ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

DATA SCIENCE

COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

for

B.TECH FOUR YEAR DEGREE PROGRAMME
(Applicable for the batches admitted from 2023-2024

AR - 23

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(An Autonomous Institution)

Approved by AICTE,

Recognized Under 2(f) & 12(b) of UGC
Permanently Affiliated to JNTUGV, Vizianagaram

K.Kotturu, Tekkali, Srikakulam -532201, Andhra Pradesh.

INSTITUTE VISION

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

INSTITUTE MISSION

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that the efficiency for employability increases on a continued basis.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

VISION & MISSION

DEPARTMENT VISION

To lead in Data Science education and research, empowering students to innovate, solve problems, and make impactful decisions using data-driven technologies for the benefit of society and industry.

DEPARTMENT MISSION

M1: Provide a strong foundation in data science for innovative thinking and problem-solving.

M2: Incorporate practical skills in database design, implementation, and decision-support systems to enhance business processes.

M3: Prepare students in creating effective data models, maintain data quality, gain insights, and manage large datasets.

PROGRAM EDUCATION OBJECTIVES

PEO1: Analyze, design, and implement data science projects, fostering critical thinking and decision-making skills based on data-driven insights and advanced analytics..

PEO2: Pursue higher education and contribute to research in Data Science, while improving data management and business processes through effective design and implementation.

PEO3 :Practice professional ethics and responsibility to contribute to industrial growth and bring positive change to society.

PROGRAM OUTCOMES

PO 1 (ENGINEERING KNOWLEDGE): Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2 (PROBLEM ANALYSIS): Identify, formulate, review research literature, and analyze complex engineering problem searching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3 (DESIGN/DEVELOPMENT OF SOLUTIONS): Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4 (CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS): Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 (MODERN TOOL USAGE): Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6 (THE ENGINEER AND SOCIETY): Apply reasoning in formed by the context acknowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7 (ENVIRONMENT AND SUSTAINABILITY): Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8 (ETHICS): Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9 (INDIVIDUAL AND TEAM WORK): Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10 (COMMUNICATION): Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 (PROJECT MANAGEMENT AND FINANCE):Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12 (LIFE-LONG LEARNING): Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: Critically design, develop, and evaluate data science projects by making informed decisions based on data analysis and analytics.

PSO2:Analyze the role of information and analytics in optimizing business processes and functions.

PSO3: Develop effective data analysis models and organize large datasets using data profiling while maintaining quality standards

I YEAR I SEMESTER						
Category	Code	Theory/Lab	L	T	P	C
MC	23MCS101	Induction Program	3 weeks			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

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B.Tech (1" Sem)	BH	23BHT207	Universal Human Values	2	0	0	2
	ES	23EST206	Python Programming	3	0	0	3
	PC	23ITT201	Database Management System	3	0	0	3
	PC	23CAT201	Computer Networks	3	0	0	3
	PC	23CAT202	Digital Logic and Computer Organization	3	0	0	3
	ES	23ESL210	Essentials of Python Programming Lab	0	0	3	1.5
	PC	23ITL201	Database Management System Lab	0	0	3	1.5
	PC	23CAL201	Computer Networks Lab	0	0	3	1.5
	SC	23CDS204	Skill Enhancement Course -1	1	0	1	1.5
			Total	15	0	10	20

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B.Tech (2°'Sem)	BH	23BHT2I2	Statistical Methods	3	0	0	3
	PC	23CAT203	Object Oriented Programming	3	0	0	3
	PC	23CDT201	Fundamentals of Data Science	3	0	0	3
	PC	23CAT205	Data Mining	3	0	0	3
	PC	23CST205	Operating Systems	2	0	0	2
	ES	23ESL209	Advanced Coding Lab - 1	0	0	3	1.5
	PC	23CAL202	Object Oriented Programming through Java Lab	0	0	3	1.5
	PC	23CDL201	Fundamentals of Data Science Lab	0	0	3	1.5
	SC	23CDS205	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
Community Internship (2 weeks) (Mandatory) during summer vacation							

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
III B.Tech. (1st Sem)	PC	23CDT302	Web Technologies	3	0	0	3
	PC	23CAT307	Modern Principles of Software Engineering	3	0	0	3
	PC	23CDT303	Statistics with R Programming	3	0	0	3
	PC	23CDT304	Design Analysis of Algorithms	3	0	0	3
	PE	23CDE31X	Professional Elective-I	3	0	0	3
	PC	23CDL302	Web Technologies Lab	0	0	3	1.5
	PC	23CDL303	Statistics with R/Python Programming 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	23CDP301	Community Service Internship	-	-	-	1
			Total	**17**	**0**	**12**	**22**

PROFESSIONAL ELECTIVE-I

Code	Electives
23CDE311	Predictive Analysis and Modelling
23CDE312	NoSQL Database System
23CDE313	Data Handling and Data Visualization

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
III B. Tech. (2nd Sem)	BH	23BHT314	Managerial Economics And Management Science	3	0	0	3
	PC	23CAT306	Machine Learning	3	0	0	3
	OE	23OET31X	Open Elective – I	3	0	0	3
	PE	23CDE32X	Professional Elective-II	3	0	0	3
	PE	23CDE33X	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	23CAL304	Machine Learning Lab	0	0	3	1.5
	MC	23MCT305	Constitution of India	2	0	0	0
			Total	**20**	**0**	**6**	**21**
			Mandatory Industry Internship of 04 weeks duration during summer vacation.				

PROFESSIONAL ELECTIVE-II

Code	Electives
23CDE321	Data Wrangling and Data Science
23CDE322	Internet of Things
23CDE323	Essentials of Natural Language Processing

PROFESSIONAL ELECTIVE-III

Code	Electives
23CDE331	Social Media Analysis
23CDE332	Cryptography and Network Security
23CDE333	Robotics and Intelligence Systems

OPEN ELECTIVE -I

Code	Open Elective-I
23OET311	Human Resource Development and Organizational Behaviour
23OET312	Business Plan and Presentation for Entrepreneurship
23OET313	E-Waste Management
23OET314	Block Chain Technologies
23OET315	Optimization Techniques
23OET316	Ethics in AI

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
IV B.Tech. (1st Sem)	PC	23CDT405	Big Data Analytics	3	0	0	3
	PC	23CDT406	Deep Learning Concepts and Applications	3	0	0	3
	PC	23CDT407	Essentials of Ethical Hacking	3	0	0	3
	PE	23CDE44X	Professional Elective-IV	3	0	0	3
	PE	23CDE45X	Professional Elective-V	3	0	0	3
	OE	23OET42X	Open Elective-II	3	0	0	3
	PC	23CDL404	Deep Learning with TensorFlow Lab	0	0	3	1.5
	PC	23CDL405	Big Data Analytics Lab	0	0	3	1.5
	IP	23CDP402	Industry Internship	-	-	-	2
	MC	23MCT406	Technical Paper Writing and Intellectual Property Rights	2	0	0	0
			Total	**18**	**0**	**6**	**23**

PROFESSIONAL ELECTIVE-IV

Code	Electives
23CDE441	Cloud Computing
23CDE442	Exploratory Data Analysis
23CDE443	Conversational AI

PROFESSIONAL ELECTIVE-V

Code	Electives
23CDE451	Essentials of Reinforcement Learning
23CDE452	Recommended Systems
23CDE453	Soft Computing

OPEN ELECTIVE -II

Code	Electives
23OET421	Entrepreneurial Development
23OET422	Digital marketing
23OET423	Renewable Energy Sources
23OET424	IT Systems Management
23OET425	Environmental Impact Management
23OET426	Cyber Crime and Law Protection

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
IV B. Tech. (2ⁿᵈ Sem)	PC	23CDP403	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

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:
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 - I: Matrices:
Rank of a matrix by echelon form, normal form. Inverse of 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- II: 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

Quadraticform to canonical forms by Orthogonal Transformation.

UNIT- III : 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- IV : 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 – V : 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)

Subject Code: 23BHT105

L	T	P	C
3	0	0	3

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)

Subject Code: 23EST105

L	T	P	C
3	0	0	3

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 PowerPointpresentations. 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 givenapplication.

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 Code: 23MCS103

L	T	P	C
0	0	1	0.5

Course Objective
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 – 1
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 – 2
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 – 3
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.
   ii) Practicing general and specific warm up, aerobics
   iii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

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 many as 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, totalling 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)

Subject Code: 23BHT103

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.

- 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:
Student will be able to :

- 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 2nd 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 - I: 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- II: Linear differential equations of higher order (Constant Coefficients):
Definitions, homogeneous and non-homogeneous, complementary function, general particular integral, method of variation of parameters. L-C-R Circuit problems.

UNIT- III : 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- IV : Vector differentiation :Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Del applied to vector point functions - Divergence and Curl, Vector identities.

UNIT – V : Vector integration Line integral: circulation- work done, surface integral –flux, Green's Theorem in the plane (without proof), Stokes'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, Higher Engineering Mathematics, 44/e, Khanna publishers,2017.
Reference

Reference Books:

1. Dennis G.Zill and Warren S.Wright, Advanced Engineering Mathematics, Jones and Bartlett, 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)

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 insemiconductors(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 – V: 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
On completion of this course, the student will be able to:

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)

Subject Code: 23BHL102

L	T	P	C
0	0	3	1.5

Course Objectives:

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

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 grating.
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-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum usingdiffraction grating in normal incidence configuration.
3. Determination of width of a slit using diffraction phenomenon.
4. Determination of wavelength of Laser light using diffraction grating.
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 circular coil by Stewart Gee's Method.
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 Torsional pendulum.
12. Sonometer: Verification of laws of stretched string.
13. Determination of Frequency of electrically maintained tuning fork 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 TWOexperiments may 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. $\boxed{7,3} \rightarrow \boxed{3,2} \rightarrow \boxed{9,1} \rightarrow \boxed{6,0} \rightarrow$ 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)

Subject Code: 23ESL102

L	T	P	C
0	0	3	1.5

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)

Subject Code: 23MCS102

L	T	P	C
0	0	1	0.5

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)

Subject Code: 23BHT207

L	T	P	C
2	0	0	2

Course Objectives:

* To help the students appreciate the essential complementarity 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 behaviour 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

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, PrenticeHall.
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

DATABASE MANAGEMENT SYSTEM

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:

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

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.

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.

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.

Nested Queries, Join Operations, Views, Data Control Language, Transaction Control Language, Triggers
Case Study: Reducing 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.

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.
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.

Textbooks:
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 andManagement. Cengage Learning, 7th Edition

Reference Links:

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

COMPUTER NETWORKS

Subject Code: 23CAT201

L	T	P	C
3	0	0	3

Course Objectives:
- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- To know the basic concepts of network services and various network applications.

Course Outcomes:

By the end of the course, the student will be able to
1. Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
2. Discuss different transmission media and different switching networks.
3. Analyses data link layer services, functions and protocols like HDLC and PPP.
4. Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
5. Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

UNIT - I:
Introduction: Network Hardware, Network Software; Reference Models: OSI Reference Model, TCP/IP Reference Model, Comparison between OSI and TCP/IP Models; Example Networks: The ARPANET, Internet. Addressing: Physical Address, Logical Address, Port Address, Specific Address.

UNIT - II:
Data Link Layer: Data Link Layer Design Issues: Services Provided to Network Layer, Framing, Error Control and Flow Control; Error Detection and Correction: Error Correcting Codes, Error Detecting Codes; Elementary Data Link Protocols, Sliding Window Protocols: One-Bit Sliding Window Protocol, Protocol Using Go Back N and Selective Repeat. The Medium Access Control Sub layer: Channel Allocation Problem: Static Channel Allocation, Dynamic Channel Allocation; Multiple Access Protocol: ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited Contention Protocol.

UNIT - III:
The Network Layer: Network Layer Design Issues, Implementation of Connection Less Service, Implementation of Connection Oriented Service, Routing Algorithms: Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Congestion Control Algorithms: General Principles of Congestion Control, Congestion Prevention Policies. Protocols-The IP Protocol, IP Address- IPV4, IPV6, utilization of Cisco Packet Tracer (CPT) tool

UNIT - IV:

The Transport Layer: Functions and Characteristics of Transport protocols, Services Provided to Upper Layer; Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release; The Internet Transport Protocols: UDP and UDP Segment, TCP Protocol, TCP Segment Header, TCP Connection Establishment, TCP Connection Release. Protocols: FTP.

UNIT - V:

The Application Layer: Services of application Layer ,Architecture ,DNS- Domain Name System, Electronic Mail: Architecture and Services, The User Agent, Message Format, Message Transfer, The World Wide Web: Architectural Overview, Static Web Document, Dynamic Web Document; Hyper Text Transfer Protocol (HTTP).

Text Books:
1. Computer Networks, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.

References Books:
1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE

DIGITAL LOGIC AND COMPUTER ORGANIZATION

Subject Code: 23CAT202

L	T	P	C
3	0	0	3

Course Objectives:

The course is designed with the objective to:

- To acquaint the students with the fundamental principles of two-valued logic and application of knowledge to understand digital electronics circuits
- To understand the concepts of combinational logic circuits and sequential circuits.
- To impart basic concepts of computer architecture and or generation.
- To study the hierarchical memory system including cache memories and virtual memory.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.

Course Outcomes:

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

1. Distinguish different number systems
2. Construct various types of adders using combinational circuits
3. Distinguish different sequential logic circuits
4. Understand the theory and architecture of computer and various micro-operations
5. Explain memory hierarchy and memory and I/O operations.

UNIT - I:

Number systems: Binary, Octal, Decimal, Hexadecimal Number Systems, Base conversions, r's Complement and (r-1)"s Complement. Binary number subtraction of unsigned numbers.

Logic Gate &Boolean algebra:

Digital Signals, Digital Circuits, Logic Gates, Introduction to Boolean algebra, Axioms and Laws of Boolean Algebra, Minimization of logic equations using Boolean theorems

UNIT - II:

Gate-Level Minimization using K-Map:

Canonical and Standard Forms, Karnaugh Map Method (K-Map): Minimization of Boolean Functions up to four variables, POS and SOP Simplifications with don't care conditions using K map.

Combinational circuits:

Introduction to combinational logic circuits, Binary adder and subtractor, 4-bit binary adder, carry Look ahead Adder, Applications of full adders

UNIT - III:

Sequential Circuits Fundamentals:

Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, D and T Type Flip Flops, Excitation Table of all Flip Flops, Conversion from one type of Flip-Flop to another.

Registers and Counters:

Design of Bi-directional shift register, universal shift register, Design of Ripple Counters, and synchronous Counters.

UNIT - IV:

Basic Organization of computer: Computer organization, computer architecture, difference between computer architecture and computer organization. Machine instructions and addressing modes, ALU, data path and control unit. Instruction pipelining. Register Transfer and Micro operation: Register transfer language, register transfer, bus and memory transfer, arithmetic micro-operations, logic micro-operations, shift micro-operations and arithmetic logic shift unit.

UNIT - V:

Memory organization: Memory hierarchy, Primary memory, Auxiliary memory,
Associative memory, Cache memory, mapping functions, Virtual memory
Input-output organization:
I/O interface, I/O Bus and interface modules, I/O versus Memory Bus, isolated versus memory mapped I/O. Asynchronous data transfer, Modes of Transfer: Programmed I/O, Interrupt driven I/O.

Text Books:
1. Digital Design ,4/e, M.Morris Mano, Michael D Ciletti, PEA
2. Computer System Architecture– M.Moris Mano, PHI/Pearson,Revised3rd edition.

Reference Books:
1. Switching and Finite Automata Theory,3/e,Kohavi, Jha, Cambridge.
2. Digital Logic Design, Leach, Malvino, Saha,TMH
3. Computer Architecture and Organization– John P. Hayes, McGraw Hill International editions.
4. Switching theory and logic Design – A Anand Kumar 3rd Addition

Reference Links:
1. https://archive.nptel.ac.in/courses/106/105/106105163/
2. https://nptel.ac.in/courses/108/105/108105132/

ESSENTIALS OF PYTHON PROGRAMMING LAB

Subject Code: 23ESL210

L	T	P	C
0	0	3	1.5

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 calculate the following
> > a) Find the factorial of given number
> > b) To print all the prime numbers below n. n value should be taken from the user at the time of execution

> **Ex 2:** Write the python programs to perform the following
> > a) To check given number Armstrong or not.
> > b) To check Strong number.
> > c) To print Fibonacci series.

Exercise Questions: 2

> **Ex 3:** Write the python programs to calculate the following
> > a) Write a Python program to get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.
> > b) Write a Python program to remove the characters which have odd index values of a given string.
> > c) To remove punctuations from the string
> > d) Write a Python program to count repeated characters in a string
> > e) Write a Python program to count Uppercase, Lowercase, special character and numeric values in a given string

> **Ex 4:** Write the python programs to perform the following
> > a) Implement a STACK program by using PYTHON.
> > b) Implement a QUEUE program by using PYTHON.
> > c) Implement a Python Program for creating a dictionary and display its keys alphabetically.
> > d) Write a Python program to convert a list into a nested dictionary of keys.
> > e) Write a python program to remove duplicates from the list

Exercise Questions: 3

Ex 5: Write the python programs to calculate the following
> a) To find HCF or GCD of two numbers
> b) To find sum of natural numbers using recursive function

Ex 6: Write the python programs to perform the following
> a) Read a file line by line into a list
> b) Get filename, line count, file extension, file creation and modification date.
> c) Reads and displays the content of the file
> d) Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.

Exercise Questions: 4

Ex 7: Write the python programs to calculate the following
> a) Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
> b) Write a python program to define a module and import a specific function in that module to another program.

Exercise Questions: 5

Ex 8: Write the python programs to calculate the following
> a) Define a class, which have a class parameter and have a same instance parameter.
> b) Define a class named 'Shape' and its subclass 'Square'. The Square class has an 'init' function which takes a given length as an argument. Both classes have an area function which can print the area of the shape, where Shape's area is 0 by default.

Ex 9: Write the python programs to calculate the following
> a) implement Re.findall, re.split, re.sub, re.subn, re.search and Match.group.
> b) Write a Python program to check the validity of a password
> (input from users).
> Validation :
> - At least 1 letter between [a-z] and 1 letter between [A-Z].
> - At least 1 number between [0-9].
> - At least 1 character from [$#@].
> - Minimum length 6 characters.
> - Maximum length 12 characters.

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

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

DATABASE MANAGEMENT SYSTEM LAB

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:

1. Ability to design and implement a database schema for given problem.
2. Ability to formulate queries using SQL commands.
3. Apply the normalization techniques for development of application software to realistic problems.
4. Apply the PL/SQL for development of applications
5. 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 (<u>branch name</u>, branch city, assets)
   customer (<u>ID</u>, customer name, customer street, customer
   city) loan(<u>loan number</u>, branch name, amount)
   borrower (<u>ID</u>, <u>loan number</u>)
   account (<u>account number</u>, branch name, balance)
   depositor(<u>ID</u>, <u>account number</u>)

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.

References Books
1. Peter Rob ,Carlos Coronel: Data base Systems design Implementation andManagement. Cengage Learning, 7th Edition

Reference Links:

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

II Year I Semester

COMPUTER NETWORKS LAB

Subject Code: 23CAL201

L	T	P	C
0	0	3	1.5

Course Objectives:
Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

Course Outcomes:
By the end of the course student will be able to
1. Know how reliable data communication is achieved through data link layer.
2. Suggest appropriate routing algorithm for the network.
3. Provide internet connection to the system and its installation.
4. Work on various network management tools
5. Analyze and implement the features and operations of various algorithms and protocols.

List of Experiments:

1. Study of network Devices in Detail.

2. Implement data Link layer Framing Methods:

   a) Character Stuffing Method b) Bit Stuffing method.

3. Implement a data link framing method for even and odd parity.

4. Implement a simple data link layer that performs the flow control using the sliding window protocol.

5. Implement the CRC encoding mechanism in data link layer.

6. Write a Program for Dijkstra's algorithm to compute the shortest path through a graph?

7. Configure a network using Distance Vector Routing Protocol?

8. Configure a network using Link State Vector Routing Protocol?

9. Write a program for congestion control using leaky bucket algorithm?

10. Write a program for congestion control using token bucket algorithm?

11. Implementation of IP address masking.

Text Books:
   1. Computer Networks, Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
   2. Data Communications and Networks, Behrouz A. Forouzan, Fifth Edition TMH.

References Books:
   1. Data Communications and Networks- Achut S Godbole, AtulKahate
   2. Computer Networks, Mayank Dave, CENGAGE

STATISTICAL METHODS
(Common to CSE, CSM, CSD & IT)

Subject Code: 23BHT212

L	T	P	C
3	0	0	3

Course Objectives:
1. To introduce and describe Binomial, Poison, Normal distribution.
2. To perform sampling theory and estimation.
3. To perform large samples tests – test of means and proportion.
4. To perform the small sample tests - t-test, F-test and Chi-square test and ANOVA for the give data.
5. 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.

OBJECT ORIENTED PROGRAMMING

Subject Code: 23CAT203

L	T	P	C
3	0	0	3

Course Objective
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. Knowledge of the structure and model of the Java programming language
2. Explain the concept of class and objects with access control to represent real world entities
3. Demonstrate the implementation of inheritance by using extends and implements keywords
4. Illustrate different techniques on creating and accessing packages (fully qualified name and import statements)
5. Understand the impact of exception handling to avoid abnormal termination of program using checked and unchecked exceptions and Use multithreading concepts to develop inter process communication and also design applet Programs.

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. INTERFACES: Interface, Multiple Inheritance using Interface, Abstract Classes vs. Interfaces

UNIT - IV:
Packages: Packages, Different Types of Packages, Access Protection, Importing Packages. **Exception Handling:** Exception-handling fundamentals, throw Clause, throws Clause. Types of Exceptions: Built-in Exception, User Defined Exception.

UNIT - V:
Threads: Java Thread Model, Main Thread, Creating a Thread and Running it, terminating the Thread, Creating Multiple Threads, Thread Synchronization, and Thread Priorities.
Applets: Applet Basics, Applet Life Cycle, A Simple Applet, HTML applet tag, Applet Parameters.

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

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

FUNDAMENTALS OF DATASCIENCE

Subject Code: 23CDT201

L	T	P	C
3	0	0	3

Course Objectives:
• To provide a comprehensive knowledge of data science using Python.
• To learn these sential concepts of data analytics and data visualization.

Course Outcomes:
Up on successful completion of the course, the student will be able to:
• Apply principles of NumPy and Pandas to the analysis of data.
• Make use of various file formats in loading and storage of data.
• Identify and apply the need and importance of pre-processing techniques.
• Show the results and present the mina pictorial format.

Unit-I:
Data science: definition, Data fiction, Exploratory Data Analysis, The Data science process, data scientist role in this process.
NumPyBasics:TheNumPyndarray:AMultidimensionalArrayObject,Creating ndarrays ,Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Data Processing Using Arrays, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays , Sorting , Unique.

Unit-II:
Getting Started with pandas: Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, Data Frame, Index Objects, Essential Functionality Reindexing, Dropping entries from an axis, Indexing, selection, and filtering),Sorting and ranking, Summarizing and Computing Descriptive Statistics, Unique Values, Value Counts, Handling Missing Data, filtering out missing data.

Unit-III:
Data Loading, Storage, and File Formats: Reading and Writing Data in Text Format, Reading Text Files in Pieces, Writing Data Out to Text Format, Manually Working with Delimited Formats, JSON Data.
XML and HTML: Web Scraping, Binary Data Formats, Using HDF5 Format, Reading Microsoft Excel Files, Interacting with Databases, Storing and Loading Data in Mongo DB.

Unit -IV:
Data Wrangling: Combining and Merging Data Sets, Database style Data Frame Merges, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap , Reshaping and Pivoting, Reshaping with Hierarchical Indexing, Data Transformation, Removing Duplicates, Replacing Values.

Unit-V:
Plotting and Visualization: A Brief matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, Plotting Functions in pandas, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots.

Text Books:
1. WesMcKinney,"PythonforDataAnalysis",O"REILLY,ISBN:978-1-449-31979-3,1st edition, October 2012.
2. Rachel Schutt & O"neil, "DoingDataScience",O"REILLY,ISBN:978-1-449-35865-5, 1st edition, October 2013.
3. SeemaAcharya,SubhashiniChellappan,"BigDataandAnalytics",Wiley,ISBN:978-8126579518, 2nd edition, 2019.

,

Reference Books:
1. JoelGrus, "Data Science from Scratch: First Principles with Python", O"Reilly Media, 2015
2. MattHarrison,"LearningthePandasLibrary:PythonToolsforDataMunging,Analysis, and Visualization , O'Reilly, 2016.

L	T	P	C
3	0	0	3

DATA MINING

Subject Code: 23CAT205

Course Objectives:
- To understand and implement classical models and algorithms in data warehousing and data mining.
- To analyse the data, identify the problems, and choose the relevant models and algorithms to apply.
- To assess the strengths and weaknesses of various methods and algorithms and to analyse their behavior.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

1. Summarize the architecture of data warehouse
2. Apply different pre-processing methods, Similarity, Dissimilarity measures for any given raw data.
3. Construct a decision tree and resolve the problem of model overfitting
4. Compare Apriori and FP-growth association rule mining algorithms for frequent item set generation
5. Apply suitable clustering algorithm for the given data set

UNIT- I:
Data Warehouse and OLAP Technology: An Overview: Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data
Mining.

UNIT- II:
Data Mining: Introduction, What is Data Mining?, Motivating challenges, The origins of Data Mining, Data Mining Tasks, Types of Data, Data Quality.
Data Pre-processing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature creation, Discretization and Binarization, Variable Transformation, Measures of Similarity and
Dissimilarity.

UNIT –III:
Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree, Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.
Model Overfitting: Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap. Bayes Theorem, Naïve Bayes Classifier.

UNIT –IV:
Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of Frequent Item sets, FP Growth Algorithm.

UNIT –V:
Cluster Analysis: Basic Concepts and Algorithms: Overview, What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.

Text Books:
1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011

Reference Books:
1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010
2. Data Mining: Introductoryand Advanced topics: Dunham, First Edition, Pearson, 2020
3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008
4. Data Mining Techniques, Arun K Pujari, Universities Press, 2001

OPERATING SYSTEMS

Subject Code: 23CST205

L	T	P	C
2	0	0	2

Course Objective
- Understand structure and functions of operating systems and its types.
- Learn about Processes, Process operations and scheduling Algorithms.
- Understand the principals of concurrency, Deadlocks and its characteristics.
- Learn various memory management techniques and virtual memory.
- Study about files system and Mass storage Devices.

Course outcomes
1. Explain the various structures of operating system and design scheduling algorithms.
2. Propose solutions for achieving process synchronization and design deadlocks algorithms.
3. Compare and contrast various memory management schemes and about virtual memory.
4. Design and implement file systems, file structure and disk structure.
5. Familiarize with disk structure, disk scheduling and organization of I/O devices.

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, Critical-section problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic problems of synchronization.
Principles of deadlock: System model, Deadlock characterization, Deadlock prevention, Deadlock detection and avoidance, Recovery from deadlock.

UNIT- III:
Memory Management: Swapping, Contiguous memory allocation, Paging, Structure of the page-table, Segmentation.
Virtual Memory Management: Virtual memory, Demand paging, Page replacement algorithms: FIFO, LRU and Optimal page replacement, Thrashing.

UNIT- IV:
File System Interface: The concept of file, File access methods: sequential access,   direct access and indexed access, Directory structure, file sharing and protection.
File System Implementation: File system structure, 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 management, Disk scheduling-FCFS, SSTF, SCAN, C-SCAN.
I/O management: I/O devices, Device controllers, Organization of I/O functions, I/O buffering.

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. D.M. Dhamdhere Operating systems-A concept based approach-, 2nd Edition, TMH.
2. Andrew S Tanenbaum Modern Operating Systems, 2nd edition Pearson/PHI.

Reference Links

1. http://www.cs.kent.edu/~farrell/osf03/oldnotes/index.html : Lecture Notes
2. http://www.personal.kent.edu/~rmuhamma/OpSystems/os.html : Lecture Notes
3. http://www.computerhope.com/os.htm : Different Types of Operating Systems
4. http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/

<div align="center">

ADVANCED CODING LAB- I
(Common to CSE, IT, CSD &CSM)

</div>

L	T	P	C
0	0	3	1.5

Subject Code: 23ESL209

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/2156

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

LAB MODULE IX:
Number Theory Class Test:
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 FelixHalim 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.

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

OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Subject code: 23CAL202

L	T	P	C
0	0	3	1.5

Course Objective:
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 username 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 are 1 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. CayS. Horstmann, Core Java Volume I–Fundamentals, 11th Edition, Pearson 2019
2. Y. Daniel Liang Introduction to Java Programming Comprehensive Version, 10th Edition, Pearson, 2015.

FUNDAMENTALSOFDATASCIENCELAB

Subject Code: 23CDL201

L	T	P	C
0	0	3	1.5

Course Objectives:
- The main objective of the course is to inculcate the basic understanding of Data Science and it's practical implementation using Python.

Course Outcomes:
Upon successful completion of the course, the student will be able to:
1. Perform various operations on numpy arrays
2. Importing data from different file formats using pandas
3. Draw different types of charts using matplotlib

List of Experiments:
1. Creating a NumPy Array
a) Basic ndarray
b) Array of zeros
c) Array of ones
d) Random numbers in ndarray
e) An array of your choice
f) Imatrix in NumPy
g) Evenly spaced ndarray

2. The Shape and Reshaping of NumPy Array
a) Dimensions of NumPy array
b) Shape of NumPy array
c) Size of NumPy array
d) Reshaping a NumPy array
e) Flattening a NumPy array
f) Transpose of a NumPy array

3. Expanding and Squeezing a NumPy Array
a) Expanding a NumPy array
b) Squeezing a NumPy array
c) Sorting in NumPy Arrays

4. Indexing and Slicing of NumPy Array
a) Slicing 1-D NumPy arrays
b) Slicing 2-D NumPy arrays
c) Slicing 3-D NumPy arrays
d) Negative slicing of NumPy arrays

5. Stacking and Concatenating Numpy Arrays
a) Stacking ndarrays
b) Concatenating ndarrays
c) Broadcasting in Numpy Arrays

6.   Perform following operations using pandas
a)   Creating dataframe
b)   Concat()
c)   Setting conditions
d)   Adding a new column

7.   Perform following operations using pandas
a)   Filling NaN with string
b)   Sorting based on column values
c)   Groupby()

8.   Read the following file formats using pandas
a)   Text files
b)   CSV files
c)   Excel files
d)   JSON files

9.   Read the following file formats
a)   Pickle files
b)   Image files using PIL
c)   Multiple files using Glob
d)   Importing data from database

10. Demonstrate web scraping using python

11. Perform following preprocessing techniques on loan prediction dataset
a)   Feature Scaling
b)   Feature Standardization
c)   Label Encoding
d)   One Hot Encoding

12. Perform following visualizations using matplotlib
a)   Bar Graph
b)   Pie Chart
c)   Box Plot
d)   Histogram
e)   Line Chart and Subplots
f)   Scatter Plot

Web References:
1. https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-data-science- beginners/
2. https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutes-guide-to-key- concepts/
3. https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formats- python/
4. https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessing-python-scikit- learn/
5. https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-data-visualization- exploration-python/

DESIGN THINKING
(Common to All Branches)

Subject Code: 23BHT208

L	T	P	C
1	0	2	2

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

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

ENVIRONMENTAL STUDIES
(Common to All Branches)

L	T	P	C
2	0	0	0

Subject Code: 23MCT204

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:
By Studying this Course Student will
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 International edition.
5. Graedel, T.E., Allenby, B.R., Industrial Ecology and Sustainable Engineering, Pearson Publications.

L	T	P	C
3	0	0	3

WEB TECHNOLOGIES

Course Objectives:

After the completion of the course, student will be able to:

1. To teach students the basics of server-side scripting using PHP
2. To explain web application development procedures
3. To facilitate students to connect to databases.
4. To familiarize various concepts of application development.

Course Outcomes:

The student will be able to:
1. Create web pages using HTML and Cascading Styles sheets, analyze a web page and identify it's elements and attributes.
2. Build dynamic web pages.
3. Infer the knowledge to Develop portable and dynamic web pages.
4. Demonstrate server-side scripting languages to develop business logic.
5. Make use of database connectivity to communicate database server from web server.

Unit 1:
Html: Basic Syntax, Standard HTML Document Structure, Images, Hypertext Links, Lists, Tables, Forms, Frames, HTML5
CSS: Introduction, CSS Properties, Selectors, Combinators, Controlling Fonts, Forms, Pseudo classes, Transitions, Animations (data-aos), 2D and 3D Transforms, Navigation Bar, Layouts.

Unit 2:
JavaScript: Introduction to JavaScript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions.

Unit 3:
Bootstrap: Responsive Design, Layouts, Grids, Media Queries, Components- Forms, Drop Downs, Cards, Input Groups, Collapse, List Groups, Navbar, Popovers, Flex Box. Utilities- Borders, Positions, Scroll spy, Visibility, CSS Components, SVG, Java Script Components. JSON: Introduction, Parsing, Objects, JSON arrays, Dynamic HTML Data. jQuery: Selectors, Filters, Form Plug-ins, Auto Validations.

Unit 4:
PHP: Introduction, Modal View Architecture (MVC), Creating PHP script, Running PHP script, Introduction to PHP, Arrays, Functions, sending parameters in URL, working with Forms.

Unit 5:
Working with Database: Running SQL Queries, connecting with Databases, Uploading Files, PHP Sessions, Redirecting, Routing, Connecting PHP with JavaScript and jQuery, Authentication.

Aditya Institute of Technology and Management - Tekkali

Textbooks

1. Sebesta, R. W. (2015). Programming the World Wide Web (8th ed.). Pearson.
2. Spurlock, J. (2013). Bootstrap: Responsive Web Development (1st ed.), Foreword by Dave Winer. O'Reilly Media.

Reference Books

1. Duckett, J. (2011). Web Programming with HTML, XHTML, and CSS (2nd ed.). Wiley India.
2. Bai, E., & Ekedahl, M. (2008). Web Programming. CENGAGE Learning, India Edition.
3. Wang, P. S. (2003). An Introduction to Web Design + Programming. India Edition.
4. Grinberg, M. (2018). Flask Web Development (2nd ed.). O'Reilly Media.

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

Aditya Institute of Technology and Management - Tekkali

L	T	P	C
3	0	0	3

Subject Code: 23CAT307

MODERN PRINCIPLES OF SOFTWARE ENGINEERING
(Common to CSD & CSM)

Course Objectives:
- To understand the principles and methodologies of software engineering and the role of agile practices in modern development.
- To explore the software development life cycle (SDLC) phases and their implementation in real-world projects.
- To gain proficiency in applying agile frameworks like Scrum and Kanban for iterative and incremental software development.
- To emphasize the importance of software quality, testing, maintenance, and documentation.
- To develop problem-solving, collaboration, and project management skills essential for team-based software development.

Course Outcomes:
Upon successful completion of this course, students will be able to:
1. Explain and apply software engineering concepts and agile approaches in software project development.
2. Analyze and document software requirements for diverse systems using industry-standard practices.
3. Design software solutions using architectural patterns, modeling techniques, and design principles.
4. Apply testing methodologies to ensure software reliability and evaluate quality metrics.
5. Use agile tools to manage software projects collaboratively, adapting to changing requirements effectively.

Unit - I: Introduction to Software Engineering
Overview of Software Engineering: Definitions, Characteristics, and Importance, Software Process Models: Waterfall, Iterative, Spiral, and V-Model, Comparison of Traditional and Agile Software Development Approaches, Software Development Life Cycle (SDLC): Phases and Activities.

Unit - II: Agile Software Development
Agile Manifesto and Principles: Philosophy and Core Values, Scrum Framework: Roles (Product Owner, Scrum Master, Development Team), Artifacts (Product Backlog, Sprint Backlog), and Events (Sprint Planning, Daily Scrum, Sprint Review, Retrospective), Kanban and Extreme Programming (XP): Practices and Benefits, Agile Tools: Jira, Trello, and Confluence.

Unit - III: Requirements Engineering
Elicitation Techniques: Interviews, Surveys, Prototyping, and Use Cases, Requirements Analysis: Prioritization, Modeling, and Validation, Documenting Requirements: Software Requirements Specification (SRS), Managing Requirements: Traceability, Change Management.

Unit - IV: Software Design and Development
Principles of Good Design: Cohesion, Coupling, and Modularity. Unified Modeling Language

Aditya Institute of Technology and Management - Tekkali

(UML): Class Diagrams, Sequence Diagrams, Activity Diagrams, Design Patterns: Creational, Structural, and Behavioral Patterns, Software Architecture Styles: Client-Server, MVC, Microservices.

Unit - V: Testing, Maintenance, and Quality Assurance
Software Testing Fundamentals: Black-Box and White-Box Testing, Test Case Design Techniques: Equivalence Partitioning, Boundary Value Analysis, Software Quality Assurance (SQA): Metrics, Standards, and Reviews, Maintenance Types: Corrective, Adaptive, Perfective, and Preventive, Version Control Systems: Git and Configuration Management Practices.

Text Books:
1. Ian Sommerville, Software Engineering, 10th Edition, Pearson Education, 2015.
2. Robert C. Martin, Clean Agile: Back to Basics, Pearson, 2019.
3. Kenneth S. Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison-Wesley, 2012.

Reference Books:
1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, 8th Edition, McGraw-Hill Education, 2014.
2. Alistair Cockburn, Agile Software Development: The Cooperative Game, 2nd Edition, Addison-Wesley, 2006.
3. Boehm and Turner, Balancing Agility and Discipline: A Guide for the Perplexed, Addison-Wesley, 2003.

MOOC:

1. https://www.mooc-list.com/course/agile-software-development-coursera
2. https://www.udacity.com/course/agile-software-development-nanodegree--nd144

Aditya Institute of Technology and Management - Tekkali

L	T	P	C
3	0	0	3

STATISTICS WITH R PROGRAMMING

Prerequisite: Basic knowledge of programming concepts, mathematical foundations, and introductory statistics.

Course Objectives:
1. To introduce the basics of R programming and its data structures.
2. To teach control structures and advanced programming concepts in R.
3. To perform mathematical computations and statistical operations using R.
4. To create and customize data visualizations using R.
5. To apply statistical and machine learning models for data analysis.

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

1. Use R for basic programming and data manipulation tasks.
2. Implement control structures and advanced programming concepts.
3. Perform mathematical and statistical computations in R.
4. Create and customize visualizations using R.
5. Apply statistical models and machine learning techniques to analyze data.

UNIT-I: **Introduction**:
How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT-II: Control Statements
R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets,- IfElse, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT-III: Math and Simulation
Doing Math and Simulation in R, Math Function, Extended Example Calculating ProbabilityCumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files,

UNIT-IV: Creating Graphs

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files. Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

UNIT-V: Linear Models
Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines-Decision-Random Forests.

Textbooks:

1. Matloff, N. (2011). The Art of R Programming. No Starch Press. ISBN: 978-1-59327-384-2
2. Lander, J. P. (2017). R for Everyone: Advanced Analytics and Graphics. Addison-Wesley Professional. ISBN: 978-0-13-454692-6

Reference Books:

1. Teetor, P. (2011). R Cookbook. O'Reilly Media. ISBN: 978-0-596-80915-7
2. Kabacoff, R. I. (2015). R in Action: Data Analysis and Graphics with R (2nd ed.). Manning Publications. ISBN: 978-1-61729-138-8

MOOC:
1)https://www.coursera.org/learn/r-programming
2)https://www.coursera.org/specializations/data-visualization-r

Aditya Institute of Technology and Management - Tekkali

L	T	P	C
3	0	0	3

Subject Code: 23CDT304

DESIGN ANALYSIS OF ALGORITHMS
(Common to CSD & CSM)

Course Objectives
1. To analyze performance of algorithms.
2. To choose the appropriate data structure and algorithm design method for a specified application.
3. To understand how the choice of data structures and algorithm design methods impacts the performance of programs.
4. To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.

Course Outcomes:
1. Analyze algorithms using asymptotic notations and evaluate their time and space complexities.
2. Apply the divide-and-conquer technique to solve problems such as binary search, quick sort, and merge sort.
3. Implement the greedy method to solve optimization problems like knapsack, spanning trees, and shortest path.
4. Solve complex computational problems using dynamic programming techniques, including knapsack, shortest paths, and traveling salesperson problems.
5. Employ backtracking to design solutions for problems such as n-queens, subset sums, graph coloring, and Hamiltonian cycles.

UNIT I
Introduction: Algorithms, Pseudo code for expressing algorithms, performance analysis-Space complexity, Time Complexity, Asymptotic notation- Big oh notation, little oh notation.
Case Study: Pseudo code conventions, Time and space complexities

UNIT II
Divide and Conquer: General method, finding the maximum and minimum Applications- Binary search, Quick sort, merge sort

UNIT III
Greedy method: General method, Knapsack problem, Spanning trees, Minimum cost spanning trees, Single source shortest path

UNIT IV
Dynamic Programming: General method, Optimal binary search trees,0/1 Knapsack problem, All pairs shortest path, Traveling sales person problem.

UNIT V

Aditya Institute of Technology and Management - Tekkali

Backtracking: General method Applications-n-queues problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles.
Case Study: Backtracking: graph coloring

Textbooks

1. Levitin, A. (2008). Fundamentals of Computer Algorithms. Universities Press. ISBN: 978-8173716126
2. Thulasiraman, K., & Keshavan, M. (2013). Design and Analysis of Algorithms. Pearson Education. ISBN: 978-8131799437
3. Horowitz, E., & Sahni, S. (1977). Algorithms: Design and Analysis. Computer Science Press.

Reference Books

1. Levitin, A. (2003). Introduction to the Design and Analysis of Algorithms. Pearson Education. ISBN: 978-0201743951
2. Goodrich, M. T., & Tamassia, R. (2001). Algorithm Design: Foundations, Analysis, and Internet Examples. John Wiley & Sons. ISBN: 978-0471383659
3. Dasgupta, S., Papadimitriou, C., & Vazirani, U. (2010). Design and Analysis of Algorithms. Oxford University Press. ISBN: 978-0198069660

REFERENCE LINKS:
1. https://nptel.ac.in/courses/106101060

Aditya Institute of Technology and Management - Tekkali

L	T	P	C
3	0	0	3

Subject Code: 23CDE311

PREDICTIVE ANALYSIS AND MODELLING
(Professional Elective – I)

Prerequisite: Data Mining and Machine Learning

Course Objectives:
After the completion of the course, students would:
  1. Be prepared with a varied range of expertise in different aspects of collection, visualization, processing and modeling of data sets.

Course Outcomes:
The student will be able to:
  1. Understand the basics of predictive analytics and summarize Data, Categorize Models, and techniques
  2. Apply Decision tree, Support Vector Machine for Data Classification
  3. Apply Methods such as Naïve Bayes Markov Model, to Boost Prediction Accuracy for Data Classification.
  4. Apply Methods such as Linear Regression, Neural Networks to Boost Prediction Accuracy for Data Classification.
  5. Analyze and Visualize predictive Model's results using Data Visualization tools.

Unit 1: Data Preparation
Introduction – Predictive Analytics in the Wild – Exploring Data types and associated Techniques - Complexities of data - Applying Models: Models and simulation, Categorizing Models, Describing, summarizing data, and decisions – Identify similarities in Data: Data Clustering, converting Raw Data into a Matrix, Identify K-groups in Data.

Unit 2: Data Classification - Part I
Background – Exploring Data classification process - Using Data Classification to predict the future: Decision tree, Algorithm for generating Decision Trees, Support Vector Machine.

Unit 3: Data Classification - Part II
Ensemble Methods to Boost Prediction Accuracy: Naïve Bayes Classification Algorithm, The Markov Model, Linear Regression, Neural Networks – Deep learning.

Unit 4: Data Prediction
Adopt predictive analytics - Processing data: identifying, cleaning, generating, reducing dimensionality of data – Structuring Data – Build predictive model: develop and test the model.

Unit 5: Visualization of Analytical Results
Visualization as a Predictive Tool, Evaluating Your Visualization, Visualizing Your Model's

Analytical Results, prediction – Novel visualization in Predictive Analytics, Big Data Visualization Tools

Text Books
  1) Anasse Bari, Mohamed Chaouchi, Tommy Jung, "Predictive Analytics For Dummies", Wiley Publisher, 2nd Edition, 2016.

Reference Books:
  1) Bertt Lantz, Machine Learning with R: Expert techniques for predictive modeling to solve all your data analysis problems, Pack Publisher, 2nd Edition, 2015.
  2) Aurelien,"Hands-On Machine Learning with Scikit-Learn & TensorFlow", O'Reilly Publisher, 5th Edition, 2017.
  3) Max Kuhn, Kjell Johnson, " Applied Predictive Modeling" Springer, 2013.

MOOC:
  1) https://www.coursera.org/learn/predictive-modeling-analytics
  2) https://www.edx.org/course/predictive-analytics
  3) https://www.udemy.com/course/machinelearningandlogisticregression/

NoSQL Database System

(Professional Elective – I)

L	T	P	C
3	0	0	3

Subject Code: 23CDE312

Course Objectives:

After the completion of the course, student will be able to:

1. Explain the fundamental concepts of NoSQL, including its definition, history, and comparison with traditional RDBMS systems, and explore popular NoSQL.
2. Perform CRUD operations, querying, indexing, and data management in NoSQL databases.
3. Utilize NoSQL in cloud environments, implement parallel processing with MapReduce.
4. Analyze database internals, migrate applications from RDBMS to NoSQL.
5. Design and develop web applications using NoSQL databases, such as creating a blog application with PHP and MongoDB.

Course Outcomes:

The student will be able to:

1. Explore fundamental concepts of NoSQL databases compared to traditional RDBMS systems, and evaluate popular NoSQL products like MongoDB.
2. Demonstrate proficiency in performing CRUD operations.
3. Apply NoSQL databases in cloud environments
4. Analyze the internal workings of NoSQL databases, plan and execute application migration from RDBMS to NoSQL
5. Design and develop scalable web applications using NoSQL databases

Unit 1: Introduction

Definition of NOSQL, History of NOSQL and Different NOSQL products. Exploring MondoDB Java/Ruby/Python, Interfacing and Interacting with NOSQL.

Unit 2: NoSQL Basics

NoSQL Storage Architecture, CRUD operations with MongoDB, Querying. Modifying and Managing NoSQL Data stores. Indexing and ordering datasets (MongoDB/CouchDB/Cassandra).

Unit 3: Advanced NOSQL

NoSQL in CLOUD. Parallel Processing with Map Reduce, Big Data with Hive.

Unit 4: Working with NoSQL

Surveying Database Internals, Migrating from RDBMS to NoSQL, Web Frameworks and NOSQL, using MySQL as a NOSQL

Aditya Institute of Technology and Management - Tekkali

Unit 5: Developing Web Application with NOSQL and NoSQL Administration
Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP, NOSQL Database Administration

Text Books
1. Professional NoSQL, Shashank Tiwari, WROX Press, 2011
2. The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing, Eelco Plugge, Peter Membrey and Tim Hawkins, Apress, 2010

Reference Books:
1. Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional, 2012.
2. Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications, 2013.

Mooc
1. https://www.coursera.org/learn/introduction-to-nosql-databases

Aditya Institute of Technology and Management - Tekkali

L	T	P	C
3	0	0	3

Subject Code: 23CDE313

DATA HANDLING AND DATA VISUALIZATION
(Professional Elective – I)

Course Objectives:

After the completion of the course, students would:
1. Be prepared with a varied range of expertise in different aspects of collection, visualization, processing and modeling of data sets.

Course Outcomes:

The student will be able to:
1. Explain the fundamentals of data visualization, including its design principles, value, and tools, as well as the characteristics of various data types such as categorical, time series, and statistical data.
2. Apply basic and advanced plotting techniques using tools like Matplotlib, Seaborn, and Plotly to visualize data effectively in the form of plots, charts, and maps.
3. Develop interactive visualizations and animations, incorporating dynamic charts, maps, and motion principles using advanced visualization libraries such as Altair.
4. Analyze and implement visualization principles such as Gestalt's and Tufte's guidelines to create user-centered and perceptually effective visual representations.
5. Query, analyze, and visualize multi-dimensional data, create dynamic dashboards, and use advanced tools to explore patterns, trends, and stories within datasets interactively.

Unit 1: Introduction
Introduction: Data for Graphics, Design principles, Value for visualization, Categorical, timeseries, and statistical data graphics, Introduction to Visualization Tools.

Unit 2: Basic Plotting & Applied Visualizations
Basic Plotting: Line plot - Bar plot - Pie Chart - Scatter Plot - Histogram - Stacked Bar Charts - Sub Plots - Matplotlib, Searborn, Plotly - Seaborn Styles, Applied Visualizations: Box plot - Density Plot - Area Chart - Heat map - Tree map - Graph Networks

Unit 3: Interactive Visualizations and Animations
Dynamic charts - Dynamic maps - Animation types - 2D, 3D, Motion Animation - Animation Principles - Altair Package - Statistical Visualizations.

Unit 4: Information Visualization
Visual Perception and Cognition - Gestalt's Principles - Tufte's Principles - Applications of Principles.

Aditya Institute of Technology and Management - Tekkali

Unit 5: Multidimensional Data and Interaction
Query, Analysis and Visualization of Multi- Dimensional Relational Databases, Interactive Exploration, tSNE, Interactive Dynamics for Visual Analysis, Visual Queries, Finding Patterns in Time Series Data, Trend visualization, Animation, Dashboard, Visual Storytelling.

Text Books
1. The Visual Display of Quantitative Information (2nd Edition). E. Tufte. Graphics Press, 2001.
2. Visualizing Data by Ben Fry 2016
3. Data Visualization Handbook by J. Koponen, J. Hildén, CRC Press, 2019

Reference Books:
1. The Book of Trees: Visualizing Branches of Knowledge by M. Lima, Princeton Architectural Press,2014.
2. Interactive Data Visualization for the Web by S. Murray O'Reilly Press, 2nd Edition, 2017.

MOOC:
1. https://nptel.ac.in/courses/110106072
2. https://nptel.ac.in/courses/108105103

Aditya Institute of Technology and Management - Tekkali

L	T	P	C
0	0	3	1.5

Subject Code: 23CDL302

WEB TECHNOLOGIES LAB

Course Objectives:

1. Master the fundamentals of HTML and CSS to create structured, visually appealing, and interactive web pages.
2. Develop dynamic and interactive web functionality through JavaScript.
3. Build responsive, user-friendly interfaces leveraging Bootstrap components, jQuery plugins, and JSON for dynamic data handling.
4. Gain proficiency in PHP programming to create dynamic server-side applications
5. Integrate PHP with databases and JavaScript to build secure, full-stack web applications.

Course Outcomes:

The student will be able to:

1. Design well-structured web pages with enhanced styling and animations using HTML5 and CSS3.
2. Implement client-side functionality through JavaScript, utilizing advanced programming concepts
3. Develop responsive and interactive web interfaces by integrating Bootstrap components, JSON data, and jQuery plugins.
4. Build dynamic server-side applications by writing efficient PHP scripts and implementing the MVC architecture.
5. Connect front-end and back-end components, manage databases, and implement secure web application features like authentication and session handling.

Experiments

1. Design the following static web pages required for Online Examination System web site.
   a) Home Page
   b) Login Page:
      i.   Student Login Page
      ii.   Admin Login Page
   c) Registration page
   d) Test Page
   e) Results Page.

Aditya Institute of Technology and Management - Tekkali

2. Apply different font styles, font families, font colors, animations and other formatting styles to the above static web pages.

3. Apply and check different validations in login page and registration page using Java Script.

4. Write a Javascript program to Calculate Factorial of any number by using html.

5. Create an HTML page with any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.

6. Make the static pages Responsive and attractive using Bootstrap components.

7. Validate login page and registration page using JQuery.

8. Write a simple PHP program on Introspection and Serialization.

9. Design a web page using following form controls:
   a. List box   b. Combo box   c. Hidden field box

10. Write a PHP program for sending and receiving plain text message (e-mail).

11. Develop a simple application to -
    a) Enter data into database
    b) Retrieve and present data from database

12. Develop a simple application to Update, Delete table data from database.

Text Books

1. Programming the World Wide Web, 8th edition Robert W. Sebesta, pearson.
2. Bootstrap: Responsive Web Development, 1st Edition, jake spurlock foreword by dave winer, O'Reilly publications.

Reference Books:

1. Web programming with HTML, XHTML and CSS, 2e, Jon Duckett, Wiley India
2. Web programming Bai, Michael Ekedahl, CENAGE Learning, India edition.
3. An Introduction to Web Design + Programming, Paul S.Wang, India Editio

L	T	P	C
0	0	3	1.5

Subject Code: 23CDL303

STATISTICS WITH R/PYTHON PROGRAMMING LAB

Prerequisite:
Basic understanding of programming, data structures, and statistics. Familiarity with R or similar languages is helpful.

Course Objectives:

1. Learn basic R programming and data handling.
2. Understand and work with data structures like vectors, matrices, and data frames.
3. Perform statistical calculations (mean, sum, product) and handle missing values.
4. Develop skills in data visualization (charts, plots, regression lines).
5. Apply regression analysis and correlation techniques for data interpretation.

Course Outcomes:

1. Write R programs to process data and handle user inputs.
2. Work with vectors, matrices, and arrays in R.
3. Perform basic statistical functions and manage missing data.
4. Visualize and analyze data with charts and plots.
5. Perform regression analysis and interpret data relationships.

Practical Component 1: Basic R Programming and User Input

1. **Experiment 1:** Take input from the user (name and age) and display the values. Also, print the version of R installation.
2. **Experiment 2:** Create a sequence of numbers from 20 to 50. Find the mean of numbers from 20 to 60 and the sum of numbers from 51 to 91.

Practical Component 2: Data Structures in R (Vectors, Matrices, Arrays)

3. **Experiment 3:** Create three vectors a, b, and c with 3 integers. Combine the three vectors to form a 3x3 matrix where each column represents a vector. Print the content of the matrix.
4. **Experiment 4:** Find row and column indices of the maximum and minimum values in a given matrix.
5. **Experiment 5:** Combine three arrays so that the first row of the first array is followed by the first row of the second array and then the first row of the third array.

Practical Component 3: Arrays and Data Frames

6. **Experiment 6:** Create an array using four given columns, three given rows, and two given tables. Display the content of the array.
7. **Experiment 7:** Create a data frame from four given vectors.

Practical Component 4: Statistical Functions and Visualization

8. **Experiment 8:** Find the Sum, Mean, and Product of a Vector, ignoring elements like NA or NaN.
9. **Experiment 9:** Create a list containing a vector, a matrix, and a list. Remove the second element.
10. **Experiment 10:** Merge two given lists into one list.
11. **Experiment 11:** Create an ordered factor from data consisting of the names of months.
12. **Experiment 12:** Plot the density and distribution functions for the normal approximation to the binomial distribution.

Practical Component 5: Regression Analysis and Data Visualization

13. **Experiment 13:** Take any dataset, visualize tables, charts, and plots. Compute measures of Central Tendency, Variation, and Shape. Create box plots and Pareto diagrams. Calculate the mean, median, standard deviation, and quantiles.
14. **Experiment 14:** Take any dataset. Calculate the correlation between two variables and draw scatter plots to investigate the relationship between them.
15. **Experiment 15:** Use the least square regression line to estimate the sales of a company in 2021 based on historical data (year vs. sales).
16. **Experiment 16:** Find the least square regression line for the given data set and plot the points along with the regression line.

Note: All the above experiments can be executed in either R or Python Programming Language.

Textbooks:

1. Matloff, N. (2011). The Art of R Programming. No Starch Press. ISBN: 978-1-59327-384-2
2. Lander, J. P. (2017). R for Everyone: Advanced Analytics and Graphics. Addison-Wesley Professional. ISBN: 978-0-13-454692-6

Reference Books:

1. Teetor, P. (2011). R Cookbook. O'Reilly Media. ISBN: 978-0-596-80915-7
2. Kabacoff, R. I. (2015). R in Action: Data Analysis and Graphics with R (2nd ed.). Manning Publications. ISBN: 978-1-61729-138-8

MOOC:
3) https://www.coursera.org/learn/r-programming
4) https://www.coursera.org/specializations/data-visualization-r

Aditya Institute of Technology and Management - Tekkali

Advanced Coding Lab – II

Subject code: 23ESL312

L	T	P	C
0	0	3	1.5

Course Objective

- 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/

Aditya Institute of Technology and Management - Tekkali

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 https://leetcode.com/problems/convert-binary-number-in-a-
Linked List to Integer: linked-list-to-integer/description/

Palindrome Linked List https://leetcode.com/problems/palindrome-linked-
list/description/

Remove Linked List https://leetcode.com/problems/remove-linked-list-
Elements: elements/description/

Lab Module – V

Linked List part 2:

Sort List: https://leetcode.com/problems/sort-list/description/

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

Merge Two Sorted Lists: https://leetcode.com/problems/merge-two-sorted-
lists/description/

Intersection of Two Linked https://leetcode.com/problems/intersection-of-two-linked-
Lists: 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 https://leetcode.com/problems/evaluate-reverse-polish-
Notation: notation/description/

Min Stack https://leetcode.com/problems/min-stack/description/

Daily Temperatures: https://leetcode.com/problems/daily-temperatures/description/

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

Implement Stack using https://leetcode.com/problems/implement-stack-using-
Queues: queues/description/

Implement Queue using https://leetcode.com/problems/implement-queue-using-
Stacks: 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 https://leetcode.com/problems/find-common-elements-between-
Between Two Arrays: two-arrays/description/

Aditya Institute of Technology and Management - Tekkali

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/

Aditya Institute of Technology and Management - Tekkali

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, 2008,
5. 2nd Edition.

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

Aditya Institute of Technology and Management - Tekkali

L	T	P	C
0	0	3	1.5

Subject Code: 23BHL306

TINKERING LAB

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:
Upon the completion of this course, the students will be able to

CO1: Apply knowledge from various engineering disciplines to build and test prototypes
CO2: Use tools, equipment, and software for basic mechanical, electronic, and digital fabrication.
CO3: Understand the basics of product design, prototyping, and iteration
CO4: Work collaboratively on real-world problem statements and interdisciplinary projects
CO5: 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:

Aditya Institute of Technology and Management - Tekkali

- 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. *Designing for Growth: A Design Thinking Tool Kit for Managers* by Jeanne Liedtka and Tim Ogilvie.

2. *The Art of Tinkering* by Karen Wilkinson and Mike Petrich.

3. *Make: Electronics: Learning by Discovery* by Charles Platt.

Online Resources:

1. Arduino, Raspberry Pi, and IoT tutorial platforms.

2. 3D modeling and CAD tutorials on platforms like Tinkercad or Fusion360.

3. MIT's Fab Lab and Fab Academy resources.

Tools and Equipment:

1. 3D printers, laser cutters, CNC machines.

2. Arduino and Raspberry Pi kits.

3. Basic electronic components: sensors, LEDs, motors, breadboards.

4. Mechanical tools: drills, saws, hand tools, etc.

Aditya Institute of Technology and Management - Tekkali

MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCE
(Common to all Branches)

Subject Code: 23BHT314	L	T	P	C
	3	0	0	3

Course Objectives:

1. To understand Managerial Economics, Law of demand, Elasticity of demand and Demand forecasting techniques

2. To understand theory of production cost analysis and its application in business

3. To understand market structure different types of competition and pricing strategies

4.To understand Principles of management. Leadership styles and social responsibility of an organization

5. To understand the concept of marketing and human resources management.

Course Outcomes:

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

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, Significance of Demand Forecasting, Factors Governing Demand Forecasting. Demand Forecasting for Established and new Product.

Unit-II

Theory of Production and Cost Analysis: Production Function in Isoquants and Iso-costs, 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 & Book costs, Break-Even Analysis (BEA), Determination of Break-Even Point, 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 of 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 Business.

Unit-V

Introduction to Marketing and Human Resources Management (HRM): Functions of Marketing, Marketing Mix, Marketing Strategies 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, S., & Maheswari, S. (2014). Managerial Economics. Sultan and Chand Publishers.
2. Das & Saibabu, N. (2024). Business Economics. Digital Publishing House.
3. Ramaswamy, T. (2017). Principles of Management. Himalaya Publishing House.
4. Rao, P. S. (2015). Personnel and Human Resource Management: Text and Cases (5th ed.). Himalaya Publishing House.
5. Kotler, P., & Keller, K. L. (2014). Marketing Management (15th ed.). PHI Learning Private Limited.
6. Nageswararao, S. B. (2021). Marketing Management. Walnet Publication.

Reference Books:

1. Dwivedi, V. (2021). *Managerial economics* (9th ed.). Vikas Publications.
2. Koontz, H., Weihrich, H., & Aryasri, M. (2015). *Principles of management* (10th ed.). Tata McGraw Hill.
3. Panda, T. K. (2009). *Marketing management: Texts and cases* (3rd ed.). Excel Books.
4. Saxena, R. (2009). *Marketing management* (6th ed.). Tata McGraw Hill.
5. Aswathappa, K. (2012). *Human resource management* (2nd ed.). McGraw Hill.
6. Flippo, E. B. (2008). *Personnel management* (6th ed.). McGraw Hill.

L	T	P	C
3	0	0	3

MACHINE LEARNING
(Common to CSD & CSM)

Course Objectives:
- Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

Course Outcomes: After the completion of the course, student will be able to
1. Explain the fundamental usage of the concept Machine Learning system
2. Demonstrate on various regression Technique
3. Understand various unsupervised learning techniques
4. Analyze the Ensemble Learning Methods
5. Illustrate the Clustering Techniques and Dimensionality Reduction Models in MachineLearning, discuss the Neural Network Models and fundamentals concepts of Deep Learning

Unit - I:
Introduction: Artificial Intelligence, Machine Learning, Deep learning, Types of Machine LearningSystems, Main Challenges of Machine Learning.
Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit - II:
Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbors, Decision Trees, Naive Bayes, Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass/Structured outputs, MNIST, Ranking.

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.

Unit - IV:
Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.
Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

Unit - V:
Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA
Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with

Keras,   Implementing MLPs with Keras, Installing Tensor Flow 2, Loading and Preprocessing Data with Tensor Flow.

Text Books:
1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'ReillyPublications, 2019.

2. Data Science and Machine Learning Mathematical and Statistical Methods, Dirk P. Kroese, ZdravkoI. Botev, Thomas Taimre, Radislav Vaisman, 25th November 2020

Reference Book(s):
1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

MOOCs:
1. https://www.coursera.org/specializations/deep-learning.
2. https://www.coursera.org/learn/unsupervised-learning-recommenders-reinforcement-learning
3. https://www.coursera.org/learn/python-machine-learning
4. https://www.coursera.org/specializations/machine-learning-introduction
5. https://www.coursera.org/learn/supervised-machine-learning-regression-classification

HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR
(Open Elective – I)
(Common to all Branches)

Subject Code: 23OET311	L	T	P	C
	3	0	0	3

Course Objectives:

1. To Gain insights into the fundamental concepts, processes, and significance of HRD.
2. To Learn the importance and methodologies of performance appraisal, both traditional and modern.
3. To Comprehend the principles, concepts, and influencing factors of compensation management.
4. To understand the meaning, scope, challenges, and opportunities in organizational behaviour.
5. 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.). (2024). The Sage handbook of human resource development. SAGE Publications Ltd.Available at SAGE Publications
2. Bierema, L. L., Callahan, J. L., Elliott, C. J., Greer, T. W., & Collins, J. C. (2023). Human resource development: Critical perspectives and practices. Routledge. Available at Taylor & Francis
3. Noe, R. A., Hollenbeck, J. R., Gerhart, B., & Wright, P. M. (2024). Fundamentals of human resource management. McGraw Hill. Available at McGraw Hill

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

Business Plan and Presentation for Entrepreneurs

(Open Elective – I)

Subject Code: 23OET312	L	T	P	C
	3	0	0	3

Course Objectives:

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

Course Outcomes

Upon completing the course, students will be able to

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 1: 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 2: 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 3: 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 4: 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 5: 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.

Recommended Books:

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

E–WASTE MANAGEMENT
(Open Elective – I)
(Common to All Branches)

	L	**T**	**P**	**C**
Subject Code: 23OET313	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
CO 1. Explain the concept of e-waste, its composition, and environmental and health impacts at national and global levels.
CO 2. Identify and compare factors influencing e-waste trade and recycling practices in India and globally.
CO 3. Apply principles of e-waste management, including EPR and reduction at source, to develop effective control measures.
CO 4. Evaluate the implications of India's E-Waste (Management) Rules of 2011 and 2016 for sustainable e-waste management.
CO 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, 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. E-waste: implications, regulations, and management in India and current global best practices",Johri R., TERI Press, New Delhi

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

WEB LINKS
1. https://ewastemonitor.info/
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

L	T	P	C
3	0	0	3

Subject Code: 23OET314

BLOCKCHAIN TECHNOLOGIES
(Open Elective-I)

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 :
 After completion of this course, the students will be able to:
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 Block chain: 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. A. 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 Ed, 2017.
2. Manav Gupta, "Blockchain for Dummies", John Wiley & Sons, 2nd Ed, 2018
3. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Imran Bashier.

Reference Links
1. https://www.cybrary.it/blog/blockchain-technology-in-information-security/ - Accessed on 17-11-2022
2. Prof. Sandeep Chakraborty, IIT Kharagpur
https://archive.nptel.ac.in/courses/106/105/106105184/ - Accessed on 17-11- 2022

Subject Code: 23OET315

L	T	P	C
3	0	0	3

OPTIMIZATION TECHNIQUES
(Open Elective-I)

COURSE OBJECTIVES:
- Develop the ability to formulate and solve linear programming problems
- Equip students with the skills to solve transportation and assignment problems

COURSE OUTCOMES:
Upon the completion of this course, the students will be able to

CO1: Formulate, solve linear programming problem using graphical and simplex method along with its Big-M and 2-Phase variations

CO2: Solve both balanced and unbalanced transportation and assignment problems

CO3: Students should able to apply the concept of non-linear programming

CO4: Compute queue performance characteristics for various queuing models

CO5: 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, P. Rama Murthy, New Age International, 2007
2. Operations Research, S D Sharma, Kedar Nath Ram Nath & Company, 1992
3. Operations Research, D.S. Hira and Prem Kumar Gupta, S. Chand & Company Ltd. 2007

Reference Books
1. Operations Research, J.K. Sharma, MacMilan Pub., 2009
2. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers, 2010
3. Optimization theory & Applications / S.S .Rao / New Age International, 2009

Subject Code: 23OET316

L	T	P	C
3	0	0	3

ETHICS in AI
(Open Elective – I)

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

Textbooks:
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.

L	T	P	C
3	0	0	3

DATA WRANGLING AND DATA SCIENCE
(Professional Elective -II)

Course Objectives
1. The course introduces the methods for data preparation and data understanding.
2. It covers essential exploratory techniques for understanding multivariate data by summarizing it through statistical and graphical methods.
3. Supports to summarize use of predictive analytics, data science and data visualization.

Course Outcomes
Upon completion of this course, the students will be able to
1. Identify and execute the basic data format.
2. Perform the computations with Excel and pdf files
3. Understand the concepts of data cleanup
4. Explore and analyze the Image and video data
5. Understand the concepts web scraping

Unit I:
Introduction to Data Wrangling: Data Wrangling- Importance of Data Wrangling -How is Data Wrangling performed- Tasks of Data Wrangling-Data Wrangling Tools-Introduction to Python-Python Basics-Data Meant to be Read by Machines-CSV Data-JSON Data-XML Data.

Unit II:
Working with excel files and pdf files: Installing Python Packages-Parsing Excel Files- Parsing Excel Files -Getting Started with Parsing-PDFs and Problem Solving in Python- Programmatic Approaches to PDF Parsing-Converting PDF to Text-Parsing PDFs Using pdf miner-Acquiring and Storing Data-Databases. A Brief Introduction-Relational Database: MySQL and PostgreSQL-Non-Relational Databases: NoSQL-When to Use a Simple File-Alternative Data Storage.

Unit III:
Data Cleanup: Why Clean Data?- Data Cleanup Basics-Identifying Values for Data Cleanup-Formatting Data-Finding Outliers and Bad Data-Finding Duplicates-Fuzzy Matching-RegEx Matching- Normalizing and Standardizing the Data-Saving the Data-Determining suitable Data Cleanup-Scripting the Cleanup Testing with New Data

Unit IV:
Data Exploration and Analysis: Exploring Data-Importing Data-Exploring Table Functions- Joining Numerous Datasets-Identifying Correlations-Identifying Outliers-Creating Groupings-Analyzing Data-Separating and Focusing the Data, Presenting Data-Visualizing the Data-Charts-Time-Related Data- Maps-Interactives-Words-Images, Video, and Illustrations-Presentation Tools-Publishing the Data-Open Source Platforms

Unit V:

Web Scraping: What to Scrape and How-Analyzing a Web Page-Network/Timeline- Interacting with

JavaScript-In-Depth Analysis of a Page-Getting Pages-Reading a Web Page- Reading a Web Page with LXML-XPath-Advanced Web Scraping-Browser-Based Parsing- Screen Reading with Selenium-Screen Reading with Ghost.PySpidering the Web-Building a Spider with Scrapy-Crawling Whole Websites with Scrapy.

Text Books:
1. Data Wrangling with Python, Jacqueline Kazil& Katharine Jarmul, O'Reilly Media,Inc,2016
2. Data Wrangling with Python: Creating actionable data from   raw   sources, Dr.Tirthajyoti Sarkar, Shubhadeep Packt Publishing Ltd,2019

Reference Books:
1. Hands-On Data Analysis with Pandas, Stefanie Molin,Packt Publishing Ltd,2019
2. Practical Data Wrangling, Allan Visochek, Packt Publishing Ltd,2017
3. Principles of Data Wrangling: Practical Techniques for Data Preparation, TyeRattenbury, Joseph M. Hellerstein, Jeffrey Heer, Sean Kandel, Connor Carreras, , O'Reilly Media, Inc,2017

MOOC's:
1. https://www.coursera.org/courses?query=data+wrangling.
2. https://pll.harvard.edu/course/data-science-wrangling

L	T	P	C
3	0	0	3

Subject Code: 23CDE322

INTERNET OF THINGS
(Professional Elective -II)

Course Objectives:
After the completion of the course, student will be able to:
1. To understand about the fundamentals of Internet of Things and its building blocks along with their characteristics
2. To understand the recent application domains of IoT in everyday life
3. To understand the protocols and standards designed for IoT and the current research on it.
4. To understand the other associated technologies like cloud computing in the domain of IoT

Course Outcomes:
The student will be able to:

1. Understand Characteristics and Design of Internet of Things (IoT).
2. Compare various M2M and IoT architectures.
3. Study various Cloud Storage Models for IoT.
4. Design IoT System using Python.
5. Apply various Data Analytics tools for IoT and Illustrate Internet of Things applications for various domains

Unit 1: Introduction
Internet of Things, 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 2: IoT & M2M
Introduction, 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, NETOPEER.

Unit 3: IoT Platforms Design Methodology
IoT Design Methodology, Case Study on IoT System for Weather Monitoring , Motivation for Using Python , IoT Systems - Logical Design using Python, Installing Python , Python Data Types & Data Structures ,Control Flow , Functions, Modules, Packages , File Handling, Date/Time Operations , Classes ,Python Packages of Interest for IoT.

Unit 4: IoT Physical Devices & Endpoints
Raspberry Pi , About the Board , Linux on Raspberry Pi ,Raspberry Pi Interfaces , Programming Raspberry Pi with Python, Other IoT Devices. Physical Servers & Cloud Offerings , Introduction to

Cloud Storage Models & Communication APIs ,WAMP - AutoBahn for IoT , Xively Cloud for IoT , Python Web Application Framework- Django, Amazon Web Services for IOT

Unit 5: Data Analytics for IoT

Introduction , Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis , Apache Oozie, Apache Spark , Apache Storm, Using Apache Storm for Realtime Data Analysis. Case Studies Illustrating IoT Design, Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

Textbooks:

1. Bahga, A., & Madisetti, V. (2015). Internet of Things: A Hands-On Approach. Universities Press. ISBN: 978-8173719547
2. Raj, P., & Anupama, C. R. (2017). Internet of Things. McGraw Hill Education. ISBN: 978-9352605224

Reference Books:

1. Lambert, K. A. (2012). Fundamentals of Python: First Programs. Cengage Learning. ISBN: 978-1111822705
2. Rayes, A., & Salam, S. (2016). Internet of Things: Principles and Paradigms. Morgan Kaufmann. ISBN: 978-0128053959
3. Holler, J., Tsiatsis, V., Mulligan, C., Avesand, S., Karnouskos, S., & Boyle, D. (2012). The Internet of Things: Key Applications and Protocols. Wiley. ISBN: 978-1119994350

Reference Links:

1. https://onlinecourses.nptel.ac.in/noc25_cs44/preview
2. https://www.javatpoint.com/iot-internet-of-things

L	T	P	C
3	0	0	3

Subject Code: 23CDE323

ESSENTIALS NATURAL LANGUAGE PROCESSING
(Professional Elective -II)

Course Objectives: At the end of the course, the students will be expected to:
1. To teach the fundamentals of NLP, and also to make them for understanding CFG, PCFG in NLP.
2. To know the role of semantics of sentences and pragmatic.
3. To teach the basic concepts of speech processing along with analysis and modeling.

Course Outcomes: After the completion of the course, student will be able to
1. learn the fundamentals of natural language processing
2. understand the use of CFG and PCFG in NLP
3. understand the role of semantics of sentences and pragmatic
4. Introduce Speech Production And Related Parameters Of Speech.
5. Show The Computation And Use Of Techniques Such As Short Time Fourier Transform, Linear Predictive Coefficients and Other Coefficients in The Analysis Of Speech.

Unit I: Introduction to Natural language
The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

Unit II : Grammars and Parsing
Grammars and Parsing- Top-Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannon game, Entropy and Cross Entropy.

Unit III: Grammars for Natural Language
Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.
Context-Free Rules and Trees -Understand the network simulation tools. Sentence- Level Constructions–Agreement – Sub Categorization

Unit IV: Semantic Interpretation
Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.
Language Modeling Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modeling

Problems, Multilingual and Cross lingual Language Modeling.

Unit V: Machine Translation Survey
Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

Text Books:
1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Taylor, D., DeRose, S., & Anderson, C. (2012). Multilingual Natural Language Processing Applications: From Theory to Practice. IBM Press. ISBN: 978-0137047833
3. Natural Language Processing: A Paninian Perspective, 1995, Prentice-Hall of India, ISBN: 978-8120309210
4. Bhattacharyya, P., & Joshi, A. (2023). Natural Language Processing. Wiley India. ISBN: 978-9357462389.

Reference Books:
1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Online Learning Resources:
1. https://nptel.ac.in/courses/106/105/106105158/
2. http://www.nptelvideos.in/2012/11/natural-language-processing.htm

L	T	P	C
3	0	0	3

SOCIAL MEDIA ANALYSIS
(Professional Elective -III)

Course Objectives:
After the completion of the course, student will be able to:
- Understand and deal with any social media network, strategy, or campaign.

Course Outcomes:
The student will be able to:
1. Demonstrate an understanding of the evolution of data analytics, digital gaps, and the role of public and private social media data sources.
2. Develop actionable insights by applying analytical techniques to social media data, focusing on metrics, comparisons, and visualization methods.
3. Evaluate and apply various types of social media analytics, including listening, advertising, CRM, and CMS analytics, to optimize digital strategies.
4. Analyze the advantages and limitations of dedicated, hybrid, and data integration tools for effective social media analytics.
5. Formulate and implement a structured analytics process by adopting dynamic cycles and cultivating a mindset for experimental and investigative analysis.

Unit 1: Introduction
Foundation for Analytics, Evolution of Data and the Digital Gap, Social Media Data Sources: Offline and Online, Definition of Social Media, Data Sources in Social Media Channels, Estimated vs. Factual Data Sources, Public and Private Data, Data Gathering in Social Media Analytics, Social Media Network Support of Data Collection, API: Application Programming Interface, Web Crawling or Scraping,

Unit 2: From Data to Insights
Example of a Single Metric Giving Actionable Insight, An Example of a Metric Leading to New Questions, Creating a Plan to Shape Data into Insights, The Planning Stage: Projecting Possible Insights, Analysis of a Social Media Post, The process of Comparison, Data Aggregation, Calculations and Display, Data Display, Social Media and Big Data, Potential Challenges

Unit 3: Analytics in Social Media
Types of Analytics in Social Media, Analytics or Channel Analytics, Social Media Listening: Keyword and Mention-Based Analysis, Demographics, Interests and Sentiment, Advertising Analytics: Focus on Conversions and ROI of Paid Social Media Campaigns, Conversions: The Key to Digital and Social Advertising, CMS Analytics: Measuring the Performance of the Content Management Team, CRM Analytics: Customer Support and Sales via Social Media.

Unit 4: Dedicated vs. Hybrid Tools
Common to all Tools, Dedicated Tools, Advantages of Dedicated Tools, Disadvantages of Dedicated tools, Hybrid Tools, Dedicated Tools with Hybrid Features, Advantages of Hybrid Tools, Disadvantages of Hybrid Tools, Data Integration Tools, Advantages of Data Integration Tools, Disadvantages of Data Integration Tools.

Unit 5: The Analytics Process
Analysis is Comparison, Investigation beyond Social Analytics, Shaping a Method: The End Game for an Analyst, The Analysis Circle, Dynamic Cycles, The Analyst Mindset: Making the Right Questions and Running the Right Experiments

Text Books

1. Alex Goncalves, "Social Media Analytics Strategy-Using Data to Optimize Business Performance," Apress, 2017.

Reference Books:

1. Qiu, Liangfei., Kumar, Subodha, "Social Media Analytics and Practical Applications: The Change to the Competition Landscape," United States: CRC Press, 2021.
2. Sponder, Marshall, "Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics," United Kingdom: McGraw-Hill Education, 2011.

Reference Links:

1. https://www.coursera.org/learn/social-media-analytics-introduction

Subject Code: 23CDE332

L	T	P	C
3	0	0	3

CRYPTOGRAPHY AND NETWORK SECURITY
(Professional Elective -III)

Prerequisite: Fundamental understanding of networking, data security, and operating systems

Course Objectives
1. To learn various cryptographic algorithms including secret key cryptography, hashes and message digests public key algorithms.

2. To Familiar in design issues and working principles of various authentication protocols and various secure communication standards including Kerberos.

3. To acquire the knowledge on various hash functions.
4. To understand the key management and distribution process.
5. To gain knowledge on PGP and SMIME.

Course Outcomes:

1) To learn the Basic Principles, different security threats, countermeasures, foundation course of Symmetric Encryption.
2) To familiarizes with the principles of Asymmetric key algorithms and operations of asymmetric key cryptography.
3) To understand with the design concepts of Cryptographic Hash Functions as SHA-512 and Digital Signatures as Elgamal.
4) To acquire the concept of Revise Key Management and Distribution and User Authentication.
5) To determine the knowledge of Network and Internet Security Protocols such as S/MIME, PGP, TLS and IP Security.

UNIT I: Cryptography
Cryptography: Concepts and Techniques: Introduction, Plain text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Cryptography, Steganography, Key Range and Key Size, Possible types of Attacks.

UNIT II: Symmetric Key Ciphers
Symmetric Key Ciphers: Block Cipher Principles and Algorithms (DES, AES), Differential and Linear Cryptanalysis, Block Cipher Modes of Operations, Stream Ciphers,Location and Placement of encryption function, Key Distribution. Asymmetric Key Ciphers: Principles of Public Key Cryptosystems, Algorithms (RSA, Diffie-Hellman, ECC), Key Distribution.

UNIT III: Message Authentication
Message Authentication Algorithms and Hash Function: Authentication Requirements, Functions, Message Authentication Codes, Hash Functions, Secure Hash Algorithms,HMAC, CMAC, Digital Signatures, Kerberos

UNIT IV: Email Privacy
Email Privacy: Pretty Good Privacy (PGP) and S/MIME. IP Security: IP Security Overview,
IP Security Architecture, Authentication Header, Encapsulating Security Payload,
Combining Security Associations and Key Management.

UNIT V: Web Security
Web Security: Web Security Considerations, Secure Socket Layer (SSL) and Transport Layer Security
(TLS), Secure Electronic Transaction (SET). Intruders, Viruses and Firewalls: Intruders, Intrusion
Detection, Password Management, Virus and related threats, Countermeasures, Firewall Design
Principles, Types of Firewalls.

TEXT BOOKS:

1. Network Security: Private Communication in a Public World, Kaufman, Pearson
   Education Asia, New Delhi, 2002.
2. Stallings, W. (2020). Cryptography and Network Security: Principles and Practice (8th
   ed.). Pearson. ISBN: 978-0135764268.

REFERENCE BOOKS:

1. Cryptography and Network Security Principals and Practice, William Stallings, 7th
   Edition, Pearson.
2. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep
   Mukhopadhyay, McGraw Hill

REFERENCE LINKS:

1) https://archive.nptel.ac.in/courses/106/105/106105162/

Subject Code: 23CDE333

ROBOTICS AND INTELLIGENCE SYSTEMS
(Professional Elective -III)

Prerequisite: Basic knowledge of Python, linear algebra, calculus, and computer science; familiarity with Linux is recommended.

Course Objectives:
1. Introduce foundational concepts in robotics and artificial intelligence.
2. Develop skills in building and programming robotic systems.
3. Explore AI techniques like supervised and reinforcement learning for robotic applications.
4. Apply engineering and design principles to create practical robotics solutions.

Course Outcomes:
1. Understand the principles of robotics and AI integration.
2. Set up and assemble a functional robot using hardware and software tools.
3. Design and implement object recognition systems using neural networks.
4. Apply learning algorithms to enable robots to perform complex tasks.
5. Build and evaluate robotics systems for real-world problem-solving.

UNIT-I:
Foundation for Advanced Robotics and AI:
The basic principle of robotics and AI, What is AI and what is it not, The example problem, Artificial intelligence and advanced robotics techniques, Introducing the robot and our development environment, Software components (ROS, Python, and Linux), Robot control systems and a decision-making framework, The robot control system – a control loop with soft real-time control.

UNIT-II:
Setting Up Your Robot:
Technical requirements, What is a robot, Robot anatomy, Subsumption architecture, Software setup, Hardware, Assembling the tracks, Mounting the tracks, Arm base assembly, Wiring.

UNIT-III:
A Concept for a Practical Robot Design Process:
A systems engineering-based approach to robotics, Use cases, The problem – put away the toys, Project goals, Decomposing hardware needs, Breaking down software needs.

UNIT-IV:
Object Recognition Using Neural Networks and Supervised Learning:
Technical requirements, The image recognition process, The image recognition training and

deployment process – step by step, The convolution neural network process, Build the toy/not toy detector.

UNIT-V:
Picking up the Toys:
Technical requirements, Task analysis, Summary of robot arm learning process, Teaching the robot arm, Version one – action state reinforcement learning, Adaptive learning rate, Q-learning implementation, Google's SAC-X, Amazon Robotics Challenge.

Text Books
1. Francis X. Govers, Artificial Intelligence for Robotics: Build intelligent robots that perform human tasks using AI techniques, PACKT
2. J. J. Craig, Introduction to Robotics, Addison Wesley Publishers, 2005

Reference Books:
1. M. Negnevitsky, Artificial Intelligence – A guide to intelligent systems Addison-Wesley, 2005

MOOC:
1. https://www.coursera.org/specializations/modern-robotics
2. https://www.coursera.org/specializations/robotics
3. https://iaac.net/educational-programmes/masters-programmes/master-in-robotics-and-advanced-construction.

L	T	P	C
3	0	0	3

EMPLOYABILITY SKILLS
(Common to all Branch)

Course Objectives:

1. To perform a wide range of mathematical and aptitude problems commonly encountered in diverse disciplines, including science, engineering, and banking management.

2. 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.

3. 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.

4. To develop the ability to effectively analyze and interpret diverse types of data, including numerical, verbal, and visual information.

5. 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 1: 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 2: Data Interpretation:

Interpretation of Data Tables, Bar Diagrams, Pie Charts, and Graphs.

Unit 3: **Logical Reasoning and Critical Reasoning:**

Series, Analogy and Classification, Alphabet, Ranking and Direction Tests, Discrete, Mathematical, and Logical Puzzles.

Unit 4: 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 5: **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."Modern Approach to Verbal and Non-verbal Reasoning", R. S. Aggarwal, S. Chand & Company LTD, New Delhi.
2."Test of Reasoning (Verbal and Non-verbal)" S. L. Gulati, Cosmos Bookhive's (P) LTD, Delhi.
3."Quantitative Aptitude for the CAT", Arun Sharma, Tata Mc Graw-Hill Publishing Company New Delhi.
4. "BARRON'S GRE The leader in Test Preparation", Sharon Weiner Green, Ira K. Wolf
5. "How to Prepare for VERBAL ABILITY & READING COMPREHENSION for CAT", Arun Sharma, Meenakshi Upadyay.
6. Arihant's Objective General English, SP Bakshi.

Subject Code: 23BHL305

L	T	P	C
0	0	3	1.5

PROFESSIONAL COMMUNICATION SKILLS LAB

Course Objectives

1. Equip students with a diverse vocabulary to excel in language tests for academic and professional pursuits.
2. Enhance active listening, comprehension, and recall by engaging with various audio materials and practicing structured retelling exercises.
3. Cultivate effective writing techniques through structured essay composition, refine email communication skills, and develop the ability to assess personality.
4. Improve presentation skills through professional slides and to develop negotiation and collaboration skills in group settings.
5. Prepare students with tailored resume-building skills for specific job roles and the confidence to perform well injobinterviews.

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.

Course Syllabus

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:
- Engagein activities such as listening to podcasts and TED talks, followed by answering comprehension questions
- Listen to short stories, read articles, and retell themfollowed by peer evaluation using rubrics designed for the purpose.

Lab Module 3: Effective Written Communication
Activities:
- Composeessays 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.
- Engagein activities like career-related self-assessment, and Thematic Association Test
- Picture perception and description test (optional)

Lab Module 4: Developing PowerPoint Presentation and Group DiscussionStrategies
Activities:
- Prepare and deliver PowerPoint presentations on current topics, followed by peer and teacher feedbackon 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: ResuméWriting and Preparation for Interviews
Activities:
- Learn to draft a resumé.
- 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:

Advanced Communication Skills Lab. Version 1.0 (Software). K-VAN Solutions Pvt. Ltd.

Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press. 2018.

Speak Well. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.

Strengthen Your Communication Skills. M. Hari Prasad. Maruthi Publications, Hyd. 2014.

Strengthen Your Steps. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.

Technical Communication. Meenakshi and Sangeetha. OUP. New Delhi. 2013

Duolingo Language Learning Application

*Instacks*E Learning Platform for LSRW practice

https://www.cambridgeenglish.org/learning-english/activities-for-learners/

	L	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Subject Code: 23CAL304   **MACHINE LEARNING LAB**
                                    (Common to CSD & CSM)

Course Objectives:
• This course will enable students to learn and understand different Data sets in implementing themachine learning algorithms.

Course Outcomes: At the end of the course, student will be able to
1. Implement procedures for the machine learning algorithms
2. Design and Develop Python programs for various Learning algorithms
3. Apply appropriate data sets to the Machine Learning algorithms
4. Develop Machine Learning algorithms to solve real world problems

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate MLmodels.

Experiment-1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis basedon a given set of training data samples. Read the training data from a .CSV file.

Experiment-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.

Experiment-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.

Experiment-4:
Exercises to solve the real-world problems using the following machine learning methods:
a)Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates, Cross Validation
Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7:
Build an Artificial Neural Network by implementing the Back propagation algorithm and testthe same using appropriate data sets.

Experiment-8:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Printboth correct and wrong predictions.

Experiment-9: Implement the non-parametric Locally Weighted Regression algorithm in orderto fit data points. Select appropriate data set for your experiment and draw graphs.

Experiment-10:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-13:
Write a Python program to construct a Bayesian network considering medical data. Use thismodel to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Experiment-14:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Experiment-15:
 Write a program to Implement Principle Component Analysis

Text Books:
1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods, Dirk P. Kroese, ZdravkoI. Botev, Thomas Taimre, Radislav Vaisman, 25th November 2020

Reference Book(s):
1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

MOOCs:
1. https://www.coursera.org/specializations/deep-learning.
2. https://www.coursera.org/learn/unsupervised-learning-recommenders-reinforcement-learni
3. https://www.coursera.org/learn/python-machine-learning
4. https://www.coursera.org/specializations/machine-learning-introduction
5. https://www.coursera.org/learn/supervised-machine-learning-regression-classification

Subject Code: 23MCT305

L	T	P	C
2	0	0	0

CONSTITUTION OF INDIA

Objectives:

1. To help Students regulate their behavior in a social environment as Engineering Professionals.
2. To make students aware of the impact of taking social, legal and Administrative decisions about their profession.
3. To understand the political and constitutional parameters in work environment.
4. To understand the need and strengths of our nation and adopt their knowledge for future career.

Course Outcomes:

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

CO 1: Realize the rigidness of our Indian Politics and Administrative aspects.

CO 2: A Student can understand our nation federalism.

CO 3: Can assess different types of risk involved in misadministration.

CO 4: Summarizes the legal and Administrative establishments.

CO 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 TheIndian 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

PARLIMENTARY 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 andAuditor General (CAG) of India (Article – 148 to 150) Finance Commission(Article – 280) - Neethi Aayog (Planning Commission) and - Political Parties.

Text Books:
1) Introduction to Indian Constitution by D.D Basu,Lexis Nexis Butterworth wadhwa Nagapur, 2008.
2) Poicits in India by Rajini Kothari, Orient LongMan, 2005.
3) The Indian Constitution by Madhav Khosla by Oxford University Press India, 2012.

L	T	P	C
3	0	0	3

BIG DATA ANALYTICS

Course Objectives:

1. To optimize business decisions and create competitive advantage with Big Data analytics
2. To learn to analyze the big data using intelligent techniques
3. To introduce programming tools PIG&HIVE in Hadoop echo system

Course Outcomes:

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

1. Illustrate big data challenges in different domains including social media, transportation, finance and medicine.
2. Use various techniques for mining data stream.
3. Design and develop Hadoop.
4. Identify the characteristics of datasets and compare the trivial data and big data for various applications.
5. Explore the various search methods and visualization techniques.

Unit I:

Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysisvs Reporting.

Unit II:

Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications.

Unit III:

Introduction to Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics.
Implementation: Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

Unit IV:

Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of H Base and Zoo Keeper.

Unit V:
Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application.

Text Books:
1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, FourthEdition,2015.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "UnderstandingBig Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP,2012

Reference Books:
1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with AdvancedAnalytics",JohnWiley&sons,2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data: The IBM Big Data Platform", Tata McGraw HillPublications,2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands OnApproach", VPT, 2016.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

Software Links:
1. Hadoop:http://hadoop.apache.org/.
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home.
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html.

L	T	P	C
3	0	0	3

DEEP LEARNING CONCEPTS AND APPLICATIONS

Course Objectives: At the end of the course, the students will be expected to:
- Learn deep learning methods for working with sequential data,
- Learn deep recurrent and memory networks,
- Learn deep Turing machines,
- Apply such deep learning mechanisms to various learning problems.
- Know the open issues in deep learning, and have a grasp of the current research directions.

Course Outcomes: After the completion of the course, student will be able to
1. Demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and Deep Learning.
2. Understand the Improving of deep networks
3. Discuss the Neural Network training, various random models.
4. Explain the Techniques of Keras, TensorFlow, Theano and CNTK
5. Classify the Concepts of CNN and RNN

Unit - I:
Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, Fundamentals of Machine Learning: Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting.

Unit - II: Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks.

Unit - III: Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification.

Unit - IV:
Convolutional Neural Networks: Neural Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, Recurrent Neural Networks: Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch.

Unit - V:
Interactive Applications of Deep Learning: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning.
Deep Learning Research: Autoencoders, Deep Generative Models: Boltzmann Machines RestrictedBoltzmann Machines, Deep Belief Networks.

Text Books:
1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
4. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'ReillyMedia, Inc., ISBN: 9781492041412

Reference Books:
1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

MOOCs:
Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

	L	T	P	C
	3	0	0	3

Subject Code: 23CDT407

ESSENTIALS OF ETHICAL HACKING

Course Objectives:
1. To find vulnerabilities and define the appropriate security policy.
2. To detect or prevent the attacks and thus reduce the damages.

Course Outcomes:
1. Describe and understand the basics of the ethical hacking
2. Perform the foot printing and scanning
3. Demonstrate the techniques for system hacking
4. Characterize the malware and their attacks and detect and prevent them
5. Detect and prevent the security attacks in different environments

UNIT I:
Introduction to Hacking – Important Terminologies – Penetration Test – Vulnerability Assessments versus Penetration Test – Pre-Engagement – Rules of Engagement –Penetration Testing Methodologies – OSSTMM – NIST – OWASP – Categories of Penetration Test – Types of Penetration Tests – Vulnerability Assessment Summary -Reports.

UNIT II:
The Technical Foundations of Hacking: The Attacker's Process, The Ethical Hacker's Process, Security and the Stack. Footprinting and scanning : Information Gathering, Determining the Network Range, Identifying Active Machines, Mapping the Network Attack Surface

UNIT III:
Vulnerability Data Resources – Exploit Databases – Network Sniffing – Types of Sniffing - Promiscuous versus Non promiscuous Mode – MITM Attacks -Hijacking Session with MITM Attack–Remote Exploitation – Attacking Network Remote Services – Overview of Brute Force Attacks – Traditional Brute Force

UNIT IV:
Malware Threats: Viruses and Worms, Trojans, Covert Communication, Keystroke Logging and Spyware, Malware Counter measures. Sniffers, Session Hijacking and Denial of Service: Sniffers, Session Hijacking, Denial of Service and Distributed Denial of Service.

UNIT V:
Wireless Hacking – Introducing Aircrack- Cracking the WEP – Evil Twin Attack – Denial of Service Web Hacking – Attacking the Authentication – Types of Authentication – Log-In Protection

Mechanisms – Captcha Validation Flaw –Manipulating User-Agents to Bypass Captcha and Other Protection

Text Books:
1. Rafay Baloch, "Ethical Hacking and Penetration Testing Guide", CRC Press, 2014.
2. Certified Ethical Hacker, Version 9, Second Edition, Michael Gregg, Pearson IT Certification

Reference Books:
1. The Unofficial Guide to Ethical Hacking, Ankit Fadia, Premier Press
2. Kevin Beaver, "Ethical Hacking for Dummies", Sixth Edition, Wiley, 2018.
3. Jon Erickson , "Hacking: The Art of Exploitation", Second Edition, Rogunix, 2007.

REFERENCE LINKS:
1. https://archive.nptel.ac.in/courses/106/105/106105217/

L	T	P	C
3	0	0	3

CLOUD COMPUTING
(Professional Elective -IV)

Course Objectives:

After the completion of the course, student will be able to:

1. To define Cloud Computing
2. To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.
3. To expose the students to the frontier areas of Cloud Computing
4. To motivate students to do programming and experiment with the various cloud computing environments
5. To shed light on the Security issues in Cloud Computing
6. To introduce about the Cloud Standards

Course Outcomes:

The student will be able to:

1. Analyze and compare centralized and distributed computing paradigms, including cluster, grid, and cloud computing models.
2. Analyze and evaluate the fundamental concepts of cloud computing.
3. Analyze and evaluate various cloud service models (IaaS, PaaS, SaaS, and XaaS) and their underlying technologies (server, storage, and network virtualization).
4. Demonstrate proficiency in developing parallel and distributed programming solutions.
5. Demonstrate the ability to design and implement secure, reliable, and compliant cloud solutions

Unit 1:

History of Centralized and Distributed Computing - Overview of Distributed Computing, Cluster computing, Grid computing. Technologies for Network based systems- System models for Distributed and cloud computing- Software environments for distributed systems and clouds.

Unit 2:

Introduction to Cloud Computing- Cloud issues and challenges - Properties - Characteristics - Service models, Deployment models. Cloud resources: Network and API - Virtual and Physical computational resources - Data-storage. Virtualization concepts - Types of Virtualization- Introduction to Various Hypervisors - High Availability (HA)/Disaster Recovery (DR) using Virtualization, Moving VMs .

Unit 3:

Service models - Infrastructure as a Service (IaaS) - Resource Virtualization: Server, Storage, Network - Case studies. Platform as a Service (PaaS) - Cloud platform & Management: Computation, Storage - Case studies. Software as a Service (SaaS) - Web services - Web 2.0 - Web

OS - Case studies – Anything as a service (XaaS).

Unit 4:
Cloud Programming and Software Environments – Parallel and Distributed Programming paradigms – Programming on Amazon AWS and Microsoft Azure – Programming support of Google App Engine – Emerging Cloud software Environment.

Unit 5:
Cloud Access: authentication, authorization and accounting - Cloud Provenance and meta-data - Cloud Reliability and fault-tolerance - Cloud Security, privacy, policy and compliance- Cloud federation, interoperability and standards.

Text Books
1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier – 2012

Reference Books:

1. Barrie Sosinsky, " Cloud Computing Bible" John Wiley & Sons, 2010
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance, O'Reilly 2009

Reference Links:

1. https://www.tutorialspoint.com/cloud_computing/index.htm
2. https://www.javatpoint.com/cloud-computing.

L	T	P	C
3	0	0	3

Subject Code: 23CDE442

EXPLORATORY DATA ANALYSIS
(Professional Elective -IV)

Course Objectives

The course introduces the methods for data preparation and data understanding. It covers essential exploratory techniques for understanding multivariate data by summarizing it through statistical and graphical methods. Supports to summarize use of predictive analytics, data science and data visualization.

Course Outcome:

1. Demonstrate the principles and steps of Exploratory Data Analysis (EDA) and differentiate it from classical and Bayesian analysis approaches.
2. Apply data transformation techniques and handle missing data using traditional methods and maximum likelihood estimation.
3. Perform univariate, bivariate, and multivariate correlation analyses and analyze time series data using indexing, grouping, and resampling techniques.
4. Summarize statistical data and create visualizations such as scatter plots, dot charts, and bar plots to interpret data effectively.
5. Develop and evaluate linear regression models, understand accuracy measures, and explore reinforcement learning concepts and applications.

UNIT I
Introduction to Exploratory Data Analysis
Introduction to Exploratory Data Analysis (EDA) –Steps in EDA, Data Types: Numerical Data – Discrete data, continuous data – Categorical data – Measurement Scales: Nominal, Ordinal, Interval, Ratio – Comparing EDA with classical and Bayesian Analysis – Software tools for EDA.

UNIT II
Data Transformation
Transformation Techniques: Performing data deduplication - replacing values – Discretization and binning.
Introduction to Missing data, handling missing data: Traditional methods - Maximum Likelihood Estimation.

UNIT III
Correlation Analysis and Time Series Analysis
Types of analysis: Univariate analysis - bivariate analysis - multivariate analysis.
Time Series Analysis (TSA): Fundamentals of TSA - characteristics of TSA – Time based indexing - visualizing time series – grouping time series data - resampling time series data.

UNIT IV

Data Summarization and Visualization

Statistical summary measures, data elaboration, 1-D Statistical data analysis, 2-D Statistical data Analysis, contingency tables, n-D Statistical data analysis. Visualization: Scatter plots –Dot charts - Bar plots.

UNIT V

Model Development and Evaluation

Constructing linear regression model, evaluation, computing accuracy, understanding accuracy. Understanding reinforcement learning: Difference between supervised and reinforcement learning, Applications of reinforcement learning.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with
    a. Python" 1st Edition, Packt Publishing.
2. Martinez, W , Martinez A & J.L. Solka : Exploratory Data Analysis with MATLAB, CRC
    a. Press, A Chapman & Hall Book, 3rd Edition.

Reference Books

1. Tukey, J. W. (1977). Exploratory Data Analysis. Addison-Wesley Publishing Company. ISBN: 978-0201076165
2. Hoaglin, D. C., Mosteller, F., & Tukey, J. W. (2007). Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining. John Wiley & Sons. ISBN: 978-0470181690
3. Wickham, H., & Grolemund, G. (2018). Exploratory Data Analysis Using R. CRC Press. ISBN: 978-1498730235
4. Kazil, J., & Walker, P. (2020). Hands-On Exploratory Data Analysis with Python. Packt Publishing. ISBN: 978-1789537253

MOOC's LINKS:

1.   https://www.coursera.org/learn/exploratory-data-analysis

L	T	P	C
3	0	0	3

Subject Code: 23CDE443

CONVERSATIONAL AI
(Professional Elective -IV)

Prerequisites

- Basic understanding of Artificial Intelligence and Machine Learning
- Knowledge of Natural Language Processing (NLP) fundamentals
- Familiarity with programming languages like Python and frameworks such as TensorFlow or PyTorch
- Basic concepts of probability, statistics, and linear algebra

Course Objectives

1. To introduce the foundational knowledge and concepts of conversational systems and dialogue systems.
2. To understand and explore various natural language processing techniques used in dialogue systems.
3. To study the architecture, design, and implementation of rule-based dialogue systems.
4. To analyze and evaluate statistical and data-driven approaches in dialogue systems, including reinforcement learning techniques.
5. To explore end-to-end neural network approaches for modeling dialogue systems and learn to address real-world challenges.

Course Outcomes

By the end of this course, students will be able to:

1. Explain the fundamental concepts and evolution of dialogue systems.
2. Design and develop simple rule-based dialogue systems using appropriate tools and techniques.
3. Analyze statistical data-driven dialogue systems and apply reinforcement learning concepts like MDPs and POMDPs.
4. Evaluate dialogue systems using various frameworks, metrics, and methodologies for task-oriented and open-domain systems.
5. Implement end-to-end neural dialogue systems, including retrieval-based and generation-based models, and address challenges in the development of conversational AI.

UNIT - I: Introducing Dialogue Systems

What's a Dialogue System?, A Brief History of Dialogue Systems, Present-Day Dialogue Systems, Modeling Conversation in Dialogue Systems, Designing and Developing Dialogue Systems

UNIT - II: Rule-Based Dialogue Systems

Architecture, Methods, and Tools in Rule-Based Systems, A Typical Dialogue Systems Architecture, Designing a Dialogue System, Tools for Developing Dialogue Systems, Rule-Based Techniques in Dialogue Systems, Participating in the Alexa Prize

UNIT - III: Statistical Data-Driven Dialogue Systems

Motivating the Statistical Data-Driven Approach, Dialogue Components in the Statistical Data-Driven Approach, Reinforcement Learning (RL) in Dialogue Systems, Representing Dialogue as a Markov Decision Process (MDP), From MDPs to Partially Observable Markov Decision Processes (POMDPs), Dialogue State Tracking, Dialogue Policy, Problems and Issues with Reinforcement Learning in POMDPs

UNIT - IV: Evaluating Dialogue Systems

How to Conduct the Evaluation, Evaluating Task-Oriented Dialogue Systems, Evaluating Open-Domain Dialogue Systems, Evaluation Frameworks: PARADISE, Quality of Experience (QoE) in Dialogue Systems, Interaction Quality, Best Way to Evaluate Dialogue Systems

UNIT - V: End-to-End Neural Dialogue Systems

Neural Network Approaches to Dialogue Modeling, A Neural Conversational Model, Introduction to the Technology of Neural Dialogue, Retrieval-Based Response Generation, Task-Oriented Neural Dialogue Systems, Open-Domain Neural Dialogue Systems, Issues and Current Solutions in Neural Dialogue Systems, Dialogue Systems: Datasets, Competitions, Tasks, and Challenges

Textbooks:

1. Michael McTear, Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots, Second Edition, Moran and Claypool Publishers, 2020.

Reference:

1. Cathy Pearl, Designing Voice User Interfaces: Principles of Conversational Experiences, O'REILLY, 2016.

MOOC:
1. https://cse.engin.umich.edu/wp content/uploads/2021/03/EECS_498_Conversational_AI
2. https://hao-fang.github.io/ee596_spr2018/

L	T	P	C
3	0	0	3

Subject Code: 23CDE451

ESSENTIALS OF REINFORCEMENT LEARNING
(Professional Elective -V)

Prerequisite: Basic knowledge of probability, linear algebra, and calculus, along with programming skills (preferably Python).

Course Objectives:
1. Understand the basics and scope of reinforcement learning.
2. Learn algorithms like bandit problems, MDPs, and Monte Carlo methods.
3. Explore real-world applications through case studies.

Course Outcomes:
1. Grasp reinforcement learning principles and algorithms.
2. Apply multi-arm bandit and Monte Carlo methods.
3. Analyze MDP-based decision-making frameworks.
4. Solve practical problems using RL techniques.
5. Evaluate RL in applications like gaming and scheduling.

UNIT-I: The Reinforcement Learning Problem:
Reinforcement Learning (RL), examples, elements of RL, limitations, and scope. Includes an extended example using Tic-Tac-Toe and the history of RL.

UNIT-II: Multi-arm Bandits:
Introduction to the n-Armed Bandit Problem, action-value methods, incremental implementation, tracking nonstationary problems, optimistic initial values, upper-confidence-bound action selection, gradient bandits, and contextual bandits (associative search).

UNIT-III: Finite Markov Decision Processes:
Agent-environment interface, goals and rewards, returns, and unified notation for episodic and continuing tasks. Focus on Markov Property, Markov Decision Processes (MDPs), value functions, and optimal value functions with optimality and approximation.

UNIT-IV: Monte Carlo Methods:
Monte Carlo prediction, action-value estimation, Monte Carlo control, control without exploring starts, off-policy prediction via importance sampling, incremental implementation, and off-policy Monte Carlo control with importance sampling on truncated returns.

UNIT-V: Applications and Case Studies:
Case studies including TD-Gammon, Samuel's Checkers Player, The Acrobot, Elevator Dispatching, dynamic channel allocation, and Job-Shop Scheduling.

Text Books
1. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning-An Introduction",2nd Edition,The MIT Press,2018
2. Marco Wiering , Martijn van Otterlo Reinforcement Learning: State-of-the-Art (Adaptation, Learning, and Optimization (12)) 2012th Edition

Reference Books:
1. Vincent François-Lavet , Peter Henderson , Riashat Islam, An Introduction to Deep Reinforcement Learning (Foundations and Trends(r) in Machine Learning) , 2019

MOOC:
1. https://www.coursera.org/specializations/reinforcement
2. https://www.cs.mcgill.ca/~dprecup/courses/RL/Winter2024/lectures.html
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-867-machine-learning-spring-2016/

L	T	P	C
3	0	0	3

Subject Code: 23CDE452

RECOMMENDED SYSTEMS
(Professional Elective -V)

Prerequisite: Basic knowledge of linear algebra (matrix operations), probability, and programming (preferably in Python). Familiarity with machine learning concepts and data processing techniques is also helpful.

Course Objectives:
1. Understand the basics of recommender systems and their applications.
2. Explore collaborative, content-based, and knowledge-based recommendation techniques.
3. Learn hybridization strategies for improving recommender systems.
4. Evaluate recommender systems using error, decision-support, and user-centered metrics.
5. Study recommender systems in social contexts and personalized search.

Course Outcomes:
1. Grasp the functions and challenges of recommender systems.
2. Implement collaborative filtering methods.
3. Apply content-based recommendation and represent item profiles.
4. Build knowledge-based recommenders using constraint and case-based methods.
5. Design hybrid systems and evaluate their effectiveness.

UNIT-I: Introduction:
Functions of recommender systems, Linear Algebra notation (Matrix addition, multiplication, transposition, inverses, covariance matrices), Understanding ratings, Applications of recommender systems, Issues in recommender systems.

UNIT-II: Collaborative Filtering:
User-based nearest neighbor recommendation, Item-based nearest neighbor recommendation, Model-based and pre-processing approaches, Attacks on collaborative recommender systems.

UNIT-III: Content-based Recommendation:
High-level architecture of content-based systems, Advantages and drawbacks of content-based filtering, Item profiles, Discovering document features, Obtaining features from tags, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, Classification algorithms.
Knowledge-based Recommendation:
Knowledge representation and reasoning, Constraint-based recommenders, Case-based recommenders.

UNIT-IV: Hybrid Approaches:
Opportunities for hybridization, Monolithic hybridization design (Feature combination, Feature augmentation), Parallelized hybridization design (Weighted, Switching, Mixed), Pipelined hybridization design (Cascade, Meta-level), Limitations of hybridization strategies.

UNIT-V: Evaluating Recommender Systems:
Introduction to evaluation, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-support metrics, User-centered metrics.

Recommender Systems and Communities:
Communities, collaboration, recommender systems in personalized web search, Social tagging recommender systems, Trust and recommendations.

Text Books
1. Jannach D., Zanker M.   and Fel Fering A., Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.
2. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1sted.

Reference Books:
1. .Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed

MOOC:
3.   https://www.coursera.org/specializations/recommender-systems
4.   https://www.coursera.org/learn/recommender-systems.

L	T	P	C
3	0	0	3

Subject Code: 23CDE453

SOFT COMPUTING
(Professional Elective -V)

Prerequisite: Basic knowledge of Mathematics (linear algebra, calculus, probability) and Programming (Python or MATLAB). Familiarity with data structures and algorithms is helpful.

Course Objectives:
1. Understand Soft Computing principles and its comparison with Hard Computing.
2. Explore techniques like Fuzzy Logic, Genetic Algorithms, and Particle Swarm Optimization.
3. Apply Fuzzy Decision Making and Genetic Algorithms in real-world scenarios.
4. Understand Rough Sets and integrate them with other techniques.
5. Explore Recent Trends and applications in Soft Computing.

Course Outcomes:
1. Grasp the fundamentals of Soft Computing and its methods.
2. Apply Fuzzy Logic and Fuzzy Rule-Based Systems.
3. Implement Particle Swarm Optimization and Fuzzy Decision Making.
4. Utilize Genetic Algorithms and their operators.
5. Understand Rough Sets, Rule Induction, and their integration with other method.

UNIT-I: Introduction
Introduction to Soft Computing, Evolutionary Computing, "Soft" computing vs "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft Computing, Applications of Soft Computing Techniques, Types of evolutionary algorithms, Real-world applications in robotics, medical imaging, data mining.

UNIT-II: Fuzzy Systems
Fuzzy Systems, Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems, Fuzzy Clustering, Fuzzy Control Systems, Defuzzification methods.

UNIT-III: **Fuzzy Decision Making**
Fuzzy Decision Making, Particle Swarm Optimization, Multi-Criteria Decision Making using fuzzy sets, Hybrid PSO with fuzzy logic, Applications in optimization and machine learning.

UNIT-IV: Genetic Algorithms
Genetic Algorithms, Basic Concepts, Basic Operators for Genetic Algorithms: Crossover and Mutation, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm, Evolutionary Programming and Evolutionary Strategies, Multi-objective Genetic Algorithms (MOGA), Genetic Algorithms in scheduling, optimization, and machine learning.

UNIT-V: Rough Sets

Rough Sets, Rule Induction, Discernibility Matrix, Integration of Soft Computing Techniques, Applications of Rough Sets in Data Mining and Knowledge Discovery, Rough Set Theory in classification and pattern recognition, Combining Rough Sets with Fuzzy Logic and Genetic Algorithms.

Text Books

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha – Cengage Learning

Reference Books:

1. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 2nd edition, Wiley India, 2008.
2. David E. Goldberg, "Genetic Algorithms-In Search, optimization and Machine learning", Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education, 2004.
4. G.J. Klir & B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI, 1995.
5. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998.
6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill International editions, 1995.

MOOC:

1. https://www.coursera.org/specializations/recommender-systems
2. https://www.coursera.org/learn/recommender-systems.

ENTREPRENEURIAL DEVELOPMENT
(Open Elective -II)
(Common to all Branches)

	L	**T**	**P**	**C**
Subject Code:23OET421	**3**	**0**	**0**	**3**

OBJECTIVES:
1. To develop an understanding on entrepreneur and entrepreneurship.
2. To have an understanding on nature and development of entrepreneurship in India
3. To provide steps to start an enterprise and project preparation.
4. To make Students gaining the knowledge about Governmental and Institutional support to entrepreneurs.
5. To make the students familiar with e-entrepreneurship and functional areas of Managing a venture in India

OUTCOME:
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 1:
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 2:
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 3:
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 4 :
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 5:

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

References:
1. H.Nandan: Fundamentals of Entrepreneurship, Third edition, PHI Learning, New Delhi, 2013
2. Robert D Hisrich, Michel P Peters, Dean A Sheperd, Sabyasachi Sinha, Entrepreneurship, 11 th edition,   Mc Graw Hill India, 2020
3. Prasanna Chandra: Projects, 10 th Edition, Mc Graw Hill India,2023

DIGITAL MARKETING
(Open Elective -II)
(Common to all Branches)

Subject Code: 23OET422	L	T	P	C
	3	0	0	3

Course Objectives:

1. To develop an understanding on the digital marketing.
2. To make students gaining the knowledge and skills related to the area of search engine optimization (SEO).
3. To make student understand Social Media Optimization (SMO).
4. To develop an understanding on SEM (Search Engine Marketing) through AdWords.
5. To familiarize the students with the Lead Management & Digital Marketing Practices with Hands on Experience

Course Outcomes:

After completion of the course the student will be able to

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, by Punit Singh, Pearson, Fundamentals of Digital Marketing Second Edition Pearson Paperback, 2019

REFERENCES:

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

Subject Code: 23OET422

L	T	P	C
3	0	0	3

RENEWABLE ENERGY SOURCES
(Open Elective-II)

Course Objective:
- 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
CO1: Define and Understand different kind of solar radiation, different methods of collection of solar energy and storage of solar energy.
CO2: Classify different types of wind mills.
CO3: Classify different types of biomass digesters and geothermal energy.
CO4: Classify different types of ocean energy extracting techniques.
CO5: 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. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

REFERENCE BOOKS:
1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame.

L	T	P	C
3	0	0	3

IT SYSTEMS MANAGEMENT
(Open Elective-II)

Course Objectives:

- Provides extensive theoretical knowledge of IT infrastructure.
- Enhances the student's computing environment knowledge.
- Provides broad based knowledge of IT System management.
- Develops management skills required for a business environment.
- Builds upon the essential core Network Security and storage management with greater emphasis.

Course Outcomes:

1. Describe the business value and processes of ICT services in an organization and apply that knowledge and skill with initiative to a workplace scenario.
2. Analyze and evaluate the impact of new and current ICT services to an organization. Describe E-Commerce.
3. Enhance how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization.
4. Evaluate The Characteristics of the network Security that affect user operations.
5. Demonstrate, track, and maintain data and data resources and recent trends in IT.

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. Service Level Agreements: A Legal and Practical Guide, by Jimmy Desai, Publishing 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/

L	T	P	C
3	0	0	3

ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective-II)

Course Objectives:
This Course is intended to build the following objectives:
1. To understand basic concepts of EIA
2. To study different methodologies of EIA
3. To appreciate the significance of ecosystem and environmental protection
4. To prepare environmental audit reports
5. To understand the legal and regulatory compliance and prepare the EIA reports

Course Outcomes:
After studying the course, the student able to:
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-1
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-2
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-3
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-4
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-5
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. Environmental Science and Engineering by Suresh K. Dhameja, S. K. Kataria& Sons Publications (Recent addition), New Delhi.
2. Environmental Impact Assessment Methodologies by Y. Anjaneyulu, B. S. Publications (Recent addition), Sultan Bazar, Kakinada.

Reference Books:
1. Environmental Pollution and Control by Dr. H. S. Bhatia, Galgotia Publications (P) Ltd., New Delhi (Recent addition).
2. Environmental Science and Engineering by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers (Recent addition).

L	T	P	C
3	0	0	3

Subject Code: 23OET426

CYBER CRIME AND LAW PROTECTION
(Open Elective-II)

Prerequisite: Basic knowledge of computer networks, IT concepts, and analytical reasoning.

Course Objectives:

1. Understand the fundamental concepts of cybercrime, including its types and impacts.
2. Explore the national and state-level legal frameworks for cybersecurity in India.
3. Learn about cybercrime investigation techniques and digital forensics.
4. Develop an understanding of ethical hacking and preventive cybersecurity measures.
5. 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 cybersecurity measures in practice.
5. Critically evaluate real-world cybercrime cases and emerging cybersecurity trends.

Unit 1: 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 2: 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 3: 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 4: 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 5: 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.

Textbooks

1. Singer, P. W., & Friedman, A. (2014). Cybersecurity and Cyberwar: What Everyone Needs to Know. Oxford University Press. ISBN: 978-0199918119
2. Duggal, P. (2023). Cyber Law. LexisNexis. ISBN: 978-8196241070
3. Casey, E. (2011). Digital Evidence and Computer Crime. Academic Press. ISBN: 978-0123742681
4. Chawki, M., Wahab, M. S., & Abbasi, A. (2011). The Law of Cybercrimes and Their Investigations. CRC Press. ISBN: 978-1439851577

Reference Books

1. Britz, M. T. (2013). Computer Forensics and Cyber Crime: An Introduction. Pearson. ISBN: 978-0132677714
2. Tikk, E., Kaska, K., & Vihul, L. (2013). Introduction to Cyber-Warfare: A Multidisciplinary Approach. Syngress. ISBN: 978-0124078147
3. Akhgar, B., & Brewster, B. (2012). Cyberlaw: The Law of the Internet and Information Technology. Pearson. ISBN: 978-0132560870
4. Matwyshyn, A. M. (2009). Privacy, Security, and Information Management: An Overview. Van Haren Publishing. ISBN: 978-9087535403

MOOC:
1. https://datalawonline.co.uk/cpd-courses/cyber-crime/cyber-crime-essentials
2. https://onlinecourses.swayam2.ac.in/cec23_lw01/preview

L	T	P	C
0	0	3	1.5

Subject Code: 23CDL404

DEEP LEARNING WITH TENSOR FLOW LAB

Course Outcomes:

   CO1: Implement and evaluate multilayer perceptron and convolutional neural networks for image classification tasks such as MNIST and Cats vs Dogs datasets.

   CO2: Design and develop neural network models for text classification using standard datasets like IMDB and Reuters, applying both binary and multi-class classification techniques.

   CO3: Apply deep learning models for regression problems such as predicting house prices using the Boston Housing dataset.

   CO4: Utilize advanced techniques like word embeddings, one-hot encoding, and recurrent neural networks to effectively preprocess and model textual data.

   CO5: Employ transfer learning using pre-trained convolutional neural networks (e.g., VGG16) to enhance performance on custom image classification tasks.

   Software Packages required:
   • Keras
   • Tensorflow
   • PyTorch

List of Experiments:
1. Implement multilayer perceptron algorithm for MNIST Hand written Digit Classification.
2. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
3. Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
4. Design a neural network for predicting house prices using Boston Housing Price dataset.
5. Build a Convolution Neural Network for MNIST Hand written Digit Classification.
6. Build a Convolution Neural Network for simple image (dogs and Cats) Classification
7. Use a pre-trained convolution neural network (VGG16) for image classification.
8. Implement one hot encoding of words or characters.
9. Implement word embedding for IMDB dataset.
10. Implement a Recurrent Neural Network for IMDB movie review classification problem.

Text Books:
   1. Reza Zadeh and BharathRamsundar, "Tensorflow for Deep Learning", O'Reilly publishers, 2018

References:
   1. https://github.com/fchollet/deep-learning-with-python-notebooks

L	T	P	C
0	0	3	1.5

Subject Code: 23CDL405

BIG DATA ANALYTICS LAB

Software Requirements:
1. Hadoop: https://hadoop.apache.org/release/2.7.6.html
2. Java:https://www.oracle.com/java/technologies/javase/javase8u211-later- archive-downloads.html
3. Eclipse : https://www.eclipse.org/downloads/

Course Outcomes (COs):

1. Implement basic data structures in Java (Linked Lists, Stacks, Queues, Sets, Maps).
2. Configure and monitor Hadoop in different operating modes.
3. Develop MapReduce programs for data analysis and graph-based problems.
4. Optimize data processing using advanced MapReduce techniques like semi-joins.
5. Use Pig and Hive for large-scale data analytics and database operations.

List of Experiments:

Experiment 1:

Implement the following Data structures in Java
   a)Linked Lists b) Stacks c) Queues d) Set e) Map

Experiment 2:
(i)   Perform setting up and Installing Hadoop in its three operating modes: Standalone, Pseudo distributed, Fully distributed
(ii)   Use web based tools to monitor your Hadoop setup.

Experiment 3:
Implement the following file management tasks in Hadoop:
   1. Adding files and directories
   2. Retrieving files
   3. Deleting files

Experiment 4:
Run a basic Word Count MapReduce program to understand MapReduce Paradigm.

Experiment 5:
Write a map reduce program that mines weather data.
Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for   analysis with Map Reduce, since it

is semi structured and record-oriented.

Experiment 6:
Use MapReduce to find the shortest path between two people in a social graph.
Hint: Use an adjacency list to model a graph, and for each node store the distance from the original node, as well as a back pointer to the original node. Use the mappers to propagate thedistance to the original node, and the reducer to restore the state of the graph. Iterate until the target node has been reached.

Experiment 7:
Implement Friends-of-friends algorithm in MapReduce.
Hint: Two MapReduce jobs are required to calculate the FoFs for each user in a social network. The first job calculates the common friends for each user, and the second job sorts the common friends by the number of connections to your friends.

Experiment 8:
Implement an iterative PageRank graph algorithm in MapReduce.
Hint: PageRank can be implemented by iterating a MapReduce job until the graph has converged. The mappers are responsible for propagating node PageRank values to their adjacent nodes, and the reducers are responsible for calculating new PageRank values for each node, and for re-creating the original graph with the updated PageRank values.

Experiment 9:
Perform an efficient semi-join in MapReduce.
Hint: Perform a semi-join by having the mappers load a Bloom filter from the Distributed Cache, and then filter results from the actual MapReduce data source by performing membership queries against the Bloom filter to determine which data source records should be emitted to the reducers.

Experiment 10:
10.   Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filteryour data.

Experiment 11:
11.   Install and Run Hive then use Hive to create, alter, and drop databases, tables, views,functions, and indexes.

Text Books:
1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'reilly Media, FourthEdition,2015.

2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "UnderstandingBig Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill Publishing, 2012.

3.   Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP,2012

Reference Books:
1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with AdvancedAnalytics",JohnWiley&sons,2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data: The IBM Big Data Platform", Tata McGraw HillPublications,2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands OnApproach", VPT, 2016.
4. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

Software Links:
1. Hadoop:http://hadoop.apache.org/.
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home.
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html.

Technical Paper Writing and Intellectual Property Rights

	L	**T**	**P**	**C**
Subject Code: 23MCT406	**2**	**0**	**0**	**0**

Course Objectives:

1. Introduce students to research fundamentals, including topic selection, literature review, and the structured components of a technical paper.
2. Familiarize students with research design, data collection methods, and statistical analysis, alongside proper citation and referencing styles.
3. Develop students' skills in writing clear and concise technical papers and delivering professional presentations of research findings.
4. Provide a comprehensive overview of intellectual property rights, covering patents, copyrights, trademarks, and trade secrets.
5. 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.

SYLLABUS

UNIT 1: 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 2: 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 3: 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 4: 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 5: 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.

Reference Books
1. Alred, G. J., Brusaw, C. T., &Oliu, W. E. (2020). *The Handbook of Technical Writing* (12th ed.). Bedford/St. Martin's.
2. Day, R. A., &Gastel, B. (2016). *How to write and publish a scientific paper* (8th ed.). Cambridge University Press.
3. Kothari, C. R., &Garg, G. (2019). *Research methodology: Methods and techniques* (4th ed.). New Age International Publishers.
4. Menell, P. S., Lemley, M. A., Merges, R. P., &Balganesh, S. (2020*). Intellectual Property in the New Technological Age 2020*: Vol. II Copyrights, Trademarks, and State IP Protections.
5. Singh, A. K. (2018). *Intellectual property rights: Unleashing the knowledge economy*. Springer.

Textbooks
1) Kumar, R. (2018). *Research methodology: A step-by-step guide for beginners* (5th ed.). SAGE Publications.
2) Goold, P. R. (2022). *A Critical Introduction to Intellectual Property Law*. Cambridge University Press.
3) Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
4) Glasman-Deal, H. (2020). *Science Research Writing: For Native and Non-Native Speakers of English* (2nd ed.). World Scientific Publishing Company