. Undertakings. - Election commission of India (Article -324) - Comptrollar and Auditor General (CAG) of India (Article – 148 to 150) Finance Commission (Article – 280) - Neethi Aayog (Planning Commission) and - Political Parties.

Text Books:

1. D.D Basu,Lexis Nexis ,"Introduction to Indian Constitution", Butterworth wadhwa Nagapur, 2008.
2. Rajini Kothari, "Politics in India", Orient LongMan, 2005.
3. Madhav Khosla," The Indian Constitution", Oxford University Press India, 2012.

Information Security

Subject Code: 23ITT410

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the fundamental concepts of security attacks, services, mechanisms, and network security models.
- Examine conventional encryption principles, algorithms, and public-key cryptography techniques.
- Explain the principles of authentication applications like Kerberos and digital signatures, and assess the security of email systems using PGP and S/MIME.
- Analyze the functions of SSL, SET, and related web security protocols in ensuring secure online transactions.
- Identify the characteristics and types of malware (viruses and worms) and examine firewall design principles and types to ensure network security.

Course Outcomes:

1. Demonstrate an understanding of basic cryptographic methods such as substitution and transposition techniques.
2. Apply knowledge of encryption algorithms and public-key cryptography to evaluate security mechanisms and design secure communication systems.
3. Analyze authentication methods like Kerberos and S/MIME to secure communication systems and demonstrate the ability to implement email security protocols.
4. Design secure communication protocols using IPSec and SSL and evaluate web security mechanisms to ensure privacy and data integrity in online transactions.
5. Evaluate the effectiveness of different firewall designs and apply techniques to prevent malware attacks and enhance network security.

Unit-I:

Introduction: Security Attacks, Security Services and Security Mechanisms, Network security model. **Software Vulnerabilities:** Buffer Overflow, Format String Attacks and SQL Injection. **Basics of Cryptography:** Substitution Techniques, Transposition Techniques, Block and Stream Ciphers.

Unit-II:

Conventional Encryption and Message Confidentiality: Conventional Encryption Principles**,** Algorithms: DES, Triple DES, Blowfish, IDEA and AES, Cipher Block Modes of Operations**.**

Public-Key Cryptography and Message Authentication: Public Key Cryptography Principles**,** Algorithms**:** RSA, Diffie-Hellman Key Exchange, Digital Signatures, Approaches to Message Authentication, Secure Hash Functions (SHA-1)**.**

Unit- III:

Authentication Applications - Kerberos: Motivation, Requirements, Version 4, X.509 Authentication Certificate format.

Electronic Mail Security - Pretty Good Privacy: Notation, Operational Description. S/MIME-RFC 822, Limitations of SMTP, MIME Overview, MIME Content Types, MIME Transfer Encodings, S/MIME Functionality.

Unit -IV:

IP Security: Overview, Architecture, AH, ESP Protocols. **Web Security:** Considerations, SSL: Architecture, Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, SET: Overview, Dual Signatures, Payment Processing.

Unit -V:

Viruses and Worms, Firewalls: Design Principles, Characteristics, Types of Firewalls.

Text Books:

1. William Stallings, Cryptography and Network Security: Principles and Practices, 8th Edition,2023.
2. William Stallings, "Network Security Essentials (Applications and Standards)", 4th Edition, Pearson Education. ,2012.

Reference Books:

1. Behrouz A Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security- Mc-GrawHill", 3rd Edition,2015.
2. Whitman, "Principles of Information Security", Thomson,3rd Edition, 2009.
3. Buchmann, "Introduction to Cryptography", Springer,2nd Edition, 2004.
4. Robert Bragg, Mark Rhodes: "Network Security: The complete reference", TMH, 1st Edition, 2004.

Reference Links:

1. https://nptel.ac.in/courses/106105031/
2. https://nptel.ac.in/courses/106105162/

IoT Systems

L	T	P	C
3	0	0	3

Subject Code: 23ITT411

Course Objectives:

- To introduce IoT fundamentals, design principles, and domain-specific applications.
- To understand IoT and M2M communication and explore IoT system management protocols.
- To design IoT platforms, program physical devices, and leverage Python for IoT development.
- To explore cloud platforms, communication APIs, and develop RESTful APIs for IoT.
- To utilize data analytics tools for batch and real-time IoT data processing and application deployment.

Course Outcomes:

1. Understand IoT concepts, design, enabling technologies, and domain-specific applications.
2. Differentiate IoT and M2M, and apply protocols like NETCONF-YANG for IoT management.
3. Design IoT systems, program physical devices like Raspberry Pi, and use Python for IoT.
4. Explore IoT cloud models, develop RESTful APIs, and use platforms like AWS and SkyNet.
5. Analyze IoT data using tools like Hadoop and Spark, and implement applications with Chef.

Unit-I

Introduction to IoT: Introduction, Definition & Characteristics of IoT, Physical Design of IoT Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates. Domain Specific IoTs: Home, Cities, Environment, Energy systems, Logistics, Agriculture, Health & Lifestyle.

Unit-II

IOT and M2M: Difference between IoT and M2M, SDN and NFV for IoT, Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems, Management with NETCONF-YANG.

Unit-III

IoT Platforms: IoT Design Methodology, Case Study on IoT System for Weather Monitoring, Motivation for Using Python, Python Packages of Interest for IoT. IoT Physical Devices & Endpoints: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

Unit-IV

IoT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT, Xively Cloud for IoT, Python Web Application FrameworkL Django, designing a RESTful Web API, Amazon Web Services for IoT, SkyNet IoT Messaging Platform.

Unit-V

Data Analytics for IoT: Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Tools for IOT: Chef, Setting up Chef and Multi-Tire Application Development, Puppet.

Text Books:

1. Vijay Madisetti, Arshdeep Bahga, Adrian McEwen, Hakim Cassimally "Internet of Things A Hands-on-Approach",University Press, 2014.
2. Misra, S., Mukherjee, A., & Roy, A." Introduction to IoT", Cambridge University Press, 2021.Doi:10.1017/9781108913560.

Reference Books:

1. Hakima Chaouchi ―The Internet of Things: Connecting Objects‖, Wiley publication.
2. Joe Biron and Jonathan Follett "Foundational Elements of an IoT Solution: The Edge, The Cloud, and Application Development", First Edition. Cisco Press, 2017.

Reference Links:

1. https://onlinecourses.nptel.ac.in/noc21_ee85/course
2. https://onlinecourses.nptel.ac.in/noc21_cs17/preview
3. https://nptel.ac.in/courses/106/105/106105166/

Machine Learning

Subject Code: 23ITT412

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce various key paradigms of machine learning approaches
- To understand various key approaches in supervised learning
- To understand various key approaches in unsupervised learning
- To illustrate various ensemble approaches in order to enhance system performance.
- To illustrate the concept of reinforcement learning

Course Outcomes:

1. Recognize the characteristics of Machine Learning techniques that enable to solve real world problems
2. Analyze various learning approaches to solve real time problems using Classification and Regression
3. Create probabilistic and unsupervised learning models for handling unknown patterns
4. Identify and integrate more than one techniques to enhance the performance of learning
5. Implement the approaches of reinforcement learning to solve real world problems

Unit-I

Machine Learning Fundamentals: Machine Learning: Definition, History, Need, Features, Block diagrammatic representation of learning machines, Classification of Machine Learning: Supervised learning, Unsupervised learning, Reinforcement Learning, Machine Learning life cycle, Applications of Machine Learning.

Unit-II

Supervised Learning (Regression/Classification): Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes**. Linear Models:** Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines

Unit-III

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.

Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA**.**

Unit-IV

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.

Evaluation: Performance measurement of models in terms of accuracy, confusion matrix, precision & recall, F1-score, receiver Operating Characteristic Curve (ROC) curve and AUC, Median absolute deviation (MAD), Distribution of errors.

Unit-V

Reinforcement Learning: Introduction, Learning Task, Q Learning, Non deterministic Rewards and actions, temporal-difference learning, Relationship to Dynamic Programming, Active reinforcement learning, Generalization in reinforcement learning.

Text Books:

1. Aurelion Geron, "Hands-on Machine Learning with Scikit-Learn, Keras, and Tensor Flow: Concepts, Tools and Techniques to build Intelligent Systems", O'Reilly Media, 3rd Edition, 2022.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep learning", MIT press, 2016.

Reference Books:

1. Tom M. Mitchell, "Machine Learning" First Edition by Tata McGraw- Hill Education.
2. Ethem Alpaydin," Introduction to Machine Learning" 2nd Edition, The MIT Press, 2014.
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning" By Springer, 2007.
4. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT Press, 2021.

Reference Links:

1. https://www.coursera.org/learn/machine-learning-duke.
2. https://medium.com/@hashirbhatti/guide-to-learning-machine-learning-in-2024-with-resources-b99416c2e9d8.
3. https://www.analyticsvidhya.com/blog/2024/05/machine-learning-resources-for-self-study.

Wireless Ad-hoc Network
(Professional Elective-IV)

Subject Code: 23ITE441

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the fundamental characteristics and applications of MANETs
- Analyze and classify different MAC protocols
- Evaluate various routing protocol mechanisms.
- Understand the architecture and challenges of MAC protocols of WSN.
- Analyze security vulnerabilities.

Course Outcomes:

1. Describe Mobile Ad Hoc networks, Design of MAC protocols
2. Distinguish various MAC protocols.
3. Discriminate various routing protocols for Ad Hoc Wireless Networks.
4. Elucidate Wireless Sensor Networks.
5. Recite the security protocols in Sensor networks.

Unit-I

Mobile Ad Hoc Networks: Introduction, Characteristics of MANETs, Applications of MANETs. Ad Hoc Wireless Networks: Cellular and Ad Hoc Wireless Networks, Issues, Ad Hoc Wireless Internet. MAC Protocols for Ad Hoc Wireless Networks: Introduction, Issues in designing a MAC Protocols for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks.

Unit-II

Classification of MAC Protocols: Contention-Based Protocols (MACAW, FAMA), Contention-Based Protocols with Reservation Mechanisms (D-PRMA, CATA). MAC Protocols: Contention-Based MAC Protocols with Scheduling Mechanisms (DPS, DWOP).

Unit-III

Routing Protocols for Ad Hoc Wireless Networks: Introduction, Issues in designing a Routing Protocol for Ad Hoc Wireless Networks. Table-Driven Routing protocols (DSDV, WRP). On-Demand Routing Protocols (DSR, AODV), Hybrid Routing Protocols (CEDAR, ZRP).

Unit-IV

Wireless Sensor Networks: Introduction, Comparison with Ad Hoc Wireless Networks, Issues and Challenges in designing a Sensor Network, Sensor Network Architecture: Layered architecture, Clustered architecture, Applications of Sensor Networks.

MAC Protocols for Sensor Networks: Hybrid TDMA/FDMA, CSMA based MAC Protocols. Quality of Sensor Network: Coverage, Exposure.

Unit-V

Security issues in Wireless Sensor Networks (WSN): Security requirements in WSNs, Vulnerabilities and attacks specific to wireless sensor networks (WSNs), security issues in WSNs, Secure protocols for wireless sensor networks: SPINS, TinySec, LEAP.

Text Books:

1. C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Pearson India Pvt. Ltd., 3rd Edition,2021
2. Carlos de Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", World Scientific Publishing Co Pvt. Ltd, 2nd Edition, Kindle Edition ,2011.
3. C.K. Tho," Ad Hoc Mobile Wireless Networks; Protocols and Systems",1st Edition, Pearson Education, 2015.

Reference Books:

1. Mohammad Ilyas, "The Handbook of Ad Hoc Wireless Networks", 1st Edition, Kindle Edition, CRC Press,2017
2. Holger Karl, Andreas Willing, "Protocols and Architectures for Wireless Sensor Networks", John Wiley &Sons, 2005.

Reference Links:

1. https://archive.nptel.ac.in/courses/106/105/106105160/
2. http://nptel.ac.in/courses/106105160/
3. https://www.sciencedirect.com/science/article/pii/S1110866522000652

Parallel Computing and Algorithms
(Professional Elective-IV)

Subject Code: 23ITE442

L	T	P	C
3	0	0	3

Course Objectives:

- Understand different parallel architectures and models of computation.
- Introduce the various classes of parallel algorithms and study parallel algorithms for basic problems.
- Introduce the various Sorting 2D mesh techniques.
- Study the Hypercubes and their algorithms
- Understand different Matrix Multiplication on Multiprocessors and Multicomputer

Course Outcomes:

1. Develop parallel algorithms for standard problems and applications.
2. Analyse efficiency of different parallel algorithms and also Tree Traversal, Searching, Sorting and Merging techniques.
3. Understand the various Sorting 2d mesh techniques.
4. Develop, analyse, and implement Hypercubes and their algorithms.
5. Comprehension the different Matrix Multiplication on Multiprocessors and Multicomputer

Unit-I:

Introduction: Need for Parallel Processing, Data and Temporal Parallelism, Models of Computation, RAM and PRAM Model, Shared Memory and Message Passing Models.

Unit-II:

Processor Organizations: Processor Organizations, PRAM Algorithm, Analysis of PRAM Algorithms, Parallel Programming Languages.

Pram Algorithms: Parallel Algorithms for Reduction, Prefix Sum, List Ranking, Preorder Tree Traversal, Searching, Sorting, Merging Two Sorted Lists, Graph Coloring, Graph Searching.

Unit-III:

SIMD Algorithms-I: 2D Mesh SIMD Model, Parallel Algorithms for Reduction, Prefix Computation, Selection, Odd-Even Merge Sorting, Matrix Multiplication.

Unit-IV:

SIMD Algorithms-II: Hypercube SIMD Model, Parallel Algorithms for Selection, Odd-Even Merge Sort, Bitonic Sort, Matrix Multiplication Shuffle Exchange SIMD Model, Parallel Algorithms for Reduction -Bitonic Merge Sort, Matrix Multiplication, Minimum Cost Spanning Tree.

Unit-V:

MIMD Algorithms: UMA Multiprocessor Model, Parallel Summing on Multiprocessor, Matrix Multiplication on Multiprocessors and Multicomputer, Parallel Quick Sort, Mapping Data to Processors.

Text Books:

1. Michael J. Quinn, "Parallel Computing: Theory & Practice", Tata McGraw Hill Edition,2nd Edition, 2017.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", University press, 2nd Edition, 2011.
3. V Rajaraman, C Siva Ram Murthy, "Parallel computers, Architecture and Programming", PHI learning, 2016.

Reference Books:

1. Ananth Grame, George Karpis, Vipin Kumar and Anshul Gupta, "Introduction to Parallel Computing", Addison Wesley, 2nd Edition, 2003.
2. M Sasikumar, Dinesh Shikhare and P Ravi Prakash, " Introduction to Parallel Processing", PHI learning, 2013.
3. S.G.Akl, "The Design and Analysis of Parallel Algorithms", PHI, 1989.

Reference Links:

1. https://archive.nptel.ac.in/courses/106/102/106102114/
2. https://www.coursera.org/courses?query=parallel%20computing

MERN Stack Technologies
(Professional Elective-IV)

L	T	P	C
3	0	0	3

Subject Code: 23ITE443

Course Objectives:

- Translate user requirements into the overall architecture and implementation of new systems and manage Project and coordinate with the Client.
- Writing optimized front end code HTML and JavaScript.
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution.
- Design and implementation of Robust and Scalable Front End Applications.

Course Outcomes:

1. Enumerate the Basic Concepts of Web & Markup Languages.
2. Develop web Applications using Scripting Languages & Frameworks.
3. Make use of Express JS and Node JS frameworks.
4. Illustrate the uses of web services concepts like restful, react js.
5. Apply Deployment Techniques & Working with cloud platform.

Unit-I

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

Unit-II

JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

Unit-III

Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

Unit-IV

RESTful Web Services: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering Factories

Unit-V

Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

Text Books:

1. Kai Hwang and Naresh Jotwani, "Advanced Computer Architecture-parallelism, Scalability, Programmability", McGraw-Hill Publications, 3rd Edition,2016.

Reference Books:

1. John L Hennessey and David A Patterson, "Computer Architecture A Quantitative Approach", Morgan Kaufmann/ Elsevier, 6th Edition, 2012.

Reference Links:

1. https://www.coursera.org/learn/comparch
2. https://www.geeksforgeeks.org/advanced-computer-subjects-tutorials

Ethical Hacking
(Professional Elective-IV)

Subject Code: 23ITE444

L	T	P	C
3	0	0	3

Course Objectives:

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
- The course Includes-Impacts of Hacking; Types of Hackers; Information Security Models, Information Security Program, Business Perspective, Planning a Controlled Attack
- Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Course Outcomes:

1. Explain the principles of hacking, ports and protocols, penetration testing, and virtualization.
2. Identify the appropriate foot printing techniques and scanning methods.
3. Describe the system hacking process and explain the concepts of Trojans, backdoors, worms, viruses, and their countermeasures.
4. Demonstrate a comprehensive understanding of sniffing, social engineering, and related attacks.
5. Recognize the appropriate techniques for cryptography, steganography, and vulnerability assessment.

Unit-I

Introduction to Hacking: Hacking, Types and phases of hacking, Introduction to Ports & Protocols: Ports, Protocols, Primary Network Types, Virtualization & Introduction to Kali Linux: Virtualization, Virtualization software, supported platforms, Introduction to Penetration Testing: Penetration test, Categories and Types of Penetration tests, Structure of Penetration Test Report.

Unit-II

Footprinting: Footprinting, Types, using ping and ns Lookup commands in Windows command line, Scanning: Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dns enum, performing flag scan using hping3.

Unit-III

Hacking into System: System Hacking, Password Cracking, Default password databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers, Trojans & Backdoors: Trojans, Working of Trojan, Infection Techniques, Attack, Lifecycle and Classification of Virus, Worms, Virus Construction Kit.

Unit-IV

Sniffing, Packet Analysis & Session Hijacking: Sniffing, Packet Analysis, Types of Sniffing, Active and Passive Sniffing Techniques, Session Hijacking, Social Engineering: Social

Engineering, Process, Identity Theft, Human and Computer Based Social Engineering Techniques, Phishing Process, Types of Phishing Attacks, Social Engineering Toolkit (SET)

Unit-V

Cryptography: Cryptography, Digital Signature, Hash Functions, Steganography: Steganography Process, watermarking, Steganography Methods and Attacks, Steganography tools, Vulnerability Assessment: Vulnerability, The Open Web Application Security Project (OWASP), Prevention, Damn Vulnerable Web Application (DVWA), installation and testing of DVWA.

Text Books:

1. Harsh Bothra, "Hacking: Be a Hacker with Ethics", Khanna Publications, 2019
2. Rafay Baloch, "Ethical Hacking and Penetration", Testing Guide, 2014

Reference Books:

1. Hacking: Be a Hacker with Ethics, Harsh Bothra, Khanna Publications, 2019
2. Ethical Hacking and Penetration Testing Guide, Rafay Baloch, 2014

Reference Links:

1. https://onlinecourses.nptel.ac.in/noc19_cs68/preview

NoSQL Database
(Professional Elective-V)

Subject Code: 23ITE451

L	T	P	C
3	0	0	3

Course Objectives:

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph).
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

Course Outcomes:

1. Discuss about Aggregate Data Models
2. Explain about Master-Slave Replication, Peer-to-Peer Replication
3. Describe the Structure of Data, Scaling, Suitable Use Cases
4. Make use of Complex Transactions Spanning Different Operations
5. Identify Routing, Dispatch and Location-Based Services

Unit-I

Definition and History of NoSQL Databases. Different NoSQL products, the importance of Relational Databases, ACID Properties, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, The Emergence of NoSQL, The CAP Theorm.

Unit-II

Comparison of relational databases with NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges of NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

Unit-III

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

Unit-IV

Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

Unit-V

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages

Text Books:

1. Sadalage,P.&Fowler,"NoSQL Distilled:A Brief Guide to the Emerging World of Polyglot Persistence", Wiley Publications, 1st Edition,2019.
2. Redmond, E. & Wilson, J.,"Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement", Pragmatic Bookshelf, 2nd Edition,2019.

Reference Books:

1. Dan Sullivan, "NoSQLFor Mere Mortals", Pearson Education India, 1st Edition, 2015.
2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", Manning Publication/Dreamtech Press, 1st Edition, 2013.
3. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", O'Reilly Publications, 2nd Edition, 2013.

Reference Links:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa

Artificial Neural Networks
(Professional Elective-V)

Subject Code: 23ITE452

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the fundamentals of Artificial Neural Networks and the main research activities in this field
- To learn architectures of various Artificial Neural Networks models.
- Enable to design and deployment of Artificial Neural Networks models.

Course Outcomes:

1. Familiar with the fundamental concepts of Artificial Neural Networks and Deep Learning.
2. Able to demonstrate the working principle of convolution neural networks.
3. Able to analyze the architectures of deep unsupervised learning algorithms.
4. Able to implement, apply and test recurrent neural network learning algorithms.
5. Able to critically evaluate the method's applicability in new contexts and construct new applications

Unit-I

Introduction to Neural Networks: Introduction of artificial neural network and deep learning, characteristics of neural networks terminology, neurons, perceptron, backpropagation, Basic learning laws, Activation and Loss function - Function approximation, applications

Unit-II

Introduction to Convolution Neural Networks: CNN Architecture and Operations, convolutional layer, Pooling layer, Variants of the Convolution Model, Forward and Backward propagation, Building a Deep Neural Network Improving Deep Neural Networks Training a deep neural network, hyper-parameter tuning, Hidden layers, Generalization Gap – Underfitting Vs Over-fitting – Optimization, Normalization.

Unit-III

Deep Unsupervised Learning: Auto encoders and relation to PCA, Regularization in auto encoders, De-Noising auto encoders, Sparse auto encoders, Variational Auto encoders, Adversarial Generative Networks.

Unit-IV

Neural Network Architectures: Introduction to RNNs, LSTM, GRU, Encoder Decoder architectures, Reservoir Computing (basic idea), The Unreasonable Effectiveness of Recurrent Neural Networks.

Unit-V

Applications of Deep Learning: Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, and video to text with LSTM models, Speech recognition

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016
2. Michael Nielsen, "Neural Networks and Deep Learning", Determination Press,2015.
3. Francois Chollet, "Deep Learning with Python", Manning Publications Company,2nd Edition, 2021

Reference Books:

1. Bengio, Yoshua. "Learning deep architectures for AI", Foundations and trends in Machine Learning ",2009.
2. Rajiv Chopra, "Deep Learning", Khanna Book Publishing, 1st Edition .2018.

Reference Links:

1. https://nptel.ac.in/courses/106/106/106106184/
2. https://www.coursera.org/specializations/deep-learning

Mobile Computing
(Professional Elective-V)

Subject Code: 23ITE453

L	T	P	C
3	0	0	3

Course Objectives:

- To make the student understand the concept of mobile computing paradigm, Its novel applications and limitations.
- To understand the typical mobile networking Infrastructure through a popular GSM protocol
- To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
- To understand the ad hoc networks and related concepts.

Course Outcomes:

1. Discover the characteristics of pervasive computing applications including the major system Components and architectures of the systems.
2. Understand the cellular radio concepts such as frequency reuse, handoff and how Interference between mobiles and base stations affects the capacity of cellular systems.
3. Explore the characteristics of different types of MAC on the performance of a mobile computing system.
4. Describe and analyze the different inter-networking challenges and solutions in wireless mobile networks-Network and Transport Layers.
5. Analyze and compare the performance of different MANET routing algorithms for mobile realtime application.

Unit-I

Introduction: Mobile Communication: Short history of wireless communication, Mobile Computing, simplified reference model, novel applications, limitations of mobile computing, simplified reference model, Mobile Computing Architecture, mobile system networks, Generation of Mobile Services.

Unit-II

Introduction to GSM: GSM Services and system architecture, Radio interface, Protocols, Localization and calling, Handover, New Data Services.

Unit-III

Medium access control(MAC): Motivation for a specialized MAC(Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA(Fixed TDM, Classical Aloha, Slotted Aloha CSMA, DAMA, PRMA, Reservation TDMA, MACA, Polling, ISMA), CDMA:SAMA, Wireless LAN (IEEE 802.11).

Unit-IV

Mobile Network Layer: IP and Mobile IP (Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunnelling and encapsulation, Optimizations), DHCP.

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANETs, Routing, Classification of Routing Algorithms: DSR, DSDV, AODV, ad-hoc routing protocols.

Unit-V

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP, WAP, Bluetooth.

Text Books:

1. Jochen H.Schiller, "Mobile Communications", Pearson Education, 2nd Edition, 2020
2. Raj Kamal, "Mobile Computing", OXFORD UNIVERSITY PRESS, 3rd Edition 2018

Reference Books:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", 2nd edition, Tata McGraw Hill, 2017.
2. Prasant Kumar Pattnail and Rajib Mall, "Fundamentals of Mobile Computing", 2nd Edition, PHI Learning Pvt. Ltd., 2015

Reference Link:

1. https://www.cse.iitb.ac.in/~mythili/teaching/cs653_spring2014/index.html.

Big Data Analytics
(Professional Elective-V)

Subject Code: 23ITE454

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the basic concepts and importance of Big Data
- Familiarize with the installation of Hadoop and how to analyze the Big Data
- Understand the design concepts of HDFS
- Provide good insight for developing a Map Reduce applications
- Illustrating Hadoop environment. and explore the concepts of Pig, Hive, Spark and HBase

Course Outcomes:

1. Explain the concepts and challenges of big data
2. Outline the operations viz. Collect, manage, store, query, and analyze various forms of big data.
3. Apply large-scale analytic tools to solve some of the open big data problems.
4. Analyze the impact of big data for business decisions and strategies.
5. Design different big data applications.

Unit-I

Introduction to Big Data: What is Big Data? Why Big Data is Important? Meet Hadoop, Data, Data Storage and Analysis, Comparison with other systems, History of Apache Hadoop, Hadoop Ecosystem, VMWare Installation of Hadoop. Analyzing the Data with Hadoop, Scaling Out.

Unit-II

HDFS: The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop File systems, The Java Interface, Data flow.

MapReduce: Developing a MapReduce application, The Configuration API, Setting up the Development Environment, Running Locally on Test Data, Running on a Cluster.

Unit-III

How MapReduce Works: Anatomy of a MapReduce, Job Run, Failures, Shuffle and Sort, Task Execution.

MapReduce Types and Formats: MapReduce Types, Input formats, output formats.

Unit-IV

Hadoop Environment: Setting up a Hadoop Cluster, Cluster specification, Cluster Setup and Installation, Hadoop Configuration, Security.

Pig: Installing and Running Pig, an Example, Comparison with Databases, Pig Latin, UserDefined Functions, Data Processing Operators.

Unit-V

Hive: Installing Hive, Running Hive, Comparison with traditional Databases, HiveQL, Tables, Querying Data.**Spark:** Installing Spark, Resilient Distributed Datasets, Shared Variables, Anatomy of a Spark Job Run. **HBase:** HBasics, Installation, clients, Building an Online Query Application.

Text Books:

1. Tom White, "Hadoop: The Definitive Guide", O'reilly Media, 4th Edition, 2015.
2. Michael Minnelli, Michelle Chambers, & Ambiga Dhiraj, "Big Data, Big Analytics: Emerging business intelligence and analytic trends for today's businesses", Wiley,2013

Reference Books:

1. Glenn J. Myatt and Wayne P. Johnson," Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining", Wiley,2nd Edition,2014.
2. Michael R. Berthold and David J. Hand," Intelligent Data Analysis: An Introduction",Springer,2nd Edition,2003.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, and Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw-Hill,2012.
4. Anand Rajaraman and Jeffrey David UIIman, "Mining of Massive Datasets", Cambridge University Press, 2012.

Reference Links:

1. https://onlinecourses.nptel.ac.in/noc21_cs45/preview
2. https://www.coursera.org/professional-certificates/google-data-analytics

Entrepreneurial Development
(Open Elective-II)

L	T	P	C
3	0	0	3

Subject Code: 23OET421

Course Objectives:

- To develop an understanding on entrepreneur and entrepreneurship.
- To have an understanding on nature and development of entrepreneurship in India
- To provide steps to start an enterprise and project preparation.
- To make Students gaining the knowledge about Governmental and Institutional support to entrepreneurs.
- To make the students familiar with e-entrepreneurship and functional areas of Managing a venture in India.

Course Outcomes:

1. Understand the concept of Entrepreneurship and demonstrate the ability to provide a self-analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
2. Understanding Entrepreneurship Development programmes in India and contents for training for Entrepreneurial competencies.
3. Understand the steps to start MSME and develop well-presented business plan that is feasible for the student.
4. Understanding the Govt. Policy and Institutional Support for Entrepreneurs in India.
5. Understanding about e-Entrepreneurship and how to manage effectively the selected Venture in India

.

Unit-I

Entrepreneur and Entrepreneurship: Nature and Scope of Business. Concept of Entrepreneur & Entrepreneurship, characteristics of an Entrepreneur, types of Entrepreneurs, Entrepreneur. Role of Entrepreneurship in Economic development. Ethics and social responsibility of an entrepreneur. Future of Entrepreneurship in India.

Unit-II

Entrepreneurship Development in India: Emergence of entrepreneurial class in India, Environmental factors effecting entrepreneurship, local mobility of Entrepreneurs, Concept of women entrepreneurship and rural entrepreneurship. Development of women Entrepreneurship, problems and remedies of women Entrepreneurship. Entrepreneurship Development programme (EDP) - need and objectives of EDPs, Designing Appropriate training programme for existing and new entrepreneurs. Institutions supporting for EDP-EDII, NIESBUD, APITCO, NIMSME and DIC.

Unit-III

Creating and starting the venture: Steps to start an MSME. Meaning of a project. Project Identification- Sources of new Ideas, methods of generating ideas, creative problem solving, and

opportunity recognition. Project selection - meaning of project report (Business Plan) & Formulation of a project report, Preparation of sample project report of any one product and service.

Unit-IV

Government and Institutional support to Entrepreneurs: AP Industrial policy (2020-23) - incentives and subsides, industrial estates, Technology Incubation Centre, Business Incubation Centre, National Skill Development Corporation, AP Skill Development Corporation. Institutional finance – sources of short term and long term capital including Venture capital. Role of SIDBI, NSIC, EXIM Bank and commercial Banks, APSFC.

Unit-V

E-Entrepreneurship & Managing the venture. Concept of e-Entrepreneurship, Difference between Entrepreneurship and e-Entrepreneurship, Purpose of Creating e-Entrepreneur, Essence of e-Entrepreneurship, e-Business Ventures in different sectors. Managing the Venture- Concepts of working capital management, Marketing management, Human Resource management, Operations management and financial management Problems and prospects of MSME in India. Profile of Entrepreneurs.

Text Books:

1. Dr.S.S.Khanka & Dr.C.B.Gupta Entrepreneurship and Small Business Management, Eighth edition, Sultan Chand & Sons, 2022
2. Rajeev Roy: Entrepreneurship, Third edition, Oxford university press, New delhi,2021
3. Vasat Desai, The Dynamics of Entrepreneurial Development and Management, Eight edition, Himalaya Publishing House, 2018

Reference Books:

1. H.Nandan, " Fundamentals of Entrepreneurship", 3rd edition, PHI Learning, New Delhi, 2013
2. Robert D Hisrich, Michel P Peters, Dean A Sheperd, Sabyasachi Sinha, "Entrepreneurship", 11th Edition, Mc Graw Hill India, 2020
3. Prasanna Chandra," Projects", 10th Edition, McGraw Hill India,2023

Digital Marketing
(Open Elective-II)

L	T	P	C
3	0	0	3

Subject Code: 23OET422

Course Objectives:

- To develop an understanding on the digital marketing.
- To make students gaining the knowledge and skills related to the area of search engine optimization (SEO).
- To make student understand Social Media Optimization (SMO).
- To develop an understanding on SEM (Search Engine Marketing) through AdWords.
- To familiarize the students with the Lead Management & Digital Marketing Practices with Hands on Experience

Course Outcomes:

1. Understand the concept on digital marketing.
2. Define and work on the concept on search engine optimization (SEO).
3. Describe the concept and work on Social Media Optimization (SMO).
4. Explain the idea and understand the practices on SEM (Search Engine Marketing) through AdWords.
5. Justify the concepts and developments on Lead Management & Digital Marketing.

Unit-I

Introduction to Digital Marketing: Digital Marketing- Importance -Digital Marketing Platforms- Difference between Traditional Marketing and digital Marketing- Advantages of Digital Marketing. Role and functions of a Digital Marketing Manager

Case Study: Analyze the change in ranking of your Web Promotion Page

[Hands on Experience on the above tools are to be undertaken]

Unit-II

Search Engine Optimisation: Definition, Scope of SEO, On-page optimisation and Off Page Optimisation, Report Preparation- Keywords, Titles, Meta Tags

Case Study: Analyse the impact of your Twitter Campaign

. [Hands on Experience on the above tools are to be undertaken]

Unit-III

Search Engine Marketing (SEM): SEM through AdWords, Keyword Selection, Create Text Ads- CPC Bidding- Navigate Ad Words- SEM Metrics & Optimization

Case Study: Analyze the performance of your Facebook and Instagram Page 2. Analyze the performance of your YouTube Video

. [Hands on Experience on the above tools are to be undertaken]

Unit-IV

Social Media Marketing: Definition, Importance, Role of SMM, Social Media Advertising, Impact of Social Media.

[Hands on Experience on the above tools are to be undertaken]

Unit-V

Social Media Optimization (SMO): Meaning and scope of SMO. Social Media Optimization of Facebook- X – LinkedIn - Social Media Services Optimization

List of Cases and Analysis to be studied

1. Digital Marketing Implementation in Business Scenario
2. Create the Digital Marketing Webpage
3. Conducting the Search Engine Optimization and Search Engine Marketing
4. Using Google Analytics to analyze website performance
5. Creating Promotional banner through Canva
6. Face book Promotion using banners
7. Creating YouTube Channel for Marketing
8. X Marketing
9. Instagram Marketing

Text Books:

1. Gupta,Seema, "Digital Marketing",3rd Edition, McGraw Hill Education, New York, August 2022.
2. Bhatia, Punit Singh,"Fundamentals of Digital Marketing", 2nd Edition, Pearson Paperback, 2019.

Reference Books:

1. Kaufman, I., & Horton, C, "Digital marketing: Integrating strategy and tactics with values, a guidebook for executives, managers, and students", Routledge,2014.
2. Stokes, R, "E-Marketing: The essential guide to digital marketing", Quirk eMarketing, 2022.
3. Kamalesh K.Bajaj,Debjani Nag, "E-commerce - The cutting edge of business", Tata Mc-Graw Hill, 2023.

Renewable Energy Sources
(Open Elective-II)

L	T	P	C
3	0	0	3

Subject Code: 23OET423

Course Objectives:

- To outline the concept regarding solar radiation.
- To Outline the concept regarding the collection of solar energy and storage of solar energy
- To outline the concept regarding different types of wind mills.
- To outline the concept regarding different types of biomass digesters and geothermal energy conversion.
- To Outline the concept regarding ocean energy conversion and to Outline the concept regarding direct energy conversion

Course Outcomes:

After completion of this course the student can able to

1. Define and Understand different kind of solar radiation, different methods of collection of solar energy and storage of solar energy.
2. Classify different types of wind mills.
3. Classify different types of biomass digesters and geothermal energy.
4. Classify different types of ocean energy extracting techniques.
5. Distinguish different kinds of direct energy conversion techniques.

Unit-I

Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, the solar constant, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation. Solar energy collection, storage and applications: Flat plate and concentrating collectors, Solar Applications- solar heating/cooling technique, solar distillation and, photovoltaic energy conversion.

Unit-II

Wind energy: Sources and potentials, block diagram, Types: horizontal and vertical axis windmills. Types of generators and its parts.

Unit-III

Biomass and Geothermal energy: Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield. Resources, types of wells, Open loop and closed loop energy conversion.

Unit-IV

Ocean energy: OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques.

Unit-V

Direct energy conversion (DEC): Need for DEC, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, principle of MHD, power generation with closed loop MHD systems.

Text Books:

1. G.D. Rai , "Non-Conventional Energy Sources".
2. Ramesh & Kumar,"Renewable Energy Technologies", Narosa.

Reference Books:

1. Tiwari and Ghosal," Renewable energy resources", Narosa.
2. Ashok V Desai, "Non-Conventional Energy",Wiley Eastern.
3. K Mittal, "Non-Conventional Energy Systems", Wheeler.
4. Sukhame, "Solar Energy".

IT Systems Management
(Open Elective-II)

Subject Code: 23OET424

L	T	P	C
3	0	0	3

Course Objectives:

- Understand IT infrastructure evolution and its management challenges.
- Learn SDLC models, compare traditional and agile methods, and explore IT trends like e-commerce and EDI.
- Analyze computing environments and understand IT system management tasks and strategies.
- Understand principles of computer, internet, physical security, and cryptography.
- Learn basics of storage management and disaster recovery.

Course Outcomes:

1. Explain computing system evolution and challenges in managing modern IT infrastructure.
2. Compare SDLC models and describe trends like e-commerce and EDI.
3. Apply service level, capacity, and availability management in IT systems.
4. Demonstrate knowledge of IT security, identity management, access control, and RSA cryptography.
5. Describe storage types and benefits; implement backup, recovery, and disaster recovery.

Unit-I

IT Infrastructure Overview: Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-new age systems) and their Management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment.

Unit-II

Software Management: SDLC, The Waterfall Model, Advantages, Disadvantages, Agile Model, Conventional Software Management performance, Software Economics.
Emerging Trends in IT: Introduction, E-Commerce, Electronic Data Interchange

Unit-III

Current computing environment: Complexity of current computing, multiple technologies, Common tasks in IT system management, approaches for organization IT management systems context diagram, patterns for IT system Management,
IT system Management: Service level management, Financial Management, Capacity Management, availability management.

Unit-IV

Security Management: Computer Security, Internet Security, Physical Security, Identity Management, Access control System, Intrusion Detection.Public Key Cryptography Principles, Algorithms: RSA.

Unit-V

Storage Management: Types of Storage management, Benefits of storage management, backups, Archive, Recovery, Disaster recovery. Space management, Hierarchical storage management.

Text Books:

1. Phalguni Gupta, "IT Infrastructure & its Management", Tata McGraw-Hill Education, 2009.
2. Walker Royce, "Software Project Management", Pearson Education, 2021.

Reference Books:

1. Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service), 2009.
2. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.
3. Jimmy Desai , "Service Level Agreements: A Legal and Practical Guide", 2010.
4. Schiesser rich, "IT Systems Management", Pearson Education, 2019.

Reference Links:

1. https://www.geeksforgeeks.org/storagemanagement/
2. https://www.geeksforgeeks.org/securitymanagement/
3. https://www.techtarget.com/

Environmental Impact Assessment
(Open Elective-II)

L	T	P	C
3	0	0	3

Subject Code: 23OET425

Course Objectives:

- To understand basic concepts of EIA
- To study different methodologies of EIA
- To appreciate the significance of ecosystem and environmental protection
- To prepare environmental audit reports
- To understand the legal and regulatory compliance and prepare the EIA reports

Course Outcomes:

1. Determine and demonstrate the environment and developmental issues to the public effectively.
2. Assess and evaluate the key EIA methodologies and generate the data.
3. Assess and diagnose the impact of developmental activities on ecosystems.
4. Demonstrate environmental audit protocols to conduct on-site audit for the generation of reports.
5. Demonstrate the environmental and legal compliance suitable for the developmental activities and generate comprehensive EIA reports to different developmental activities.

Unit-I

Basic Concepts of EIA: History and guiding principles of EIA-EIA Process-types of EIA-Initial Environmental Evaluation (IEE)-elements of EIA-factors affecting EIA during impact evaluation and analysis-preparation of environmental base maps and importance-classification of environmental parameters.

Unit-II

EIA Methodologies: Introduction-criteria for the selection of EIA methodology-EIA Methods: Ad-hoc method-matrix method-networks Method-Environmental Media Quality Index method (EMQIM)-overlay method-cost/benefit analysis.

Unit-III

Ecosystems Assessment: Assessment of Ecosystems-Assessment of impact of development activities on vegetation and wildlife, mitigation-causes and effects of deforestation-environmental impacts of deforestation.

Unit-IV

Environmental Auditing: Environmental audit definition-objectives of environmental audit-types of environmental audit-audit protocol-stages of environmental audit-onsite audit activities-post audit activities-evaluation of audit data and preparation of audit report.

Unit-V

Environmental Legislations: Environmental Legislations introduction-The Environmental (Protection) Act-1986-The Water (Prevention and Control of Pollution) Act-1974-The Air (Prevention and Control of Pollution) Act-1981-The Motor Vehicles Act-1988-The Wildlife (Protection) Act-1972.

EIA Report Writing: Introduction - Case studies and preparation of Environmental Impact Assessment (EIA) statement report for coal mining activities – chemical industries – Thermal power plants.

Text Books:

1. Suresh K. Dhameja, "Environmental Science and Engineering" S. K. Kataria& Sons Publications (Recent addition), New Delhi.
2. Y. Anjaneyulu, "Environmental Impact Assessment Methodologies", B. S. Publications (Recent addition), Sultan Bazar, Kakinada.

Reference Books:

1. Dr. H. S. Bhatia, "Environmental Pollution and Control", Galgotia Publications (P) Ltd., New Delhi (Recent addition).
2. J. Glynn and Gary W. Hein Ke,"Environmental Science and Engineering", Prentice Hall Publishers (Recent addition).

Cyber Crime and Law Protection
(Open Elective-II)

Subject Code: 23OET426

L	T	P	C
3	0	0	3

Prerequisite: Basic knowledge of computer networks, IT concepts and analytical reasoning.

Course Objectives:

- Understand the fundamental concepts of cybercrime including its types and impacts.
- Explore the national and state-level legal frameworks for cyber security in India.
- Learn about cybercrime investigation techniques and digital forensics.
- Develop an understanding of ethical hacking and preventive cyber security measures.
- Analyze real-world case studies to apply theoretical knowledge practically.

Course Outcomes:

By the end of this course students will be able to:

1. Differentiate between types of cybercrime and identify their root causes.
2. Analyze and apply national and state-level provisions under Indian cyber laws.
3. Utilize digital forensic tools and techniques for cybercrime investigation.
4. Implement ethical hacking and cyber security measures in practice.
5. Critically evaluate real-world cybercrime cases and emerging cyber security trends.

Unit-I

Introduction to Cyber Crime: Overview of Cyber Crime and Cyber Law, Evolution of Cyber Crimes, Types of Cyber Crimes, Cyber Crime vs. Traditional Crime, Classification of Cyber Crimes: Individuals, Property, Government, Society, Causes and Motivations Behind Cyber Crimes.

Unit-II

National and State Legal Frameworks for Cyber Security:

- **National Laws**:
  Information Technology Act, 2000, Amendments to IT Act, Cyber Crimes under Indian Penal Code (IPC), National Cyber Security Policy, 2013, Data Protection Bill in India, Intellectual Property Rights in Cyberspace, Jurisdiction and Legal Challenges in Indian Cyber Law.
- **State Laws**:
  Andhra Pradesh Cyber Security Policy, Andhra Pradesh Data Protection and Governance Policies, Initiatives for Reducing Cyber Crimes in Andhra Pradesh, State-specific Data Protection Rules and Regulations.

Unit-III

Cyber Crime Investigation and Digital Forensics: Fundamentals of Cyber Crime Investigation, Digital Forensics Process, Digital Evidence Collection, Chain of Custody and

Evidence Preservation, Disk Imaging and Memory Analysis, Forensic Tools: Network Analysis and Disk Imaging, Challenges in Cyber Crime Investigation.

Unit-IV

Cyber Security Measures and Ethical Hacking: Basics of Cyber Security: Threats, Vulnerabilities, and Attacks, Cyber Security Strategies: Prevention, Detection, Response, Role of Encryption and Authentication, Ethical Hacking: Concepts, Phases, Tools and Techniques, Legal and Ethical Boundaries in Cyber Space.

Unit-V

Emerging Trends and Case Studies in Cyber Law: Landmark Cases in Cyber Crime and Cyber Law (Indian and International), Cyber Warfare and Cyber Terrorism, Data Privacy Laws: GDPR and Data Protection Bill in India, State-Level Privacy Initiatives in Andhra Pradesh, Emerging Threats: IoT Security, AI in Cyber Security, Future of Cyber Crime and Cyber Law.

Text Books:

1. Singer,P.W.,& Friedman,A,"Cybersecurity and Cyberwar:What Everyone Needs to Know", Oxford University Press,2014.ISBN: 978-0199918119
2. Duggal,P, "Cyber Law",Lexis Nexis,2023. ISBN: 978-8196241070
3. Casey,E, "Digital Evidence and Computer Crime", Academic Press,2011. ISBN:978- 0123742681
4. Chawki,M.,Wahab,M.S.,&Abbasi,A, "The Law of Cyber crimes and Their Investigations". CRC Press, 2011. ISBN: 978-1439851577

Reference Books:

1. Britz,M.T , "Computer Forensics and Cyber Crime: An Introduction",Pearson,2013. ISBN: 978-0132677714
2. Tikk,E.,Kaska,K.,&Vihul,L, "Introduction to Cyber-Warfare: A Multidisciplinary Approach", Syngress,2013 . ISBN: 978-0124078147
3. Akhgar,B.,&Brewster,B, "Cyberlaw: The Law of the Internet and Information Technology". Pearson , 2012. ISBN: 978-0132560870
4. Matwyshyn,A.M, "Privacy, Security, and Information Management: An Overview", Van Haren Publishing, 2009. ISBN: 978-9087535403

Reference Links:

1. https://datalawonline.co.uk/cpd-courses/cyber-crime/cyber-crime-essentials
2. https://onlinecourses.swayam2.ac.in/cec23_lw01/preview

IoT Systems Lab

Subject Code: 23ITL406

L	T	P	C
0	0	3	1.5

Course Objectives:

- To familiarize students with IoT concepts and the practical use of hardware such as Arduino, Raspberry Pi, and ESP8266 for embedded system applications.
- To understand the installation and configuration of operating systems and software on Raspberry Pi and Beagle boards for IoT development.
- To develop hands-on skills in interfacing basic peripherals like LEDs, buzzers, and switches with Arduino and Raspberry Pi.
- To learn to interface various sensors such as DHT11, LDR, soil moisture, PIR, smoke (MQ-02), and ultrasonic sensors with IoT hardware.
- To enable students to analyze sensor data and integrate it with IoT systems for real-time monitoring and decision-making.

Course Outcomes:

1. Install and configure software for Arduino, Raspberry Pi, and ESP8266, and set up IoT systems with these devices.
2. Interface Raspberry Pi board with basic peripherals and understand the use of GPIO pins for input/output control.
3. Implement sensor-based systems using DHT11, LDR, soil moisture, PIR, smoke (MQ-02), and ultrasonic sensors with Arduino/Raspberry Pi.
4. Develop simple IoT applications by processing and visualizing sensor data on IoT platforms.
5. Demonstrate the ability to design functional IoT prototypes for environmental monitoring and smart automation applications.

List of Experiments:

1. Familiarization with concept of IoT and setting up Arduino IDE and programming environment.
2. Installing and configuring the ESP8266 module.
3. Introduction to Raspberry Pi and initial setup with Raspbian OS.
4. Arduino UNO, /LED/ Switch/ Buzzer working
5. Temperature & Humidity Sensor- DHT11
6. Light Dependent Resistor (LDR) using Arduino UNO board.
7. Soil Moisture Sensor
8. PIR Sensor
9. Smoke Sensor -MQ-02
10. Ultrasonic Sensor

Text Books:

1. Vijay Madisetti , Arshdeep Bahga, Adrian McEwen,Hakim Cassimally, "Internet of Things A Hands-on-Approach", University Press, 2014.
2. Misra, S., Mukherjee, A., & Roy, A.," Introduction to IoT". Cambridge University Press,2021. doi:10.1017/9781108913560.

Reference Books:

1. Hakima Chaouch," The Internet of Things: Connecting Object", Wiley publication.
2. Joe Biron and Jonathan Follett, "Foundational Elements of an IoT Solution: The Edge, The Cloud, and Application Development", Cisco Press, 1st Edition, 2017.

Reference Links:

1. https://onlinecourses.nptel.ac.in/noc21_ee85/course
2. https://onlinecourses.nptel.ac.in/noc21_cs17/preview
3. https://nptel.ac.in/courses/106/105/106105166/

Machine Learning with Python Lab

Subject Code: 23ITL407

L	T	P	C
0	0	3	1.5

Course Objectives:

- Implement procedures for the machine learning algorithms
- Design and Develop Python programs for various supervised Learning algorithms
- Design and Develop Python programs for various unsupervised Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Develop Machine Learning algorithms to solve real world problems

Course Outcomes:

1. Describe the implementation procedures for the Machine Learning algorithm
2. Apply appropriate data sets to solve real world problems using classification algorithms.
3. Apply appropriate data sets to solve real world problems using regression algorithms.
4. Develop probabilistic and unsupervised learning models for handling unknown patterns
5. Develop models that integrate more than one techniques to enhance the performance of learning.

List of Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Write a program to implement the Linear regression for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Write a program to implement the random forest for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.
10. Write a program to implement support vector machine and Principal component analysis.

Text Books:

1. Aurelion Geron, "Hands-on Machine Learning with Scikit-Learn, Keras, and Tensor Flow: Concepts, Tools and Techniques to build Intelligent Systems", O'Reilly Media, 3rd Edition, 2022.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep learning", MIT press, 2016

Reference Books:

1. Tom M. Mitchell, "Machine Learning" First Edition by Tata McGraw- Hill Education.
2. Ethem Alpaydin," Introduction to Machine Learning" 2nd Edition, The MIT Press, 2014
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning" By Springer, 2007.
4. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT Press, 2021.

Reference Links:

1. https://www.coursera.org/learn/machine-learning-duke
2. https://medium.com/@hashirbhatti/guide-to-learning-machine-learning-in-2024-with-resources-b99416c2e9d8
3. https://www.analyticsvidhya.com/blog/2024/05/machine-learning-resources-for-self-study/

Technical Paper Writing and Intellectual Property Rights (IPR)

Subject Code: 23MCT406

L	T	P	C
2	0	0	0

Course Objectives:

- Introduce students to research fundamentals, including topic selection, literature review, and the structured components of a technical paper.
- Familiarize students with research design, data collection methods, and statistical analysis, alongside proper citation and referencing styles.
- Develop students' skills in writing clear and concise technical papers and delivering professional presentations of research findings.
- Provide a comprehensive overview of intellectual property rights, covering patents, copyrights, trademarks, and trade secrets.
- Raise awareness of ethical considerations in research, emerging issues in IPR (such as digital rights and open access), and the importance of protecting intellectual property in collaborative settings.

Course Outcomes:

1. Ability to identify a research topic, conduct a literature review, and organize a paper into sections like introduction, methodology, and conclusion.
2. Proficiency in designing research, choosing appropriate data collection methods, analyzing data, and applying accurate citation styles.
3. Competence in writing a complete technical paper with clarity and delivering a professional oral presentation on research findings.
4. Understanding of various types of intellectual property, their protection processes, and relevance in engineering contexts.
5. Ability to recognize and address ethical issues in research, understand open-access licensing, and discuss recent developments in IPR related to digital technologies.

Unit-I

Introduction to Research and Technical Writing: Fundamentals of Research: Definition, objectives, types (basic and applied), and research methodology.Types of Technical Documents: Research papers, theses, and technical reports.Literature Review: Importance, methods for conducting surveys, and reviewing scholarly articles.Research Topic Selection: Identifying research gaps and formulating research questions.

Unit-II

Research Design and Data Collection: Research Design: Types (exploratory and descriptive) and planning research. Data Collection: Primary vs. secondary data, qualitative and quantitative methods. Visual Data Representation: Graphs, tables, and charts. Citation Styles: Overview of APA and IEEE formats.

Unit-III

Writing and Presenting Technical Papers: Writing Skills: Clarity, conciseness, and coherence in technical writing. Abstract and Conclusion: Techniques for writing effectively. Presentation Skills: Preparing presentations and using visual aids.

Unit-IV

Intellectual Property Rights (IPR): Fundamentals of IPR: Introduction to patents, copyrights, and trademarks. Patents: Basic criteria for patentability. Case Studies: Real-world applications of IPR in engineering.

Unit-V

Ethical Considerations in Research: Ethical Issues: Plagiarism avoidance, responsible authorship, and ethical use of data.Open Access: Introduction to Creative Commons and open-source research.

Text Books:

1. Kumar, R," Research methodology: A step-by-step guide for beginners", SAGE Publications. 5th Edition, 2018.
2. Goold, P. R.," *A Critical Introduction to Intellectual Property Law".* Cambridge University Press,2022
3. Creswell, J. W., & Creswell, J. D, "Research design: Qualitative, quantitative, and mixed methods approaches", SAGE Publications. 5th Edition, 2018.
4. Glasman-Deal, H, *"Science Research Writing: For Native and Non-Native Speakers of English",* World Scientific Publishing Company, 2nd Edition, 2020

Reference Books:

1. Alred, G. J., Brusaw, C. T., & Oliu, W. E., "The Handbook of Technical Writing", Bedford/St. Martin's, 12th Edition, 2020.
2. Day, R. A., & Gastel, B.,"How to write and publish a scientific paper", (8th ed.). Cambridge University Press,8th Edition,2016.
3. Kothari, C. R., & Garg, G, "Research methodology: Methods and techniques", New Age International Publishers, 4th Edition, 2016.
4. Menell, P. S., Lemley, M. A., Merges, R. P., & Balganesh, S, "Intellectual Property in the New Technological Age 2020", Vol. II Copyrights, Trademarks, and State IP Protections, 2020.
5. Singh, A. K., "Intellectual property rights: Unleashing the knowledge economy", Springer,2018.