UTKAL UNIVERSITY

VANI VIHAR, BHUBANESWAR - 751004

B.Sc. Data Science
B.Sc. (Honours)

COMMON SYLLABUS FOR B.Sc. DATA SCIENCE

B. Sc. (Honours) Data Science (CBCS)

PREAMBLE

Information and Communication Technology (ICT) has today become integral part of all industry domains as well as fields of academics and research. The industry requirements and technologies have been steadily and rapidly advancing. Organizations are increasingly opting for open source systems. The students too these days are thinking beyond career in the industry and aiming for research opportunities. A genuine attempt has been made while designing the new syllabus for this 3-year B.Sc. Data Science (H) course. Not only does it prepare the students for a career in Software industry, it also motivates them towards further studies and research opportunities. The core philosophy of overall syllabus is to:

a. Form strong foundation of Data science,

b. Introduce emerging trends to the students in gradual way,

c. Groom the students for the challenges of ICT industry

The Government of Odisha has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of the State of Odisha in line with the University Grants Commission (UGC). The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching- learning process, examination and evaluation systems, besides governance and other matters.

The Government of Odisha has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Universities & Colleges in Odisha in line with UGC. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. However, due to lot of diversity in the system of higher education, there are multiple approaches followed by universities towards examination, evaluation and grading system. While the Universities and Colleges must have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching–learning methods, there is a need to devise a sensible system for awarding the grades based

on the performance of students. Presently the performance of the students is reported using the conventional system of marks secured in the examinations or grades or both. The conversion from marks to letter grades and the letter grades used vary widely across the Universities and Colleges in the states as well as the country. This creates difficulty for the academia and the employers to understand and infer the performance of the students graduating from different universities and colleges based on grades.

The grading system is considered to be better than the conventional marks system and hence it has been followed in the top institutions in India and abroad. So, it is desirable to introduce uniform grading system. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students. To bring in the desired uniformity, in grading system and method for computing the cumulative grade point average (CGPA) based on the performance of students in the examinations, the UGC has formulated these guidelines, which is being adopted by the state of Odisha.

CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in Odisha. This will benefit the students to move across institutions within Odisha to begin with and across states and countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

PROGRAMME LEARNING OUTCOMES

The Bachelor of Science Honours in Data Science (B.Sc. (Hons) in DS) programme enables students to attain, by the time of graduation:

- Demonstrate the aptitude of Computer Programming and Computer based problem solving skills.
- Display the knowledge of appropriate theory, practices and tools for the specification, design, and implementation.

- Display ethical code of conduct in usage of Internet and Cyber systems.
- Ability to pursue higher studies of specialization and to take up technical employment.
- Ability to formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate.
- Ability to operate, manages, deploy, and configure Computer Network, Hardware, and Software operation of an organization.

  Ability to appreciate emerging technologies and tools.
- Apply standard Software Engineering practices and strategies in real-time Software Project Development.
- Design and develop computer programs/computer-based systems in the areas related to Algorithms, Networking, Web Design, Cloud Computing, IoT and Data Analytics.
- Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems.
- The ability to work independently on a substantial software project and as an effective team member.

OUTLINE OF CHOICE BASED CREDIT SYSTEM

1. **Core Course**: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
2. **Elective Course**: Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

Dissertation/Project: An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

3. **Ability Enhancement Courses (AEC)/Competency Improvement Courses/Skill Development Courses/Foundation Course**: They ((i) Environmental Science, (ii) English/MIL Communication) are mandatory for all disciplines. AEC courses are value-based and/or skill- based and are aimed at providing hands-on-training, competencies, skills, etc.

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

GUIDELINES FOR PROJECT FORMULATION

As the project work constitutes a major component in most of the professional programs and it is to be carried out with due care and should be executed with seriousness by the candidates.

TYPE OF PROJECT

As majority of the students are expected to work out a real-life project in some industry/research and development laboratories/educational institutions/software companies, it is suggested that the project is to be chosen which should have some direct relevance in day-to-day activities of the candidates in his/her institution. It is not mandatory for a student to work on a real-life project. The student can formulate a project problem with the help of Guide.

PROJECT PROPOSAL (SYNOPSIS)

The project proposal should be prepared in consultation with the guide. The project proposal should clearly state the project objectives and the environment of the proposed project to be undertaken. The project work should compulsorily include extraction, manipulation and screening, data visualization, modeling, analysis and interpretation. It can also include recommendations as well as limitations of study. The project proposal should contain complete details in the following form:

I. Title of the Project

II. Introduction and Formulation of the problem

III. Review of literature and identification of the study gap
IV. Research questions and Objectives
V. Research Hypothesis
VI. Methodology and Data Source
VII. Statistical tools and techniques used
VIII. Analysis, Interpretation and model development
IX. Limitations and suggestions
X. Conclusion
XI. References

B. Sc. (Honors) Data Science (CBCS)

SEMESTER	COURSE OPTED	COURSE NAME	CREDITS
I	Ability Enhancement Course-1	AECC-1: Environmental Studies & Disaster Management	4
	Core Course-1	Basic Statistics for Data Science	4
	Core Course-1 Practical	Basic Statistics for Data Science LAB	2
	Core Course-2	Introduction to Programming & Web Technology	4
	Core Course-2 Practical	Introduction to Programming & Web Technology Lab	2
	Generic Elective-1	GE-1: Linear Algebra and Calculus	4
	Generic Elective-1 Practical	GE-1 Lab	2
II	Ability Enhancement Course-2	AEC-2 (English Communication/MIL)	4
	Core Course-3	Programming using R	4
	Core Course-3 Practical	Programming using R LAB	2
	Core Course-4	Probability and Distributions	4
	Core Course-4 Practical	Probability and Distributions Lab	2
	Generic Elective-2	Data Structure and Algorithms	4
	Generic Elective-2 Practical	Database Management and Data Structure Lab (SQL and PL/SQL Lab)	2
	AECC/EV-I	Microeconomics / Principles of Management	1
III	Core Course-5	Data Warehousing	4
	Core Course-5 Practical	Data Warehousing Lab	2
	Core Course-6	Optimization Techniques	4
	Core Course-6 Practical	Optimization Techniques Lab	2
	Core Course-7	Data Science Using Python	4
	Core Course-7 Practical	Data Science Using Python LAB	2
	Skill Enhancement Course-1	Digital System Design	4
	Generic Elective-3	Big Data Analysis	4
	General Elective-3 Practical	Big Data Analysis Lab	2
	AECC/EV-I	Database Management Systems	1
IV	Core Course-8	Numerical Methods and Statistical Inference	4
	Core Course-8 Practical	MATLAB Programming	2
	Core Course-9	Artificial Intelligence	4
	Core Course-9 Practical	Artificial Intelligence LAB	2
	Core Course-10	Cloud Computing	4
	Core Course-10 Practical	Cloud Computing LAB	2
	Skill Enhancement Course-2	Data Visualization with Power BI / Tableau	4
	Generic Elective-4	Data Mining	4
	General Elective-4 Practical	Data Mining Lab	2
	AECC/EV-I	Business Research Methods	1
V	Core Course-11	Machine Learning	4
	Core Course-11 Practical	Machine Learning LAB	2
	Core Course-12	Internet of Things	4
	Core Course-12 Practical	Internet of Things Lab	2
	Discipline Specific Elective-1	Time Series Analysis and Business Forecasting	4

	Discipline Specific Elective-1 Practical	Business Forecasting Lab	2
	Discipline Specific Elective-2	Applied Regression Analysis	4
	Discipline Specific Elective-2 Practical	Applied Regression Analysis Lab	2
	AECC/EV-I	Robotic Process Automation	1
VI	Core Course-13	Reinforcement Learning	4
	Core Course-13 Practical	Reinforcement Learning LAB	2
	Core Course-14	Social Media Analytics and Knowledge Management	4
	Core Course-14 Practical	Social Media Analytics and Knowledge Management LAB	2
	Discipline Specific Elective-3	Deep Learning and Natural Language Processing	4
	Discipline Specific Elective-3 Practical	Deep Learning and Natural Language Processing Lab	2
	Discipline Specific Elective-4	Project Work	6
	Discipline Specific Elective-4 Practical	Data Security and Compliance	1

CORE PAPERS (Credits: 06 Each)

CORE – 1: Basic Statistics for Data Science

CORE – 2: Introduction to Programming & Web Technology

CORE – 3: Programming using R

CORE – 4: Probability and Distributions

CORE – 5: Data Warehousing

CORE – 6: Optimization Techniques

CORE – 7: Data Science Using Python

CORE – 8: Numerical Methods and Statistical Inference

CORE – 9: Artificial Intelligence

CORE – 10: Cloud Computing

CORE – 11: Machine Learning

CORE – 12: Internet of Things

CORE – 13: Reinforcement Learning

CORE – 14: Social Media Analytics and Knowledge Management

DISCIPLINE SPECIFIC ELECTIVES (DSE) PAPERS (Credits: 06 Each)

DSE–1: Time Series Analysis and Business Forecasting

DSE–2: Applied Regression Analysis

DSE–3: Deep Learning and Natural Language Processing

DSE–4: Project Work

SKILL ENHANCEMENT COURSES (SEC)

SEC – 1: Digital System Design
SEC – 2: Data Visualisation with Power BI / Tableau

ABILITY ENHANCEMENT COURSES (AEC)

AEC– 1: Environmental Studies & Disaster Management
AEC – 2: English Communication/MIL.

GENERIC ELECTIVE (GE): (Credit: 06 each)

Papers offered by Computer Science/IT Departments for other disciplines. It is recommended that the other departments must offer the following papers as GE.

GE – 1: Linear Algebra and Calculus
GE – 2: Data Structure and Algorithms
GE – 3: Big Data Analysis
GE – 4: Data Mining

However, the students from **Data Science** discipline shall choose **four papers of anyone discipline** as their GE papers from the following list**.**

GE-1:	GE-2:
Mathematics–1 Physics–1 Statistics–1 Electronics –1	Mathematics–2 Physics–2 Statistics–2 Electronics –2
GE-3:	**GE-4:**
Mathematics–3 Physics–3 Statistics–3 Electronics –3	Mathematics–4 Physics–4 Statistics–4 Electronics –4

SEMESTER - I

SEMESTER-I

ENVIRONMENTAL STUDIES & DISASTER MANAGEMENT (AECC I) FOR UNDER-GRADUATE COURSES ARTS, SCIENCE AND COMMERCE (2021-22)

FULL MARK-100 (Credit - 4)

Course Objectives:

The following objectives have been framed for the proposed curriculum to:

1. Find out solutions for a sustainable Earth for future generation
2. Make the stakeholders aware of their rights, responsibilities, consequences of their conduct towards nature and build resilience
3. Develop a sense of equitable use of resources and their preservation for the future generation
4. Sensitize the stakeholders on Disaster and Pandemic preparedness

Learning Outcomes:

On successful completion of the course students will be able to:

1. Identify the historical origins of destructive attitudes and practices toward the natural environment;
2. Know the compatibility of human and environmental/ecological values
3. Know the natural resources available on earth and how to conserve and manage them
4. Understand the disasters and pandemic they are facing and empower the new generation to face the new challenges

Pedagogy/Teaching Transaction

1. Classroom teaching
2. Self-Study
3. E-Learning
4. Guest Lectures
5. Case Study Analysis and Discussion
6. Field Trip/Visit
7. Seminars
8. Audio, Video, Film Based Discussion/Analysis
9. Group Exercises
10. Group Discussions

Detailed Syllabus

UNIT - I

1. Environment (13 periods x 45 min)

The Environment: The Atmosphere, Lithosphere, Hydrosphere, Biosphere (01 period)

Ecosystem: Energy flow in the ecosystem (01 period)

Biogeochemical Cycle: Water Cycle, Carbon Cycle, Nitrogen Cycle (02 periods)

Pollution: Water Pollution, Air Pollution, Soil Pollution, Radiation Pollution, Industrial Pollution, Light Pollution, Sound Pollution (05 periods)

Environmental Laws (Water Act 1974, Air Act 1981, The Wildlife Protection Act 1972, The Environment Protection Act 1986), The Forest Conservation Act 1980 (04 periods)

UNIT – II

2. Climate Change & Sustainable Development (13 periodsx45 min)

Population Ecology: Individuals, Species, Population, Community (01 period)

Human Population Growth, Population Control Methods (01 period) Urbanization and its effect on society (01 period)

Climate Change. Causes, effect, Global Warming. Carbon footprint and Environmental protection (05 periods) Steps taken towards sustainable development: Ban of single use plastics, Automobile Scrapping Policy, Promotion of Electrical Vehicles (03 periods)

Brief idea on Sustainable Development Goals (SDGs), Agenda 21 of Rio Earth Summit (02 periods)

UNIT - III

3. Disaster Management (13 periods x 45 min)

Disaster Management: Types of disasters (Natural and Man-made) and their causes and effect) (02 periods)

Vulnerability Assessment and Risk Analysis: Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves and Lightning) (02 periods)

Institutional Framework: Institutional arrangements for disaster management (National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), District Disaster Management Authority (DDMA), National Disaster Response Force (NDRF) and Odisha Disaster Rapid Action Force (ODRAF) (02 periods)

Preparedness Measures: Disaster Management Cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, Strengthening of SDMA and DDMA, Community Preparedness, Stakeholder participation, Corporate Social Responsibility (CSR) (05 periods)

Survival Skills: Survival skills adopted during and after disaster (Flood, Fire, Cyclone and Lightening) (02 periods)

UNIT - IV

4. Public Health Management (13 periods x 45min)

Brief idea on Epidemics and Pandemics (01 period)

Non-communicable diseases with special reference to Cardiovascular diseases, Cancer, Diabetes, Hypertension and Obesity and their Prevention (02 periods)

Communicable diseases with special reference to Covid-19, Flu, Hepatitis, AIDS and Tuberculosis and their transmission (02 periods)

Dynamics of Disease Transmission: Mode of transmission (Direct/Indirect), Events after infection: Immunity (Active vs Passive. Innate vs Acquired, Herd Immunity), Incubation Period (02 periods)

Prevention of Epidemics/Pandemics Diseases: Preventing Measures (Quarantine, Sanitization, Personal Protective measures such as Hand washing and use of protective devices, Vaccination); Control Measures (Surveillance, Isolation, Contact Tracing) (03 Periods)

Life Style management (Diet, Physical Exercise, Yoga and sleeping habit) (02 periods)

Role of Different Sectors in Managing Health Disaster: Role of Government (Centre and State), Community, Civil Society, Student mass, NGOs (01 period)

Books Recommended:

1. Asthana DK and Asthana M: A Text Book of Environmental Studies, S. Chand, New Delhi
2. Bharucha E: A Text Book of Environmental Studies, New Delhi: UGC
3. Dash MC and Mishra PC: Man and Environment, McMillan, London
4. Disaster Management and Mitigation Plan,2013 of Dept. of Health & Family Welfare, Govt. of Odisha
5. Mishra DD: Fundamental Concepts in Environmental Studies, S. Chand, New Delhi
6. National Policy on Disaster Management,2009* 7. National Disaster Management Plan, 2019
7. Odum EP: Fundamentals of Ecology, Natraj Publications
8. State Disaster Management Plan, 2019 of Government of Odisha
9. Standard Operating Procedure (SOP) issued by Govt. of India and Govt. of Odisha on Public Health Managements in the websites: www.mohfw.gov.in and health.odisha.gov.in*
10. The Disaster Management Act, 2005 of Government of India"

[Note: Star (*) marked References, published by the State as well as Central Government are available in the open sources]

CORE–1: Basic Statistics for Data Science

UNIT - I

1. Introduction to Statistics and Use in Business:

a) Meaning of Statistics as a Science, Importance of Statistics,

b) Scope of Statistics: In the field of Industry, Biological Sciences, Medical Sciences, Economics Sciences, Social, Sciences, Management Sciences, Agriculture, Insurance, Information Technology, Education and Psychology.

2. Types of Data and Data Condensation:

a) Method of sampling: Concept of population and sample. Finite, Infinite population, Notion of SRS, SRSWOR and SRSWR

b) Types of Characteristics, Different types of scales: nominal, ordinal, interval and ratio scale. Linear and circular scale.

c) Types of Data: Primary data, Secondary data, Collection of data and concept of a questionnaire and a schedule, Cross-sectional data, time series data, failure data, industrial data, and directional data.

d) Tabulation.

e) Dichotomous classification - for two and three attributes, Verification for consistency.

f) Association of attributes: Yule's coefficient of association Q. Yule's coefficient of Colligation,

g) Notion of a statistical population: Finite population infinite population, homogeneous population and heterogeneous population. Notion of sample, random sample and non-random sample.

UNIT - II

3. Presentation of Data

a) Univariate frequency distribution of discrete and continuous variables. Cumulative frequency distribution and relative frequency distribution.

b) Graphical representation of frequency distribution by Histogram, frequency polygon, Cumulative frequency curve. Stem and leaf diagram

c) Check sheet, Pareto diagram

4. Measures of central tendencies

a) Concept of central tendency of data. Requirements of good measure

b) Locational averages: Median, Mode, and Partition Values: Quartiles, Deciles, and Percentiles, Box Plot, Percentile ranks

c) Mathematical averages Arithmetic mean (Simple, weighted mean, combined

mean), Geometric mean, Harmonic mean

d) Empirical relation between mean, median and mode

e) Merits and demerits of using different measures & their applicability

f) Partition Values: Quartiles, Deciles and Percentiles, Box Plot, Percentile ranks

UNIT - III

5. Measures of Dispersion, Skewness & Kurtosis

a) Concept of dispersion. Requirements of good measure.

b) Absolute and Relative measures of dispersion: Range, Quartile Deviation, Mean absolute deviation, Standard deviation.

c) Variance and Combined variance, raw moments and central moments and relations between them. Their properties

d) Concept of Skewness and Kurtosis: Measures of Skewness: Karl Pearson's, Bowley's and Coefficient of skewness based on moments. Measure of Kurtosis

6. Mean square deviation:

a) Definition, minimality property of mean square deviation (with proof),

b) Variance and standard deviation: Definition, merits and demerits, effect of change of origin and scale, combined variance (derivation for 2 groups), combined standard deviation, generalization for n-groups.

c) Measures of dispersion for comparison: coefficient of range, coefficient of quartile deviation and coefficient of mean deviation, coefficient of variation (C.V.)

UNIT - IV

7. Correlation and regression analysis

a) Scatter Diagram, Product moment correlation coefficient and it's properties. Spearman's Rank correlation. (With and without ties)

b) Concept of linear regression. Principle of least squares. Fitting a straight line by method of least squares.

c) Relation between regression coefficients and correlation coefficient.

d) Fitting of curves reducible to linear form by transformation. Concept and use of coefficient of determination(R^2)

e) Fitting a quadratic curve by method of least squares.

f) Case study

References:

1. Statistical Methods, An Introductory Text, Medhi J., New Age International Ltd.
2. Basic Statistics, Agarwal B.L., New Age International Ltd.
3. Theory and Problems of Statistics, Spiegel M.R., Tata Mc-Graw Hill.

4. Fundamentals of Statistics, Volume II, Goon A.M., Gupta M.K., Dasgupta B., The World Press Private Limited, Calcutta.

5. Complete Business statistics, Aczel Sounderpandian, Tata Mc-Graw Hill

6. Excel Data Analysis Modeling and simulation, Hector Gurrero, Springer, Second Edition

7. Data Analysis and Decision-Making Albright, Wilston, Zappe Thomson

List of Practical: (Can be done in MS-Excel-or any Spreadsheet)

1. **Introduction to Excel**
   a. Understanding Data Tools
   b. Understanding Formula Tools, insert functional library using insert function
   c. Add-Ins Analysis Tool packs
2. Using Formulae and Charts
   a. Formula writing, Functions, using Cell reference
   b. Understanding Insert Tool: Chart Tools, Different types of charts and their use
3. Data Entry and manipulation
   a. Tools for data entry and accuracy: Quick Access Tool bar customization, Form tool.
   b. Data Transposition to Fit Excel (as an Array).
   c. Data Conversion with the Logical IF, VLOOKUP, HLOOKUP. Pivot table, Pivot chart.
   d. Data Conversion of Text from Non–Excel Sources, Using Text to Column (From Data tool)
   e. Data Queries with Sort, Filter, and Advanced Filter Exact function data entry comparison
4. Data Validation
   a. Specifying a valid range of values for a cell
   b. Specifying a list of valid values for a cell
   c. Specifying custom validations based on formula for a cell
5. Measures of central tendency
   a. Calculating Mean, Median, Mode, Minimum, Maximum, range with cell reference
   b. Using Summary statistics
   c. Calculate A.M., G.M., H.M.
   d. State the Finding so fall above exercise.
6. Measures of Dispersion, Skewness & Kurtosis
   a. Calculate Range, Quartile Deviation, Mean absolute deviation, Standard deviation with cell reference
   b. Using summary statistics Measures of Skewness, Coefficient of skewness based on moments .Measure of Kurtosis.
   c. Graphical representation of Skewness.
   d. State the Finding of exercise.
7. Graphical Presentation with Excel -1
   a. Producing a Histogram
   b. Improving the Graph
   c. Producing a Cumulative Frequency Diagram
   d. Producing a Histogram of subgroups of data

8. Graphical Presentation with Excel–2
    a. Producing a bar chart of subgroups of data
    b. Pareto chart
    c. Combined variance (derivationfor2groups), combined standard deviation.
    d. Coefficient of variation (C.V.).
9. Correlation
    a. Use of formula for calculating correlation and Co-variance.
    b. Use of error checking (Using Exact (), IF)
    c. Use of frequently used financial functions (e.g.NPV) with suitable example of correlation.
    d. State the Finding so fall above exercise.
10. Regression analysis
    a. Using Summary statistics/Cross sectional Data: Descriptive Statistic
    b. Linear Regression and visual analysis (Chart)
    c. Multiple Regression equation with coefficient standard error and visual chart
    d. State the Finding so fall above exercise.

CORE – 2: Introduction to Programming & Web Technology

UNIT-I

Introduction to Python Language: Overview, Features of Python, Execution of a Python Program, Innards of Python, Frozen Binaries, Python Interpreter, Comparison of Python with C and Java, Installing Python, Writing & Executing, IDLE
Data Types, Variables and Other Basic Elements: Comments, Docstrings, Data types-Numeric, Compound, Boolean, Dictionary, Sets, Mapping, Basic Elements of Python, Variables
Input and Output Operations: Input Function, Output Statements, Command Line Arguments
Control Statements: Control Statements- Loop Statement, The else Suite, break Statement, continue Statement, pass Statement, assert Statement, return Statement

UNIT-II

Functions: Defining &Calling a Function, Returning Results, Returning Multiple Values, Built in Functions, Parameters and Arguments, Recursive Functions, Anonymous or Lambda Functions
Operators: Arithmetic operators, Assignment operators, Unary minus operator, Relational operators, Logical operators, Bitwise operators, Membership operators, Identity operators, Precedence of Operators, Associativity of Operators
Arrays: Creating Arrays, Indexing and Slicing, Basic Array Operations, Arrays Processing, Mathematical Operations on Array, Aliasing Arrays, Slicing and Indexing in NumPy Arrays, Basic Slicing. Advanced Indexing. Dimensions of Arrays, Attributes of an Array
Strings: Creating Strings, Functions of Strings, Working with Strings, Length of a String, Indexing & Slicing, Repeating & Concatenation of Strings, Checking Membership, Comparing Strings, Removing Spaces, Finding Substrings, Counting

Substrings, Strings are Immutable, Splitting and Joining Strings, Changing Case, Checking Starting and Ending of a String, Sorting & Searching in the Strings, Formatting the Strings, Working with Characters

Lists and Tuples: Lists, List Functions and Methods, List Operations, Tuples

UNIT-III

Web Essentials: Clients, Servers and Communication: The Internet –Basic Internet protocols–The WWW, HTTP request message –response message, web clients web servers – case study.

Introduction to HTML: HTML, HTML domains, basic structure of an HTML document– creating an HTML document, mark up tags, heading, paragraphs, line breaks, HTML tags. Elements of HTML, working with text, lists, tables and frames, working with hyperlink, images and multimedia, forms and controls.

Introduction to cascading style sheets: Concepts of CSS, creating style sheet, CSS properties, CSS styling (background, text format, controlling fonts), working with the block elements and objects. Working who lists and tables, CSS ID and class. Box model (introduction, border properties, padding properties, margin properties), CSS colour, groping, Dimensions, display, positioning, floating, align, pseudo class, Navigation bar, image sprites.

UNIT-IV

Java scripts: Client side scripting, what is java script, simple java script, variables, functions, conditions, loops and repetitions. Java scripts and objects, java script own objects, the DOM and web browser environment, forms and validations.

DHTML: Combining HTML, CSS, java scripts, events and buttons, controlling your browser.

1. Programming through Python, M. T. Savaliya, R. K Maurya, G.M Magar , Staredu Solutions 1st 2018
2. Python Data Science Handbook Jake Vander Plas O'Reilly Media 1st 2016
3. Let Us Python Y. Kanetkar, BPB 1st 2019
4. HTML 5 Step by Step Faithe Wempen Microsoft Press 2011
5. Web Design The Complete Reference Thomas Powell TMH 2009
6. Head First HTML 5 programming Eric Freeman O'Reilly 2013

List of Practical:

1. Write a Python program to explore various data types including numeric types, Boolean types and compound types.
2. Write a Python program to perform Input and Output Operations.
3. Write a Python program to demonstrate looping in python and use of break statement and continue statement
4. Write a Python program to define and use functions
5. Write a Python program to demonstrate the use of Built-in Functions.
6. Write a Python Program to implement Lambda Functions.
7. Write a Python Program to implement arrays for storing homogeneous data items. Apply indexing and slicing operations to access elements of array.
8. Write a Python Program to demonstrate operations and properties of string data types.
9. Write a Python Program implement and demonstrate the use of Membership operators and Identity operators
10. Write a Python Program to implement Numpy for handling multidimensional arrays.
11. Write a Python Program to create list, apply various functions to it.
12. Write a Python Program to demonstrate concept of aliasing and cloning.

13. Write a Python Program to implement tuples for storing data. Verify the immutability property on tuples.
14. Use of Basic Tags
15. Navigation, list and paragraph
16. Lists, images and semantics
17. CSS with list, link sand table
18. CSS with font, paragraph and types
19. Java Script: Validating User fields
20. JavaScript: Handling the events

GE-1: Linear Algebra and Calculus

COURSE OBJECTIVES:

This course introduces students to some basic mathematical ideas and tools which are at the core of any engineering course. A brief course in Linear Algebra familiarizes students with some basic techniques in matrix theory which are essential for analyzing linear systems. The calculus of functions of one or more variables taught in this course are useful in modelling and analyzing physical phenomena involving continuous change of variables or parameters and have applications across all branches.

COURSE OUTCOMES:

Upon completion of this course, the students should be able to:
1. Apply the Matrix Methods to solve the system of linear equations
2. Test the convergence and divergence of the infinite Series.
3. Determine the extreme values of functions of two variables.
4. Apply the vector differential operator to scalar and vector functions.
5. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.

UNIT-I

Rank of a matrix, Echelon form, consistency of linear System of equations, Linear dependence of vectors, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic form.

UNIT-II

Vector spaces, subspaces, examples, algebra of subs paces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces. Linear transformations, null space, range, rank and nullity of a linear transformation.

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UNIT-III

Differential Calculus: Limits of function, continuous functions, properties of continuous functions, partial differentiation and total differentiation. Indeterminate forms: L-Hospital's rule, Leibnitz rule for successive differentiation. Euler's theorem on homogeneous functions. Maxima and minima of functions of one and two variables. Partial derivatives, transformations and Jacobians.

UNIT-IV

Integral Calculus: Review of integration and definite integral. Differentiation under integral sign, double integral, change of order of integration, transformation of variables. Beta and Gamma functions: properties and relationship between them.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2010.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, Reprint, 2017. 4. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCE BOOKS:

1. Sastry, S.S, —Engineering Mathematics, Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
2. Wylie, R.C. and Barrel, L.C., —Advanced Engineering Mathematics —Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

ETHICS AND VALUES

COURSE OBJECTIVES:

To enable the students to create an awareness on Engineering Ethics and Human Values, to instil Moral and Social Values and Loyalty and to appreciate the rights of others.

COURSE OUTCOMES:

Upon completion of this course, the students should be able to:
• After successful completion of the course, the student will be able to:
• Apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

UNIT-I

HUMAN VALUES
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage –

Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT-II

ENGINEERING ETHICS

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moraldilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest –Customs and Religion – Uses of Ethical Theories

UNIT-III

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT-IV

SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights(IPR) – Discrimination

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, NewDelhi, 2017.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics –Concepts and Cases", Cengage Learning, 2009
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003

SEMESTER - II

AECC-2 (English Communication/MIL)

Introduction:

The paper is focused upon developing one fundamental skills of Language learning; reading which needs a thorough rethink and revision. In order to build a strong base for acquisition of the communication skills, suitable reading content is selected from diverse areas in prose form. This would boost the learner's competence in expressive and comprehension skills. The well-researched language exercises in the form of usage, vocabulary and grammar is the other area that should attract the teacher and learner to work out for giving decent shape to the mastery of English language.

UNIT 1: Short Story

(i) Jim Corbett-The Fight between Leopards
(ii) Dash Benhur- The Bicycle
(iii) Dinanath Pathy- George V High School (iv)Alexander Baron- The Man who knew too much
(v) Will f Jenkins- Uneasy Homecoming

UNIT 2: Prose

(i) Mahatma Gandhi- The way to Equal Distribution
(ii) S Radhakrishnan- A Call to Youth
(iii) C V Raman-Water- The Elixir of Life
(iv) Harold Nicolson- An Educated Person
(v) Claire Needell Hollander- No Learning without Feeling

UNIT 3:
(i) Comprehension of a passage and answering the questions

UNIT 4:
(i) Language exercises-test of vocabulary, usage and grammar

Text Books

All Stories and Prose pieces

Reference Books

- The Widening Arc: A Selection of Prose and Stories, Ed. A R Parhi, S Deepika, P Jani, Kitab Bhavan, Bh ubaneswar.
- A Communicative Grammar of English, Geoffrey Leech.
- A University Grammar of English, Randolph Quirk and Sidney Greenbaum
- Developing Reading Skills. F. Grellet. Cambridge: Cambridge University Press, 1981.

UG Honours/Pass Syllabus in English

Scheme of examination

For Core English Honours Papers :CC & DSE

Midterm: 20 marks (to be conducted by the respective college)
Final examination: 80 marks
(A) 4 long questions of 14 marks each to be set from unit 1-4 with internal choice [4x14=56]
(B) 4 Short notes/annotation/analysis of 6 marks each covering all the units [4x6=24]
Scheme of examination

For SEC (English Communication)

Midterm: 20 marks (to be conducted by the respective college)
Final examination: 80 marks
A. 2 long questions of 20 marks each to be set from unit 1-2 with internal choice [2x20=40]
B. Students have to answer 2 questions of 10 marks each based on (unit 4):Précis writing/note taking/writing reports/official correspondences/writing letters etc
(A) 1. 10 bit questions of one mark each to be set exclusively from unit 3 section (i): grammar portion [1x10=10]
1. 1 question of 10 marks to be set on methods of developing a paragraph/expansion of idea into an essay [10]
Scheme of examination

For AEEC-II (MIL Alternative English)

Midterm: 20 marks (to be conducted by the respective college)
Final examination: 80 marks
(A) 5 short questions of 4 marks each to be set from unit 1-2 covering all prescribed stories and prose pieces [10x4=40]
(B) An unknown passage to be set with 5 questions carrying 4 marks each [5x4=20]
(C) 10 bit questions carrying 2 marks each from grammar/vocabulary and usage [10x2=20]

For pass courses
*The scheme of evaluation for rest of the pass courses (DSC+ DSE) will remain the same as that of the core honours papers

CORE – 3: Programming using R

UNIT-I

Introduction to R Programming
Overview of R – Installation of R – Installation and Loading of R Packages – R—Basic Syntax – Data Types and Objects – Variables – Constants – Comments – Debugging in R. Data Definition and Categorization: Overview of Data – Source of Data – Big Data – Data Categorization – Data Cube,
Operators: Introduction to Operator – Arithmetic Operators – Relational Operator – Logical Operators – Miscellaneous Operators – Precedence and Associativity of Operators – String Manipulation – Solved Example of Regular Expressions**,**

Control Statement and Functions: The if Statement – The for Statement – The while Loop – The repeat and break Statement – The repeat and Break Statements – the next Statement – The switch Statement – Functions

Interfacing with R: Introduction to Extending R – Interfacing R with C/C++ - Interfacing R with Python, Vectors: Overview of vectors – Creating a Vector – Accessing the Elements of a Vector – Vector Manipulation and Vector Arithmetic – Deleting a Vector – Vector Element Sorting,

UNIT-II

Matrices: Creating a Matrix – Coercion of Matrix Elements – Matrix Sub-setting – Matrix Operations – Combining Matrices – Special Matrices – Eigenvector and Eigenvalues – Arrays,

Lists: Introduction to Lists – Creating a List – General List Operations – Accessing the Elements of a lists – Manipulating the elements of a lists – Merging Lists – Applying Functions to a List – Recursive List – Sorting and Searching

Data Frames: Introduction to Data Frame – Creating a Data Frame – General Operations on Data Frames – Expanding a Data Frame – Applying Functions to Data Frame,

Factors and Tablets: Introduction to Factors – Creating a Factor – Factor Levels – Summarizing a Factor – Ordered Factor – Converting Factors – Common Functions Used with Factors.

Introduction to Tablets and Creating Tables – Table-related Function, Regular Expression and String Manipulation in R :Introduction to Regular Expression – Regular Expressions and Pattern Matching – String Manipulation – Solved Example of Regular Expression, S3 and S4 Classes and Objects: Introduction to S3 and S4 Classes and Objects – S3 Classes – S4 Classes.

Accessing Input and Output: Introduction to Files and Input / Output – Accessing the Keyboard and Monitor- File Function

UNIT-III

Graphs in R Programming :Introduction to Graphs – Creating Graphs – Histograms and Density plots – Bar Plots – Line Charts – Pie Charts – Box Plots – Scatter Plots – Saving Graphs to a file – Creating Three-Dimensional Plots. R Apply Family: Introduction to the Apply Family – The apply () Function – The lapply () Function – The sapply () Function – Slicing a Vector – The tappy () Function – The Rep () Function – The mapply () Function – The vapply() Function. The R Profile: Introduction – Using system.time() Function – timing Longer Expressions – Using the R Profiler – Using the summaryrprof () Function. Descriptive Statistics using R: Introduction to Statistical Analysis in R – Measure of Central Tendency or Location – Measures of Shape

UNIT-IV

Correlation and Regression Analysis: Introduction to Correlation and Regression Analysis – Correlation Analysis – Regression Analysis: lattice package in R - 1D, 2D, 3D plots using lattice ggplot2 package in R- 1D, 2D, 3D plots using ggplot2, Statistical Inference : Introduction to Statistical Inference – Hypothesis Testing. Analysis of Variance: Introduction to Analysis of Variance – Implementing Analysis of Variance – Variants of ANOVA – ANOVA in R.

Programming using R LAB

LIST OF PROGRAMS:

1. Demonstrate the usage of Numbers and Vectors in R
2. Simple manipulations on Numbers and Vectors, Objects- modes and attributes, Ordered and unordered Factors.
3. Implement the concepts of Arrays and Matrices.
4. Demonstrate the usage of Data Frames and Lists and its attributes -attach, detach, scan and importing a file.
5. Implement the concept of grouping and conditional execution on Data Frames and Lists
6. Demonstrate the usage of apply () functions.
7. Implement the usage of dplyr package
8. Utilize a lattice package to plot 1D, 2D and 3D plots for a given dataset.
9. Utilize ggplot2 package to plot 1D, 2D and 3D plots for a given dataset.
10. Demonstrate Pearson correlation and regression analysis.

CORE – 4: Probability and Distributions

UNIT-I

Theory of Probability: Introduction, history, different terms, mathematical tools, Axiomatic approach to probability, Mathematical notation, multiplication and conditional probability, Baye's theorem, Geometric probability.

Random Variables and Distribution Functions: Random Variable, distribution function, discrete random variable, continuous random variable, joint probability law, transformation of one dimensional random variable, transformation of two dimensional random variable

UNIT-II

Mathematical Expectation and Generating Functions: Mathematical expectation, Expectation of a Function of a Random Variable, Addition Theorem of Expectation, Multiplication Theorem of Expectation, Expectation of a Linear Combination of Random Variables, Covariance, Variance of a Linear Combination of Random Variables, Moments of Bivariate Probability Distributions, Conditional Expectation and Conditional Variance, Moment Generating Function, Cumulants, Characteristic Function, Chebychev's Inequality, Convergence in- Probability, Weak Law of Large Numbers, Borel Canteli Lemma, Probability Generating Function

UNIT-III

Theoretical Discrete Distributions: Introduction, Bernoulli Distribution, Binomial Distribution, Poisson Distribution, Negative Binomial Distribution, Geometric Distribution, Hyper geometric Distribution, Multinomial Distribution, Discrete Uniform Distribution

UNIT-IV

Theoretical Continuous Distributions: Rectangular or Uniform Distribution, Normal Distribution, Gamma Distribution, Beta Distribution of First Kind, Beta Distribution of Second Kind, The Exponential Distribution, Laplace Double Exponential Distribution Weibul Distribution, Cauchy Distribution, Central Limit Theorem

Books and References:

1. Fundamentals of Mathematical statistics, S.C, Gupta and V. K. Kapoor, S. Chand and Sons, Tenth Edition 2002
2. Applied Statistics and Probability for Engineers Douglas C. Montgomery and George C. Runger, Wiley, Sixth Edition 2014
3. Probability, Statistics, and Stochastic Processes Peter Olofsson and Mikael Andersson, Wiley, Second Edition 2012

Probability and Distributions Lab

List of Practical: (Can be done in MS-Excel-or any Spreadsheet)

1. Introduction to Probability:
a. Formulate and apply Bayes' Theorem Calculations for problems like The "Two Supplier Example". [Hint: Use Prior Probabilities and Conditional Probabilities to compute Joint and Posterior Probabilities.]
b. Design spreadsheet to demonstrate the association Between Two Variables by Computing the Covariance and Correlation Coefficient.[Hint: Use COVAR and C ORREL)]
2. Discover Probability using formulas:
a. Design and spread sheet experiment to compute the probability using the geometric distribution formula.
b. Create a spread sheet application to compute the Conditional Probability. Also determine the probability that a randomly chosen event.
3. Random Variables and Distribution Functions:
a. Create spread sheet application to Compute the Expected Value, Variance, and Standard Deviation
b. Create a spread sheet application to Compute Binomial Probabilities. [Hint Use BINOM DIST]
4. Probability Distribution and Law:
a. Create a spread sheet application to Poisson Probability Distribution.[Hint: Use POISSO N]
b. Create a spread sheet application to implement joint probability law.
5. Mathematical Expectation and Chebychev's Theorem:
a. Create a spread sheet application to compute the expectation of a Function of a Random Variable
b. Create a spread sheet application to apply Chebychev's Theorem.
6. Conditional Expectation and Generating Functions:
a. Create a spread sheet application to compute Conditional Expectation and Conditional Variance.
b. Create a spread sheet application to demonstrate the use of Generating Functions
7. Theoretical Discrete Distributions1:
a. Create spread sheet application to demonstrate Bernoulli distribution.
b. Create spread sheet application to use excel function for computing hyper geometric probabilities.
8. Theoretical Discrete Distributions 2:

a. Create spread sheet application to Calculate Binomial Distribution in Excel. [Hint: Use BINOM.DIST]
b. Create suitable spread sheet application to work with Power Series Distribution.

9. Theoretical Continuous Distributions 1:
a. Create spread application for computing probabilities and z values for the standard normal distribution. [Use NORMSDIST and NORMSINV]
b. Create spread application for computing probabilities for the exponential probability distribution. [Hint: Use EXPONDIST]
10. Theoretical Continuous Distributions 2:
    a. Create spread application for demonstrating Weibull Distribution to obtain a model for data sets. [Hint: Use WEIBULL.DIST]
    b. Create spread application for demonstrating Pearson's Distributions.

GE-2: Data Structure and Algorithms

UNIT-I

Introduction of algorithms, analyzing algorithms, Arrays: Representation of Arrays, Implementation of Stacks and queues, Application of Stack: Evaluation of Expression - Infix to postfix Conversion - Multiple stacks and Queues, Sparse Matrices.
Linked list: Singly Linked list - Linked stacks and queues - polynomial addition - More on linked Lists - Doubly linked List and Dynamic Storage Management - Garbage collection and compaction.

UNIT-II

Trees: Basic Terminology - Binary Trees - Binary Tree representations - Binary trees - Traversal - More on Binary Trees - Threaded Binary trees - counting Binary trees. Graphs: Terminology and Representations - Traversals, connected components and spanning Trees, Single Source Shortest path problem.

UNIT-III

Symbol Tables: Static Tree Tables - Dynamic Tree Tables - Hash Tables Hashing Functions - overflow Handling. External sorting: Storage Devices -sorting with Disks: K-way merging - sorting with tapes.

UNIT-IV

Internal sorting: Insertion sort - Quick sort - 2 way Merge sort - Heap sort - shell sort - sorting on keys. Files: Files, Queries and sequential organizations - Index Techniques - File organization.

Text Book:

Ellis Horowitz, Sartaj Shani, —Fundamentals of Data Structures‖, Galgotia publication

Reference Book:

1. Data structures Using C‖ Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J.Augenstein, Kindersley (India) Pvt. Ltd.,
2. Data structure and Algorithms‖, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Pearson Education Pvt. Ltd.

Database Management and Data Structure Lab
(SQL and PL/SQL Lab)

LIST OF PROGRAMS:

1. Array implementation of Stack.
2. Array implementation of Linear Queue.
3. Array implementation of Circular Queue.
4. Linked list implementation of Stack.
5. Linked list implementation of Queue.
6. Polynomial representation using linked list.
7. To implement a Binary Search Tree.
8. To represent a Sparse Matrix.
9. To perform binary search operation.
10. To perform Insertion sort.
11. To perform Quick sort.
12. To perform Merge sort.

NOTE: Demonstrate the following SQL commands and can take any back end RDBMS system for implementation purpose.

1. Data Definition of Base Tables.
2. DDL with Primary key constraints.
3. DDL with constraints and verification by insert command.
4. Data Manipulation of Base Tables and Views.
5. Demonstrate the Query commands.
6. Write a PL/SQL code block that will accept an account number from the user and debit an amount of Rs. 2000 from the account if the account has a minimum balance of 500 after the amount is debited. The Process is to fired on the Accounts table.
7. Write a PL/SQL code block to calculate the area of the circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in a table Areas. Areas – radius, area.
8. Write a PL/SQL block of code for reversing a number. (Example: 1234 as 4321).
9. Create a transparent audit system for a table Client_master (client_no, name, address, Bal_due). The system must keep track of the records that are being deleted or updated. The functionality being when a record is deleted or modified the original record details and the date of operation are stored in the audit client (client_no, name, bal_due, operation, user-id, update) table, then the delete or update is allowed to go through.

AECC/EV-I: Principles of Management

OBJECTIVES

- To understand the basic principles of management.

- To provide a basis of understanding towards working of business organization through the process of management.

Unit-1

Nature of Management: Meaning, Definition, it's nature purpose, importance & Functions, Management as Art, Science & Profession- Management as social System Concepts Of management-Administration-Organization. Evolution of Management Thought: Contribution of F.W. Taylor, Henri Fayol, Elton Mayo, Chester Barhard & Peter Drucker to the management thought. Various approaches to management (i.e. Schools of management thought) Indian Management Thought.

Unit-2

Functions of Management (Part-I) Planning - Meaning - Need & Importance, types levels– advantages& limitations, Forecasting - Need & Techniques, Decision making - Types - Process of rational decision making &techniques of decision making, Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation – Decentralization.

Unit-3

Functions of Management (Part-II) Staffing - Meaning & Importance, Direction - Nature – Principles, Communication – Types & Importance, Motivation - Importance – theories, Leadership - Meaning - styles, qualities & functions of leaders Controlling- Need, Nature, importance, Process & Techniques, Coordination - Need, Importance.

Unit-4

Strategic Management: Definition, Classes of Decisions, Levels of Decision, Strategy, Role of different Strategist, Relevance of Strategic Management and its Benefits, Strategic Management in India.

Text Books:

1. Horold Koontz and Iteinz Weibrich, Essential of Management, McGraw-Hill International
2. K.Aswathapa, Essential of Business Administration, Himalaya Publishing House

Reference Books:

1. L.M.Parasad Principles & practice of management - Sultan Chand & Sons - New Delhi
2. Tripathi, Reddy, Principles of Management, Tata McGraw Hill

SEMESTER – III

CORE-5: Data Warehousing

UNIT-I

Introduction to Data Warehouse

Data warehouse Introduction-Data warehouse components-operational database vs data warehouse-Data warehouse Architecture-Three tier data warehouse Architecture-Autonomous data warehouse-Autonomous data warehouse vs snowflake-modern data warehouse

UNIT-II

ETL AND OLAP TECHNOLOGY

What is ETL-ETL vs ELT- Types of data warehouses-Data warehouse design and modelling - Delivery process-online analytical processing(OLAP) – characteristics of OLAP-online transaction processing(OLTP) vs OLAP-OLAP Operations- Types of OLAP –ROLAP vs MOLAP vs HOLAP

META DATA, DATA MART & PARTITION STRATEGY

Meta data-category of Meta data-Role of Meta data- Meta data Repository-Challenges in meta data management-Data mart-Need of data mart-Cost effective data mart-Designing data marts- cost of data marts- partitioning strategy- vertical partition-Normalization- Row splitting-horizontal partition.

UNIT-III

DIMENSIONAL MODELING AND SCHEMA

Dimensional modelling- multi dimensional data modelling – Data cube- star scheme-snow fall schema- star is snow flake schema- fact constellation schema- schema definition- process architecture- types of database parallelism-Data warehouse tools

UNIT-IV

SYSTEM AND PROCESS MANAGERS

Data warehousing system managers; System configuration manager- system scheduling manager- system event manager- system database manager - system backup recovery manager- data warehousing process managers: load manger-ware house manager-query manager-Tuning-Testing

Text Books:

1. Alex Berson & Stephen J. Smith, " Data Warehousing Data Mining & OLAP" ,TMH, 13th reprint edition 2008
2. Ralph Kimball, " The Data Warehouse toolkit: The Complete Guide to Dimensional Modelling", 3rd edition 2013

Data Warehousing LAB

1. Data exploration and integration with WEKA
2. Apply WEKA tool for data validation
3. Plan the architecture for real time application
4. Write the query for schema definition
5. Design data warehouse for real time application

6. Analyze the dimensional modeling
7. Case study using OLAP
8. Case study using OTLP
9. Implementation of warehouse testing

CORE – 6: Optimization Techniques

COURSE OBJECTIVES:
To impart knowledge on various categories of existing engineering problems and solutions to such problems through different optimization techniques and approaches
COURSE OUTCOMES:
At the end of the course, the students should be able to:
1. Relate key concepts and applications of various optimization techniques
2. Identify the appropriate optimization technique for the given problem
3. Formulate appropriate objective functions and constraints to solve real life optimization problems

UNIT-I

INTRODUCTION
Statement of an optimization problems – classification of optimization problem – classical optimization techniques; Single variable optimizations, Multi variable optimization, equality constraints, inequality constraints, No constraints.

UNIT-II

LINEAR PROGRAMMING
Graphical method for two dimensional problems – central problems of Linear Programming – Definitions – Simples – Algorithm – Phase I and II of simplex Method – Revised Simplex Method. Simplex Multipliers – Dual and Primal – Dual Simplex Method – Sensitivity Analysis– Transportation problem and its solution – Assignment problem and its solution – Assignment problem and its solution by Hungarian method – Karmakar's method – statement, Conversion of the Linear Programming problem into the required form, Algorithm.

UNIT-III

NON LINEAR PROGRAMMING
Non linear programming (one dimensional minimization: Introduction – Unrestricted search – Exhaustive search – interval halving method – Fibonacci method. NON LINEAR PROGRAMMING: (UNCONSTRAINED OPRIMIZATION): - Introduction – Random search method – Uni variate method – Pattern search methods – Hooke and jeeves method, simplex method- Gradient of a function – steepest descent method – Conjugate gradient method. NON LINEAR PROGRAMMING – (CONSTRAINED OPTIMIZATION): Introduction – Characteristics of the problem – Random search method – Conjugate gradient method.

UNIT-IV

DYNAMIC PROGRAMMING

Introduction – multistage decision processes – Principles of optimality – Computation procedures. Decisions under uncertainty, under certainty and under risk – Decision trees – Expected value of perfect information and imperfect information.

Text Books:

1. Kalynamoy Deb, “Optimization for Engineering Design, Alogorithms and Examples”, Prentice Hall, 2012.
2. Hamdy A Taha, “Operations Research – An introduction”, Pearson Education, 2017

Reference Books:

1. Hillier / Lieberman, “Introduction to Operations Research”, Tata McGraw Hill Publishing company Ltd, 2002.
2. Singiresu S Rao, “Engineering optimization Theory and Practice”, New Age International, 1996.
3. Mik Misniewski, “Quantitative Methods for Decision makers”, MacMillian Press Ltd., 1994.
4. Kambo N S, “Mathematical Programming Techniques”, Affiliated East – West press, 1991.

Optimization Techniques LAB

List of Experiments

1. Matrix operations in Matlab
2. Differentiation of a vector and matrix in Matlab
3. Integration of a vector and matrix in Matlab
4. Simplex algorithm in Matlab
5. Implementation of Newton's method in Matlab
6. Implementation of Secant method in Matlab
7. Implementation of Lagrange multiplier method in Matlab
8. Implementation of KKT theorem in Matlab
9. Implementation of BFGS method in Matlab

CORE – 7: Data Science Using Python

UNIT-I

Introduction: Data Science- A Brief History of Data Science - A History of Data Analysis -The Emergence and Evolution of Data Science. Where Is Data Science Used? What Are Data, and What Is a Data Set? Perspectives on Data. A Data Science Ecosystem: Moving the Algorithms to the Data - The Traditional Database or the Modern Traditional Database.

UNIT-II

Learning from Data with Your Machine: Defining Machine Learning and Its Processes

-Learning Styles - Selecting algorithms based on function. Math, Probability, and Statistical Modeling: Exploring Probability and Inferential Statistics - Quantifying Correlation -Reducing Data Dimensionality with Linear Algebra - Introducing Time Series Analysis.

UNIT-III

Data Visualizations: The Big Three - Picking the Most Appropriate Design Style – Selecting the Appropriate Data Graphic Type - WebBased Applications for Visualization Design: Designing Data Visualizations for Collaboration - Visualizing Spatial Data with Online Geographic Tools.

UNIT-IV

Web Services in Python: Parsing XML, JSON, Application Programming Interfaces NumPy Libraries for Arrays, Pandas Library for Data Processing Matplotlib for Visualization, Seaborn Library for Visualization, SciPy Library for Statistics

Text Books:

1. John D. Kelleher and Brendan Tierney, —Data Science‖, First Edition, The MIT Press, London, 2018. Unit I (Text Book 1): Chapter 1.1, 1.2, 1.3, 2.1, 3.1, 3.2.
2. Lillian Pierson, —Data Science for Dummies‖, 2nd Edition, John Wiley & Sons publications, 2017. Unit II (Text Book 2): Chapter 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7. Unit III (Text Book 2): Chapter 9.1, 9.3, 9.5, 11.1, 11.2.
3. Wesley J Chun, Core Python Applications Programming, 3rd Edition. Pearson 4. Michael Bowles, Machine Leaning in Python, Essential techniques for predictive analysis, Wiley

Reference Books:

1. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, —Introducing Data Science‖, Manning Publications Co, 2016.
2. Ramesh Sharda, DursunDelen, Efraim Turban, —Business Intelligence, Analytics, and Data Science: A Managerial Perspective‖, Pearson Education, Fourth edition, 2019.
3. Alex Martelli, Python Cookbook, O'REILLY

Data Science using Python LAB

LIST OF PROGRAMS:

1. Write a program using generator function.
2. How to call same function with decorator and without decorator.
3. Construct an XML formatted data and Write Python Program to Parse that XML data.
4. Construct a JSON formatted data and Write Python Program to Parse that XML data.
5. Implement a program using Pandas.
6. Accessing Array index using NumPy
7. Aggregation function using NumPy.
8. Implement

a) Matplotlib
b) Seaborn

9. Implement a program using SciPy

SEC-I: Digital System Design

COURSE OBJECTIVES

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

COURSE OUTCOMES

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

1. Explain the fundamentals of number system, Codes and digital logic families
2. Develop combinational circuits.
3. Design synchronous sequential circuits using flip-flops.
4. Demonstrate Asynchronous Sequential circuits and Programmable Logic Devices.
5. Apply simulation tools for designing digital logic circuits.

UNIT-I

Boolean Algebra and Logic Gates

Number Systems – Arithmetic Operations – Binary Codes- Boolean Algebra and Logic Gates – Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Simplification of Boolean Functions using Karnaugh Map – Logic Gates – NAND and NOR Implementations.

UNIT-II

Combinational Logic

Combinational Circuits – Analysis and Design Procedures – Binary Adder-Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Introduction to HDL – HDL Models of Combinational circuits.

UNIT-III

Synchronous Sequential Logic

Sequential Circuits – Storage Elements: Latches , Flip-Flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure – Registers and Counters – HDL Models of Sequential Circuits.

Asynchronous Sequential Logic

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT-IV

Memory and Programmable Logic

RAM – Memory Decoding – Error Detection and Correction – ROM – Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

Text Books:

1. M. Morris R. Mano, Michael D. Ciletti, ―Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog‖, 6th Edition, Pearson Education, 2017.

Reference Books:

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, Digital Principles and Design‖, Tata Mc Graw Hill, 2003.

GE-3: Big Data Analysis

UNIT-I

Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, Bigdata Challenges, Case Study of Big Data Solutions.

UNIT-II

HADOOP: Introducing Hadoop – Why Hadoop – Why not RDBMS – RDBMS versus Hadoop – History of Hadoop – Hadoop Overview – Hadoop Distributed File System (HDFS) – Processing Data with Hadoop – Managing Resources and Applications with Hadoop YARN – Interacting with Hadoop Ecosystem

UNIT-III

No SQL DATA MODEL: Introduction to NoSQL – NoSQL Business Drivers – NoSQL Data Architectural Patterns – Variations of NoSQL Architectural Patterns – Using NoSQL to Manage Big data – Case study of NoSQL MAP REDUCE Programming: Introduction to MapReduce – Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.

UNIT-IV

Hadoop streaming with R: Understanding the basics of Hadoop streaming – How to run Hadoop streaming with R – Understanding a MapReduce application – Understanding how to code and run a Map-Reduce application – how to explore the output of Map Reduce application.

Text Books:

1. Radha Shankarmani, M Vijayalakshmi, ―Big Data Analytics‖, Wiley publications,first Edition 2016.
2. Seema Acharya, Subhashini Chellappan, ―Big Data and Analytics‖, Wiley Publication, first edition. Reprint in 2016.
3. Vignesh Prajapati, ―Data analytics with R and Hadoop‖, Copyright © 2013, Packt Publishing.

Reference Books:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, Big Data, —Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businessesǁ, Wiley, 2013
2. Bill Franks, Taming, —The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analyticsǁ, Wiley

Big Data Analysis LAB

List of Experiments

1. (i) Perform setting up and Installing Hadoop in its two operating modes: Pseudo distributed, fully distributed.

(ii) Use web based tools to monitor your Hadoop setup.

2. (i) Implement the following file management tasks in Hadoop: Adding files and directories• Retrieving files• Deleting files

(ii) Benchmark and stress test an Apache Hadoop cluster

3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm. Find the number of occurrence of each word appearing in the input file(s) Performing a MapReduce Job for word search count (look for specific keywords in a file.

4. Stop word elimination problem:

Input:
A large textual file containing one sentence per line
A small file containing a set of stop words (One stop word per line) Output:
A textual file containing the same sentences of the large input file without the words appearing in the small file.

5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented. Data available at: https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all.

Find average, max and min temperature for each year in NCDC data set?
Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

6. Purchases.txt Dataset
Instead of breaking the sales down by store, give us a sales breakdown by product category across all of our stores. What is the value of total sales for the following categories? Toys Consumer Electronics
Find the monetary value for the highest individual sale for each separate store
What are the values for the following stores? Reno Toledo Chandler Find the total sales value across all the stores, and the total number of sales.

7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
8. Write a Pig Latin scripts for finding TF-IDF value for book dataset (A corpus of eBooks available at: Project Gutenberg)
9. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

10. Install, Deploy & configure Apache Spark Cluster. Run apache spark applications using Scala.
11. Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.
Write a single Spark application that:
Transposes the original Amazon food dataset, obtaining a Pair RDD of the type: <USER_ID>
(list of the product_ids reviewed by user_id>
Counts the frequencies of all the pairs of products reviewed together;
Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

AECC/EV-I: Database Management Systems

COURSE OBJECTIVES:

1. To explain basic database concepts, applications, data models, schemas and instances.
2. To demonstrate the use of constraints and relational algebra operations.
3. Describe the basics of SQL and construct queries using SQL.
4. To emphasize the importance of normalization in databases.
5. To facilitate students in Database design
6. To familiarize issues of concurrency control and transaction management

COURSE OUTCOMES:

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

1. Recall the basic concepts of database systems.
2. Identify the SQL queries for a given scenario.
3. Illustrate relational database theory, and be able to write relational algebra expressions for queries.
4. Summarize the various data storage devices and types of indexes.
5. Demonstrate transaction processing and concurrency control.
6. Explain Object oriented dB, Distributed dB, XML, data warehousing and Mobile database.

UNIT-1

INTRODUCTION AND CONCEPTUAL MODELING

Introduction to File and Database systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra and Calculus.

UNIT-2

RELATIONAL MODEL

SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependencies and Normalization for Relational Databases (up to BCNF).

UNIT-3

DATA STORAGE AND QUERY PROCESSING

Record storage and Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files – Different types of Indexes- B-Tree - B+Tree – Query Processing.

UNIT-4

TRANSACTION MANAGEMENT

Transaction Processing – Introduction- Need for Concurrency control- Desirable properties of Transaction- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Recovery Techniques.

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- —Database System Concepts, seventh Edition, 2019.

Reference Books:

1. Ramez Elmasri and Shamkant B. Navathe, —Fundamental Database Systemsǁ, Seventh Edition,Pearson Education,2016.

2. Raghu Ramakrishnan, —Database Management System, Tata McGraw-Hill Publishing Company, Third Edition, 2014.

3. Jiawei Han, Micheline Kamber, Jian Pei -Data Mining Concepts and Techniques,Morgan Kaufmann, Third Edition, 2012.

SEMESTER – IV

CORE – 8: Numerical Methods and Statistical Inference

COURSE OBJECTIVES:

- To introduce the fundamental principles of numerical and statistical methods.
- To provide various methods of solving algebraic/transcendental equations and system of simultaneous equations.
- To identify the areas applied in numerical interpolation, differentiation, integration and differential equations and method of finding solutions.
- To have knowledge in probability distributions and testing of hypothesis

COURSE OUTCOMES:

Upon completion of the course the students will be able

- To solve problems using numerical methods.
- To obtain the solution of system of equations using matrix theory.
- To identify real life problems into Mathematical Models.
- To apply the probability theory in the field of Computer Science Applications.

UNIT-I

Solution of Equations: Fundamental principles of Numerical Methods - Solution of algebraic/transcendental equations: method of false position, Newton Raphson method – Solution of simultaneous linear equations – direct methods: Gauss elimination and Gauss Jordan methods – iterative methods: Gauss Jacobi and Gauss Seidel methods.

UNIT-II

Numerical Interpolation, Differentiation & Integration: Interpolation: difference table - Newton's forward and backward interpolation – Lagrange's interpolation – Differentiation formulae –Integration: Trapezoidal, Simpson's one-third rule and Gaussian quadrature in one dimension.

Ordinary Differential Equations: Solution of first order ordinary differential equations – Taylor Series and Euler methods, Runge-Kutta method of fourth order.

UNIT-III

Estimation: Concepts of point estimation, Criterion of a good estimator, unbiasedness, sufficiency, consistency and efficiency. Methods of Estimation: Method of moments, method of maximum likelihood estimation, confidence intervals.

UNIT-IV

Principles of test of significance: Null and alternative hypotheses (simple and composite), Type-I and Type-II errors, critical region, level of significance, size and power, best critical region, most powerful test, uniformly most powerful test, Neyman

Pearson Lemma (statement only). Sampling distributions –Small sample tests: t-test for single mean and double mean, F-test, chi-square test for goodness of fit and independence of attributes

Text Books:

1. Grewal B.S, “Numerical methods in Engineering and Science”, Khanna Publishers, 2013. (Units - 1, 2 & 3).
2. John.E..Freund, Irwin Miller, Marylees Miller, “Mathematical Statistics with Applications”, Prentice Hall of India, Seventh Edition, 2004. (Units - 4).

Reference Books:

1. Gupta, S. K. “Numerical Methods for Engineers“, New age International Publishers, 2012.
2. Gupta S.C. & Kapoor V.K., “Fundamentals of Mathematical Statistics”, Sultan Chand & Sons, 2011.

Numerical Techniques Practical:

1. Basics of MATLAB programming
2. Array operations in MATLAB
3. Loops and execution control
4. Working with files: Scripts and Functions
5. Plotting and program output
6. Linear algebra in MATLAB
7. Gauss Elimination
8. LU decomposition and partial pivoting
9. Iterative methods: Gauss Siedel
10. Newton-Raphson in single variable
11. MATLAB function fsolve in single and multiple variables
12. Newton-Raphson in multiple variables
13. Linear least squares regression(including lsqcurvefit function)
14. Functional and nonlinear regression (including lsqnonlin function)
15. Interpolation in MATLAB using spline and pchip
16. Second-Order Runge-Kutta Methods
17. Higher order Runge-Kutta methods
18. Error analysis of Runge-Kutta method

CORE – 9: Artificial Intelligence

UNIT-I

Introduction: AI Problems – AI techniques – Criteria for success. Problems, Problem Spaces, Search: State space search – Production Systems – Problem Characteristics – Issues in design of Search.

UNIT-II

Heuristic Search techniques: Generate and Test – Hill Climbing – Best-Fist, Problem Reduction, Constraint Satisfaction, Means-end analysis.
Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem.

UNIT-III

Using Predicate Logic: Representing simple facts in logic – Representing Instance and Isa relationships – Computable functions and predicates – Resolution – Natural deduction.

UNIT-IV

Representing knowledge using rules: Procedural Vs
Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge Brief explanation of Expert Systems-Definition-Characteristics- architecture- Knowledge Engineering- Expert System Life Cycle-Knowledge Acquisition Strategies- Expert System Tools.

Text Books:
Elaine Rich and Kevin Knight, Shiva Shankar Nair, —Artificial Intelligence‖, McGraw-Hill Companies, 3rd edition.

Reference Books:

1. Stuart Russell & Peter Norvig , —Artificial Intelligence A Modern Approach‖, Perason, 2nd Edition.
2. George F Luger , —Artificial Intelligence‖, Pearson 2002, 4th Edition.
   V S Janaki Raman, K Sarukesi, P Gopalakrishnan, —Foundations of Artificial Intelligent and Expert Systems‖, MacMillan India limited.

Artificial Intelligence LAB

List of Experiments:
1. Write a Program to Implement Breadth First Search using Python.
2. Write a Program to Implement Depth First Search using Python.
3. Write a Program to Implement Tic-Tac-Toe game using Python.
4. Write a Program to implement 8-Puzzle problem using Python.
5. Write a Program to Implement Water-Jug problem using Python.
6. Write a Program to Implement Travelling Salesman Problem using Python.
7. Write a Program to Implement Tower of Hanoi using Python.
8. Write a Program to Implement Monkey Banana Problem using Python.
9. Write a Program to Implement Alpha-Beta Pruning using Python.
10. Write a Program to implement 8-Queens Problem using Python.

CORE – 10: Cloud Computing

COURSE OBJECTIVE:

This course gives students an insight into the basics of cloud computing along with

virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

UNIT-I

Cloud Computing Overview: Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

UNIT-II

Cloud Insights: Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

UNIT-III

Cloud Architecture- Layers and Models : Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

UNIT-IV

Cloud Simulators- CloudSim and GreenCloud: Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud. **Introduction to VMWare Simulator:** Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

Text Books:

1. Cloud computing a practical approach‖ - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online‖ - Michael Miller - Que 2008

Reference Books:

1. Cloud computing for dummies‖- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
2. Cloud Computing (Principles and Paradigms)‖, Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

Practical:

List of Exercises

1. Study and Usage of Google Apps.
2. Implement Virtual OS using virtual box.
3. Simulate VM allocation algorithm using CloudSim.
4. Simulate Task scheduling algorithm using CloudSim.
5. Simulate Energy-conscious model using CloudSim.
6. Setup a Private Cloud Using Open Stack or Eucalyptus.
7. Install and configure Open Stack Object Storage - Swift in Ubuntu.
8. Implement Open Stack Nova-Compute.
9. Implement Open Stack Image services – Glance.
10. Implement Map Reduce concept for an application.

SEC-2: Data Visualization with Power BI / Tableau

COURSE OBJECTIVE:

❖ Students will explore story telling with data by develop skills to both design and critique visualization.

❖ Understand why visualization is an important part of data analysis by understands the components involved in visualization design. 3. Exploring the type of data impacts and type of visualization.

UNIT-I

Introduction to Data Visualization
Why Data Visualization? What Can You Believe? Some Pictures Are More Persuasive, Different Shades of the Truth in visualization, Start Sketching Your Data Story, Recommended Tools for data visualization and demonstration of Tools.

Data Management for data visualization
Select Your Spreadsheet Tools, Download to CSV or ODS Format, Make a Copy of a Google Sheet, Share Your Google Sheets, Upload and Convert to Google Sheets, Geocode Addresses in Google Sheets, Collect Data with Google Forms, Sort and Filter Data, Calculate with Formulas, Summarize Data with Pivot Tables Match Columns with VLOOKUP, Spreadsheet Versus Relational Database

UNIT-II

Data sources and Data processing for data visualization
Open Data Repositories, Source Your Data, Recognize Bad Data Smart Cleanup with Google Sheets, Find and Replace with Blank, Transpose Rows and Columns, Split Data into Separate Columns, Combine Data into One Column, souring data and processing data for Banking data, Retail data and Healthcare data.

UNIT-III

Advanced Data processing and Basic Charting
Extract Tables from PDFs with Tabula, Clean Data with OpenRefine, Set Up OpenRefine, Load Data and Start a New Project, Convert Dollar Amounts from Text to Numbers, Cluster Similar Spellings Precisely Describe Comparisons, Normalize Your Data Chart Design Principles, Deconstruct a Chart, Some Rules Are More Important Than Others, Chart Aesthetics, Google Sheets Charts, Bar and Column Charts

UNIT-IV

Interactivity Charting and Storyboard
Visualization: Histograms, Pie, Line, and Area Charts, Datawrapper Charts, Annotated Charts, Range Charts, Scatter and Bubble Charts. Map Design Principles: Deconstructing a Map, Clarify Point-Versus-Polygon Data, Map One Variable, Not Two, Choose Smaller Geographies for Choropleth Maps **Storyboard**: Build a Narrative on a Storyboard, Draw Attention to Meaning, Acknowledge Sources and Uncertainty Decide on Your Data Story Format

Text Book:

Hands-On Data Visualization— by Jack Dougherty, Ilya Ilyankou

Reference Books:
1. The Truthful Art: Data, Charts, and Maps for Communication‖, Pearson Education, 2016.
2. Few, Stephen —Show Me the Numbers: Designing Tables and Graphs to Enlighten‖, Second edition, Burlingame, CA: Analytics Press, 2012.

GE-4: DATA MINING

COURSE OBJECTIVE:

- To introduce the basic concepts and techniques of Data Mining.
- To study the basic concepts of cluster analysis.
- To study a set of typical clustering methodologies, algorithms and applications.

UNIT-I

Introduction: Data mining application – data mining techniques – data mining case studies- the future of data mining – data mining software - Association rules mining: basics- task and a naïve algorithm- Apriori algorithm – improve the efficient of the Apriori algorithm – mining frequent pattern without candidate generation (FP-growth) – performance evaluation of algorithms.

UNIT-II

Classification : Introduction – decision tree – over fitting and pruning - DT rules- Naive

bayes method- estimation predictive accuracy of classification methods - other evaluation criteria for classification method – classification software.
Cluster analysis: cluster analysis – types of data – computing distances-types of cluster analysis methods- partitioned methods – hierarchical methods – density based methods – dealing with large databases – quality and validity of cluster analysis methods - cluster analysis software.

UNIT-III

Web data mining: Introduction- web terminology and characteristics- locality and hierarchy in the web- web content mining-web usage mining- web structure mining – web mining software - Search engines: Search engines functionality- search engines architecture – ranking of web pages.

UNIT-IV

Data warehousing: Introduction – Operational data sources- data warehousing - Data warehousing design – Guidelines for data warehousing implementation - Data warehousing metadata - Online analytical processing (OLAP): Introduction – OLAP characteristics of OLAP system – Multidimensional view and data cube - Data cube implementation - Data cube operations OLAP implementation guidelines.

Text Book:

G.K. Gupta, —Introduction to Data mining with case studies‖, 2nd Edition, PHI Private limited, New Delhi, 2011
Reference Book:

Arun K Pujari, —Data Mining Techniques‖, 10th impression, University Press, 2008.

Data Mining Practical

LIST OF EXPERIMENTS:

1. Creation of a Data Warehouse.
2. Apriori Algorithm.
3. FP-Growth Algorithm.
4. K-means clustering.
5. One Hierarchical clustering algorithm.
6. Bayesian Classification.
7. Decision Tree.
8. Support Vector Machines.
9. Applications of classification for web mining.
10. Case Study on Text Mining or any commercial application**.**

AECC/EV-I: Business Research Methods

COURSE OBJECTIVES:

- Research methodology provides a decision making base to managers to take sound managerial decisions.
- Developing in them a core competence of the managers tomorrow.
- To give knowledge about the process of research to students

UNIT-1

Introduction: Meaning-objectives – Research Categories(Basic Research and Applied Research)-Types of research(Descriptive, Analytical, Applied, Fundamental, Quantitative, Qualitative, Conceptual and Empirical research) - research approaches(Quantitative and Qualitative Approaches) - research methods Vs research methodology- Research Process

UNIT-2

Defining the Research Problem: Meaning - selecting the problem –techniques involved in defining the problem- formulating of the problem-formulation of hypothesis (concept only) - Developing the research plan

UNIT-3

Research Design: Meaning - need - features important concepts relating to research design -types of research design (Exploratory and Conclusive Research Design) - basic principles of experimental designs
Sampling: Meaning - need - census and sample survey - sampling designs -probability sampling (simple random, systematic, stratified, cluster, area multistage, sequential sampling methods)- nonprobability sampling (convenience, snowball, judgmental, case study. Quota sampling methods)

UNIT-4

Data collection and processing: Collection of primary data - collection of data through questionnaire- construction of a questionnaire- and schedules - secondary data - qualitative techniques of data collection – interview, Case study Method, observation - tabulation of data- Difference between primary and secondary data.

Reference Books:

1. C.R. Kothari, Research Methodology.
2. O.R. Krishna Swamy, Research Methodology
3. Wilkinson and Bhandarkar, Methodology and techniques of social research
4. Sadhu Sing, research methodology in social sciences
5. V.P. Michael, Research Methodology in Management
6. Willium M.K. Trochim, Research Methods, Bzantra.

SEMESTER – V

CORE – 11: Machine Learning

COURSE OBJECTIVE:

- To study the basics of machine learning.
- Learn about supervised and unsupervised learning techniques
- Learning how to build a machine learning model from the scratch.
- To understand the Implementation of genetic algorithms.

UNIT-I

Introduction to machine learning: Introduction, Types of machine learning, Applications of Machine Learning, Perspectives and issues in machine learning, Tools in machine learning, basic types of data in machine learning, exploring structure of data, data preprocessing. Performance metrics - accuracy, precision, recall, sensitivity, specificity, AUC, RoC, Bias Variance decomposition.

UNIT-II

Probabilistic and Stochastic Models: Bayesian Learning – Bayes theorem, Concept learning, Maximum likelihood, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Expectation maximization and Gaussian Mixture Models, Hidden Markov models.
Supervised learning: Introduction, Regression, Linear regression, Classification: Decision trees, k-Nereast Neighbours, Support Vector Machine, Logistic regression, Naïve Bayes, Random Forest. Artificial Neural Network: Introduction, Perceptrons, multi-layer networks and back propagation.

UNIT-III

Unsupervised learning: Introduction, Supervised vs Unsupervised Cluster Analysis, K-means clustering, Hierarchical clustering. Dimension reduction: Principal Component Analysis, Linear Discriminant Analysis.

UNIT-IV

Modelling, evaluation and Genetic algorithms: Building the model, Training a model, evaluating a model, improving a model. Genetic Algorithms – Representing hypothesis, Genetic operators and Fitness function and selection, Simple applications of the Genetic Algorithm.

Text Books:

1 SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, —Machine Learning‖, Pearson Education. **Chapters 1-3, 6-10. (unit I,II,III,IV,V)**
2 ShaiShalev-Shwartz, Shai Ben-David, —Understanding Machine Learning: From Theory to Algorithms‖, Cambridge University Press. **Chapters 20, 23-24 (Unit III,IV)**

Reference Books:

1. T. Hastie, R. Tibshirani and J. Friedman, —Elements of Statistical Learning‖,

Springer.

2. Charu C. Aggarwal, —DATA CLUSTERING Algorithms and Applications‖, CRC Press, 2014.

3. C. Bishop, —Pattern Recognition and Machine Learning‖, Springer. Ethem Alpaydin,"Introduction to Machine Learning‖, MIT Press, Prentice Hall of India, Third Edition 2014.

Machine Learning Practical

LIST OF EXPERIMENTS

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

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set

6. 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.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.

8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. 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. 9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem. 10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

CORE – 12: Internet of Things

COURSE OBJECTIVES:

- To explain about the definition and usage of Internet of things
- To explain the key components of IoT system

UNIT-I

Introduction to IoT

Introduction – Definition and Characteristics of IoT, Physical Design of IoT; Things in IOT, Logical Design of IoT; IoT Functional Blocks, IoT Communication APIs, IoT Enabling Technologies; WSN, Cloud Computing, Big Data Analysis, Communication Protocols, Embedded Systems

UNIT-II

IoT Hardware

IoT Hardware, Devices and Platforms – Basics of Arduino Hardware, The Arduino IDE, Basic Arduino Programming, Basics of Raspberry pi; Introduction to Raspberry pi, Programming with Raspberry pi, CDAC IoT devices: Ubimote, Wi-Fi mote, BLE Mote, WINGZ gateway, Introduction to IoT Platforms, IoT Sensors and actuators

UNIT-III

IoT Protocols

IoT Protocols – IoT Data link Protocols, Network Layer Routing Protocols, Network Layer Encapsulation Protocols, Session Layer Protocols, IoT Security Protocols, Service Discovery Protocols, and Infrastructure Protocols.

UNIT-IV

IoT Programming

IoT Programming – Arduino Programming: Serial Communications – Getting Input from Sensors, Visual, Physical and Audio Outputs, Remotely Controlling External Devices, Wireless Communication, Programming with Raspberry pi: Basics of python Programming, Python Packages of IoT, IoT Programming with CADC IoT devices.

Domain Specific IoT

Domain Specific IoT – Home automation, smart cities, Smart Environment, IoT in Energy, Logistics, Agriculture, industry and Health & Life style sensors.

TEXT BOOKS

1. Vijay Madisetti and ArshdeepBahga, —Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.

REFERENCE BOOKS

1. Margolis, Michael. —Arduino CooK book: Receipes t obegin, Expand and Enhance Your Projects‖. O'Reilly Media Inc.2011.

2. Monk, Simon. Raspberry Pi Cookbook: Software and hardware problems and Solutions. O'Reilly Media,Inc. 2016.

Internet of Things Practical

List of Experiments:

1. Study and configure the development board
2. Write a program to establish database connectivity using Python and perform basic query operations
3. Write a program to implement client-server interaction
4. Study the working of different types of sensors using IoT Training Kit
5. Write a program to prepare a humidity data logger and access the logs over Wifi/Ethernet
6. Write a program to collect temperature data and turn on/off actuator like servo motor, led etc. based on some fixed threshold value of the temperature. The collected temperature data should be stored in the database and displayed to the user upon request.
7. Allocation of mini projects
8. Write a program to display a warning message if fire is detected using flame sensor
9. Write a program to control led lights using motion sensor
10. Write a program to access, capture and store the image feed from serial camera
11. Study and Implement MQTT Protocol
12. Study the functionalities and working of drones
13. Write a program to collect sensor data using drone and send the data to the users using MQTT protocol
14. Study the functionalities and working of a mobile robot

DSE-1: Time Series Analysis and Business Forecasting

Course Objectives:

- Students will have a command of business theory and practice in the field of business forecasting.
- To learn different forecasting models/techniques both quantitative and qualitative.
- Students will use reasoned and ethical judgment when analyzing problems and making decisions.
- Students will be able to understand complex business situations and provide solutions to improve current business practices.
- Students will be effective communicators.

UNIT-I

Introduction to times series data, applications, components of a times series, Decomposition of time series. Trend: Estimation of trend by free hand curve method, method of semi averages, fitting various mathematical curves, and growth curves,

Method of moving averages. Detrending. Effect of elimination of trend on other components of the time series. Seasonal Component: Estimation of seasonal component by Method of simple averages, Ratio to Trend, Ratio to Moving Averages and Link Relative method, Deseasonalization.

UNIT-II

Time series as discrete parameter stochastic process. Auto-covariance and autocorrelation function and their properties. Exploratory Time Series Analysis, Tests for trend and Seasonality. Exponential and Moving Average Smoothing, Holt and Winters smoothing. Forecasting based on smoothing, Adaptive smoothing.

UNIT-III

Detailed study of the stationary processes: (1) moving average (MA), (2) Auto regressive (AR)., (3) ARMA and (4) AR integrated MA (ARIMA) models, Box Jenkins models, Discussion (without proof) of estimation of mean, auto covariance and autocorrelation functions under large sample theory, Choice of AR and MA periods. Estimation of ARIMA model parameters.

UNIT-IV

Fundamental Considerations in Business Forecasting, Methods of Statistical Forecasting, Data Mining for Forecasting: An Introduction, Process and Methods for Data Mining for Forecasting, Forecasting Performance Evaluation and Reporting, Process and Politics of Business Forecasting, Artificial Intelligence and Machine Learning in Forecasting: Deep Learning for Forecasting, Deep Learning For Forecasting: Current Trends And Challenges, Neural Network–Based Forecasting Strategies

Time Series Analysis and Business Forecasting Practical

List of Practical

1. Estimation of trend by free hand curve method, method of semi averages, fitting various mathematical curves (linear, parabolic and exponential), and growth curves
2. Method of moving averages
3. Detrending
4. Estimation of seasonal component by Method of simple averages, Ratio to Trend, Ratio to Moving Averages and Link Relative method
5. Deseasonalization
6. Moving average (MA), Auto regressive (AR)., ARMA and ARIMA models, Box

Jenkins models

7. Estimation of mean, auto covariance and autocorrelation functions
8. Statistical Forecasting
9. Data Mining for Forecasting
10. Artificial Intelligence and Machine Learning in Forecasting

Text Books:

1. Box, G.E.P., Jenkins, G. M. and Reinsel, G. C.: Time Series Analysis, Pearson Edition
2. Burr, I.W.: Engineering Statistics and Quality Control, McGraw-Hill
3. Grant, E.L. and Leavenworth, R.S.: Statistical Quality Control, McGraw-Hill.
4. Anderson, T.W. (1971).The Statistical Analysis of Time Series, Wiley, N.V.
5. Business Forecasting Michael Gilliland, Len Tashman, et.al. Wiley, 1st, 2021
6. Demand-Driven Forecasting: A Structured Approach to Forecasting Charles W. Chase, Jr. Wiley, 2nd, 2013

DSE-2: Applied Regression Analysis

Course Objectives:

- ❖ Develop an understanding of regression analysis and model building.
- ❖ Provide the ability to develop relationship between variables
- ❖ Investigate possible diagnostics in regression techniques
- ❖ Formulate feasible solution using regression model for real-life problems

UNIT-I

Simple Regression Analysis: Introduction to a linear and nonlinear model. Ordinary Least Square methods. Simple linear regression model, using simple regression to describe a linear relationship. Fitting a linear trend to time series data, validating simple regression model using t, F and p test. Developing confidence interval. Precautions in interpreting regression results.

Multiple Regression Analysis: Concept of Multiple regression model to describe a linear relationship, Assessing the fit of the regression line, inferences from multiple regression analysis, problem of over fitting of a model, comparing two regression model, prediction with multiple regression equation.

UNIT-II

Fitting Curves and Model Adequacy Checking: Introduction, fitting curvilinear

relationship, residual analysis, PRESS statistics, detection and treatment of outliers, lack of fit of the regression model, test of lack of fit, Problem of autocorrelation and heteroscedasticity. Estimation of pure errors from near neighbors.

Transformation techniques: Introduction, variance stabilizing transformations, transformations to linearize the model, Box Cox methods, transformations on the repressor's variables, Generalized and weighted least squares, Some practical applications.

UNIT-III

Multi collinearity: Introduction, sources of multi collinearity, effects of multi collinearity. Multi collinearity diagnostics: examination of correlation matrix, variance Inflation factors (VIF), Eigen system analysis of X1X. Methods of dealing with Multi collinearity: collecting additional data, model, re-specification, and ridge regression

Generalized Linear Models: link functions and linear predictors, parameter estimation and inference in the GLM, prediction and estimation with the GLM, Residual Analysis, and concept of over dispersion.

UNIT-IV

Model building and Nonlinear Regression: Variable selection, model building, model misspecification. Model validation techniques: Analysis of model coefficients, and predicted values, data splitting method. Nonlinear regression model, nonlinear least squares, transformation to linear model, parameter estimation in nonlinear system, statistical inference in nonlinear regression.

Contemporary issues: Research and Analytical problems on various applications of the regression analysis and predictive modeling.

TEXT BOOKS:

1. Introduction to Linear Regression Analysis, Douglas C.Montgomery,Elizabeth A. Peck, G. Geoffrey Vining Wiley IndiaPvt. Ltd 3rd 2016

2. Applied Regression Analysis, Norman R. Draper,Harry Smith, Wiley India Pvt. Ltd, 3rd, 2016

Applied Regression Analysis LAB

Practical:

Correlation coefficient, various types of correlation coefficients, partial and multiple, testing of hypotheses; Multiple linear regression analysis, partial regression

coefficients, testing of hypotheses, residuals and their applications in outlier detection; Handling of correlated errors, multicollinearity; Fitting of quadratic, exponential and power curves, fitting of orthogonal polynomials.

AECC/EV-I: Robotic Process Automation

Course Objectives:

- To make the students aware about the automation today in the industry.
- To make the students aware about the tools used for automation.
- To help the students automate a complete process

Unit-I

Robotic Process Automation: Scope and techniques of automation, About UiPath Record and Play: UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder, Step-by-step examples using the recorder. Sequence, Flowchart, and Control Flow: Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Stepby-step example using Sequence and Flowchart, Step-by-step example using Sequence and Control flow

Unit-II

Data Manipulation: Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example, CSV/Excel to data table and vice versa (with a step-by-step example) Taking Control of the Controls : Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR, Avoiding typical failure points

Unit-III

Tame that Application with Plugins and Extensions: Terminal plugin, SAP automation, Java plugin, Citrix automation, Mail plugin, PDF plugin, Web integration, Excel and Word plugins, Credential management, Extensions – Java, Chrome, Firefox, and Silverlight Handling User Events and Assistant Bots: What are assistant bots?, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger ,Monitoring image and element triggers, An example of monitoring email, Example of monitoring a copying event and blocking it, Launching an assistant bot on a keyboard event.

Unit-IV

Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging techniques, Collecting crash dumps, Error reporting, Managing and Maintaining the Code: Project organization, Nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences, Using config files and examples of a config file, Integrating a TFS server Deploying and Maintaining the Bot: Publishing using publish utility, Overview of Orchestration

Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management, Publishing and managing updates

TEXT BOOKS:

1. Learning Robotic Process Automation Alok Mani Tripathi Packt 1st 2018
2. Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation Srikanth Merianda Createspace Independent Publishing, 1st, 2018
3. The Simple Implementation Guide to Robotic Process Automation (Rpa): How to Best Implement Rpa in an Organization, Kelly Wibbenmeyer , iUniverse ,1st 2018

SEMESTER – VI

CORE – 13: Reinforcement Learning

Course Objectives:

- ❖ To present the mathematical, statistical and computational challenges of building neural networks
- ❖ To study the concepts of deep learning
- ❖ To enable the students to know deep learning techniques to support real-time applications

UNIT-I

Applied Math and Machine Learning Basics: Linear Algebra: Scalars, Vectors, Matrices and Tensors , Multiplying Matrices and Vectors , Identity and Inverse Matrices, Linear Dependence and Span, norms, special matrices and vectors, Eigen decompositions. Machine Learning Basics: Learning Algorithms, Capacity, Over fitting and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, building a Machine Learning Algorithm, Challenges Motivating Deep Learning

UNIT-II

Deep Networks: Deep feed forward network, regularization for deep learning, Optimization for Training deep models

UNIT-III

Deep Networks: Convolutional Networks, Advanced Convolution network, Sequence Modelling, Applications. Deep Learning Research: Linear Factor Models, Auto encoders

UNIT-IV

Fundamentals of Reinforcement Learning: introduction, reinforcement learning as MDP, learnable functions in reinforcement learning, deep reinforcement learning algorithms, deep learning for reinforcement, reinforcement learning and supervised learning.

TEXT BOOKS:

1. Deep Learning Ian Goodfellow, Yoshua Bengio, Aaron Courvile, An MIT Press book 1st 2016
2. Fundamentals of Deep Learning, Nikhil Buduma O'Reilly 1st 2017
3. Deep Learning: Methods and Applications, Deng & Yu Now Publishers 1st 2013
4. Deep Learning Cook Book, Douwe Osinga O'Reilly 1st 2017

Reinforcement Learning Practical

List of Practical:

1. To Write a program to implement Perceptron.
2. To write a program to implement AND OR gates using Perceptron.
3. To implement Crab Classification using pattern net

4. To write a program to implement Wine Classification using Back propagation.
5. To write a MatLab Script containing four functions Addition, Subtraction, Multiply and Divide functions
6. Write a program to implement classification of linearly separable Data with a perceptron
7. To study Long Short Term Memory for Time Series Prediction
8. To study Convolutional Neural Network and Recurrent Neural Network
9. To study ImageNet, GoogleNet, ResNet convolutional Neural Networks
10. To study the use of Long Short Term Memory / Gated Recurrent Units to predict the stock prices based on historic data.

CORE – 14: Social Media Analytics and Knowledge Management

Course Objectives:

- ❖ Understand the fundamentals of social media analytics and its relevance in today's digital landscape.
- ❖ Learn different types of social media analytics and their applications, including customer profiling, location analytics, action analytics, mobile/app analytics, and Google Analytics.
- ❖ Gain knowledge of social network analysis, including network structure, egocentric networks, network metrics, and clustering techniques.
- ❖ Explore text analytics techniques used in social media, including data types, deployment models, and text mining algorithms.
- ❖ Develop practical skills in building recommender systems in social media using techniques such as association rule mining, collaborative filtering, and similarity measures

UNIT-I

Introduction to Social Media : Social Media Data, Social Media Intelligence & Listening, Social Media Monitoring Metrics, Types of Social Media tools, Theories in Media Research, Long Tail, electronic word-of-mouth (eWOM), Power Law& Popularity.

UNIT-II

Types of Social Media Analytics, Knowing your customers –Seven layer Approach, Location Analytics, Action Analytics, Mobile/App Analytics, Google Analytics.

UNIT-III

Social Network Analysis
Introduction to Networks, Common network terms, Network structure, Types of Networks, Egocentric Networks, Network analysis metrics, Strong and Weak Ties, Clustering and Grouping.
Text Analytics in Social Media: Text Analytics data types, Deployment models, Purpose of text analytics, Text analytics value creation cycle, Text Mining algorithms.

UNIT-IV

Recommender Systems in Social Media: Overview – Association rule mining – Collaborative filtering – User based similarity – Item-based similarity Hands-on: Recommender System.

Social Media Analytics and Knowledge Management Practical
List of Practical:

1. Social Media Intelligence & Listening
2. Social Media Monitoring Metrics
3. Tap into data from diverse social media platforms using the R ecosystem
4. Use social media data to formulate and solve real-world problems
5. Analyze user social networks and communities using concepts from graph theory and network analysis
6. Learn to detect opinion and sentiment, extract themes, topics, and trends from unstructured noisy text data from diverse social media channels
7. Understand the art of representing actionable insights with effective visualizations
8. Analyze data from major social media channels such as Twitter, Facebook, Flickr, Foursquare, Github, StackExchange, and so on
9. Learn to leverage popular R packages such as ggplot2, topicmodels, caret, e1071, tm, wordcloud, twittR, Rfacebook, dplyr, reshape2

TEXT BOOKS:

1. "Networks, Crowds, and Markets: Reasoning about a Highly Connected World" , David Easley and Jon Kleinberg, Cambridge University Press, 3rd Edition, 2017
2. "Analysing Social Media Networks with Node XL", "Derek Hansen Ben Shneiderman Marc Smith ItaiHimelboim, Morgan Kaufmann, 2nd Edition, 2019
3. "Social Media Mining: An Introduction", Huan Liu, Mohammad Ali Abbasi, and Reza Zafarani, Cambridge University Press, 1st Edition, 2014
4. Learning Social Media Analytics with R, Sarkar, Bali & Sharma, Packt

DSE-3: Deep Learning and Natural Language Processing

COURSE OBJECTIVES:

The main aim of this course is to provide fundamental knowledge of neural networks and deep learning. On successful completion of the course, students will acquire fundamental knowledge of neural networks and deep learning, such as Basics of neural networks, shallow neural networks, deep neural networks, forward & backward propagation process and build various research projects

UNIT – I

ARTIFICIAL NEURAL NETWORKS: The Neuron – Activation Function – Gradient Descent – Stochastic Gradient Descent – Back Propagation – Business Problem.
CONVOLUTIONAL NEURAL NETWORKS: Convolution Operation – ReLU layer – Pooling – Flattening – Full Conversion Layer – Softmax and Cross-Entropy.

UNIT – II

RECURRENT NEURAL NETWORKS: RNN intuition – Tackling Vanishing Gradient Problem – Long Short-Term Memory – Building a RNN – Evaluating the RNN – Improving the RNN – Tuning the RNN.

UNIT – III

OVERVIEW AND LANGUAGE MODELING: Overview, Origins and challenges of NLP Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model.
WORD LEVEL AND SYNTACTIC ANALYSIS: Word Level Analysis: Regular Expressions Finite-State Automata-Morphological Parsing Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging.
Syntactic Analysis: Context-free Grammar Constituency- Parsing-Probabilistic Parsing.

UNIT – IV

Extracting Relations from Text: From Word Sequences to Dependency Paths: Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation. Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations. A Case Study in Natural Language Based Web Search: In Fact System Overview, The GlobalSecurity.org Experience.

TEXT BOOKS:

1. Nikhil Buduma, Nicholas Locascio, “Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms”, O'Reilly Media, 2017.
2. Li Deng and Dong Yu “Deep Learning Methods and Applications”, Foundations and Trends in Signal Processing, 2013

Practical:

List of Experiments:

1. Implementing word similarity
2. Implementing simple problems related to word disambiguation
3. Simple demonstration of part of speech tagging.
4. Lexical analyzer.
5. Semantic Analyzer.
6. Sentiment Analysis.

AECC/EV-I: Data Security and Compliance

UNIT-I

- Introduction to digital data
- Types and states of digital data

UNIT-II

- Security vulnerabilities and breaches
- Detection, mitigation, and resilience

UNIT-III

- Privacy and anonymity concerns, Technical and ethical approaches
- Data Analytics and Machine learning
- Protecting the data models and analytics

UNIT-IV

- Laws and policies for data management
- Tools and processes for compliance