UNIVERSITY ⚜ OF MYSORE
Estd.1916

Vishwavidyanilaya Karyasoudha
Crawford Hall, Mysore 570 005

———————— (Re-accredited by NAAC at "A" Grade with a CGPA of 3.47) ————————
———————— (NIRF-2020 Ranked 27 in University Category & 47 in Overall Category) ————————

No.: PMEB/AC10/759(3)/2019-20   **Date:28-01-2021**

NOTIFICATION

Sub.: Introduction of new courses under Specialized Programmes from the academic year 2020-21-reg.

Ref.: 1. Decision of the BOS Meeting held on 25-11-2020.
        2. Decision of the Academic Council meeting held on 07-12-2020.

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The Board of Studies in **B.Sc. (Hon's) (Advanced Agriculture), B.Sc. (Biomedical Science), B.Sc. (Artificial Intelligence & Data Analytics) (UG)** at its meeting held on 25-11-2020 has recommended to introduce **B.Sc. (Hons.) (Advanced Agriculture), B.Sc. (Biomedical Science), B.Sc. (Artificial Intelligence & Data Analytics)** courses in University of Mysore under specialized/specified programs. The Regulations, Syllabus and Scheme of Examination was approved from the academic year 2020-21.

The Academic Council has also approved the above said proposals at its meeting held on 07-12-2020 and the same is hereby notified.

The Regulations, Syllabus and Scheme of Examination of B.Sc. (Hons.) (Advanced Agriculture), B.Sc. (Biomedical Science), B.Sc. (Artificial Intelligence & Data Analytics) courses is uploaded in University website. The contents may be downloaded from the University website **www.uni-mysore.ac.in.**

REGISTRAR
REGISTRAR
University of Mysore
MYSURU - 570 005

To;
1. The Registrar (Evaluation), University of Mysore, Mysuru.
2. The Dean, Faculty of Science & Technology, DOS in Psychology, MGM.
3. Prof. Suresha, DOS in Computer Science, Manasagangotri, Mysuru.
4. Prof. K. Kemparaju, DOS in Bio-chemistry, Manasagangotri, Mysuru.
5. Prof. K.N. Amruthesh, DOS in Botany, Manasagangotri, Mysuru.
6. The Secretary, Fortuna Advanced Institute of Research & Studies(FAIR), Devinagar, 1st Main Road, Deveerammanahalli, Najanagud Taluk, Mysuru Dist.
7. The Deputy Registrar/ Asst. Registrar/ Superintendent, Examination Branch, UOM, Mysuru.
8. The Special Officer to Hon'ble Vice-Chancellor, University of Mysore, Mysuru.
9. The PA to Vice-Chancellor/Registrar/Registrar(Evaluation), University of Mysore, Mysuru.
10. Office Copy.

REGULATIONS

&

SYLLABUS FOR

B.Sc. [ARTIFICIAL INTELLIGENCE

&

DATA ANALYTICS]

UNDER SPECIALIZED PROGRAM

2020 ONWARDS

Academic Regulations for Specialized Programme

in

B. Sc. (Artificial Intelligence & Data Analytics)

Recognized By

UNIVERSITY OF MYSORE
MANASAGANGOTHRI, MYSORE

OFFERED AT

FORTUNA ADVANCED INSTITUTE OF RESEARCH AND STUDIES
(FAIR)
Venue: # 2707 / 3 & 4, Devi Nagara, 1st Main Road,
Deveerammanahalli, Mysore-Ooty Road
Nanjanagud – 571301, Mysore District

2020-21

RULES & REGULATIONS OF THE COURSE

1. Course title:

The program shall be called as B.Sc. (ARTIFICIAL INTELLIGENCE & DATA ANALYTICS)

Short form for the course is B.Sc. (AI & DA).

It is three years program consisting of six semesters; two semesters in each year. Candidate admitted to this course shall be governed by following rules and regulations

2. Eligibility, mode of selection

a. A candidate who has passed $10 + 2$ in science stream from a recognized board with overall 40% marks is eligible for admission to the program. Selection will be on the basis of merit.

b. The lateral entry students who has passed diploma in Electrical Sciences (Computer Science / Electronics / Electrical / Electronic) or equivalent with overall 45% marks is eligible for admission to the programme.

c. There shall be a total intake of 40 candidates.

3. Course content:

a. The course of study for the B.Sc. (ARTIFICIAL INTELLIGENCE & DATA ANALYTICS) comprises subjects, internship project work as prescribed. The academic calendar shall be as notified by the university from time to time. Pedagogy includes PowerPoint Presentation, lecturing, case studies, group discussion, seminar, computer practical, factory visit etc.

4. Medium of Instruction: -English.

5. Attendance, Progress and Conduct

- Each semester shall be taken as a unit for the purpose of calculating attendance.
- The students shall attend practical and theory classes as prescribed by the University during each semester.
- Minimum attendance of 75% of actual working hours is required in each paper, a student who doesn't satisfied the requirement of attendance shall not be permitted to write the examination in concern subject
- If the conduct/behaviour of the student is not found to be satisfactory, action will be initiated as per the University regulations.

- A candidate can take a maximum of Six years for completion as per double the duration norms of University of Mysore.

6. **Formation of Board of Examiners**
   - Chairman Board of Studies shall form Board of Examiners members consisting of Principal Partnership Institution, Head of the Concerned Department, Subject Faculties and University Representatives. The duties of Board of Examiners include setting question papers, conducting the examinations, valuation of answer scripts and submitting the marks list to University for result announcement.

7. **Scheme of examination**
   - There shall be a University examination at the end of each semester.
   - There shall be a term end examination of 3 hrs. duration for each theory subject and 3 hrs. duration for practical subject at the end of the semester
   - Repeaters have to take exam during respective semesters

   - **Question paper:** 3 sets for each subject shall be set by faculty as per the panel of examiners approved by university prior to one month of exam, both in hard and soft copy.
   - **Valuation:** valuation will be done by respective subject experts identified by the BOS
   - Each subject is divided into internal assessment and end term exam with marks allotted as shown below

   a) **Total Marks -Theory papers**   100 marks
      i.   External examination: 70 marks
      ii. Continues Assessment   30 marks
      (Continues Assessment Includes test, Presentation, Assignments and Portfolios)
         Continues Assessment   (1st to 8th week)   15 marks
         Continues Assessment   (9th to 16th week)   15 marks
      - Each student has to score minimum of 40% in each paper.

   b) **Total marks –Practical papers**   100 marks
      i.   External examination: 70 marks
      ii. Continues Assessment   30 marks
      (Continues Assessment Includes Test, Presentation, Assignments and Portfolios)

3

| Continues Assessment | (1st to 8th week) | 15 marks |
| Continues Assessment | (9th to 16th week) | 15 marks |

- Each student has to score minimum of 40% in each paper.

c) Project work (TOTAL 200 Marks)

- Project report (portfolio) completed during the semester will be evaluated, as follows 100 marks for project Continuous Assessment (portfolio) by internal guide, 100 marks for exam conducted by internal and external examiner appointed by BOE chairperson.

8. Credits :

- As per the undergraduate courses of university of Mysore

9. Declaration of results:

- The results of the B.Sc. (ARTIFICIAL INTELLIGENCE & DATA ANALYTICS) shall be declared as per the regulations of the Choice Based Credit System -Graduate courses of University of Mysore.

B.Sc. (AI & DA): DETAILED SYLLABUS FOR ACADEMIC YEAR 2020-21

SEMESTER SCHEME

YEAR	COURSE	SUBJECTS	L	T	P	CREDITS
FIRST SEMESTER	AECC 1A	Functional English - 1	3	0	0	3
	AECC 2A	Modern Indian Language (MIL)-1	3	0	0	3
	AECC- 3	Constitution of India	2	1	0	3
	DSC-1	Basics of Mathematics and Calculus for Science	5	1	0	6
	DSC-2	Fundamentals of Computers	5	1	0	6
	DSC-3	Programming in C	4	0	2	6
	TOTAL CREDITS		22	3	2	27

YEAR	COURSE	SUBJECTS	L	T	P	CREDITS
SECOND SEMESTER	AECC-1B	Functional English - 2	3	0	0	3
	AECC-2B	Modern Indian Language (MIL) -2	3	0	0	3
	AECC- 4	Environmental Science	2	0	0	2
	DSC-4	Discrete Mathematics	5	1	0	6
	DSC-5	Operating System and System Software	5	1	0	6
	DSC-6	Analysis of Algorithm with data structure	4	0	2	6
	TOTAL CREDITS		22	2	2	26

YEAR	COURSE	SUBJECTS	L	T	P	CREDITS
THIRD SEMESTER	AECC-3A	Functional English - 3	3	0	0	3
	AECC-3B	Modern Indian Language (MIL)- 3	3	0	0	3
	DSC-7	Linear Algebra	5	1	0	6
	DSC-8	Introduction to Big Data Analytics and Visualization	5	1	0	6
	DSC-9	Python Programming	4	0	2	6
	TOTAL CREDITS		20	2	2	24

YEAR	COURSE	SUBJECTS	L	T	P	CREDITS
FORTH SEMESTER	AECC-4A	Functional English -4	3	0	0	3
	AECC-4B	Modern Indian Language (MIL)-4	3	0	0	3
	DSC-10	Probabilities and Statistics	5	1	0	6
	DSC-11	Software Engineering	5	1	0	6
	DSC-12	Database Management System	4	0	2	6
	TOTAL CREDITS		20	2	2	24

YEAR	COURSE	SUBJECTS	L	T	P	CREDITS
FIFTH SEMESTER	DSC-13	Foundations of AI & ML	5	1	0	6
	DSC-14	Introduction to Neural Networks	4	0	2	6
	DSC-15	Big Data Management	4	0	2	6
	DSE-1	Elective -1 1. Computer Architecture 2. Image Processing	5	1	0	6
	TOTAL CREDITS		18	2	4	24

YEAR	COURSE	SUBJECTS	L	T	P	CREDITS
SIXTH SEMESTER	DSC-16	Deep Learning	5	1	0	6
	DSE-2	Elective - II: 1. Natural Language Processing; or 2. Information Security System	4	0	0	4
	DSE-3	Elective - Ill 1. Data Mining or 2. Fuzzy Logic and ANN	4	O	O	4
	SEC-1	Skill Enhancement Course - 1 1. Business Intelligence and Financial Analytics or 2. Introduction to Networks and Cloud Computing	4	0	0	4
	SEC-2	Skill Enhancement Course - 2: 1. Predictive Analytics and Web Analytics 2. Main Project	4	0	4	8
	TOTAL CREDITS		21	01	04	26

AECC: Ability Enhancement Compulsory Course; SEC: Skill Enhancement Courses; DSE: Discipline Specific Elective; DSC: Discipline Specific Course;

YEAR 1	SEMESTER 1	AECC-1A	FUNCTIONAL ENGLISH 1	CREDIT	3:0:0

OBJECTIVES:

1. To introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills that is integral to personal, social and professional interactions.

2. Inculcate abilities needed to students such as: ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

3. Fulfil the above state goals through an interactive mode of teaching-learning process and by focusing on various dimensions of communication skills: language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note-taking etc.

SYLLABUS

UNIT-I:

Introduction to grammar - What is grammar - Its importance, etc.; - Different approaches to grammar: Traditional - Generative - Trans formative - Communicative.

UNIT-II:

Articles and Determiners - Forms and Functions of Nouns, Pronouns and Prepositions.

UNIT-III:

Verbs (Transitive & Intransitive, Regular & Irregular) - Tense & Aspect -Auxiliaries (Primary & Modal)

Negatives - Questions - Agreement and Concord.

UNIT-IV.

Forms and Functions of Adjectives, Adverbs, Agreement and Concord.

Text Books and References:

"A Communicative Grammar of English", by G Leech and J Svarvik

"Complete Grammar", by J H Pandey

"Advanced English Grammar ", PC Wren and H Martin

YEAR 1	SEMESTER 1	AECC-2A	MODERN INDIAN LANGUAGES	CREDIT	3:0:0

OBJECTIVES:

To impart working knowledge on multi-lingual ability to students as part of projecting the composite culture of our country envisaged under Article 351 of the Indian Constitution and for strengthening national integration, MIL in **five** Indian languages viz., Kannada, Tamil, Telugu, Malayalam and Hindi are offered. Students can chose any **one** the above five languages for study.

SYLLABUS

As stipulated by the University of Mysore

YEAR 1	SEMESTER 1	AECC-3	CONSTITUTION OF INDIA	CREDIT	2:1:0

OBJECTIVES:

Students will learn the structure of the Constitution of India and its importance.

SYLLABUS

UNIT-I:

Meaning of the term "Constitution"-Its importance-making of the Indian Constitution 1946-49- Dr.Ambedkar's contribution-Preamble-Method of amending the constitution and its limitation-An over view of constitutional developments.

UNIT-II:

The democratic institutions created by the Constitution-bicameral system of legislature and cabinet form of government at the Center and States-Role and Position of President and Prime Minister-Adult Franchise System-Election Commission, Panchayat Raj System.

UNIT-III:

Fundamental Rights and Duties- Their content and significance-Special, rights created in the constitution for Dalit s, Backwards, Women, Children and the Religious and Linguistic Minorities. Enforcing rights through writs: Certiorari, Mandamus, Quo-Warr anto and Habeas Corpus-public interest Litigation Directive Principles of State Policy-The need to balance.

UNIT-IV:

Fundamental Rights with Directive Principles - Constitution and sustainable development. Doctrine of Separation of Powers- Legislative, Executive and Judicial and their composition and functioning in India Features of Indian Federalism -Center State relations. Measures for national Unit- Public Service Commissions.

TEXT BOOKS AND REFERENCES:

1. *'The Constitution of Indio- A Politico -Le go/ Study"* by J.C. Johari
2. *"Constitutional Law of India",* by J.N.Pandey
3. *"The Indian Constitution-Corner Stone of a Nation"* by Granville Austin

YEAR 1	SEMESTER 1	DSC-1	BASIC MATHEMATICS & CALCULAS FOR SCIENCE	CREDIT	5:1:0

OBJECTIVES:

Learning the basics of mathematics with applications - Equip students to get started with lab applications and hands-on training

SYLLABUS

UNIT-I:

Basics: Functions and Graphs - Basic of Complex Numbers - Differential Calculus (DIF) Limit s - Differentiation - Integral Calculus: Integration - Techniques of Integration - Calculus of Logarithmic - Exponential and Inverse Trigonometric Function - Applications of Integration - Techniques of Differentiation - Logarithmic Differentiation - Applications of Differentiation - implicit Differentiation - Basic Partial Derivatives - Functions of more -than-one Variable: Limits - Continuity - Partial Derivatives - Differentiability and Total Differential - Chain Rule

UNIT-II:

Leibnitz Theorem - Mean-value Theorem - Rolle's Theorem - Lagrange's Mean-value Theorem - Maxima and Minima - Calculus of Vector-valued Functions: Implicit Function Theorem - Directional Derivatives - Gradient s - Double Integrals - Surface Area - Triple Integrals - Line Integrals - Green's Theorem - Surface Integrals - Gauss' Divergence Theorem - Stokes' Theorem

UNIT-III:

Differential Equations - General Concepts - Formulation and Solution of Differential Equations - Solution of Higher Order Linear Differential Equations - Partial Differential Equations – Laplace and inverse Laplace Transforms

UNIT-IV: Theory of Numbers - Prime Numbers - Unique Factorization Theorem - Euclidean Algorithms - Congruencies - Fermat's Theorem - Wilson's Theorem

TEXT BOOKS FOR READING & REFERENCE: -

1. *"Basic Mathematics"*, Marvin L. Bittinger
2. *"Fundamentals of Calculus"*, Robert M. Stark, Carla C. Morris
3. *"Calculus"*, Ron Larson and Bruce Edwards
4. *"Contemporary Abstract Algebra"*, by Joseph Gallian
5. *"Introduction to Algorithms"*, by Thomas H.Corm en, Leiserson and Rivest
6. *'The Princeton Companion to Mathematics"*, by Timothy Gowers
7. *"Fundamentals of Complex Analysis Applications to Engineering & Science"*, Edward Saff, Snider

YEAR 1	SEMESTER 1	DSC-2	FUNDAMENTALS OF COMPUTERS	CREDIT	5:1:0

OBJECTIVES:

At the completion of the course students will gain hands-on experience and be conversant with operations of computers

SYLLABUS

UNIT-I:

Evolution of computers: Classes of computers, Communication and networks, Information processing cycle, Computer Hardware and software, Social Effects of Computers. Computer Component s: CPU, Memory, Secondary Storage, Input Devices- Keyboard , mouse, Scanner, Touchscreen, Digital Camera, Output devices- Audio output, Visual Display, Communication Devices, Bus.

UNIT-II:

System Software - Operating Systems - Personal operating systems, Smart phones, Utility Programs, Device Drivers, Application software - Productivity software , Classes of Software. Ethical issues related to computer software - Ethical issues for software users and soft war e producers. System Unit: Motherboards, Memory, Instructions and Machine cycle, Cache, ROM & other types, Data representation, Adapter cards, Connectors and ports, Video connectors, Networking - Intern et, How the web works.

UNIT-III:

Number Systems and Boo lean Algebra -Introduction to number systems- Numeric and Non-numeric representation of data - Decimal, Binary (Addition, subtraction, Multiplication, division, 1"s and 2"s complement methods), Octal and hexadecimal number systems. Conversion from one number system to another number system. Excess-3-code and Gray code. Conversion between Gray and binary codes. Logic Gates- AND, OR, NOT, and Universal Gates. Combinational Logic Circuit- Half and Full Adder, Half and Full Subtracters.

UNIT-IV:

Introduction to Office Automation - Word Processing, Page, Paragraphs format ting, creating tables, inserting special objects in a document s, mail merge. Spreadsheet - Features, Applications and Advantages, the spread sheet screen display, entering different types of data, Functions - Mathematical , Statistical and Date functions, creating and formatting chart s. Presentations - Features , Applications and advantages creating slides and formatting presentations, customized animation , inserting charts and other objects in a presentation.

TEXT BOOKS FOR STUDY AND REFERENCE:

1. *"Introduction to Computers"* by Darrell Hajek, Cesar Herrera (2019)
2. *"Computers Made Easy: From Dummy To Geek"* by James Bernstein
3. *"Digital Design: Wit on Introduction to the Verilog HDL, VHDL, and System Verilog",* by M. Morris R. Mano, Michael D. Ciletti, 6th Edition (2018)
4. *"Exploring Microsoft Office 2016"* by Mary Anne Poatsy, Robert T. Grauer, et.al, 1 st Edition
5. *"Computer Systems: A Programmer's Perspective",* by Randal E Bryant
6. *"Computer Architecture: A Quantitative Approach",* by John L. Hennessy
7. *"Principles of Secure Processor Architecture Design",* Jakub Szefer
8. *" Fixing Your Computer: Absolute Beginners' Guide",* Paul McFedries
9. *"Networking Bible",* by Barrie Sosinsky

YEAR 1	SEMESTER 1	DSC-3	PROGRAMMING IN C	CREDIT	4 : 0 : 2

OBJECTIVES

To familiarize the students with the basic concepts and to allow them to write programs using standard language infrastructure.

SYLLABUS

UNIT-I:

Programming Concepts and .Introduction to C language: System software, Application software. Program Translators - Assembler, Compiler, and Interpreter. Programming languages -Machine Level language, Assembly level language, High level language. Program development life cycle: Problem definition, analysis, Design, Coding, Testing and debugging, Documentation and maintenance. Algorithm Features, simple examples. Flowchart -Symbols used in a flowchart, suitable examples, Overview of C: Importance of C, basic structure of C program, executing a C program, sample C program, and Constants, variables and data types. C character set, C tokens, identifiers, constants, variables, declaration of variables, assigning values to variables. Data type conversion. Operators in C: arithmetic operators, relational operators. Logical operators, assignment operators, increment and decrement operators, conditional operators, bitwise operators, special operators, precedence of arithmetical expression, relational expression, logical expressions.

UNIT-II:

Input and output operations: Input and output statements, reading a character: get char (), writing a character: put char (), formatted and unformatted I/O statements. Control structures: Branching: i f, if else, nested if, else-if ladder, switch. Looping: while, do-while and for loop. Jump statements, nested loop s.

UNI T-III:

Arrays, Strings and Functions: Arrays: Introduction, single dimensional array, two-dimensional arrays, initializing 2 -d arrays, multidimensional arrays. Operations on arrays: traversal, insertion and deletion. Searching: linear search & binary search. Sort in g: bubble sort, selection sort and insertion Sort.

Strings: Declaring and initializing string variables, reading string from terminal, writing string to screen, putting strings together. Comparison of two strings, length of a string, copying a string, string operations using library functions & User defined functions. Functions:

Introduction, types of functions, need for user defined function s, function call, types of arguments, nesting of functions, a multi-function program, recursion, storage classes.

UNIT-IV:

Structures, Unions Pointers and Files Structures : Definition and declaration of a structure, assigning and accessing the members of a structure, structure initialization, structure elements in memory, comparison of structure variables, structure with in the structure, array within structures.

Unions: Definition and declaration, accessing the members of a union. Comparison of structure and union.

Pointers: Advantages of pointers, declaration of pointer variable, pointer expressions, pointers and functions: call by value and call by reference, pointers and arrays, array of pointers, pointer to pointer.

Files: Definition, types of files. Creating text file. Modes of opening a file, formatted and unformatted i/o operations, random files.

TEXTS BOOKS AND REFERENCES:

1. *"C Complete Reference"* by Herbert Schildt (4th Edition)
2. *"The C Programming Language"*, by Brian W. Kernighan
3. *"ANSI C Programming"* (PHI 2015) by Brain Verminghan & Dennis M. Ritchie
4. *"Programming with C'* by Byron Gottfried (2nd Edition)

YEAR 1	SEMESTER 1	AECC-1B	FUNCTIONAL ENGLISH-2	CREDIT	3 : 0 : 0

SYLLABUS

UNIT -I:

Introduction to Linguistic s and Phonetics - Air-stream Mechanism - Organs of Speech Mechanism, Classification and description of speech sounds in English a. Vowels and Diphthongs b. Consonants - Elementary Phonetic Symbols in Transcription

UNIT-II:

Verbs: linking verbs, auxiliaries, transitive ad-intransitive verbs, negative verbs and infinitives - Tenses, concord, adverbs, confusion of adjectives and adverbs, Degrees of Comparison

UNIT-III:

Introduction to the Language of Communication: Theory of Communication, types and modes of Communication; Verbal and Non-verbal (Spoken and Written), Persona l, Social and Business, Barriers and Strategies, Intra -personal, Inter -personal and Group communication

UNIT-IV:

Speaking Skills: Monologue, Dialogue, Group Discussion, Effective Communication, Interview, Public Speech - Reading and Understanding: Close Reading, Comprehension, Summary, Paraphrasing, Analysis and Interpretation - Writing Skills : Documenting, Report Writing, Making notes, Letter writing, E mail

Text books for reading & reference:-
1. *"Unlock: Reading and Writing Skills"*, BY Sabina Ostrowska
2. *"Soft Skills and Professional Communication"*, by Francis Peter SJ
3. *"Basic Communication Skills"*, by P Kiranmai Dutt and Geetha Rajeevan
4. *"Language in Use: Student s' Self-study Workbooks"*, by Adrrian Doff & Christopher Jones
5. *"Oxford Word Skills"*, by Ruth Gairns and Stuart Redman
6. *"English Vocabulary in Use: Advanced"*, by Michael McCarthy and Felicity O'Dell

YEAR 1	SEMESTER- 2	AECC-2B	MODERN INDIAN LANGUAGES -2	CREDIT	3 : 0 : 0

SYLLABUS

As stipulated by the University of Mysore

YEAR 1	SEMESTER- 2	AECC-4	ENVIRONMENTAL SCIENCE	CREDIT	2 : 0 : 0

SYLLUBUS

UNIT-I:

Introduction - Energy r e sources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles - Ecosystems Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposer - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids: introduction, types, characteristic features - Structure and function of the foll owing ecosystem :- a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem . D. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuarie.l

UNIT-II:

Biodiversity and its conservation: Introduction - Definition : genetic, species and ecosystem diversity – Biogeographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values Biodiversity at global, National and local levels - India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity : habitat loss, poaching of wildlife,man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity .

UNIT-III:

Environmental Pollution: Definition - Causes, effects and control measures of:- a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards Solid waste Management : Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevent ion of pollution - Pollution case studies - Disaster management : floods, earthquake, cyclone and landslides - Social Issues and the Environment - From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting,

watershed management Resettlement and rehabilitation of people: its problems and concerns - Case studies.

UNIT-IV:

Environmental ethics : issues and possible solutions; - Climate change - Global warming - Acid rain - Ozone layer depict ion - Nuclear accidents and holocaust - Case studies - Wasteland reclamation - Consumerism and waste products - Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act -Wildlife Protection Act - For est Conservation Act - Issues involved in enforcement of environmental legislation - Public awareness - Human Population and the Environment - Population growth, variation among nations - Population explosion - Family Welfare Programme- Environment and human health - Human Right s - Value Education - HIV / AIDS - COVID-19 - Wo m en and Child Welfare - Role of Information Technology in Environment and Human Health - Case Studies - Field Work: Visit to a local area hill (Chamundi Hill) and a lake.

TEXTS BOOKS AND REFERENCES:

1. *"Environmental Science: A Global Concern"*, by William Cunningham
2. *"Environmental Science and Engineering"*, by N Arumugam and V. Kumaresan

YEAR 1	SEMESTER 2	DSC -4	DISCRITE MATHEMATICS	CREDIT	5 : 1 : 0

OBJECTIVES:

To introduce students to most of the basic terminologies used in computer science courses; to familiarize the applications of algebraic structures; to make them understand the concepts and significance of lattices and Boolean algebra

SYLLABUS

UNIT-I:

Introduction: Sets and subsets - Operation on sets - Sequences - Division in the integers - Matrices - Mathematical structure - Logic: Proposition and logical operation - Conditional Statement - Methods of proof - Mathematical induction - Mathematical Logic - Statement and not at ion - Connectivity - Normal Forms - Theory of Inference - Statement calculus - Predicate calculus - Inference theory· of the predicate calculus - Counting: Introduction - Permutation, combinations - Pigeon-hole principle - Recurrence relations and digraph s - Product sets and partition s, relation s and Digraphs - Paths in relations and digraphs - Properties of relations - Equivalence relations - Computer representation of relations and Digraphs - Manipulation of relations - Transitive closure _ and Warshall' s algorithm - Function s: introduction - Function for computer science – Permutation functions - Growth of functions

UNIT-II:

Graph Theory: Basic concepts - Euler path s and Circuits - Hamiltonian paths and circuits - Relation and structure - Partially Ordered Sets - Lattice s - Finite Boolean Algebras - Functions of Boolean algebras - Boolean function as Boolean Polynomials Tress - Undirected trees - Minimal · spanning Trees - Semi-Groups and Groups: Binary Operations - Semi -groups, products and quotients of Semi-groups and Groups - Products and quotients of groups - Compatibility Theory - Languages - Finite state Machines - Semi-groups. Machines and languages - Analytical Geometry - Coordinates - Distance Formula - Section Formula - Area of a triangle Formula - Locus of Point - Straight Line: Slope and angles - Equations of Lines - Derivation - Point of intersection - Boolean Algebra: Introduction - Various Boolean

Identities Join-irreducible elements - Atoms and Min-terms - Boolean Forms and their Equivalence - Min-term Boolean Forms - Canonical Forms - Minimization of Boolean Functions - Applications to Switching Theory - The Karnaugh Map method.

UNIT-III:

Graph Theory - Definition of Graphs, Paths, Circuits, Cycles and Subgroups - Induced Sub – graphs - Degree of a vertex - Connectivity - Planar Graphs and their properties - Trees - Duler's Formula for connected Planar Graphs - Bipartite Graphs - Kur to wski' s Theorem and its use - Spanning Trees - Cut sets - Fundamental Cut-sets and Cycles - Minimal Spanning Trees and Kruskal's Algorithm - Matrix Representations of Graphs - Euler's Theorem on the Existence of Eulerian Paths and Circuits - Directed Graphs - Indegree and Outdegree of a Vertex - Weighted undirected Graphs - Dijkstra's Algorithm - Strong Connectivity - Warshall's Algorithm - Directed Trees - Search Trees -Tree Traversals.

UNIT-IV:

Computability Theory: Introduction - Finite state machines and the ir transition table diagrams - Equivalence of finite state machines - Reduced Machines - Homomorphism - Finite automata - Acceptors - Non-deterministic finite automata - Deterministic Finite Automata - Moore and Mealy Machines - Grammar and Languages -Phrase Structure Grammars - Rewriting Rules - Derivations Sentential Forms - Generation of Language - Context Sensitive Grammar and Languages - Regular sets - Regular Expressions - Pumping Lemma, Kleene's Theorem - Notions of Syntax Analysis - Polish Notations - Conversion of In fi x Expressions to Polish Notations - Reverse Polish Notation.

TEXT BOOKS FOR READING & REFERENCE

1. *"Discrete Mathematics and its Applications"*, Kenneth Rosen
2. *"Introductory Discrete Mathematics"*, V.K.Balakrishnan
3. *Beginner's Guide to Discrete Mathematics"*, W.D.Wallis
4. *"Discrete Mathematics with Applications"*, Susanna S. Epp
5. *"Discrete Mathematics for Computer Science"*, David Liben-Nowell

YEAR 1	SEMESTER 2	DSC-5	OPERATING SYSTEM & SYSTEM SOFTWARE	CREDIT	5:1 : 0

OBJECTIVES:

To understand the concepts, core structure, functions and design principles of the domain subject.

SYLLABUS

UNIT -1:

Introduction - What is Operating System, History, Computer Hardware Review, Operating System Zoo, Operating System Concepts, System Calls, and Operating System Structure. Processes and Threads: Processes, Threads, Inter -process Communication, Scheduling, and Classical IPC Problems Memory Management: No Memory Abstraction, Memory Abstraction, Virtual Memory, Page replacement Algorithms, Design Issues for Paging System, Implementation, and Segmentation.

UNIT - II:

Files Systems: Files, Directories, File -System Implementation, File -System Management & Optimization, Examples Input/ output: Principles of 1/ 0 Hardware, Software, 1/0 Software Layers, Disks, Clocks, User Inter faces, Thin Client s, Power Management. Deadlocks: Introduction, Ostrich Algorithm, Deadlock Detect ion, Recovery and Avoidance, Prevention

UNIT III:

Virtualization and Cloud: Requirements, Types, Techniques, Memory Virtualization, 1/0 Virtualization, Virtual Appliances, VMs on Multicore CPU, Clouds. Multiple Processor Systems: Multi Processors, Multi-Computers, Distributed Systems.

UNIT IV:

Security: Security Environment, OS Security, Controlling access to resources, Formal Models of Security systems, Cryptography basics, Authentication, Exploiting Software, Attacks, Malware, Defenses. Introduction to Android Programming, setting up development Environment, Discovering Kernel, HAL and virtual Hardware, Customizing Android Emulator, Enabling ARM translator and Native bridge

TEXT BOOKS FOR READING & REFERENCE

1. *"Modern Operating System"* by Andrew S. Tanenbaum (2015)
2. *"Android System Programming"* by Roger Ye
3. *"Operating System: Three Easy Pieces"* by Andrea C. Arpaci-Dusseau and Remzi H. Arpaci Dusseau (2015)

YEAR 1	SEMESTER 2	DSC-6	ANALYSIS OF ALGORITHM WITH DATA STRUCTURES	CREDIT	4 : 0 : 2

OBJECTIVES:

To introduce students to data structures and how they are implemented in different programming languages. Students will also learn typical usages through case studies.

SYLLABUS

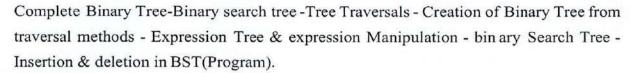**UNIT-I:**

Introduct ion: - Definitions - Concept Data Structure -Example - Need of Data structure; Advantages of using DS Algorithm & Pseudocode: - Algorithm Definition - Characteristics of algorithm - Elements of algorithm -Pseudocode example - Difference of Algorithm & Pseudocode Function: - What is function -Types of function -How function works -Function recursion and how it works - Array: -Concept of Array -Types of array - Basic Programs -Array with Functions - Single & Two-dimensional array in function argument. Pointer: - Pointer Basics -Pointer with functions - Call by reference -Array of pointers & pointer to array & Programs Structure : - Understanding about Structure - Pointer structure variable - Structure as function argument -using call by member value - hole structure and call by- passing reference of structure. Stack: -Operations on Stack - Array & Linked Representation -Programs on stack - Push & Pop operations -Traversing.

UNIT-II:

Applications of Stack: -Arithmetic Expression Evaluation - Notations, Infix - Postfix, Prefix - Conversion infix to post fix -Conversion postfix to infix -Evaluation of Postfix and Prefix using stack. Queue: - Operations on Queue -Array & Linked Representation -Programs on stack - Insert & Delete operations - Circular queue -representation -Deque - Priority Queue - Application of queue - Case Studies

UNIT-III:

Linked List: -Concept of linked list -Difference of linked list & array -Single linked list - Representation - Operations -Traversing – insertion (first node, last node, at a position, after a node value)- Deletion(first node, last node, at a position, after a node value) - Double link ed list -Representation - Operations, traversing - Insert ion (first node, last node, at a posit ion, aft er a node value) - Deletion (first node, last node, at a position, after a node value) - Circular link list & header link list example Tree: -Tree terminology -Binary tree -

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Complete Binary Tree-Binary search tree -Tree Traversals - Creation of Binary Tree from traversal methods - Expression Tree & expression Manipulation - bin ary Search Tree - Insertion & deletion in BST(Program).

UNIT-IV:

Algorithm Analysis: Performance Analysis Asymptotic Notation Graph: -Graph terminology -Representation of graphs - Path matrix -Graph Traversal -BFS (breadth first search) - DFS (depth first search) - Minimum spanning Tree - Kruskal's Algorithm & Prim's Algorithm -Warshall's algorithm (shortest path algorithm). Hashing & Searching: - Linear and binary search methods - Hash functions - Hashing techniques & Chaining. Sorting: -Bubble sort -Selection sort Insertion sort -Quick sort - Merge sort -Heap sort - Radix sort

TEXT BOOKS FOR STUDY AND REFERENCE:

1. *"Data Structures and Algorithms Using CII" by Michael McMillan (2007)*
2. *"Introduction to Algorithms" by Thomas H Cormen, Charles E Leiserson (2nd Edition)*
3. *"Doto Structures and Algorithms made easy", by Narasimha Kanumanchi*
4. *Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.*

| YEAR 2 | SEMESTER 3 | AECC-3A | FUCNTIONAL ENGLISH -3 | CREDIT | 3 : 0 : 0 |

SYLLABUS

UNIT-I:

Pronunciation : phonemic symbols - consonants - vowels - syllables - word stress - strong and weak forms - intonation - principles of grammar - verbs and nouns - use of thesaurus - Listening skill s: Difference between listening and hearing - active listening - barriers - academic listening - listening for details - simultaneous notes taking - listening for sound contents of videos - descriptions - meanings - announcements - news programs.

UNIT-II:

Phonology - Received Pronunciation (RP) - General Indian English (GIE) - Syllable and Syllable Structure - Word Accent - Accent and Rhythm in Connected Speech - Intonation - Assimilation and Elision

UNIT-III:

Speaking skills - nature of communication - importance of context - formal and informal - expressions in different situations - greeting and introduction - request making - seeking and granting permissions - instruct ions and directions - agreements and advices - telephonic skills - conversational etiquette.

UNIT-IV:

Voice -Direct and Indirect Speech - Sentence Connectors - Guided Paragraph Writing - Dialogue practices - Practice in exhibition of elegances and eloquence - Classroom workshop

TEXT BOOKS FOR READING & REFERENCE

1. *"English in Use"*, by T Vijay Kumar, K Durga Bhavani and Y L Srinivas
2. *"Longman Grammar of Spoken and Written English"*, by Douglas Biber
3. *"PracticeMakes Perfect Basic English"*, by Ju li e Lachance
4. *"Wo rd Power Mode Easy"*, by Norman Lewis
5. *"English Words and Sentences"*, by Eva Duran Eppler and Gabriel Ozon

YEAR 2	SEMESTER 3	AECC-3B	MODERN INDIAN LANGUAGES -3	CREDIT	3 : 0 : 0

SYLLABUS

As stipulated by the University of Mysore

| YEAR 2 | SEMESTER 3 | DSC-7 | LINEAR ALGEBRA | CREDIT | 5 : 1 : 0 |

OBJECTIVES

To familiarize the students with basic concepts of domain subject and its applications

SYLLABUS

UNIT - I:

Fields, vector spates, subspaces; line ar depend ence and independence; basis and dimension of a vector space, finite dimensional vector spaces completion theorem. Examples of vector spaces over real and complex fields. Linear equations. Vect or spaces with an inner product, Gram-Schmidt ort hogonalization process. Orthonormal basis and orthogonal projection of a vector.

UNIT - II:

Linear c transformations, algebra of matrices, row, and column spaces of a matrix. Elementary matrie s, determinants, rank, and inverse of a matrix. null space and nullity; partitioned matrices; Kronecker product. Hermite canonical form, generalized inverse, Moore Penrose Inverse, Idempotent matrices. Solutions of matrix equations .

UNIT- Ill:

Triangular reduction of a positive definite matrix. Characteristic roots and vectors, Cayley Hamilton theorem, minimal polynomial, similar matrices. Algebraic and geometric multiplicity of characteristic roots, spectral decomposition of a real symmetric matrix, reduction of a pair of real symmetric matrices, Hermitian matrices.

UNIT - IV:

Real quadratic forms, reduction and classification of quadratic forms, index and signature. Singular values and singular decomposition, Jordan decomposition, extreme a of quadratic forms. Vector and matrix differentiation.

TEXT BOOKS FOR READING & REFERENCE:-

1. *"Linear Algebra and its Applications"*, by Gilbert Strang, 5th Edition (2016) Schaum Series
2. *"Elementary Linear Algebra"*, by S.F. Andrilli, D. Hecker, 5th Edit io n, Associated Press {2016)
3. *"Contents of Linear Algebra: Pure and Applied"*, by Edgar Goodaire
4. *"Linear Algebra and its Applications"*, by David C. Lay, Steven R. Lay and Judi J.

YEAR 2	SEMESTER -3	DSC-8	INTRODUCTION TO BIG DATA ANALYTICS & VISUALIZATION	CREDIT	5 : 1 : 0

OBJECTIVES:

To understand basic concepts, principles and approac hes to description of the Big Data landscape and get acquainted with the archit ectural components and programming models for scalable data analysis. To imp art knowledge to student s on understanding and analyzing Big Data, that is a fast changing technology, by hands-on expe rience on analytics, mobile, social and securit y issues. They get an insight into tools, algorithms and plat for ms to be employed in real world applications.

SYLLABUS

UNIT -I:

Introduction - Big data: definition and taxonomy - Big data value for the enterprise - Sett in g up the demo environment - First steps wit h the Hadoop "ecosystem" - Classroom exercises - The Hadoop ecosystem - Introduction to Hadoop - Hadoop components: MapReduce/Pig / Hive/ HBase - Loading data into Hadoop - Handling files in Hadoop - Gett ing data from Hadoop Querying big data with Hive - Intro duction to the SQL Language - From SQL to HiveQL Exercises 4 Querying big data with Hive - Introduction to HIVE e HIVEQL - Using Hive to query Hadoop files - Classroom exercisesBig data & Machine learning – Quick into to Machine learning - Big Data & Machine Learning - Machine learning tools - Spark & SparkML - H20 - Azure ML - Big data & Machine learning - Next steps in the big data world - Classroom exercises - A case study

U N I T-II:

HDFS {Hadoop Distributed Fil e System) - Design of HDFS - Concepts - Command-line Inte rface - Data Ingest - Map Reduce: Map Reduce Job Run - Failures - Job Scheduling - Shuffle and Sort - Task Execution - Map Red uce Types and Formats - Map Reduce Features - Hadoop Eco System Pig: Modes of Pig - Comparison of Pig with Databases - Grunt - Pig Latin - User Defined Functions - Data Processing operators - Introduction to BigSQ L - Data Analytics with R Machine Learning: Introduction - Superv i sed Learning - Unsupervised Learn in g - Collaborative Filtering - Big Data Analytics with BigR.Applications on Big Data using Pig and

Hive: Introduction - Data processing in Pig - Hive Services - HiveQL - Predict ive Analytics - Simple Linear Regression - Multi- Linear Regression - Regression Coefficients - Visual Data Analysis - Interaction techniques - Systems and applications - NoSQL Databases: Schema - less Models - Flexibility for Data Manipulation - Key Value Stores - Document Stores - Tabular Stores - Object Data Stores- Graph Databases Hive- Sharding- Hbase - Analyzing big data with twitter

UNIT- III:

Triangular reduction of a positive definite matrix. Characteristic roots and vectors, Cayley Hamilton theorem, minimal polynomial, similar matrices. Algebraic and geometric multiplicity of characteristic roots, spectral decomposition of a real symmetric matrix, reduction of a pair of real symmetric matrices, Hermitian matrices.

UNIT-IV:

Data Visualization: Introduction - Types - Visual Encoding - Bar Chart - Pie Chart - Line Chart- Multiple Chart :.. Highlight Tables - Scatter Plot - Heat-M ap - Geographic Mapping - Gnatt Chart - Circle View ,- Tableau - Data Import - Data Extraction - Relationship to Data Management - Pivot - Hierarchy - Decision Analytic Thinking: Introduction - Expected Value Framework - Structuring business problems - Fitting a Model: Introduction - Characteristics of a good model - Evaluation Process - Plain Accuracy - Con fusion Matrix - Unbalanced Classes - Frame Classifier Evaluation - Performance - Data Visualization using Tableaus-Classroom Exercises Data Analytics with R Machine Learning: Introduction - Supervised Learning - Unsupervised Learning - ,Collaborative Filter in g - Big Data Analytics with BigR - Intro to Oozie - Intro to NoSQL Data Management -

Case Studies

TEXT BOOKS FOR READING & REFERENCE

1.   *"Big Datafor Beginners ", by Vince Reynolds*
2.   *"Big Data Analytics", Radha Shankaramani and M.Vijayalakshmi*
3.   *"Business Analytics: The Science of Data-Driven Decision M aking", U. Dinesh Kumar*
4.   *'Too Big to Ignore: The Business Case for Big Data", Phil Sim on*
5.   *'The Data Revolution: Big Data, Data Infrastructure s and consequences", Rob Kitchin*
6.   *"Big Data at Wark", T. H. Davenport*
7.   *"Analytics in A Big Data World", Bart Baesens*
8.   *"Big Data and Analytics", Seema Acharya and Subhashini Chellappan*

YEAR 2	SEMESTER- 3	DSC-9	PYTHON PROGRAMMING	CREDIT	4 : 0 : 2

OBJECTIVE:

To introduce students to the programming language and enhance their technical abilities.

SYLLUBUS

UNIT - I:

Introduction: What is Python, What is python good for? What isn't Python good for? Python Fundamentals: Exec ut in g Python program, Script, program or Module. Component s of Python Program: Built in object types, Statements

UNIT - II:

Functions: Definition and Execution, Scoping, Arguments, Return Values, Advanced function calling. Modules: Importing modules, Tricks for importing modules, Packages, Creating a module, Python's built-i n functions

UNIT - III:

Object Orientation: Creating a Class, Exception and Error Trapping: Exception and occurring, Exception Handling, Built -In Except ions , Rolling you row n Exceptions

UNIT - IV:

Interfacing to the OS: Working with System, OS, Multithreading. Processing In format ion: Manipulating numbers and text, Time, Data types and operators. Working with Files: File processing, controlling file 1/ 0 , getting file list s, File/Directory management, Access, and ownership, manipulating file paths. Data Management and st or age: Managing internal structures, Object Persistence.

TEXT BOOKS FOR READING & REFERENCE

1. *"The Complete Reference Python"* by Martin C. Brown (2018)
2. *"Head First Python: A Brain-friendly Guide"*, Paul Barry
3. *"Python Automation Cookbook"*, Jaime Buelta
4. *"Learn Python The Hard Way"*, Zed A Shaw
5. *" Python Crash Course: Hands-on, Project-based Introduction to Programming"*, Eric Matthes

YEAR 2	SEMESTER 4	AECC-4A	FUCTIONAL ENGLISH-4	CREDIT	3:0:0

SYLLUBUS

UNIT-I:

Interactions in Meetings face-to-face: Opening Greetings - Reply to Greetings - Introduction: Self and others - Welcoming - Bidding farewell - Interview appearance: Maintain Gaiety - Self Introduct ion –Present oneself; Interaction via phone: Etiquette to maintain during conversation - Taking Messages - Making Enquiri es - Comp laining - Seeking/Giving Information - Notes Making

UNIT-II:

Address Gatherings: Etiquette to maintain - Public Address - Presentation: Preparation Needed - Techniques: Answering Queries - Offering Opinions - Persuading the audience -Offering Opinions - Presenting Arguments - Promoting Products/Services; Voice Delivery: Modulation - Problems of Voice Quality and Delivery - Categories of Sounds - Accent to maintain - Types of Audience in Mass Communication - Feedback: Nature - Importance - Market-bi:lsed and Research-based Feedback.

UNIT-III:

Conversational Skill s: Introduction - Definition - Types of Communication - Barriers; - Interview: Purpose - Homework needed - Writing Questions for Interview - Conducting/ Facing an interview - Gait, Dress Sense, Grace and Demeanour - Nuances.

UNIT-IV:

Group Discussion Techniques; - Anchoring: Theory behind - Modes of Anchoring; - Class presentations - Power-point Presentations - Webinars Participation

TEXT BOOKS FOR READING & REFERENCE
1. *"Communication Skills",* by M Raman and S Sharma
2. *"Mass Communication in India",* by K J Kumar
3. *"Media In Development Arena",* R K Ravindran
4. *"Improve Your Communication Skills",* by Barker and Alan
5. *"Essential Speaking Skills",* by Baker, Joannaand Hearher
6. *"Speaking",* by Bygate Martin

YEAR 2	SEMESTER 4	AECC-4B	MODERN INDIAN LANGUAGES -4	CREDIT	3 : 0 : 0

SYLLABUS

As stipulated by the University of Mysore

YEAR 2	SEMESTER- 4	DSC-10	PROBABILITIES & STATISTICS	CREDIT	5 : 1 : 0

OBJECTIVES:

To familiarize the students with basic concepts of domain subject and its applications.

SYLLABUS

UNIT - I:

Sam ple Spaces - events - probability axioms - conditional probability - independent events - Baye's formula. Random Variables: Discrete, Continuous and Joint pro b ability Distribution, Expectation, Functions of Random Variables.

UNIT - II:

Discrete Probability distributions: Binomial and Multinomial, Hypergeometric Distribution, Poisson Distribution. Continuous Probability Distributions - Binomial, uniform, normal, gamma & exponential, beta, chi-squared distributions.

UNIT - III:

Random sampling, statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S2, t-Distribution, F Distribution, Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, P Values for Decision Making in Testing Hypotheses, Sing le and Two Sample tests concerning mean and variance

UNIT.IV:

Correlation - Regress ion - The Simple Linear Regression Model, Least Squares and the Fitted M ode l, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Choice of a Regression Model, Analysis-of-Variance Approach, Test for Linearity of Regression, Correlation.

TEXT BOOKS FOR READING & REFERENCE

1. *"Probability & Statistics for Engineers & Scientists"* by Rona ld E. Walpole, Raymond H. Myers, Sharon l. Myers
2. *"Probability, Statistics and Random Processes"*, by AL Garcia
3. *"Intuitive Probability and Random Processes using MATLAB"*, by 5 M Kay

YEAR 2	SEMESTER -4	DSC-11	SOFTWARE ENGINEERING	CREDIT	5 : 1 : 0

OBJECTIVES:

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

- Appreciate the importance of having a process for software development;
- Understand the various activities undertaken for a software development project following the Function Oriented Design & Object Oriented Design;
- Understand the issues in code design and development;
- Test software developed using SSAD and OOAD methodologies
- Have in depth knowledge about the different OOAD Themes and compare them with SSAD.

UNIT-I:

SOFTWARE PROCESS Introduction -S/W Engineering Paradigm - life cycle models (water fall, incremental, spiral, prototyping, object oriented) - system engineering - computer based system – verification validation - life cycle process - development process -system engineering hierarchy.

UNIT-II:

SOFTWARE REQUIREMENTS: Role of Management in Software Development, Role of Metrics and Measurement, Problem Analysis, Requirement Specification, Validation, Metrics, Monitoring and Control. Software Prototyping - Prototyping in the software process - Rapid prototyping techniques - User interface prototyping -S/ W document. Analysis and modelling - data, functional and behavioral models - structured analysis and data dictionary.

UNIT-III:

DESIGN CONCEPTS AND CODING: System Design, Problem Partitioning, Abstraction, Top-down and • bot tom -up Design, Structured Approach, Functional v/s Object-Oriented Approach, Design specification & verification, metrics. Coding : Top-down & Bottom-up, Structured Programming, Information Hiding, Programming Style, Internal Documentation, Verification, Metrics, monitoring &control

UNIT-IV:

TESTING AND PROJECT MANAGEMEN T: Taxonomy of software testing - levels - test activities - types of s/w test - black box testing - testing boundary conditions- Functional

Testing, - structural Testing, Levels of Testing -Structural Testing, Test Plan, Test Cases Specification, Reliability assessment. Testing - integration tests validation testing - system testing and debugging. Software Project Management, Cost Estimation, Project Scheduling, Staffing. Software Con figuration Management, Quality Assurance. Measures and measurements - S/W complexity measure - size mea sure - data and logic structure measure - information flow measure. Software cost estimation COCOMO model- Delphi method.- software maintenance

TEXT BOOKS FOR STUDY AND REFERENCE:

1. *"Fun domen tols of Software Engineering",* by Ghezo
2. *"Software Enginee ring: Concepts ond Practices",* by Ugrasen Suman
3. *"A Textbook of Software En gineering",* by Nazeer Shaik
4. *"Patterns of Enterprise Application Architecture",* by Martin Fowler

YEAR 2	SEMESTER-4	DSC-12	DATABASE MANAGEMENTSYSTEMS	CREDIT	4 : 0 : 2

OBJECTIVES:

To impart in-depth knowledge on Structured Query Language, bring capability to build database and write database triggers, cursors and index.

SYLLUBUS

UNIT - I:

Introduction to Database System Concepts and Architecture Databases and Database Users, Characteristics of the Database Approach, Actors on the Scene, Advantages of Using a DBMS Data Models, Schemas and Instances, DBMS Architecture and Data Independence , Database Languages and Interfaces, The Database System Environment Data Modelling Using the Entity -Relationship Model Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraint s, Weak Entity Types, ER Diagrams, Naming Conventions and Design Aspects

UNIT - II:

Transaction- Transaction Concepts, States, ACID properties, Concurrent executions, Serializability Relational Data Model, Relational Constraints, and Relational Algebra Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Basic Relational Algebra Operations, Additional Relational Operations, Examples of Queries in Relational Algebra. Normalization- Functional Dependencies, Transitive and Multivalued dependency, First Normal form, Second Normal Form, Third Normal Form and Boyce Codd Normal Form

UNIT - Ill :

Advantages of RDBMS- Codd's Rule s. SQL-The Relational Database Standard Data Definition, SQL Data Types and Schemas, Constraint s, Basic Queries in SQL, Insert, Delete, and Update Statements in SQL, Set Operation s, Aggregate functions, Views (Virtual Tables) in SQL, Joins - Inner, Outer and Self, Additional Features of SQL,DCL-commit, Rollback, Save-point, Grant privileges.

UNIT - IV:

Storage Strategies - Indices, B-Trees, Hashing. Transaction Processing, Transaction and System Concept s, Properties of Transactions Locking Techniques for Concurrency Control, Timestamp based schedules, Database Recovery Techniques Introduction - Object-Oriented and Object Relational Databases, Logical Database, Web Databases, Distributed Databases, Data Warehouse and Data Mining

TEXT BOOKS FOR READING & REFERENCE

1. *"Principles of Database Management"* by Wilfried Lemahieu, Seppevanden Broucke, Bart Baesens (2018).

2. *"SQL: The Complete Reference",* Groff and James (3rd Edition)

YEAR 3	SEMESTER -5	DSC-13	FOUNDATIONS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	CREDIT	5 : 1 : 0

OBJECTIVES:

To introduce to students Al and ML concepts and gain application of the principles in real-world scenario.

SYLLUBUS

UNIT -1:

Introduction to Al: What is Al, Foundations of Al, History of Al, State of the Art Intelligent Agents: Agents and Environment, Good Behaviour, Nature of Environments, The structure of agents. Logical Agents, First order logic, Inference in First order logic.

UNIT - II:

Introduction to ML: Machine Perception, Pattern Recognition systems, Design Cycle, Learning and Adaptation. Bayesian Decision Theory: Minimum error rate classification, Classifiers, Discriminant functions & Decision surfaces, Discriminant functions for Normal Density, Maximum -Likelihood estimation, Bayesian Estimation - Gaussian Case, PCA, Fisher Discriminant Analysis. Expectation Maximization

UNIT- III:

K-Nearest Neighbor Estimation and Rule, Metrics and Nearest Neighbor Classification, Support Vector Machines - linear SVM , Slack variables, nonlinear SVMs, Kernel trick, multi-class SVMs.

UNIT -IV:

Hidden Markov Models - First order HMM, Evaluation, Decoding & Learning, Discrete HMMs and Continuous HMMs, Combining Classifiers: boosting.

TEXT BOOKS FOR READING & REFERENCE

1. *"Pattern Classification"* by Richard O Duda, Hart, Start {2nd Edition)
2. *"Artificial Intelligence: A Modern Approach"* by Stuart Russell, Peter Norvig {4th Edition)
3. *"Pattern Recognition"* by Sergios Theodoridis, Konstantinos Koutroumbas (4th Edition)
4. *"Machine Learning using Python"* by U Dinesh Kumar Manaranjan Pradhan (2019)

YEAR 3	SEMESTER -5	DSC-14	INTRODUCTION TO NEURAL NETWORKS	CREDIT	4 : 0 : 2

OBJECTIVES:

To introduce the students basic neuron models, network models, basic learning algorithms and applications.

SYLLABUS

UNIT - I:

Introduction: What is Neural Network, Human Brain, Models of Neuron, Neural Networks Viewed as Directed Graphs, Feedback, Network Architecture, Knowledge Representation, Learning processes and tasks.

UNIT - II:

Filtering Structure of the LMS Algorithm, Perceptron and its Convergence theorem, The Batch Perceptron Algorithm, The Least-Mean-Square Algorithm, Virtues and Limitations of the LMS Algorithm

UNIT - III:

Multilayer Perceptron: Preliminaries, Batch Learning and On-Line Learning, The Back-Propagation Algorithm, XOR Problem, Back Propagation and Differentiation, The Hessian and Its Role in On-Line Learning, Optimal Annealing and Adaptive Control of the Learning Rate, General ization, Appro ximat ions o f Functions, Cross-Validation, Complexity Regularization and Network Pruning , Virtues and Limitation s of Back-Propagation Learning.

UNIT - IV:

Radial -Basis-Function Networks, Boltzmann Machine. Two Basic Feature Mapping Models, Self Organizing Map, Properties of the Feature Map

TEXT BOOKS FOR READING & REFERENCE

1. *"Neural Networks and Learning Machines"* by Simon Haykin {3rd Ed it ion)
2. *"Neural Networks -A Visual Introduction for Beginners"* by Michael Taylor {2017)
3. *"Neural Network Design"* by M art in T. Hagan, Howard B. Demuth, Mark Hudson Beale, Orlando De Jesus

YEAR 3	SEMESTER -5	DSC-15	BIG DATA MANAGEMENT	CREDIT	4 : 0 : 2

OBJECTIVES:

Through this advanced level course students will get imbibed with real-world cutting edge data management technologies that help them acquire the skills to handle vast amounts of complex data in practice. The students will also be exposed to nuances for presenting research paper in the field.

SYLLABUS

UNIT-I:

Advanced topics in Big Data Management - Distributed and Parallel Data Management Framework - Data Management in Cloud - Programming Models and Declarative languages - Managing high velocity data streams - Distributed data management: Using Sp ecialized Processors - Big Data Cleaning - Data Science in the current Century - Application of Big Data Management principles in real-world.

UNIT-II:

Big Data Tools: SAS: Introduction - Cloud-source Proprietary software - Statistical modelling - Statistical Libraries - Usages - Apache Spark: Introduction - Batch Processing and Stream Processing - Comparison with MapReduce - Spark for real-time data - Conjunction with Scala - Speed in Spark

UNIT-III:

BigML: Introduction - Processing ML Algorithms - Usages in Forecasting, Risk Analytics and Product Innovation - Rest APls - Visual Charts on loT devices - D3.js: Introduction to Java-script Library - Animated transitions - Combination with CSS - MATLAB: Intro duction - Processing mathematical information - Usage in scientific disciplines - Neural Networks - Fuzzy Logic - Limitations - MS Excel: Introduction - Connecting with SQL - Analyzing data - Usages - ggplot 2: Introduction - tidyverse - Library for creating & customizing visualizations - St y le s of Maps (choropleths, cartgrams, hexbins, etc) - Tableau: Introduction - Usages - Interface with databases, spreadsheets, Online Analytical Processing, etc - Plotting in maps -

Jupyter : Introduction - Applications - Julia, Python and R - Jupyter Notebooks - Collaboratory - Google Drive

UNIT-IV:

Matplot lib: Introduction - Pyplot - Data Visualization with Python - Natural Language Tool Kit (NLTK): Introduction -Collection of libraries in Python - Sci Kit Learn: int r oduction - Supporting features - Usages – Tensor Flow: Introduction - Multidimensional arrays - Processing advanced ML Algorithms - WEKA: Introduction - GUI Software - Usages - Pandas: Applications - Usages - NumPy: Applications - Usages - Plotly: Introduction - Applications - Visualizat ion of data - Usages

TEXT BOOKS FOR READING & REFERENCE:-

1. *"Big Data: Techniques and Technologies in Geo-informatics"*, Hassan A. Kanmi
2. *"Designing Doto-intensive Applications: The Big Ideas"*, Mart in Kleppmann
3. *"Practical Statistics far Doto Scientists"*, Peter Bruce and Andrew Bruce
4. *"Python far Data Analysis"*, Wes McKinney
5. *"Python Machine Learning by Example"*, Yuxi Liu (Kindle version)
6. *"Inflection Point: How the Convergence of Cloud, Mobility, Apps and Data Will Shape the Future af Business"*, Scott Stawski
7. *"The Big Data Handbook: Advice and Insights"*, Carl Shan and William Chen

YEAR 3	SEMESTER -5	DSE-1	COMPUTER ARCHITECTURE	CREDIT	5 : 1 : 0

OBJECTIVES:

To understand the Big Data Platform and its applications; to identify business applications.

SYLLABUS
UNIT I:

Number Systems – decimal, binary, octal, hexadecimal, alphanumeric representation, 2.Complements 3. Fixed point representation – Integer representation, arithmetic addition, arithmetic subtraction, overflow, decimal fixed point representation, Floating point representation Subtraction algorithms of signed 2's complement data, Multiplication algorithm, Booth's algorithm, Division algorithm

UNIT II

Register transfer and micro-operations Register transfer language, Register transfer, Bus system for registers, Memory transfers– memory read, memory write, Micro operations – register transfer micro operations, arithmetic micro operations, logic micro operations, shift micro operations, Binary adder, binary adder, subtractor, binary incrementer, arithmetic circuit for arithmetic micro operations, Instruction codes, Direct address, Indirect address & Effective address, List of basic computer registers, Computer instructions: memory reference, register reference & input – output instructions Block diagram & brief idea of control unit of basic computer, Instruction cycle, Control memory, Address sequencing

UNIT III

Memory organization Memory hierarchy, Main memory definition, types of main memory, types of RAM, ROM, difference between SRAM & DRAM, Cache memory, Cache memory mapping – Direct, Associative, Set Associative, CAM, hardware organization of CAM, Virtual memory, mapping using pages, page fault, mapping using segments, TLB,

UNIT IV

Central processing unit : General register organization, Stack organization, Register stack, Memory stack, Stack operations – push & pop, Evaluation of arithmetic expression using stack, Instruction format, Types of CPU organization , Three, two, one & zero address instruction, Definition and example of data transfer, data manipulation & program control instructions, Basic idea of different types of interrupts Difference between RISC & CISC, Pipeline and vector processing (3L) Parallel processing, Flynn's classification, Pipelining, space time diagram, speedup, Basic idea of arithmetic pipeline, addition/ subtraction using pipeline

TEXT BOOKS FOR READING & REFERENCE

1. *Computer System Architecture*, M. Morris Mano, PEARSON
2. *Computer Organization & Architecture –Designing For Performance*, William Stallings, PEARSON
3. *Computer Architecture & Organization*, J.P. Hayes, TATA MCGRAW HILL
4. *Computer Organization and Architecture*, T. K. Ghosh, TATA MCGRAW-HILL
5. *Computer Architecture*, Behrooz Parhami, OXFORD UNIVERSITY PRESS

| YEAR 2 | SEMESTER -5 | DSC-1 | IMAGE PROCESSING | CREDIT | 5 : 1 : 0 |

OBJECTIVES:

After completion of the course, the students will have understood: (a) the basic image enhancement techniques in spatial and frequency domains; (b) various kinds of noise and how to restore the noisy image; (c) basic multiresolution techniques; and (d) applicat ion of the concepts for image handling.

SYLLABUS

UNIT - I:

Digital Image Fundamentals: What is Digital Image Processing?, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships Between Pixels, Linear and Nonlinear Operations.

UNIT - II:

Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. Frequency Domain: Preliminary Concepts, The Discrete Fourier Transform (OFT) of Two Variables, Properties of the 2-D OFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filtering.

UNIT - III:

Restoration: Noise models, Restoration in the Presence of Noise only using Spatial Filtering and Frequency Domain Filtering, Linear, Position -Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.

UNIT - IV:

Morphology and segmentation: Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transforms, Some Basic Morphological Algorithms. Segmentation: Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds. Representation and Description: Multiresolution Expansions Representation, Boundary descriptors.

TEXT BOOKS FOR READING & REFERENCE:-

1. *"Digital Image Processing"* by Rafael C. Gonzalez, Richard E. Woods (4th Edition)
2. *"Principles of Digital Image Processing",* by Burger, Wilhelm, Burge, Mark J... *"Mastering OpenCV4 with Python"* by Alberto Fernandez Villan

YEAR 3	SEMESTER -6	DSC-16	DEEP LEARNING	CREDIT	5 : 1 : 0

OBJECTIVES:

To introduce the students with neural networks and set ate-of-t he-art approaches to deep learning; to train students to design neural network architectures.

SYLLABUS

UNIT - I:

Deep Feed Forward Networks: Gradient based learning, Hidden units, Architecture Design, Back propagation, and other differentiation algorithms. Regularization for Deep Learning: Parameter Norm Penalties, Norm penalties as constrained optimization, Regularization and under constrained problems, Dropouts, Adversarial Training.

UNIT - II:

Optimization for training Deep models: Challenges in NN optimization, Basic Algorithms, Parameter Initialization strategies, Algorithms with adaptive learning rates, approximate second-order methods. CNN: Basic concepts of Convolutional Neural Networks, Convolution and pooling operation, variants of basic convolution function, structured outputs, efficient convolution algorithm. Discussions on famous convent architectures.

UNIT - III:

Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder sequence to sequence architecture, deep recurrent network, Long-Short Term Memory. Performance Metrics, Baseline models, data size, hyper parameters, debugging strategies, digit recognition.

UNIT- IV: Auto encoders & GANs: Intro duct ion, Architecture, Implementation, Denoising Auto encoders, Sparse Auto encoders, Use Cases, and Introduction to Generative Adversarial Networks.

TEXT BOOKS AND REFERENCES

1.   *"Deep Learning"* by Bengio, Yoshua, Ian J.Goodfellow, and Aaron Courville. An MIT Press book in preparation. (2016).

2.   *"Neural Networks and Deep Learning"* by Michael Nielsen, Determinat ion Press, 2015.

3.   *"Deep Learning with Python"* by Francois Chollet, 1/e, Manning Publications Company, 2017.

4.   *"GANs in Action"* by Jakub Langr and Vladimir Bok {Manning, 2019)

YEAR 3	SEMESTER -6	DSE-2	NATURAL LANGUAGE PROCESSING	CREDIT	4 : 0 : 2

OBJECTIVES:

To prepare students to cope with high volume of data and give them ability in applying the techniques to real-world applications

SYLLABUS
UNIT-I:

Language Processing: Text and words, simple statistics, Automatic natural language understanding, text corpora, conditional frequency distribution, lexical resources and word net. Accessing Text, text processing with Unicode, regular expression for detecting word patterns and applications, normalizing text, tokenizing text, segmentation.

UNIT-II:

Categorizing and tagging words: Tagger, tagged corpora, automatic tagging, Engram tagging, transformation -based tagging, determining category of word. Supervised classification - Gender Identification, Choosing the Right Features, Document Classification, Part-of-Speech Tagging, Exploiting Context, Sequence Classification, Sentence Segmentation, Identifying Dialogue Act Types, Recognizing Textual Entailment.

UNIT-III:

Information Extraction, chunking, development and evaluating hunkers, recursion in linguistic · structure, named entity recognition, relation extraction. Context free grammar and parsing, dependencies, grammar development, grammatical feature, processing feature structures, extending feature-based grammar. Semantics of English sentences.

UNIT-IV:

Building Chatbots: Rasa NLU, training and building chatbot from scratch, dialog management using rasa core, writing custom actions of the chatbot, data preparation for training and testing the bot.

TEXT BOOKS FOR READING & REFERENCE

1. *"Natural Language Processing with Python"*, by Steven Bird, Ewan Klein & Edward Loper
2. *"Building Chatbots with Python"* by Sumit Raj A Press Pub.
3. *"Natural Language Processing in Action"* by Hobson Lane, Hannes Max Hapke, Cole Howard {Manning, 2019)
4. *"Speech and Language Processing"*, Daniel Jurafsky and Jam s Martin

YEAR 3	SEMESTER -6	DSE-2	INFORMATION SECURITY SYSTEM	CREDIT	4:0:2

OBJECTIVES:

To enable students assess the security landscape, appraise the interrelationships among elements forming part of a modern current system and design information security system for an information-driven enterprise.

SYLLABUS

UNIT -I:

Introduction - Concepts of information security - Terminologies used - Human aspects involved - information security or server systems: Types of attacks to web-servers - information security for client devices: Attacks for PCs and smart phones - Counter-measures - Malicious software intrusions and their effects - information security risk management: Processes involved - Information assets - Evaluation of security risk - Mitigation of risks - Classroom exercises

UNIT II

Security Risk Management: Information Security governance in an organization - Information Security Management Systems - Information Security Policy, Standards and Procedures - In formation Security Evaluation - Security Incident Response: Overview - Computer Security incident s and responses.

UNIT-III:

Information Security and Cryptography: Basic Concepts - Secure communication - Definitions - Types of Cryptography: Classic Cryptography - Modern Cryptography - Common Key Cryptography - Public Key Cryptography - Classroom exercises

UNIT-IV:

Common Key Cryptography: Algorithms involved - DES - Triple DES - AES - Encryption modes - Key Distribution :-- Public Key Cryptography: RSA - Hybrid Encryption - Data Integrity - Hash Function - Digital Signature - Public Key Certificate - Public Key Infrastructure (PKI) - Certification Authority - Laws in India governing - Classroom exercises

TEXT BOOKS FOR READING & REFERENCE

1. *"Introduction to Information Security and Cyber Laws"*, by Surya Prakash Tripathi & Ritendra
2. *" Cyber Security for Beginners"*, by Raef Meeuwisse
3. *"Cryptography ond Information Securit y"*, by V K Pachghare
4. *" Networ k Security : The Complet e Reference"*, by Bragg
5. *"Practical Malware are Analysis"*, by Michael Sikorski
6. *"Understanding Cryptography "*, by Christof Paar and Jan Pelzi

YEAR 3	SEMESTER -6	DSE-03	DATA MINING	CREDIT	4:0:2

OBJECTIVES:

To equip students both in theory and practical applications of different methods of extracting processed information from data by using appropriate tools and evaluate derived end results.

SYLLABUS

UNIT-I:

Introduction -Terminologies used - Process involved - Applications - Classes of techniques - Databases and data warehousing - Exploratory Data Analysis and Visualization - Data Mining Algorithms

UNIT-II:

Modelling for Data Mining: Principles - Model Scoring - Search and Optimization - Descriptive Modelling - Predictive Modelling - Case Studies

UNIT-III:

Text Mining and Natural Language Processing - Information Visualization - Crowd Sourcing and Active Learning - Bayesian Data Mining - Observational Studies - Cluster Analysis

UNIT-IV:

Data Mining in different industries: Healthcare - Humanities - Case Studies - Classroom Workshops

Text books for reading & reference:-

1. *"Introduction to Doto Mining"*, Pang-Ning Tan, Michael Steinbach & Vipin Kumar
2. *"Doto Mining: The Textbook"*, Charu C Aggarwal
3. *"Doto Mining: Practical ML Tools & Techniques"*, Iam H Witten, Elbe Frank & Mark Hall
4. *"Programmer's Guide to Doto Mining"*, Ron Zacharski
5. *"Doto Mining: Concepts and Techniques"*, Jiawei Han
6. *"Doto Mining and Analysis: Fundamental Concepts & Algorithms"*, Zaki and Meira
"Predictive Analytics and Doto Mining", Vipin Kotu Bala, Deshpande

YEAR 3	SEMESTER -6	DSC-03	FUZZY LOGIC & ANN	CREDIT	4:0:2

OBJECTIVES:

To inculcate in students the knowledge of principles of fuzzy logic, models of Artificial Neural Networks and their application to design and manufacturing sectors

SYLLABUS

UNIT-I

Introduction - Basic Concepts of Fuzzy Set Theory - Fuzzy Sets Operations and Properties - Crisp Relations - Fuzzy Related Equations - Fuzzy Systems - Propositional Logic - Inference - Predicate Logic - Inference in Predicate Logic - Fuzzy Logic Principles - Fuzzy Quantifier s - Fuzzy Inference - Fuzzy Rule-based Systems – Fuzzyfication – Defuzzyfication - Types

UNIT-II

Fuzzy Logic Controllers (FLC) - Principles - Control Systems Theory - Industrial Applications of FLC - Fuzzy Decision-making - Fuzzy Classifications - Clustering - Fuzzy Pattern Recognition - App li cat ions for Image Process in g - Fuzzy Optimization

UNIT-III

Artificial Neural Networks (ANN): Introduction - Model of Artificial Neuron - Architectures - Learning Methods - Supervised Learning - Neuron as a Computing Element - Perceptron - Back-propagation Networks - Multilayer Perceptron - Back-propagation Learning Input Layer - Accelerated Learning - Hopfield Networks - Bi-directional Associate Memories - Unsupervised Learning: Hebbian Learn ing - Hebb ian Learning Algorithms, Competitive Learning - Computational Maps - Kohonen Networks

UNIT-IV

Taxonomy of Neural Networks Architecture - Standard Back Propagation Algorithms - Selection of various Parameters - Variations Applications of Back Propagation Algorithm s - Genetic Algorithm s: Introduction to concepts - Encoding - Fitness Function - Convergence of Genetic Algorithms - Applications of Genetic Algorithms - Basic Concepts of Genetic Programming - Case Studies

TEXT BOOKS FOR READING & REFERENCE

1   *"Fuzzy Logic for Beginners"*, by Masao Mukaidono

2.   *"Introduction to Fuzzy Sets, Fuzzy Logic and Fuzzy Control Systems"*, by Guanrong Chen and Trung Tat Pham (Free PDF Book)

3. *"Neural Networks, Fuzzy Logic and Genetic Algorithms"*, by S Rajasekaram & Vijayalakshmi Pai

4. *"Fuzzy Set Theory, Fuzzy Logic & Their Applications"*, by AK Bhargava

5. *"Introduction to Artificial Neural Systems"*, by G Klir & B Yuan

6. *"Genetic Algorithm and Engineering Design"*, by M Gen and R Cheng

YEAR 3	SEMESTER -6	SEC-1	BUSINESS INTELLIGENCE & FINANCIAL ANALYTICS	CREDIT	4:0:0

OBJECTIVES:

To impart to students the knowledge and skills for using data-warehouses for purposes of business intelligence and solve real-world problems in Finance & Accounts value-chain by applying data and analytics skills.

SYLLABUS

UNIT-I:

Introduction - Definitions - Bl Segments - Difference between Information and Intelligence - Bl Value Chain - Factors of Bl System - Bl Applications; - Bl Environment creation - Bl Landscape - Types - Platform - Dynamic Ro les; -Types: Multiplicity of Bl Tools -Types of Bl Tools - Applications; - Architecting Data: Types of Data - Enterprise Subject Area Model - Enterprise Conceptual Model - Enterprise Conceptual Entity Model - Granularity - Data Reporting - Query Tools - Data Partitioning - Metadata - Total Data Quality Management;- Brief on Data Mining: Definitions - Working of Data Mining - Architecture - functionalities – Classifications - Risks Perceived - Ethical Issues in Data Mining - Global Issues; - Data Mining Techniques: Introduction - Statistical Perspective - Statistical Needs - Similarity Measurement - Decision-Tree illustrations - Neural Networks vs. Conventional Computers - Kohen's Self-organizing Maps -Genetic Algorithms; Data Warehousing: Introduction - Advantages and Disadvantages - Data Mart - Online Analytical Processing (OLAP)- Characteristics - OLAP Tools - OLAP Data Modelling- Comparison of OLAP with OLTP - Data Modelling using Star Schema and Snowflake Schema; - Ways of Data Warehousing: Types of Business Models - B2B Bl Model - EDI and E-commerce Models - Systems for Improving Models - B2C Bl Model - Needs - Types; - Knowledge Management (KM): Introduction - Characteristics - Knowledge Assets - Generic Knowledge Management Process - KM Technologies - Essentials of KM Process.

UNIT-II:

Data Extraction: Introduction - Importance of Source Identification - Techniques Involved - Logical Extraction Method s - Physical Extraction Methods - Change Data Capture; - Bl Life Cycle: Introduction - Enterprise Performance Life Cycle (EPLC) Framework - Life Cycle Phases - Human Factors in Bl Implementation - Bl Strategy - Objectives and Deliverables - Transformation Roadmap - Building Transformation Roadmap - Bl Development Stages - Bl Steps - Parallel Development Tracks - Bl Framework; - Bl User Model: Introduction - Opportunity Analysis - Content Management System - End -user Segmentation - Basic Reporting - Querying - OLAP Techniques - OLAP Applications - OLAP to Data Warehousing - Dashboard - Advanced Bl Technologies - Future opportunities in Bl; - Issues & Challenges in Bl: Introduction - Critical Challenges- Cross –organizational Partnership - Business Sponsors - Dedicated Business

Representation - Bl Application Development Methodology - Planning the Bl Projects - Business Analysis - Data Standardization - Dirty Data - Meta Data Importance - Silver Bullet Syndrome - Customer Pain Points - Creation of Cost effective Bl Solutions; - Strategy and Ro ad-map: Introduction - Planning Process - Limitations of Bl - Usages of Bl - Advantage s of Bl - Organization Culture - Total Cost of Ownership (TCO) - Factors affecting TCO; - Implementation Phase: Introduction - Bl Platform Capability Matrix - Bl Target Database - Data Mart - Bl Products and Vendors - Business Performance Management (BPM) - Six Sigma usages - Levels of Bl Maturity - Critical Success Factors - Peer-evaluated classroom exercise.

UNIT-III:

Financial Analytics: Introduction and overview - Changing Finance & Accounts Landscape - Techniques to analyze Time Series Data - Application of Statistics for Business - Applicat ion of Analytics in F&A - Application of Analytics in Financial Services; - R for Analytics: Introduction - Programming basics - Assembling Data - Calculating Results - Logical Types and Relational Operators - Conditional Statements - Stacking Data - Loops

UNIT-IV:
Advanced Analytics Techniques: Tree Models -Time Series Analysis - Advanced SQL and best practices - Advanced Excel - Structured Problem Solving using Frameworks - Hypothesis Formulation - Business Problem Tasks - Revenue and Operational Cost Modelling - Effective Communication Strategies - Classroom case study; - Data Visualization: Introduction - Data Mapping - Charts - Glyphs - Coordinates - Stacked Graphs - Tufte' s Design Rules - Use of Color ; - Visualization Dash Board: Introduction - Systems - Information Visualization - Database Visualization - System Design - Future Technologies in F&A - Classroom exercises {Data Reporting; Forecasting Techniques; Risk Assessment; Product Costing Analysis)

TEXT BOOK S FOR READING & REFERENCE

1. *"Business Intelligence, Analytics and Data Science"*, by Ramesh Shard and Dorsum Dilan
2. *"Business Intelligence Guide Book: From Data Integration to Analytics"*, by Rick Sherman
3. *"Business Intelligence Roadmap : The Complete Project Lifecycle"*, by Larissa T Moss
4. *"Data Strategy: How to Profitfr9m a World of Big Data"*, by Bern are Marr
5. *"Financial Analytics with R: Building o laptop Laboratory"*, by Mark J Bennett
6. *"Global Business Analytics Models: Concepts & Applications"*, by Hokey Min
7. *"Analytics for Insurance: The Real Business of Big Doto"*, by Tony Boobler

YEAR 3	SEMESTER -6	SEC 1	INTRODUCTION TO NETWORKING & CLOUD COMPUTING &	CREDIT	5:1:0

OBJECTIVES:

To introduce students the domain and cover the topics of cloud, virtualization, networks, cloud storage and programmes. It covers also the technological benefit s of the cloud paradigm and concepts behind its deployment.

SYLLABUS

UNIT-I:

Computing Paradigm: Introduction - Current trends in computing: Grid computing, Cluster computing , Utility computing, and Cloud computing - Evolution of Cloud computing - Cloud computing: History - Service providers - Properties, Characteristics and Constraint s - Open Standards - Cloud computing Architecture: Cloud computing Stack - How Cloud computing Works - Role of Net Works in Cloud computing, Protocols and Role of Web Services - Service Models : IaaS (Infrastructure as a Service) - PaaS (Platform as a Service) - SaaS (Software as a Service) - Deployment Models.

UNIT-II

IaaS (Infrastructure as a Service): Introduction: Definition - Virtualization - Different approaches' to Virtualization - Hypervisors - Machine Image - Virtual Machine - Resource Virtualization: Server - Storage - Network - Data Storage in Cloud Computing - Examples - Amazon EC2 - Eucalyptus - PaaS (Platform as a Service): Introduction: Definition - Cloud Platform and Management - Examples (Google App Engine, MS Azure, Force.com Platform) - PaaS (Platform as a Service): Introduction - Web Services - Web 2.0 - Web OS - Case studies.

UNIT-III

Service Management in Cloud Computing: Service Level Agreements (SLAs) - Billing and Accounting - Comparing Scaling Hardware - Economics of a Scaling - Managing Data: Data, Scalability and Cloud Services - Database and Data Stores in Cloud - Large Scale Data Processing.

UNIT-IV

Cloud Security: Infrastructure Security - Data Security and Storage - Identity and Access Management - Access Control - Trust, Reputation and Risk - Authentication in Cloud Computing - Client Access in Cloud - Cloud Contracting Model - Commercial Consideration - Case Studies on Open Source and Commercial Clouds

TEXT BOOKS FOR STUDY AND REFERENCE

1. *"Computer Networking: A Top-down Approach"*, by Kurose & Ross (6th Edition)
2. *"Introduction to Networking"* by Charles R Severance
3. *"Cloud Computing"*, by M.Ray Rafaels
4. *"Cloud Foundry: The Definitive Guide: Develop, Deploy & Scale"*, by Duncan CE Winn
5. *"Cloud Computing Security: Foundations and Challenges"*, by John R Vacca
6. *"Hands on Virtual Computing"*, by Ted Simpson and Jason Novak
7. *"Cloud Computing: Business Trends and Technologies"*, by Igor Faynberg" *Cryptography and Information Security"*, by V K Pachghare
7. *"Network Security : The Complete Reference"*, by Bragg
8. *"Practical Malware Analysis"*, by Michael Sikorski
9. *"Understanding Cryptography "*, by Christof Par and Jan Pelzer

YEAR 3	SEMESTER -6	SEC-2	PREDICTIVE ANALYTICS & WEB ANALYTICS	CREDIT	4:0:0

OBJECTIVES:

To impart working knowledge to students on Predictive Analytics using Python, ML, Data Visu etc techniques whereby they learn to apply predictive analytics and business intelligence to tackle and solve business problems in real-world applications. Diagnostic techniques and practices for understanding how web analytics can be employed to achieve greater ROI and higher level of customer satisfaction.

SYLLABUS

UNIT - I

Predictive Data Analytics, The Predictive Data Analytics Project Lifecycle, Data Explorations - Data Quality Report, Getting to Know the Data, Identifying Data Quality Issues, Handling Data Quality Issues, Data Exploration & Preparations. Information based Learning – Fundamentals.

UNIT – II

Similarity-based Learning - Fundamentals, Probability-based Learing - Fundamentals, Error-based Learning - Fundamentals, Evaluation - Fundamentals, The Art of Machine Learning for Predictive analysis - Different Perspectives on Prediction Models and Case Studies.

UNIT- III

Introduction - Definitions - Terminology used - Needs, Usages, Advantages and Limitations - Categories: Off-site Web; On-sit e Web -Evolution - Web Analytics Platform - Data Collection - Web Logs - Web Beacons - JavaScript Tags - Packet Sniffing - Outcomes Data: E-commerce - Lead Generation - Brand Support; - Research data: Mindset - Organizational structure - Timing; - Competitive Data: Panel-Based Measurement - ISP-based Measurement - Search Engine Data; - Qualitative Analysis: Heuristic evaluations: Conducting a Heuristic Evaluation - Benefits of Heuristic Evaluations; - Site Visits: Purpose for a Sit e Visit and its benefits; - Surveys : Benefits - Website Surveys - Post -visit Follow-up Surveys - Creating and Running a Survey ; - Web Analytic fundamentals: Capturing data: Web logs or JavaScript'

s tags - Separate data serving and data capture - Type and size of data - Innovation - Integration - Optimal Web Analytic Tool - Click Stream Data Quality - Identifying Unique Page Definition - Using Cookies - Link Coding.

UNIT-IV

Web Metrics: Common metrics: Hits - Page views - Visit s - Unique Visitors - Unique Page Views - Bounces - Bounce rat e - Page/visit - Average time on site - New visits; - Optimization: Improving Bounce Rates - Optimizing ad-words campaigns; - Real-Time Report - Audience Report - Traffic Source Report - Custom campaigns - Content Report - Basics of Google analytics - Key Performance Indicators (KPI) - Characteristics - Need for KPI — Perspectives and Uses of KPI; - Relevant Technologies: Internet & TCP/IP - Client / Server Computing - HTTP (Hypertext Transfer Protocol) - Server Log Files & Cookies - Web Bugs; - Web Analytics 2.0: Web Analytics 1.0 vies-a-vis Web Analytic 2.0; - Competitive Intelligence (CI) Analysis: CI Data Sources - Toolbar Data - Panel Data - Internet Service Provider (ISP) Data - Search Engine Data - Hybrid Data; - Website Traffic Analysis: Comparing Long-term Traffic Trends - Analyzing Competitive Site Overlap and opportunities; - Google Anal tics: Its Working - Google Analytics Set-up - Terminology - Navigation - Overview and Full Reports - Sharing - Setting-up Dash Boards and Shortcuts; - Basic Reports: Audience Reports - Acquisition Reports - Behavior Reports; - Categories of Traffic - Google Website Optimizer - Implementation Technology - Limitations - Performance Concerns — Privacy Issues.

TEXT BOOKS FOR READING & REFERENCE

1. *"Web Analytics 2.0"*, by Avinash Kaushik
2. *"Google Analytics: A Complete Guide"*, by Gerardus Blokdyk (2020 edition)
3. *"Google BigQuery: The Definitive Guide"*, by Valliappa Lakshmanan
4. *"Fundamentals of Machine Learning for Predictive Data Analytics"* by John D. Kelleher, Brian Mac Namee, Aoife D'Are
5. *"Hands-On Predictive Analytics with Python"* by Alvaro Fuentes

YEAR 3	SEMESTER -6	SEC-2	MAIN PROJECT WORK	CREDIT	4:0:0

OBJECTIVES

To expose students to industry-standard project practices, through a real-life project work under time and deliverable constraint s, applying the knowledge acquired through various courses.

1. To provide an opportunity to apply the knowledge gained through various courses in solving a real life problem
2. To provide an opportunity to practice different phases of software/system development life cycle
3. To introduce the student to a professional environment and/or style typical of a glob al IT industry
4. To provide an opportunity for structured team work and project management
5. To provide an opportunity for effective, real-life, technical documentation
6. To provide an opportunity to practice time, resource and person management.

Guidelines and preparations for the project work:

Selection of Team: To meet the stated objectives, it is imperative that Major Project is done through a team effort. Though it would be ideal to select the team members at random (drawing lot s) and this should be strongly recommended, due to practical considerations, students may also be given the choice of forming themselves into teams with maximum of 4 members. A gender mix should also be strongly suggested. A team leader shall be elected through drawing lots. Teams shall maintain team meeting minutes and ensure that every team member has tasks assigned in writing. Team meeting minutes shall form a part of the Project Report. Even if student s are doing projects as groups, each one must independently take up different modules of the work and must submit the report is also independently (though, in such cases, some common materials is permissible). Evaluation will also be done independently.

Selection of Tools: No restrictions shall be placed on the students in the choice of plat form s/ tools/ languages to be utilized for their project work, though open source is strongly recommended, wherever possible. No value shall be placed on the use of tools in the evaluation' of the project.

Selection of Organization & Guide: No restrictions shall be placed on the students in the choice of organization where project work may be done, in terms of locality, type of organization (public/private} etc. It is the duty of the Head of Institution or the Principal of College to ensure that the Aims, Objectives and full project guidelines are communicated to the external organization. The guide should ideally be a post-graduate with minimum 2 years of work experience.

Students may also choose to do project in the college/institute (or partially in the college and partially in an external organization), especially product-based work, but in such cases the supervisors must ensure that (i) industry practices are followed (ii) the students undertake a planned visit to an IT industry with international operations to make up for the loss of experience and (iii) the services of an external guide with industry experience is obtained.

Head of Institution or the Principal of College should publish a list of students, projects topics, internal guide and external organization (if any} and teams agreed, before the end of semester VI. Changes in this list may be permitted for valid reasons and shall be considered favorably by Head of Institution or the Principal of College any time before commencement of the project. Any request for change after commencement should considered by a committee of 3 teachers and their recommendation shall be accepted by Head of Institution or the Principal of College.

Gantt-chart of proposed activities and a draft statement of project deliverables (which may subsequently be altered if justified) should be prepared before the commencement of the project. The actual completion of each phase should be noted on the chart in the course of the project work. Students should submit a fortnightly report of progress which could be indication of percentage of completion marked on the original Gantt-chart, with any notes attached. Students should ideally keep a daily activity log sheet. Team meetings should be documented in the format given at the end. Changes in the submitted documents are possible, as project development is essentially an evolutionary process. The Project Guide must ensure that changes are necessary due to the knowledge gained in succeeding phases of the project. The date of completion of a phase should be brought forward if the changes made are deemed to be errors and not due to additional knowledge gained from a succeeding phase.

Project Guidelines (subject to alteration to suit different industries):-

1. Group size: Not over four members.
2. Number of records: One copy to each participant and one copy to the Department.

3. Certificate will contain the names of all participating member and of the Project Guide.

4. Minimal phases for the project work: Project search, finalization and allocation, Investigation of system requirements, Data and Process Modelling, System Design, Program design, Program coding and unit testing, System integration, System implementation and acceptance testing.

5. Planning the Project: The Major Project is an involved Exercise that has to be planned well in advance. The topic should be chosen in Semester IV itself and the case study of Course in Semester IV should as far as possible, be based on the project topic, though on exceptional cases and for valid reasons, the Project Guide may waive this condition. Related reading, training and discussions should start from Semester V itself.

6. Suggestive project work are three in nature:

Project Methodology: Wherever applicable, object oriented approach should be used for software development. The project report should generally contain details of the following steps (though students should not attempt to fit every kind of project into this format):

(a) Analysis

- Study of existing systems and its drawbacks (general)
- Understanding the functionalities of the system (detailed)
- Preparation of requirement
- Conduct of Feasibility study
- Identification of relevant Objects
- Abstraction of each object (attributed and methods)
- Relations hi p between objects

(b) Design

- Design of each subsystems
- Design of each classes
- Design of communications between objects
- Design of Algorithms for problem solving
- User interface Design
- Any other steps if necessary

(c) Coding and implementation

(d) Testing

(e) Security, Backup and Recovery Mechanisms

(f) On line help and User Manuals

(g) Upgradability Possibilities

INTELLECTUAL PROPERTY RIGHTS:

The intellectual property rights in all project work done by the student s shall vest jointly with "Fortuna Advanced Institution of Research & studies (FAIR)" ,Nanjanagud except in cases where some external organizations seek undertaking from students to concede IPR in all work done in their organization or under t heir guidance. Where possible, students should attempt to obtain at least a join t IPR for the College and the University. In cases where project works are of public utility, students shall be asked to publish their work including source code and documentation, in so far as their rights are clear.

EVALUATION OF PROJECT

- Documentation - 30 marks
- Content & Methodology - 50 marks
- Viva Voce - 20 marks

Certificate should be in the format : "Certified that this report titled..............................is a bonafide record of the project work done by Sri/Kum...................... Under our supervision and guidance, towards partial fulfilment of the requirements for the award of the Degree of B.Sc. (Hon's)(AI & DA) of the University of Mysore" with dated signatures of Internal Guide, External Guide and also Head of Institution or the Principal of the College.

If the project is done in an external organization, another certificate on the letterhead of the organization is required: "Certified that this report tit led.............................. is a bonafide record of the project work done by Sri/Kum............................ Under any supervision and guidance, at the ....Department of.................... (Organization) towards partial fulfilment of the requirement s for the award of the Degree of B.Sc. (AI & DA) of the University of Mysore".

References shall be IEEE format {see any IEEE magazine or transaction). Take care in use of italics and punctuation. While doing the project, keep note of all books you refer, in the correct format, and include them in alphabetical order in your reference list. (Eg: A book is cited as: *"Understanding Neural Network s and Fuzzy Logic"*, Author: Kartalopoulos, S V Publishers: BPB Publishers, 1996 Edn. pp.21-27. (pp.21-27 indicates that pages 21-27 have been referred.) If the whole book is being referred, this may be omitted. If a single page is referred, say page 47, it may be cited as p.47.

Report writing is NOT a hast y activity done after finishing the project.Students must try to develop the report along with the work, so as to give it flesh and blood. Drafts should be read, modified, spell checked and grammar checked at least thrice during the course of the project and before a final printout is taken, the same may be got approved from the internal guide. The students should send two interim reports to internal guides. This will also help the student s in their report writing.

The Gantt chart, fort nightly progress report s, and team meeting minutes.

Mentioned above should appear as appendix to the project report. Regarding the body of the report, as an indicative example, is as follows:-

- Organizational overview (of the client organization, where applicable)
- Description of the present system
- Limitations of the present system
- The Proposed system- Its advantages and features
- Context diagram of the proposed system.

- Top level DFD of the proposed system with at least one additional level of Expansion
- Structure Chart of the System
- System flowchart
- Menu Tree
- Program List
- Files or tables (for DBMS projects) list.
  Class names to be entered for each file in
  OO system s.
- List of fields or attributes (for DBMS projects) in each file or table.
- Program - File table that shows the files/tables used by each program and the files are read, written to, updated queried or reports were produced from them.
- Reports List with column headings and summary information for each report.
- System Coding and variable/file/table naming conventions
- System controls and standards
- Screen layouts for each data entry screen.
- Report formats for each report.

Program documentation is suggested on the following lines:
- Program id
- Program level run chart

Developing Solution for A Real-Life Problem: In this case, a requirement for developing a computer based solution already exist s and the different stages of system development life cycle is to be implemented successfully. Examples are Accounting Software Package for a particular organization, Computerization of administrative functions of an organization, Web-Based Commerce, etc. The scope for creativity and Exploration in such projects is limited, but if done meticulously, valuable Experience in the industrial context can be gained.

Innovative Product Development: These are projects where a clear-cut requirement for developing a computer based solution may not be existing but a possible utility for the same is conceived by the proposer. Example are: a Kannada Language Editor with Spell Checker, Computer Music Software for Indian Music, Heat Engines Simulation Software fore-Learning, Digital Water Marking Software.

Research Level Project: These are projects which involve research and development and may not be as structured and clear cut as in the above cases. Examples are Kannada Character Recognition, Neural Net Based Speech Recognizer, Biometric Systems, and Machine Translation System etc. These projects provide more challenging opportunities to students, but

at the student level is a difficult choice. If any student identifies proper support in terms of guidance, technology and references from external organizations and also the supervisors are convinced of the ability of the student(s) to take up the project, it shall be permit ted. The methodology and reporting of such projects could be markedly different from type (a) and is left to the proposer/external supervisor of the projects.

DOCUMENTATION GUIDELINES:

The final outer dimensions of the report shall be 21cm X 30 cm. The color of the flap cover shall be light Blue. Only hard binding should be done, with title of the thesis and the words "<BRIEF TITLE> B.Sc. (AI & DA) Project Report 20...." displayed on the spine in 20 point, Bold, Times New Roman, as in example below. In case the title is too long, a shorter version of it may be used (Like "Image Pro" instead of" Image Pro - An Interactive Image Processing package").

- It is highly recommended that Latex be used for documentation.
- The text of the report should be set in 12 pt., Times New Roman, Single Spaced.
- Headings should be set as follows: CHAPTER HEADINGS 20 pt., Times New Roman, Bold, All Caps, and Centered. Example: " HUM ANOIDROBOTS": BSc.(AI & DA) PROJECT 2023;
- SECTION HEADINGS 12 pt., Times New Roman, Bold, All Caps, Left Adjusted.
- Section Sub-headings 12 pt., Times New Roman, Bold, Left Adjusted.
- Titles of Figures, Tables etc. are done in 12 point, times New Roman, Italics, and Centered.

  <PROJECT TITLE> <STUDENT'S NAME> <FARTUNA ADVANCED INSTITUTE OF RESEARCH & STUDIES (FAIR)> PROJECT REPORT: Submitted in partial fulfilment of the requirements for the award of B.Sc. (AI & DA) degree of University of Mysore: 2024

1. Some general guidelines on documentation stylistics are:
a. Double quotes and single quotes ("", ') should be used only when essential. In most cases words put in quotes are better highlighted by setting them in italics. This process is known as "morphing".
b. Page numbers shall be set at right hand top corner, paragraph indent shall be set as 3.
c. Only single space need be left above a section or sub- section heading and no space may be left after them.