



VELS

INSTITUTE OF SCIENCE TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University under section 3 of UGC Act, 1956)
Pallavaram - Chennai



NAAC ACCREDITED WITH 'A' GRADE
Marching Beyond 25 Years Successfully

Bachelor of
Computer Applications
(B.C.A)
Specialization In
Data Science (DS)
CURRICULUM AND SYLLABUS
(Based on Choice Based Credit System)

Effective from the Academic year

2019 - 2022

DEPARTMENT OF INFORMATION TECHNOLOGY

SCHOOL OF COMPUTING SCIENCES

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

- PEO1: Exhibit practical hands on experience on the core and fundamentals like Programming in C, Data Structures and algorithms.
- PEO2: Display practical knowledge, able to store and manage data in a way that allows for data exploration and analysis (building information platforms).
- PEO3: Collaborate Work as a team in inter disciplinary and intra disciplinary projects to develop software solutions for diverse applications based on machine language-based data mining, etc
- PEO4: Publish research findings and innovations in technical symposiums, hackathons, project presentations, and publication of research articles in peer reviewed and indexed conferences and journals.
- PEO5: Familiar with the major legal and ethical issues associated with the application of data science in addressing business and societal challenges.

PROGRAM OUTCOME (PO)

- PO1: Critical Thinking:** Apply knowledge of Computer Science to identify, analyze, problems and to provide effective solution in the area of Computing.
- PO2: Computing Skills and Ethics:** Analyze a problem, and identify and define the computing requirements appropriate to its solution.
- PO3: Analytical skill:** Ability to design, develop algorithms and provide software solutions to cater the industrial needs.
- PO4: Modern Tool Usage:** Use current techniques, skills, and tools necessary for computing practices
- PO5: Employability Skills:** Inculcate skills to excel in the fields of Information Technology and its Enabled services, Government and Private sectors, Teaching and Research.
- PO6: Ethics:** Insists ethical responsibilities, human and professional values and make their contribution to the society.
- PO7: Self Directed and Life-long Learning:** Engaged in lifelong learning to equip them to the changing environment and be prepared to take-up mastering programmes.

PROGRAMME SPECIFIC OUTCOME (PSO)

- PSO1: Understand the basic concepts in computer.
- PSO2: An ability to apply knowledge of mathematics, computer science and management in practice. An ability to enhance not only comprehensive understanding of the theory but its application too in diverse field
- PSO3: Analyze and apply the latest technologies to solve problems in the areas of computer applications.
- PSO4: Apply technical and professional skills to excel in business.
- PSO5: Able to build software applications and tools through quantitative and qualitative techniques.
- PSO6: Develop in depth understanding of the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics
- PSO7: Practice problem analysis and decision-making.
- PSO8: Able to communicate effectively in both verbal and written form.
- PSO9: Gain practical, hands-on experience with statistics programming languages and big data tools through coursework and applied research experiences.
- PSO10: Awareness on ethics, values, sustainability and creativity aspects.

Vels Institute of Science Technology & Advanced Studies

School of Computing Sciences

Department of Information Technology

Board of Studies

Chairman : **Dr.P.Swaminathan**, Dean,
School of Computing Sciences,
Vels Institute of Science,Technology and Advanced Studies,
Chennai.

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School of Computing Sciences,
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4. **Dr.K.Kalaiselvi**, HOD,

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Vels Institute of Science,Technology and Advanced Studies,

Chennai.

External Member

: **Dr.K.R.Ananthapadmanaban**, Professor & HOD,

Department of Computer Science,

SRM Arts and Science College, Chennai.

Industry Member

: **Dr.P.Magesh Kumar**,

Calibsoft Technologies Pvt Ltd., Chennai.

Special Invitees

: **Dr.Jothi Venkateswaran**, HOD,

Department of Computer Science,

Presidency College, Chennai.

Alumni Member

: **Mr.R.Balamurugan**, SCOPUS Ltd, Chennai.

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES (VISTAS)**BCA DATA SCIENCE DEGREE COURSE****COURSES OF STUDY AND SCHEME OF ASSESSMENT****(TOTAL NO OF CREDITS: 140)**

Code No.	Course	Hours/Week			Credits	Maximum Marks		
		Lecture	Tutorial	Practical		CA	SEE	Total
SEMESTER 1								
LANG	Tamil I/ Hindi / French	5	0	0	5	40	60	100
ENG	English I	5	0	0	5	40	60	100
CORE	Programming in C	4	1	0	5	40	60	100
CORE	Mathematics - I	4	0	0	4	40	60	100
CORE	Programming in C Lab	0	0	4	2	40	60	100
CORE	MS Office Lab	0	0	4	2	40	60	100
		18	1	8	23			

SEMESTER 2

LANG	Tamil II / Hindi / French	5	0	0	5	40	60	100
ENG	English II	5	0	0	5	40	60	100
CORE	Data Structures and Algorithms	4	1	0	5	40	60	100
CORE	Mathematics II	4	0	0	4	40	60	100
CORE	Operating System Lab	0	0	4	2	40	60	100
CORE	Data Structures and Algorithm Lab	0	0	4	2	40	60	100
		18	1	8	23			

CA - Continuous Assessment

SEE - Semester End Examination

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES

BCA DATA SCIENCE DEGREE COURSE

Code No.	Course	Hours/Week			Credits	Maximum Marks		
		Lecture	Tutorial	Practical		CA	SEE	Total
SEMESTER 3								
CORE	Programming in Java	5	0	0	5	40	60	100
CORE	Computer Networks	5	0	0	5	40	60	100
CORE	Statistics and Probability	5	0	0	5	40	60	100
CORE	Introduction to Data Science	3	1	0	4	40	60	100
CORE	Programming in Java Lab	0	0	4	2	40	60	100
CORE	Computer Networks Lab	0	0	4	2	40	60	100
SEC	Soft Skills – I	2	0	0	2	40	60	100
		20	1	8	25			

SEMESTER 4

CORE	Database Management Systems.	5	0	0	5	40	60	100
CORE	Machine Learning	4	1	0	5	40	60	100
CORE	R Programming Language	4	0	0	4	40	60	100
CORE	R Programming Language Lab	0	0	4	2	40	60	100
CORE	DBMS Lab	0	0	4	2	40	60	100
AECC	Environmental Studies	2	0	0	2	40	60	100
SEC	Soft Skills – II	2	0	0	2	40	60	100
		17	1	8	22			

CA - Continuous Assessment

SEE - Semester End Examination

VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES

BCA DATA SCIENCE DEGREE COURSE

Code No.	Course	Hour / Week			Credits	Maximum Marks		
		Lecture	Tutorial	Practical		CA	SEE	Total
SEMESTER 5								
DSE	Discipline Specific Elective -1	4	1	0	5	40	60	100
DSE	Discipline Specific Elective -2	4	0	0	4	40	60	100
DSE	Discipline Specific Elective -3	4	0	0	4	40	60	100
DSE	Discipline Specific Elective -4	4	0	0	4	40	60	100
DSE	Discipline Specific Elective -2 Lab	0	0	4	2	40	60	100
GE	Generic Elective -1	2	0	0	2	40	60	100
SEC	SEC-1	2	0	0	2	40	60	100
		20	1	4	23			

SEMESTER 6

DSE	Discipline Specific Elective -5	4	1	0	5	40	60	100
DSE	Discipline Specific Elective -6	5	0	0	5	40	60	100
GE	Generic Elective -2	2	0	0	2	40	60	100
SEC/VA C	SEC -2	2	0	0	2	40	60	100
DE	Project Work	0	0	0	10	40	60	100
		13	1	0	24			

CA - Continuous Assessment

SEE - Semester End Examination

List of Discipline Specific Elective (DSE)

Subject code	Title of the Paper
DSE 1A	Data Analytics using SQL
DSE 1B	NoSQL databases
DSE 2A	Big Data Analytics
DSE 2B	Exploratory Data Analysis
DSE 2AL	Big Data Analytics Lab
DSE 2BL	Exploratory Data Analysis
DSE 3A	Multivariate Statistical Analysis
DSE 3B	Design and Analysis of Experiments
DSE 4A	Sampling Methods
DSE 4B	Optimization Techniques
DSE 5A	Data Visualization
DSE 5B	Dimension Reduction and Model Validation Techniques.
DSE 6A	Advanced Big Data Analytics
DSE 6B	Real Time Data Processing

List of Generic Elective (GE)

Subject Code	Title of the Paper
GE 1A	Web Technology Fundamentals
GE 1B	Computer Organization & Architecture
GE 1C	Server side Scripting Language
GE 1D	Advanced Excel
GE 2A	Python Programming
GE 2B	Internet of Things
GE 2C	Artificial Intelligence
GE 2D	Disaster Recovery and Business Continuity Management

List of Languages

Subject Code	Title of the Paper
18LEN001	Foundation Course English I
18LTA001	Foundation Course Language I
18LHN001	Hindi Paper – I
18LFR001	French Paper - I
18LEN002	Foundation Course English II
18LTA002	Foundation Course Language II
18LHN002	Hindi Paper – II
18LFR002	French Paper - II

List of Skill Enhancement Course (SEC)

Subject Code	Title of the Paper
SEC 1	Soft Skill -I
SEC 2	Soft Skill - II
SEC 3	Personality Development
SEC 4	National Service Scheme (NSS).
SEC 5	Ethics & Values

List of Ability Enhancement Compulsory Course(AECC)

AECC 1	Environmental Science
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Semester – I

Syllabus

18LTA001 தமிழ் மொழி, இலக்கிய வரலாறு – அறிமுகம் 5 0 0
5

நோக்கம்:

தமிழ்மொழி மற்றும் இலக்கியத்தின் வரலாற்றை அறிமுகம் செய்யும் நோக்கில் இப்பாடம் வடிவமைக்கப்பட்டுள்ளது. தமிழ்மொழியின் வரலாற்றை அறிவியல் கண்ணோட்டத்துடனும் மொழிக்குடும்பங்களின் அடிப்படையிலும் விளக்குகிறது. சங்க இலக்கியம் தொடங்கி, இக்கால இலக்கியம் வரையிலான தமிழிலக்கிய வரலாற்றை இலக்கிய வரலாறு அறிமுகப்படுத்துகின்றது. அரசு வேலை வாய்ப்பிற்கான போட்டித் தேர்வுகளுக்குப் பயன்படும் வகையிலும் இப்பாடம் அமைந்துள்ளது.

அலகு 1 தமிழ் மொழி வரலாறு

13மணி

நேரம்

மொழிக்குடும்பம் - இந்திய மொழிக்குடும்பங்கள் - இந்திய ஆட்சி மொழிகள் - திராவிட மொழிக்குடும்பங்கள் - திராவிட மொழிகளின் வகைகள் - திராவிட மொழிகளின் சிறப்புகள் - திராவிட மொழிகளின் வழங்கிடங்கள் - திராவிட மொழிகளுள் தமிழின் இடம் - தமிழ்மொழியின் சிறப்புகள் - தமிழ் பிறமொழித் தொடர்புகள்.

அலகு 2 சங்க இலக்கியம்

12 மணி

நேரம்

சங்க இலக்கியம் - எட்டுத்தொகை - நற்றிணை - குறுந்தொகை - ஐங்குறுநூறு - பதிற்றுப்பத்து - பரிபாடல் - கலித்தொகை - அகநானூறு - புறநானூறு - பத்துப்பாட்டு - திருமுருகாற்றுப்படை - சிறுபாணாற்றுப்படை - பெரும்பாணாற்றுப்படை - பொருநராற்றுப்படை - மலைபடுகடாம் - குறிஞ்சிப்பாட்டு, முல்லைப்பாட்டு, பட்டினப்பாலை - நெடுநல்வாடை - மதுரைக்காஞ்சி.

மணி நேரம்

களப்பிரர் காலம் விளக்கம் - நீதி இலக்கியத்தின் சமூகத்தேவை - பதினெண்கீழ்க்கணக்கு நூல்கள் அறிமுகம் - திருக்குறள், நாலடியார்.காப்பியங்கள் - ஐம்பெருங்காப்பியங்கள் மற்றும் ஐஞ்சிறுங்காப்பியங்கள் அறிமுகம்-காப்பிய இலக்கணம் - சிலப்பதிகாரம் - மணிமேகலை - சீவகசிந்தாமணி - வளையாபதி - குண்டலகேசி.

அலகு 4 பக்தி இலக்கியங்களும் சிற்றிலக்கியங்களும்

மணி நேரம்

தமிழகப் பக்தி இயக்கங்கள் - பக்தி இலக்கியங்கள் - சைவ இலக்கியம் - நாயன்மார்கள் அறுபத்து மூவர் - சமயக்குரவர் நால்வர் - வைணவ இலக்கியம் - பன்னிரு ஆழ்வார்கள் - முதல் மூன்று ஆழ்வார்கள்.சிற்றிலக்கியக் காலம் - சிற்றிலக்கியங்கள் - வகைகள் - பரணி - கலிங்கத்துப்பரணி - குறவஞ்சி - குற்றாலக் குறவஞ்சி - பிள்ளைத்தமிழ் - மீனாட்சியம்மைப் பிள்ளைத்தமிழ் - தூது - தமிழ்விடு தூது - கலம்பகம் - நந்திக்கலம்பகம் - பள்ளு - முக்கூடற்பள்ளு.

அலகு 5 இக்கால இலக்கியங்கள்

நேரம் நவீன காலம் - நவீன இலக்கியம் - உள்ளடக்கம் - புதுக்கவிதை - தோற்றமும் வளர்ச்சியும்- நாவல் - முதல் மூன்று நாவல்கள் - நாவலின் வகைகள் - பொழுது போக்கு நாவல்கள் - வரலாற்று நாவல்கள் - சமூக நாவல்கள் - இக்கால நாவல்கள் - மொழிபெயர்ப்பு நாவல்கள் - சிறுகதை - வகைகளும் வளர்ச்சியும் - நாடகம் -காலந்தோறும் நாடகங்கள் - புராண இதிகாச நாடகங்கள் - சமூக நாடகங்கள் - வரலாற்று நாடகங்கள் - மொழிபெயர்ப்பு நாடகங்கள் - நகைச்சுவை நாடகங்கள்.

மொத்தம்: 60 மணி நேரம்

பாட நூல்கள்

1. அகத்தியலிங்கம். ச., "திராவிடமொழிகள் தொகுதி 1", மணிவாசகர் பதிப்பகம், முதற்பதிப்பு, 1978.

2. சக்திவேல். ச., "தமிழ்மொழி வரலாறு", மணிவாசகர் பதிப்பகம், முதற்பதிப்பு 1998.

பார்வை நூல்கள்

1. பூவண்ணன், " தமிழ் இலக்கிய வரலாறு", சைவசித்தாந்த நூற்பதிப்புக் கழகம், முதற்பதிப்பு, 1998.

2. வரதராசன். மு., "இலக்கிய வரலாறு", சாகித்ய அகாதெமி, ஒன்பதாம் பதிப்பு, 1994.

3. விமலானந்தம். மது.ச., "இலக்கிய வரலாறு", பாரி நிலையம், மறுபதிப்பு, 2008.

COURSE OBJECTIVE

To train the students in the use of Karyalayin Basha. To enable the students to develop the communication skill in Hindi language.

UNIT I GADYA AUR KARYALAYIN BASHA 12

Mamata, -Yogyatha evam vyavasay kaa Chunaav Paribashik shabdavalil prashasanik vakyansh,padanam

UNIT II GADYA AUR SARKARI PATRA 12

Rajneethi kaa Bhantwara, , Samanya sarkari patra,gyapan,karyalay gyapan

UNIT III GADYA AUR SARKARI PATRA 12

Computer nayi krantee kee dastak, , Karyalay aadesh,Ardha sarkari patra paripatra,Adhisoochana

UNIT IV GADYA AUR SAMANYA PATRA 12

Raspriya, Samanya patra- chutti patra,sampadak ke naam patra, shikayati patra,
pustak vikretha ke naam patra

UNIT V YAVASAAYIK PATRA 12

Bankon mein bach khaata kholne ke liye – chek buk ke liye, run lene hetu, chek buk gum ho
jane hetu, kitaabon kaa krayadesh

Total No of Hours: 60 Hrs

TEXT BOOK

1. Gadya Aur Prayojanmulak Hindi ed by Dr.N.Lavanya Mayura Publishers,
edition 2008.

COURSE OBJECTIVE:

- To introduce French Language.
- To enable the students to understand and to acquire the basic knowledge of French
- Language with the elementary grammar.

UNIT I INTRODUCTION**12**

Introduction - Alphabet – Comment prononcer, écrire et lire les mots- Base : Les prénoms personnel de 1^{er}, 2^{ème} et 3^{ème} personnes – Conjugaisons les verbes être et avoir en forme affirmative, négative et interrogative

UNIT II LEÇONS 1-3**12**

Leçons 1.Premiers mots en français,- 2. Les hommes sont difficiles,- 3 Vive la liberté- Réponses aux questions tirés de la leçon - Grammaire : Les adjectives masculines ou féminines – Les articles définis et indéfinis - Singuliers et pluriels

UNIT III LEÇONS 4-6**12**

Leçons 4. L'heure, C'est 1 ; heure,- 5. Elle va revoir sa Normandie,- 6 .Mettez –vous d'accord groupe de nom - Réponses aux questions tirés de la leçon - Grammaire : A placer et accorder l'adjectif en groupe de nom- Préposition de lieu –A écrire les nombres et l'heure en français

UNIT VI LEÇONS 7-9**12**

Leçons7. Trois visages de l'aventure,- 8. A moi, Auvergne,- 9. Recit de voyage - Réponses aux questions tirés de la leçon - Grammaire : Adjectif possessif – Les Phrases au Présent de l'indicatif - Les phrases avec les verbes pronominaux au présent

UNIT V COMPOSITION**12**

A écrire une lettre à un ami l'invitant à une célébration différente ex : mariage – A faire le dialogue - A lire le passage et répondre aux questions

Total No Of Hours : 60 Hrs

TEXT BOOK

1. Jacky GIRARDER & Jean Marie GRIDLIG, « Méthode de Français PANORAMA », Clé Internationales, Goyal Publication, New Delhi., Edition 2004

REFERENCE BOOKS

1. DONDO Mathurin , “ Modern French Course”, Oxford University Press., New Delhi., Edition 1997
2. Nitya Vijayakumar, “Get Ready French Grammar – Elementary”, Goyal Publications, New Delhi., Edition 2010

ENGLISH I

5 0 0 5

COURSE OBJECTIVE:

- To enable the students to develop their communication skills effectively. To make students familiar with the English Language.
- To enrich vocabulary in English
- To develop communicative competent

UNIT I - Preparatory Lesson 12

1. Competition Matters
Suzanne Sievert
2. A Personal Crisis May Change History
Dr. A.P.J. Abdul Kalam
3. Why Preserve Biodiversity
Prof. D. Balasubramanian

UNIT II –Prose 12

1. The Unexpected
Robert Lynd
2. My Greatest Olympic Prize
Jesse Owens
3. If You are wrong, admit it
Dale Carnegie

UNIT III –Poetry 12

1. The Night of the Scorpion
Nissim Ezekiel
2. Pulley or The Gift of God
George Herbert
3. La Bella Dame Sans Merci
John Keats

UNIT IV- Short Story 12

1. The Gift of Magi
O Henry
2. Three Questions
Leo Tolstoy

UNIT V – One Act Play 12

1. The Shirt
Francis Dilion
2. The Pie and the Tart
Hugh Chesterman

Total: 60 Hours

COURSE OUTCOME

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

- CO 1** Examine the difference between poetic language and the language of the prose.
- CO 2** Utilize instructions on fundamentals of grammar
- CO 3** Develop their own style of writing after studying diverse prose essays.
- CO 4** Classify different poems on the basis of their types.
- CO 5** Conclude the textual content of both prose and poetry.

Books Prescribed:

- Confluence - AnuChithra Publications

COURSE OBJECTIVE

- This course introduces the basic concepts of programming in C.
- This subject deals various methods programming using the C languages.
- On successful completion the students should have programming ability on C.

UNIT I OVERVIEW OF PROGRAMMING 12

Introduction to computer based problem solving, Program design and implementation issues- Flowcharts & Algorithms, Top down design & stepwise refinement, Programming environment – Machine language, assembly language, high level languages, Assemblers, Compilers, Interpreters.

UNIT II FUNDAMENTALS OF C PROGRAMMING 12

Overview of C, Data Types, Constants & Variables, Operators & Expressions, Control constructs-if then, for, while, Arrays- single & multidimensional arrays, Functions-fundamentals – general form, function arguments, return value, Basic I/O-formatted and Unformatted I/O, Advanced features-Type modifiers and storage class specifiers for data types, Bit operators, ? operator, &operator, * operator, Type casting, type conversion.

UNIT III ADVANCED PROGRAMMING TECHNIQUES 12

Control constructs- Do while, Switch statement, break and continue, exit() function, go to and label, Scope rules- Local & global variables, scope rules of functions, Functions-parameter passing, call by value and call by reference, calling functions with arrays, argc and argv, recursion- basic concepts, ex-towers of Hanoi

UNIT IV DYNAMIC DATA STRUCTURES IN C 12

Pointers- The & and * operator, pointer expression, assignments, arithmetic, comparison, malloc vs calloc, arrays of pointers, pointers to pointers, initializing pointers, pointers to functions, function returning pointers, **Structures**- Basics, declaring, referencing structure elements, array of structures, passing structures to functions, structure pointers, arrays and structures within structures, **Unions** – Declaration, uses, enumerated data-types, typedef.

File Handling – The file pointer, file accessing functions, fopen, fclose, puc, getc, fprintf, C Preprocessor- #define, #include, #undef, Conditional compilation directives, C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions

TOTAL HOURS: 60

COURSE OUTCOME

At the end of this course the students can,

- CO1: Understand the basic terms, syntax and semantics of high-level languages .
- CO2: Able to differentiate structured and Un-Structured, Procedural and Non-Procedural Language.
- CO3: Able to develop conditional statements
- CO4: Able to apply the concepts of structures and Unions
- CO5: Able to develop create small applications using C program

TEXT BOOK

1. Let us C by Yashwant Kanetka, 6th Edition, PBP Publication

REFERENCE BOOKS

1. The C programming Language by Richie and Kenninghan, 2004, BPB Publication
2. Programming in ANSI C by Balaguruswamy, 3rd Edition, 2005, Tata McGraw Hill.

MATHEMATICS – I**5 0 0 5**

Course objective: To develop the skills of the students in the areas of Trigonometry, Set Theory, Calculus and Algebra. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I TRIGNOMETRY**18**

Introduction – Angles – Expansions of \sin , \cos , \tan . Expansion of \sin , \cos , \tan , in terms of - Simple problems.

UNIT II SET THEORY**18**

Sets – Operations on sets – Relations – Relations and functions: Equivalence relations – Partial order relation.

UNIT III MATRICES**18**

Introduction-Basic operations-Symmetric-skew symmetric-Hermitian-Skew Hermitian –Unitary orthogonal-Inverse of a matrix -Solution of linear system(Cramer’s rule)- Finding the Eigen roots and Eigen vectors of a matrix-Cayley Hamilton theorem(without proof)

UNIT IV THEORY OF EQUATIONS**18**

Polynomial, equations with real coefficients, irrational roots, complex roots, symmetric functions of roots, Transformation of equation by increasing or decreasing roots by a constant, reciprocal equations, Newton’s method to find the root approximately.

UNIT V DIFFERENTIAL CALCULUS**18**

Differentiation – Successive differentiation – Partial differentiation – Maxima and Minima of functions of two variables.

Total No of Hours: 90

COURSE OUTCOME

At the end of this course the students can

CO1: Apply the concepts of trigonometry function. .

CO2: Build set and equivalence function

CO3: Construct matrix using various techniques.

CO4: Experiment with theory of equation with example

CO5: Analysis differential calculus with example.

TEXT BOOK

1. P.R. Vittal, "Allied Mathematics", Margham Publications, 4th Edition 2009.

REFERENCE BOOK

1. A. Singaravelu, "Allied Mathematics", Meenakshi Agency, 2007.

COURSE OBJECTIVE

- This course introduces the basic concepts of C programming.
- This course practices the student to write simple programs using C.
- This course improves the logical thinking in C programming.

LIST OF EXPERIMENTS**Part A**

- 1 Printing the reverse of an integer.
- 2 Printing the odd and even series of N numbers.
- 3 Get a string and convert the lowercase to uppercase and vice--versa using getchar() and putchar().
- 4 Input a string and find the number of each of the vowels appear in the string.
- 5 Accept N words and make it as a sentence by inserting blank spaces and a full stop at the end.
- 6 Printing the reverse of a string.

Part B

- 1 Searching an element in an array using pointers.
- 2 Checking whether the given matrix is an identity matrix or not.
- 3 Finding the first N terms of Fibonacci series.
- 4 Declare 3 pointer variables to store a character, a character string and an integer respectively. Input values into these variables. Display the address and the contents of each variable.
- 5 Define a structure with three members and display the same.
- 6 Declare a union with three members of type integer, char, string and illustrate the use of union.
- 7 Recursive program to find the factorial of an integer.
- 8 Finding the maximum of 4 numbers by defining a macro for the maximum of two numbers.
- 9 Arranging N numbers in ascending and in descending order using bubble sort.
- 10 Addition and subtraction of two matrices.
- 11 Multiplication of two matrices.
- 12 Converting a hexadecimal number into its binary equivalent.
- 13 Check whether the given string is a palindrome or not.
- 14 Demonstration of bitwise operations.

15 Applying binary search to a set of N numbers by using a function.

16 Create a sequential file with three fields: empno, empname, empbasic. Print all the details in a neat format by adding 500 to their basic salary.

Total No. of Hours: 60

COURSE OUTCOME

At the end of this course the students can

CO1: Understand the basic terms, syntax and semantics of high--level languages

CO2: Able to differentiate structured and Un-Structured, Procedural and Non-Procedural Language

CO3: Able to develop conditional statements

CO4: Able to apply the concepts of structures and Unions

CO5: Able to develop create small applications using C program

LIST OF EXPERIMENTS

1. Text Manipulation using MS-WORD.
2. Usage of Bullets and Numbering, Header and Footer using MS-WORD.
3. Usage of Spell check, Find & Replace using MS-WORD.
4. Table Manipulation using MS-WORD.
5. Picture Insertion and Alignment using MS-WORD.
6. Usage of Spell check, Find & Replace using MS-WORD.
7. Creation of documents using templates using MS-WORD.
8. Cell Editing using MS-EXCEL.
9. Data Sorting using MS-EXCEL.
10. Usage of Formulas & Built In Functions using MS-EXCEL.
11. Worksheet Preparation using MS-EXCEL.
12. Drawing Graphs using MS-EXCEL.
13. Inserting ClipArt's & Pictures using MS-EXCEL.
14. Slide Transitions and Animation using MS-POWER POINT.
15. Organisation Chart using MS-POWER POINT.

COURSE OUTCOME**At the end of this course the students can**

- CO1:** Understand the basic tools and icons in IDE and able to format a document in word document
- CO2:** Able to mail a document to more than two people through mail merge concept.
- CO3:** Able to develop power point presentation.
- CO4:** Able to apply to mathematical functions in table.
- CO5:** Able to develop create small applications Ms Excel

Semester – II

Syllabus

TAMIL I/HINDI /FRENCH

5 0 0 5

18LTA002

தமிழிலக்கியம்

5 0 0 5

நோக்கம்:

சங்க காலம் தொடங்கி தற்காலம் வரையிலும் தமிழில் உள்ள படைப்பிலக்கியங்களை இப்பாடம் அறிமுகம் செய்கின்றது. தமிழ் இலக்கியத்தில் தேர்ந்தெடுக்கப்பட்ட மிக முக்கியமான செய்யுட்கள், கவிதைகள், கதைகள், உரைநடை ஆகியவற்றைக்கொண்டு இப்பாடம் கட்டமைக்கப்பட்டுள்ளது. மாணாக்கரிடம் இலக்கியத் தேடலை உருவாக்குவதும், தற்சார்புடைய அறிவை மேம்படுத்துவதும் இப்பாடத்தின் நோக்கமாகும்.

அலகு 1 செவ்வியல் இலக்கியங்கள்

12

மணி நேரம்

திருக்குறள்- அன்புடைமை, ஒழுக்கமுடைமை, பெரியாரைத்துணைக்கோடல் -மூன்று அதிகாரங்கள் முழுமையும்.புறநானூறு- பாடல் எண்: 18, 55, 182, 183, 192 -ஐந்து பாடல்கள்.குறுந்தொகை- பாடல் எண்: 2, 167, 27, 202, 184 - ஐந்து பாடல்கள்.

அலகு 2 காப்பியங்கள்

12 மணி

நேரம்

சிலப்பதிகாரம்- கனாத்திறம் உரைத்தக் காதை முழுவதும்.மணிமேகலை- பவத்திறம் அறுக எனப் பாவை நோற்ற காதை முழுவதும்.கம்பராமாயணம் - மந்தரைச் சூழ்ச்சிப்படலம் (தேர்ந்தெடுக்கப்பட்ட ஒன்பது பாடல்கள்).

அலகு 3 கவிதையும் புதுக்கவிதையும்

11

மணிநேரம்

பாரதிதாசனின் 'தமிழியக்கம்' -(i) நெஞ்சு பதைக்கும் நிலை - (ii) இருப்பதைவிட இறப்பது நன்று - இரண்டு கவிதைகள்.ஈரோடு தமிழன்பனின், "அந்த நந்தனை எரித்த நெருப்பின் மிச்சம்" என்னும் தொகுதியில் இடம்பெற்றுள்ள 'விடிகிறது' என்னும் புதுக்கவிதை.

அலகு 4 சிறுகதைகள்

12 மணி

நேரம்

தி. ஜானகிராமனின் 'சக்தி வைத்தியம்' கி. ராஜநாராயணனின் 'கதவு' -
இரண்டு கதைகள்

அலகு 5 உரைநடை

13 மணி

நேரம்

வைரமுத்து எழுதிய 'சிற்பியே உன்னைச் செதுக்குகிறேன்' முழுவதும்

மொத்தம்: 60 மணி நேரம்

பாட நூல்கள்

1. இரவிச்சந்திரன். சு. (ப.ஆ), "செய்யுள் திரட்டு", வேல்ஸ் பல்கலைக்கழகம், முதற்பதிப்பு, 2008.
2. வைரமுத்து. இரா., "சிற்பியே உன்னைச் செதுக்குகிறேன்", திருமகள் நிலையம், பதினேழாம் பதிப்பு, 2007.

பார்வை நூல்கள்

1. பாலச்சந்திரன்.சு., "இலக்கியத் திறனாய்வு", நியூ செஞ்சுரி புக் ஹவுஸ், பத்தாம் பதிப்பு, 2007.
2. மாதையன்.பெ., "தமிழ்ச் செவ்வியல் படைப்புகள்", நியூ செஞ்சுரி புக் ஹவுஸ், முதல் பதிப்பு, 2009.
3. வரதராசன்.மு., "குறள் காட்டும் காதலர்", பாரி நிலையம், மறுபதிப்பு, 2005.

HINDI II

5 0 0 5

COURSE OBJECTIVE

- To enable the students to have the knowledge in contemporary literature of the modern era.
It also provides an idea how translation to be effected.

UNIT I KAHANI AUR EKANKI 12

Poos Kee Raat., - Duzhazar

UNIT II EKANKI AUR KAHANI 12

Vaapasi, Akeli, . Akbhari vigyapan

UNIT III KAHANI AUR ANUVAD 12

Sharandatha - Anuvad anuched angreji se hindi me karne ke liye.

UNIT IV EKANKI AUR ANUVAD 12

Raat ke Raahi Main Bhi Maanav hoon Anuvad anuched angreji se hindi me karne ke liye.

UNIT V KAHANI ,EKANKI AUR ANUVAD 12

Parda - Yeh Meri Janma Bhoomi Hai -anuvad anuched angreji se hindi me karne ke liye.

Total No of Hours: 60 Hrs

TEXT BOOK

1.Sankalan Kahani evam Ekankied by Dr.N.Lavanya, Mayura Publishers,edition 2010

COURSE OBJECTIVE:

- To fortify the grammar and vocabulary skills of the students.
- Enable the students have an idea of the French Culture and Civilization

UNIT I LEÇONS 10 – 11 12

Les affaires marchent,- 11. Un après midi à problèmes- Réponses aux questions tirés de la leçon - Grammaire : Présent progressif, passé récent ou future proche - Complément d'objet directe - Complément d'objet indirecte .

UNIT II LEÇONS 12 – 13 12

Tout est bien qui fini bien,- 13. Aux armes citoyens – Réponses aux questions tirés de la leçon - Grammaire : Les pronoms « en ou y » apporter des paroles - Les pronoms relatifs que, qui, ou où ,

UNIT III LEÇONS 14 – 15 12

Leçons 14. Qui ne risqué rien n'a rien,- 15. La fortune sourit aux audacieux – Réponses aux questions tirés de la leçon - Grammaire : Comparaison – Les phrases au passé composé

UNIT IV LEÇONS 16 – 18 12

Leçons 16 La publicite et nos rêves 17 La France le monde 18 Campagne publicitaire Réponses aux questions tirés de la leçon - Grammaire :- Les phrases à l' Imparfait - Les phrases au Future

UNIT V COMPOSITION 12

A écrire une lettre de regret// refus à un ami concernant l'invitation d'une célébration reçue- A écrire un essai sur un sujet générale - A lire le passage et répondre aux questions

Total No Of Hours : 60 Hrs**TEXT BOOK**

1. Jacky GIRARDER & Jean Marie GRIDLIG, « Méthode de Français PANORAMA », Clé Internationale , Goyal Publication, New Delhi., Edition 2004

ENGLISH II

5 0 0 5

COURSE OBJECTIVE:

- To enable the students to develop their communication skills effectively. To make students familiar with the English Language.
- To enrich vocabulary in English
- To develop communicative competent

UNIT-I Prose**12**

1. The Words of Wisdom
ChetanBhagat
2. Forgetting
Robert Lynd
3. My Early Days
Dr. A.P.J. Abdul Kalam

UNIT II –Poetry**12**

1. Ozymandias
Percy Bysshe Shelley
2. Mending Wall
Robert Frost
3. Where the Mind is Without Fear
Rabindranath Tagore

UNIT III –Short Story**12**

1. Am I Blue?
Alice Walker
2. The Last Leaf
O’ Henry
3. The Selfish Giant
Oscar Wilde

UNIT IV – One Act Play**12**

1. Soul Gone Home
Langston Hughes

UNIT V**12**

1. Lexical Skills
2. Vocabulary
3. Communication and Grammar at the end of all lessons

Total: 60 Hours

COURSE OUTCOME

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

- CO 1** Construct sentences owing to advanced grammar skills taught.
- CO 2** Prove better communicative ability because of illustrations from fundamental grammar.
- CO 3** Prove their skill in writing sentences after the modals of American, British and Indian English writers.
- CO 4** Develop different sensibilities in approaching life.
- CO 5** Solve life's problems as highlighted in the selections.

Books Prescribed:

Radiance - Emerald Publications

COURSE OBJECTIVE

- A data structure is a particular way of storing and organizing data in a computer so that it can be used efficiently.
- Different kinds of data structures are suited to different kinds of applications and some are highly specialized to specific tasks.
- This course covers the basic concepts of different data structures which are the basic building blocks of Programming and problem solving.

UNIT I INTRODUCTION TO DATA STRUCTURES**12**

Definition, Classification of data structures: primitive and non-primitive, Elementary data organization, Time and space complexity of an algorithm (Examples), String processing. Dynamic memory allocation and pointers: Definition of dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer, Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). Recursion: Definition, Recursion in C (advantages), Writing Recursive programs – Binomial coefficient, Fibonacci, GCD

UNIT II SEARCHING AND SORTING**12**

Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. Sort: General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort.

UNIT III STACK AND QUEUE**12**

Stack – Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks. Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque), Priority queue, Operations on all types of Queues.

UNIT IV LINKED LIST**12**

Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages

of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

UNIT V TREE GRAPHS AND THEIR APPLICATION

12

Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and postorder. Graphs, Application of Graphs, Depth First search, Breadth First search.

TOTAL HOURS: 60

Course Outcomes:

After completion of the course the student will be able:

- CO1 Understand and implement the both array based and linked-list based data structures, including singly, doubly, and circular linked-lists.
- CO2 Understand and implement the Stack data structure and stack operations.
- CO3 Understand and implement the both array based circular queue and linked-list based queue implementations.
- CO4 Understand and implement general tree data structures, including binary tree, both array based and reference based implementations.

Understand and implement binary search trees.

TEXT BOOK

1. Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001.
2. Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill.
3. Robert Kruse Data Structures and program designing using 'C'.

REFERENCE BOOKS

1. Trembley and Sorenson Data Structures
2. E. Balaguruswamy Programming in ANSI C.
3. Bandyopadhyay, Data Structures Using C Pearson Education, 1999
4. Tenenbaum, Data Structures Using C. Pearson Education, 2006
5. Kamthane: Introduction to Data Structures in C. Pearson Education 2005.
6. Hanumanthappa M., Practical approach to Data Structures, Laxmi Publications, Fire Wall media 2006
7. Langsam, Ausenstein Maoshe & M. Tanenbaum Aaron Data Structures using C and C++ Pearson Education

MATHEMATICS – II**5 0 0 5**

COURSE OBJECTIVE : To impart the knowledge of Integral calculus, Differential Equations, Fourier Series and Laplace transform. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I DIFFERENTIAL CALCULUS 18

Differential Calculus: Functions and limits – Differentiation – Successive Differentiation – Partial Differentiation – Maxima and Minima of Functions of two variables.

UNIT II INTEGRAL CALCULUS 18

Integral Calculus: Integration – Definite Integrals – Reduction Formulae.

UNIT III EULER'S EQUATION 18

Ordinary differential equations: Second order and non-homogenous linear differential equations with constant coefficients – Second order linear differential equations with variable coefficients. (Euler's form only).

UNIT IV PARTIAL EQUATION 18

Formation of Partial differential equations by eliminating arbitrary constants and arbitrary function – Solutions of standard types of First order equations – $f(p,q)=0$; $f(x,p,q)=0$, $f(y,p,q)=0$, $f(z,p,q)=0$, $z=px+qy+f(p,q)$ – Lagrange method of solving linear partial differential equations $Pp+Qq=R$.

UNIT V FOURIER SERIES 18

Fourier series of periodic functions on the interval $[c, c+2\pi]$ – Half range series.

Total No of Hours: 90

COURSE OUTCOME

At the end of this course the students can

CO1: Apply the concepts of integral calculus.

CO2: Develop ordinary differential equation

CO3: Examine partial differential equation.

CO4: Analyze Fourier transformation function.

CO5: Understand the concept of Dissect Laplace transform function

TEXT BOOK

1. Higher engineering mathematical by B.S Grewal

REFERENCE BOOK

1. Mathematical foundations by P.R. Vittal.

COURSE OBJECTIVE

- This course introduces the basic concepts of UNIX programming.
- This course practices the student to write Vi Editor

LIST OF EXPERIMENTS

1. Execute 25 basic commands of UNIX.
 2. Basics of functionality and modes of VI Editor.
 3. WAP that accepts user name and reports if user is logged in.
 4. WAP which displays the following menu and executes the option selected by user:
 1. ls
 2. Pwd
 3. ls -l
 4. ps -fe
 5. WAP to print 10 9 8 7 6 5 4 3 2 1 .
 6. WAP that replaces all "*.txt" file names with "*.txt.old" in the current.
 7. WAP that echoes itself to stdout, but backwards.
 8. WAP that takes a filename as input and checks if it is executable, if not make it executable.
 9. WAP to take string as command line argument and reverse it.
 10. 1. Create a data file called employee in the format given below:
 - a. EmpCode Character
 - b. EmpName Character
 - c. Grade Character
 - d. Years of experience Numeric
 - e. Basic Pay Numeric
- \$vi employee

A001	ARJUN	E1	01	12000.00
A006	Anand	E1	01	12450.00
A010	Rajesh	E2	03	14500.00
A002	Mohan	E2	02	13000.00
A005	John	E2	01	14500.00
A009	Denial Smith	E2	04	17500.00
A004	Williams	E1	01	12000.00

Perform the following functions on the file:

- a. Sort the file on EmpCode.
- b. Sort the file on
 - (i) Decreasing order of basic pay
 - (ii) Increasing order of years of experience.
- c. Display the number of employees whose details are included in the file.
- d. Display all records with 'smith' a part of employee name.
- e. Display all records with EmpName starting with 'B'.
- f. Display the records on Employees whose grade is E2 and have work experience of 2 to 5 years.
- g. Store in 'file 1' the names of all employees whose basic pay is between 10000 and 15000.
- h. Display records of all employees who are not in grade E2

TOTAL HOURS: 60

COURSE OUTCOME:

- CO1 will be able to run various UNIX commands on a standard UNIX/LINUX Operating system
- CO2 will be able to run C / C++ programs on UNIX.
- CO3 will be able to do shell programming on UNIX OS

COURSE OBJECTIVE

- Students will benefit from the knowledge of Data Structures and different operating one can perform on these like searching, sorting, stacking and etc
- This forms a very strong foundation for programming in different languages that the students will take up in subsequent semesters or in any other course1. Building Simple Applications.

LIST OF EXPERIMENTS**Part A**

1. Use a recursive function to find GCD of two numbers.
2. Use a recursive function to find the Fibonacci series.
3. Use pointers to find the length of a string and to concatenate two strings.
4. Use pointers to copy a string and to extract a substring from a given a string.
5. Use a recursive function for the towers of Hanoi with three discs.
6. Insert an integer into a given position in an array.
7. Deleting an integer from an array.
8. Write a program to create a linked list and to display it.
9. Write a program to sort N numbers using insertion sort.
10. Write a program to sort N numbers using selection sort.

Part B

1. Inserting a node into a singly linked list.
2. Deleting a node from a singly linked list.
3. Pointer implementation of stacks.
4. Pointer implementation of queues.
5. Creating a binary search tree and traversing it using in order, preorder and post order.
6. Sort N numbers using merge sort.

Total No of Hours 60

COURSE OUTCOME:

CO1 Design and implement programs using recursive functions and strings

CO2 Implement linear data structures like stack, queue and linked list.

CO3 Develop programs to implement Binary Search Tree.

CO4 Implement searching algorithms

CO5 Implement and compare various sorting algorithms.

CO6 Sort N numbers using merge sort

Semester – III

Syllabus

COURSE OBJECTIVE

- To make students familiar with oops & applet programming
- Java programming can be used to develop both web based & console based application & stand-alone application
- Java is one of the top most languages used in most of the IT companies. It is a job assured course.

UNIT I INTRODUCTION TO JAVA**12**

History and Overview of Java, Object Oriented Programming, Control statements- if and for loop. Using Blocks of codes, Lexical issues - White space, identifiers, Literals, comments, separators, Java Key words, Data types - Integers, Floating point, characters, Boolean, A closer look at Literals, Variables, Type conversion and casting. Automatic type promotion in Expressions Arrays. Operators - Arithmetic operators, Bit wise operators, Relational Operators, Boolean Logical operators, Assignment Operator, Operator Precedence. Control Statements – Selection Statements - if, Switch, Iteration Statements - While, Do-while, for Nested loops, Jump statements.

UNIT II CLASSES**12**

Class Fundamentals, Declaring objects, Assigning object reference variables. Methods - constructors, “this” keyword, finalize () method A stack class, Over loading methods. Using objects as parameters, Argument passing, Returning objects. Recursion, Access control, Introducing final, understanding static. Introducing Nested and Inner classes. Using command line arguments. Inheritance – Basics, Using super, method overriding, and Dynamic method Dispatch, Using abstract classes and final with Inheritance.

UNIT III PACKAGES**12**

Definition. Access protection importing packages. Interfaces: Definition and implementation. Exception Handling – Fundamentals, types, Using try and catch and Multiple catch clauses, Nested try Statements, throw, throws, finally. Java’s built-in exception, using Exceptions.

UNIT IV MULTITHREADED PROGRAMMING**12**

Java thread model – main thread, creating single and multiple thread. Is alive () and join (). Thread – Priorities, Synchronization, Inter thread communication, suspending, resuming and stopping threads, using multi-threading. I / O basics – Reading control input, writing control output, Reading and Writing files. Applet Fundamentals – AWT package, AWT Event handling concepts, the transient and volatile modifiers. Using instance of using assert..

UNIT V JAVA Database Connectivity (JDBC)**12**

Database connectivity – JDBC architecture and Drivers. JDBC API - loading a driver, connecting to a database, creating and executing JDBC statements, handling SQL exceptions. Accessing result sets: types and methods. An example - JDBC application to query a database.

Total No of Hours: 60**COURSE OUTCOME****At the end of this course the students can****CO1:** Determine java features and explain the supporting OOPs concepts**CO2:** Develop the Java Classes make use of Constructors and Inheritance**CO3:** Analyze the packages and classify the thread communication**CO4:** Construct the IO streams experiment with Applets and Java Utilities**CO5:** Build the AWT classes and utilize Controls and Layout Managers**TEXT BOOKS**

1. The complete reference Java –2: V Edition by Herbert Schildt Pub. TMH.

REFERENCE BOOKS

1. Personality Development & Soft Skills, Barun K. Mitra, Oxford University Press.

COMPUTER NETWORKS**5 0 0 5**

COURSE OBJECTIVE

- It is important for networking professionals to have a sound grounding in the basics of networking and with the networking technology being developed thick and fast, the professionals need to be updated of them at all times.
- The focus of this unit is providing a background to the basics of networking and its underlying principles.
- The learners taking this unit will explore the fundamentals of networking, the principle and purpose behind layered models, devices used in networks and their wireless connectivity and the ways to troubleshoot network related issues.

UNIT I NETWORKING FUNDAMENTALS

12

Basics of Network & Networking, Advantages of Networking, Types of Networks, Network Terms- Host, Workstations, Server, Client, Node, Types of Network Architecture- Peer-to-Peer & Client/Server, Workgroup Vs. Domain. Network Topologies, Types of Topologies, Logical and physical topologies, selecting the Right Topology, Types of Transmission Media, Communication Modes, Wiring Standards and Cabling- straight through cable, crossover cable, rollover cable, media connectors (Fibre optic, Coaxial, and TP etc.) Introduction of OSI model, Seven layers of OSI model, Functions of the seven layers, Introduction of TCP/IP Model, TCP, UDP, IP, ICMP, ARP/RARP, Comparison between OSI model & TCP/IP model. Overview of Ethernet Addresses

UNIT II BASICS OF NETWORK DEVICES

12

Network Devices- NIC- functions of NIC, installing NIC, Hub, Switch, Bridge, Router, Gateways, And Other Networking Devices, Repeater, CSU/DSU, and modem, Data Link Layer: Ethernet, Ethernet standards, Ethernet Components, Point-to-Point Protocol(PPP),PPP standards, Address Resolution Protocol, Message format, transactions, Wireless Networking: Wireless Technology, Benefits of Wireless Technology, Types of Wireless Networks: Ad-hoc mode, Infrastructure mode, Wireless network Components: Wireless Access Points, Wireless NICs, wireless LAN standards: IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, wireless LAN modulation techniques, wireless security Protocols: WEP,WPA, 802.1X, Installing a wireless LAN

UNIT III BASICS OF NETWORK, TRANSPORT AND APPLICATION LAYERS

12

Network Layer: Internet Protocol (IP), IP standards, versions, functions, IPv4 addressing, IPv4 address Classes, IPv4 address types, Subnet Mask, Default Gateway, Public & Private IP Address, methods of assigning IP address, IPv6 address, types, assignment, Data encapsulation, The IPv4 Datagram Format, The IPv6 Datagram Format, Internet Control Message Protocol (ICMP), ICMPv4, ICMPv6, Internet Group Management Protocol (IGMP), Introduction to Routing and Switching concepts, Transport Layer: Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of Ports & Sockets, Application Layer: DHCP, DNS, HTTP/HTTPS, FTP, TFTP, SFTP, Telnet, Email: SMTP, POP3/IMAP, NTP.

UNIT IV WAN TECHNOLOGY

12

What Is a WAN?, WAN Switching, WAN Switching techniques Circuit Switching, Packet Switching etc., Connecting to the Internet : PSTN, ISDN, DSL, CATV, Satellite-Based Services, Last Mile Fiber, Cellular Technologies, Connecting LANs : Leased Lines, SONET/SDH, Packet Switching, Remote Access: Dial-up Remote Access, Virtual Private Networking, SSL VPN, Remote Terminal Emulation, Network security: Authentication and Authorization, Tunneling and Encryption Protocols, IPSec, SSL and TLS, Firewall, Other Security Appliances, Security Threats

UNIT V NETWORK OPERATING SYSTEMS AND TROUBLESHOOTING NETWORK

12

Network Operating Systems: Microsoft Operating Systems, Novell NetWare, UNIX and Linux Operating Systems, Macintosh Networking, Trouble Shooting Networks: Command-Line interface Tools, Network and Internet Troubleshooting, Basic Network Troubleshooting : Troubleshooting Model, identify the affected area, probable cause, implement a solution, test the result, recognize the potential effects of the solution, document the solution, Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble shooting tools, system monitoring tools.

Course Outcomes:

After completion of the course the student will be able:

- Discuss the evolution of Computer Networks.
- Evaluate the different standard organizations related to computer networks.
- Understand the Concept of protocols at different layers.
- Compare features of TCP/IP Model with reference to the OSI Model.
- Examine reassembly and fragmentation with respect to a data packet in hand.

- Inspect the different switching technologies for LAN.
- Understand the Concept of WAN switching.
- Understand the basics of network utility and network troubleshooting.

TEXT BOOKS

1. CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011
2. CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013

REFERENCE BOOK

1. Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008
2. CCNA Exploration Course Booklet : Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010

STATISTICS AND PROBABILITY

5 0 0 5

COURSE OBJECTIVE

- To understand the basic concepts of statistics and probability.
- To understand the description of data using statistical techniques
- To understand the statistical methods involved in hypothesis testing
- To understand the difference between parametric and non-parametric tests
- To understand the random variables, statistical expectation and its statistical and mathematical properties.
- To understand the concepts of regression and correlation analysis.

UNIT I INTRODUCTION TO STATISTICS AND PROBABILITY

12

History and evolution of statistics, types of data, important terminologies, contingency table, frequency and cross table, graphs, histogram and frequency polygon, Random variables, statistical properties of random variables, Expectation, , jointly distributed random variables, moment generating function, characteristic function, limit theorems, probability, trial, events, types of events, apriori probability, limitations of classical probability, statistical or empirical probability, axiomatic approach to probability, probability function, theorems on probabilities of events, law of probability theory, Bayes theorem, application of Bayes Theorem.

UNIT II MEASURES OF CENTRAL TENDENCY AND DISPERSION

12

Descriptive Statistics, Mean: Arithmetic, Geometric and Harmonic means, mathematical relationship among different means, median for raw data and grouped data, mode for raw data and grouped data, relationship among mean, median and mode, measure of dispersion – standard deviation, variance, covariance and its properties, coefficient of variation, quartiles, quartile deviation and mean deviation, Mean absolute deviation.

UNIT III TESTING OF HYPOTHESIS

12

Introduction to testing of hypothesis, Statistical assumptions, Level of significance, confidence level, Type I Error, Type II error, Critical value, power of the test, Application of small sample test

– t and F test, Large Sample test – Z test in Data Science Industry with small use cases (application oriented).

UNIT IV ANALYSIS OF VARIANCE (ANOVA)

12

Introduction to general linear model, assumptions of ANOVA, factors and levels in ANOVA, layout of one way ANOVA, skeleton of one way ANOVA, multiple comparison of sample means, one way analysis of variance with unequal sample sizes, two factor analysis of variance – introduction and parameter estimation, two way analysis of variance with interaction, Post ANOVA: testing of hypothesis for significance of mean using Fishers Least Significance Difference test (lsd), Tukeys test, Dunnet test, Duncan Multiple Range test.

UNIT V REGRESSION AND CORRELATION

12

Introduction to linear model, concepts of factor, effect, residuals, dependency, independency, assumptions of linear model, estimation of parameters using OLS, properties of regression coefficients, Spurious regression concepts, significance of regression coefficients using t test and F test, concepts of auto correlation, multiple linear regression analysis, multi collinearity, heteroscedasticity, significance of estimated parameters in multiple linear regression, partial test for the individual significance, correlation analysis, properties of correlation coefficients, significance of single correlation coefficient, significance of multiple correlation coefficients, concepts of multiple correlation and partial correlation.

COURSE OUTCOME:

- CO1** After completing this course, students will be able to appreciate the need of data science in day to day life
- CO2** They will be able to understand the process and components of data science project.
- CO3** Student will the Learn importance of probability and statistics in data science
- CO4** Student will be able to understand the machine learning in today's business world.
- CO5** Understands the various components of computer science being used for data science

CO6 Student will be able to understand the execution flow of a data science project

TEXT BOOKS

1. Fundamentals of mathematical statistics – SC Gupta and VK Kapoor, Sultan Chand & Sons Publication, New Delhi

REFERENCE BOOK

1. Introduction to probability Models, Ninth Edition – Sheldon M. Ross, Elsevier Publication, Academic Press, UK
2. Introduction to Probability and Statistics for Engineers and Scientists, Third Edition - Sheldon M. Ross, Elsevier Publication, Academic Press, UK
3. An introduction to Probability and Statistical Inference – George Roussas, Academic Press.

COURSE OBJECTIVE

- To understand the overview and definition of Data Science with its crucial role in current business world.
- To understand the importance of mathematics & Statistics in Data Science.
- To understand the role of machine learning techniques in Data Science and its different types.
- To know the integrated role of computers and its components in Data Science
- To understand the flow and process model of data science project management. .

UNIT I DATA SCIENCE- AN OVERVIEW 12

Introduction to Data Science, Definition and description of Data Science, history and development of Data Science, terminologies related with Data Science, basic framework and architecture, difference between Data Science and business analytics, importance of Data Science in today's business world, primary components of Data Science, users of Data Science and its hierarchy, overview of different Data Science techniques, challenges and opportunities in business analytics, different industrial application of Data Science techniques

UNIT II MATHEMATICS AND STATISTICS IN DATA SCIENCE 12

Role of mathematics in Data Science, importance of probability and statistics in Data Science, important types of statistical measures in Data Science : Descriptive, Predictive and prescriptive statistics, introduction to statistical inference and its usage in Data Science, application of statistical techniques in Data Science, overview of linear algebra : matrix and vector theory, role of linear algebra in Data Science, exploratory data analysis and visualization techniques, difference between exploratory and descriptive statistics, EDA and visualization as key component of Data Science.

UNIT III MACHINE LEARNING IN DATA SCIENCE 12

Role of machine learning in Data Science, different types of machine learning techniques and its broad scope in Data Science : Supervised, unsupervised, reinforcement and deep learning, difference between different machine learning techniques, brief introduction to machine learning algorithms, importance of machine learning in today's business, difference between machine learning classification and prediction.

UNIT IV COMPUTERS IN DATA SCIENCE 12

Role of computer science in Data Science, various components of computer science being used for Data Science, role of relation data base systems in Data Science: SQL, NoSQL, role of data warehousing in Data Science, terms related with data warehousing techniques, importance of operating concepts and memory management, various freely available software tools used in Data Science : R, Python, important proprietary software tools, different business intelligence tools and its crucial role in Data Science project presentation.

UNIT V DATA SCIENCE PROJECT MANAGEMENT

12

Data Science project framework, execution flow of a Data Science project, various components of Data Science projects, stakeholders of Data Science project, industry use cases of Data Science implementation, challenges and scope of Data Science project management, process evaluation model, comparison of Data Science project methods, improvement in success of Data Science project models.

Total Hours - 60

COURSE OUTCOME:

- CO1** After completing this course, students will be able to appreciate the need of data science in day to day life.
- CO2** They will be able to understand the process and components of data science project.
- CO3** Student will the Learn importance of probability and statistics in data science
- CO4** Student will be able to understand the machine learning in today's business world.
- CO5** Understands the various components of computer science being used for data science

Student will be able to understand the execution flow of a data science project

TEXT BOOKS

1. Data Science from Scratch: First Principles with Python 1st Edition by Joel Grus

2. Principles of Data Science by Sinan Ozdemir, (2016) PACKT.

REFERENCE BOOKS

1. Data Science For Dummies by Lillian Pierson (2015)
2. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking by Foster Provost, Tom Fawcett
3. Data Smart: Using Data Science to Transform Information into Insight 1st Edition by John W. Foreman. (2015) Wiley Publication.

COURSE OBJECTIVE

- To make students familiar with oops & applet programming
- Java programming can be used to develop both web based & console based application & stand-alone application
- Java is one of the top most languages used in most of the IT companies. It is a job assured course.

Part A

1. Write a program to check whether two strings are equal or not.
2. Write a program to display reverse string.
3. Write a program to find the sum of digits of a given number.
4. Write a program to display a multiplication table.
5. Write a program to display all prime numbers between 1 to 1000.
6. Write a program to insert element in existing array.
7. Write a program to sort existing array.
8. Write a program to create object for Tree Set and Stack and use all methods.
9. Write a program to check all math class functions.
10. Write a program to execute any Windows 95 application (Like notepad, calculator etc)
11. Write a program to find out total memory, free memory and free memory after executing garbage Collector (gc).

Part B

1. Write a program to copy a file to another file using Java to package classes. Get the file names at run time and if the target file is existed then ask confirmation to overwrite and take necessary actions.
2. Write a program to get file name at runtime and display number of lines and words in that file.
3. Write a program to list files in the current working directory depending upon a given pattern.
4. Create a text field that allows only numeric value and in specified length.
5. Create a Frame with 2 labels, at runtime display x and y coordinate of mouse pointer in the labels.

Total No of Hours: 60

COURSE OUTCOME

At the end of this course the students can

- CO1:** Build Java program with basic OOP concept
- CO2:** Examine the string concepts with string buffer class
- CO3:** Explain the database creation in Java programs
- CO4:** Apply the exception handling solve with thread based
- CO5:** Build java program utilize the Applet concepts

COURSE OBJECTIVE:

- The focus of this unit is providing a background to the basics of networking and its underlying principles. The learners taking this unit will explore the fundamentals of networking, the principle and purpose behind layered models, devices used in networks and their wireless connectivity and the ways to troubleshoot network related issues.
- This course enables learners to understand computer networking concepts, how they work, how they operate and the protocols, standards and the models associated with networking technology and their troubleshooting mechanisms.

LIST OF EXPERIMENTS:

1. Implementation of TCP/IP protocol – I
2. Implementation of TCP/IP protocol - II
3. Troubleshooting Scenarios Network - I
4. Troubleshooting Scenarios Network - II
5. Router – Configuration - I
6. Router – Configuration - II
7. Router – Configuration - III
8. Configuration of IP Address for a Router – I
9. Configuration of IP Address for a Router - II
10. Setting up of Passwords – I
11. Setting up of Passwords – II
12. Setting up of Passwords – III

COURSE OUTCOME:

CO1 Understand fundamental underlying principles of computer networking

CO2 Understand details and functionality of layered network architecture.

CO3 Apply mathematical foundations to solve computational problems in computer networking

CO4 Analyze performance of various communication protocols.

CO5 Compare routing algorithms

CO6 Practice packet /file transmission between nodes

SOFT SKILLS -I

2 0 0 2

COURSE OBJECTIVE:

- To train students in the use of English language in varied literary and non-literary context
- To teach them soft skills and strengthen their foundation in grammar and composition
- To evaluate their comprehension skills.

Credit Hours**UNIT - I- Prose****12**

1. Two Gentleman of Verona - A.J. Cronin
2. Judas Iscariot - Bonnie Chamberlain
3. Dangers of Drug Abuse - J. V. S. Henbane

UNIT II - Short Stories**12**

1. Journey by Night - Norah Burke
2. The 2000-Mile Turtle - Henry Edward Fox
3. Fools Paradise - Isaac Bashevis Singer

UNIT III – Fiction**12**

R. L. Stevenson - Dr. Jekyll & Mr. Hyde (Retold by Kennet) – S. Chand
& company Ltd.

UNIT IV - Functional English**12**

1. Paragraph Writing
2. Comprehension
1. Letter Writing
2. Report writing
 - a) News Paper Report
 - b) Reports for Government Official Attention
 - c) Definition

UNIT V – Conversation In Situations & Conversation Practice**12****1. Conversation in Situations**

- a) At the Airport
- b) In a Bank
- c) On the Beach
- d) At the Customs
- e) At the Doctors’
- f) In a Flight
- g) In a Hotel
- h) In a Restaurant
- i) In a Shop
- j) Tea Time
- k) On the Telephone

- l) In a Travel Agency
- m) On a Country Walk
- n) At the theatre
- o) In a Street

2. Conversation Practice

- a) Daily Activities
- b) Asking Directions
- c) Travel plans
- d) Living in an Apartment
- e) Money Problems
- f) Weather Conditions
- g) Dinner Conversations
- h) Common Health Problems
- i) Tag Questions
- j) Office Conversations

3. Expansion of Hints

Total: 60 Hours

COURSE OUTCOME

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

- CO 1** Estimate the essays in the light of appeal of values-based essays.
- CO 2** Prioritize pragmatic day to day communication through letter and comprehension.
- CO 3** Develop narrative skill after reading the short stories.
- CO 4** Improve their own style of writing after an expose to the prescribed prose pieces.
- CO 5** Adapt themselves to life context wherein soft skill learning is a must.

Books Prescribed:

1. Effective English Communications for You – V. Syamala, Emerald Publishers, Chennai.
2. English Conversation Practice by D. H. Spencer, Oxford University Press
3. English Conversation Practice by Grant Taylor, Tata McCraw-Hill, Publishing Company Limited, New Delhi.

Semester – IV

Syllabus

COURSE OBJECTIVE:

- A database management system (DBMS) is collection of software meant to manage a Database. Many popular databases currently in use are based on the relational database model.
- RDBMSs have become a predominant choice for the storage of information in new databases used for financial records, manufacturing and logistical information, personnel data and much more.
- The course covers the basic concepts of databases in general with an emphasis on relational databases, modeling techniques and writing queries. Normalization techniques, Transaction processing, Concurrency Control techniques and Recovery of databases against crashes are also covered.

UNIT I INTRODUCTION**12**

Purpose of Database System -- Views of data – Data Models – Database Languages — Database System Architecture – Database users and Administrator – Entity– Relationship model (E-R model) – E-R Diagrams -- Introduction to relational databases.

UNIT II RELATIONAL MODEL**12**

The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations- SQL fundamentals, Oracle data types, Data Constraints, Column level & table Level Constraints, working with Tables, Defining different constraints on the table, Defining Integrity Constraints in the ALTER TABLE Command, Select Command, Logical Operator, Range Searching, Pattern Matching, Oracle Function, Grouping data from Tables in SQL, Manipulation Data in SQL.

UNIT III SQL**12**

Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins), Sub queries Union, intersect & Minus Clause, Creating view, Renaming the Column of a view, Granting Permissions, - Updating, Selection, Destroying view Creating Indexes, Creating and managing User, Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views – Introduction to Distributed Databases and Client/Server Databases.

UNIT IV DATABASE DESIGN**12**

Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form-Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

Unit V TRANSACTIONS

12

Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit - Save Points – SQL Facilities for recovery –Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Intent Locking – Deadlock-Serializability – Recovery Isolation Levels – SQL Facilities for Concurrency

Total No of Hours: 60

COURSE OUTCOME:

CO1 Write queries, transactions and different modelling techniques in a relational database.

CO2 Normalize data and know its techniques.

CO3 Find the familiarity with relational database model.

CO4 Understand fundamentals of relational systems including data models.

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Fifth Edition, Tata McGraw Hill, 2006.
2. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition, Pearson/Addision Wesley, 2007.

REFERENCE BOOKS

1. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill, 2003.

COURSE OBJECTIVE:

- To understand the basic concepts of statistical learning methods and models.
- To understand the importance of unsupervised learning in multivariate data sets.
- To understand the importance of supervised learning in classifying class labels for prediction.
- To understand the different algorithms related to classification techniques.
- To understand the estimation procedure for multiple Linear regression coefficients
- To understand the assumptions in estimating regression coefficients using OLS method.
- To understand the concepts of hypothesis testing in parametric and nonparametric classification techniques.

UNIT I INTRODUCTION TO MACHINE LEARNING ALGORITHMS 12

Introduction to Machine learning – Statistical Learning – types of Machine Learning –learning models: geometric, probabilistic and logistic models, introduction to supervised, unsupervised and reinforcement learning – model evaluation – model implementation – model accuracy indicators.

UNIT II SUPERVISED LEARNING – SIMPLE LINEAR REGRESSION ANALYSIS 12

Introduction to parametric machine learning method, assumptions of parametric machine learning methods, linear model and its assumptions, simple linear regression, scatter diagram, Simple linear Regression parameter estimation, properties of regression parameters, testing the significance of regression parameters using ANOVA and t test, estimation of σ^2 , Interval Estimation of the Mean Response, R Square, Adjusted R Square, Normality of response variable, prediction of new observations, Confidence interval for β_0, β_1 and σ^2 .

UNIT III SUPERVISED LEARNING – MULTIPLE LINEAR REGRESSION ANALYSIS I 12

Multiple linear regression model, assumptions of Multiple linear regression variables – multicollinearity, homoscedasticity, autocorrelation, effects of multicollinearity, effect of homoscedasticity and auto autocorrelation in parameter estimation, Least - Squares Estimation of the Regression Coefficients, Geometrical Interpretation of Least Squares, Properties of the Least - Squares Estimators, Estimation of σ^2 , Inadequacy of Scatter Diagrams in Multiple Regression.

UNIT IV SUPERVISED LEARNING – MULTIPLE LINEAR REGRESSION ANALYSIS II 12

Testing the general linear hypothesis, Test for Significance of Regression, Tests on Individual Regression Coefficients and Subsets of Coefficients, Special Case of Orthogonal Columns in X, Confidence Intervals on the Regression Coefficients, CI Estimation of the Mean Response, Simultaneous Confidence Intervals on Regression Coefficients, predicting new observations, residual analysis, model adequacy and validation.

UNIT V SUPERVISED LEARNING – NON LINEAR REGRESSION ANALYSIS 12

Introduction to non-linear regression models, non-linear least square method to estimating the regression parameters, transformation of non-linear model to linear model, linearization, other parameter estimation methods, starting values, statistical inference in non-linear regression models

TOTAL HOURS: 60

COURSE OUTCOMES:

After completion of the course the student will be able:

- CO1** Understand the difference between continuous class label and discrete class label classification methods.
- CO2** Predict the continuous class variable using linear regression analysis.
- CO3** Predict the binary class variable using decision tree and random forest.
- CO4** Understand the importance of Logistic regression and its application in business.
- CO5** Understand the important concepts of neural networks and its prediction techniques.
- CO6** Apply the assessment method to find the better number of PCA and Clusters for the given data.

TEXT BOOK

1. Introduction to Linear Regression Analysis, Fifth Edition - Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining, A John Wiley & Sons, Inc., Publication
2. Introduction to Machine Learning - Ethem Alpaydm, The MIT Press

REFERENCE BOOKS

1. Python Machine Learning - Sebastian Raschka, PACKT Publishing
2. Using Multivariate Statistics - Barbara G. Tabachnick, Linda S. Fidell, Pearson Education Inc

R PROGRAMMING LANGUAGE

5 0 0 5

COURSE OBJECTIVE

- To understand the basic concepts of R programming language.
- To understand the data structures in R programming language.
- To understand the important packages and functions in R programming language.
- To understand the procedure for summary statistics and parametric testing of hypothesis using R programming Language.
- To understand the functions for graphs and non-parametric testing of hypothesis in R programming Language.

UNIT I INTRODUCTION TO R ENVIRONMENT

12

History and development of R Statistical computing programming language, installing R and R studio, getting started with R, creating new working directory, changing existing working directory, understanding the different data types, installing the available packages, calling the installed packages, arithmetic operations, variable definition in R, simple functions, vector definition and logical expressions, matrix calculation and manipulation using matrix data types, workspace management, help function in R environment.

UNIT II DATA STRUCTURES AND CONTROL STATEMENTS

12

Introduction to different data types, vectors, atomic vectors, types and tests, coercion, lists, list indexing, function applying on the lists, adding and deleting the elements of lists, attributes, name and factors, matrices and arrays, matrix indexing, filtering on matrix, generating a covariance matrix, applying function to row and column of the matrix, data frame – creating, coercion, combining data frames, special types in data frames, operations in data frame, applying functions: `lapply()` and `sapply()` on data frames, control statements, loops, looping over non vector sets, arithmetic and Boolean operators and values, branching with `if`, looping with `for`, `if-else` control structure, looping with `while`, vector based programming.

UNIT III I/O OPERATIONS AND STRING MANIPULATIONS 12

Introduction to I/O functions in R, accessing I/O devices, using of scan(), readline () function, comparison and usage of scan and readline function, reading different format files into R: text file, CSV file, Statistical package files, xls and xlsx files, reading data frame files, converting from one format to another using in built function, writing different file format in to the local machine directory, getting file directory information, accessing the internet : overview of TCP/IP, sockets in R, basics of string manipulations – grep (), nchar (), paste(), sprintf(), substr(), regexpr(), strsplit(), testing of file name with given suffix

UNIT IV R FOR SUMMARY STATISTICS AND PARAMETRIC TESTS: 12

Descriptive statistics – summary statistics for vectors, making contingency tables, creating contingency tables from vectors, converting objects in to tables, complex flat tables, making ‘Flat’ contingency tables, testing tables and flat table objects, cross tables, testing cross tabulation, recreating original data from contingency tables, switching class, mean (arithmetic, geometric and harmonic), median, mode for raw and grouped data, measure of dispersion – range, standard deviation, variance, coefficient of variation, testing of hypothesis – small sample test, large sample test – for comparing mean, proportion, variance (dependent and independent samples), correlation and regression – significance of correlation and regression coefficients

UNIT V R FOR GRAPHS, NONPARAMETRIC TESTS AND ANOVA: 12

Introduction to graphs, Box-Whisker Plot, Scatter plots, pairs plots, line chart, Pie Chart, Cleveland Dot Charts, Bar Charts, Customization of charts, non-parametric test: The Wilcoxon U-Test (Mann-Whitney): One and Two-Sample U-Test, Tests for association: Chi Square Tests, Monte Carlo simulation, Yates Correction for 2X2 Tables, single category goodness of fit tests, Analysis of Variance for one-way variation and two variation – with and without interaction.

Total No of Hours: 60

COURSE OUTCOME:

completion of the course, students will be able to

CO1 Know how to install R packages and invoking the same for data analysis.

CO2 Program in R and how to use R for effective data analysis.

CO3 Know the important statistical packages for data analytics.

- CO4** Know the data management like importing different data types and exporting the same into different file format.
- CO5** Understand the environment and describe generic programming language concepts as they are implemented in a high-level statistical language.
- CO6** Implement various concepts learnt in earlier courses like statistics and probability, linear algebra etc.

TEXT BOOK

1. Beginning R: The statistical Programming Language – Dr. Mark Gardener, John Wiley & Sons, Inc
2. The art of R programming – Norman Matloff, no starch Press, San Francisco

REFERENCE BOOK

1. Introduction to Scientific Programming and Simulation using R – Owen Jones, Robert Maillardet and Andrew Robinson, CRC Press
2. Advanced R – Hadley Wickham, CRC Press.
3. The R Book - Michael J. Crawley, Wiley & Sons, Inc

COURSE OBJECTIVE:

- To understand the basic concepts of R programming language.
- To understand the data structures in R programming language.
- To understand the important packages and functions in R programming language.

LIST OF EXPERIMENTS:**Exercise -1**

1. Install and configure R, set working directory.
2. Install Packages and calling installed packages
3. R studio environment and functionalities of R studio
4. Implement basic R operations (data input, missing values, importing data into R using different formats : xlsx, CSV, Text files)
5. Use R as a calculator
6. Explore various functionalities of dataframes.
7. Create data set using data frames, list and tables.
8. Calculate the remainder after dividing 31079 into 170166719
9. Calculate the interest earned after 5 years on an investment of \$2000,
10. Assuming an interest rate of 3% compounded annually.
11. Use R to calculate the area of a circle with radius 7 cm.
12. Do you think there is a difference between $48:14^2$ and $48:(14^2)$?
13. Using `rep()` and `seq()` as needed, create the vectors?

0000011111222223333344444 and 1234512345123451234512345

14. Create the vector

```
## [1]000111100011110001111000111100011
```

```
## [34] 1 1
```

and convert it to a factor. Identify the levels of the result, and then change the level labels to obtain the factor:

```
## [1] Male Male Male Female Female Female Female Male Male
```

```
## [10] Male Female Female Female Female Male Male Male Female
```

```
## [19] Female Female Female Male Male Male Female Female Female
```

```
## [28] Female Male Male Male Female Female Female Female
```

```
## Levels: Male Female
```

Explore various functionalities of plots

Exercise -2

1. Create the contingency table for the given raw data.
2. Create the interactive user input code line in r using `readline ()` function.
3. Create the contingency table for the given vector format data.
4. Convert the contingency table to original format of the given data.
5. Analyse and give interpretation of summary statistics for the given data.
6. Calculate mean, median and mode for the grouped data and compare the results for the given data.
7. Analyse the given data for non-parametric tests and give the interpretations.
8. Use R for test the given data

In order to compare the effectiveness of two sources of nitrogen, namely ammonium chloride (NH_4Cl) and urea, on grain yield of Coarse cereal, an experiment was conducted. The results on the grain yield of Coarse Cereal (kg/plot) under the two treatments are given below.

NH₄Cl : 13.4, 10.9, 11.2, 11.8, 14.0, 15.3, 14.2, 12.6, 17.0, 16.2, 16.5, 15.7.

Urea : 12.0, 11.7, 10.7, 11.2, 14.8, 14.4, 13.9, 13.7, 16.9, 16.0, 15.6, 16.0.

Assess which source of nitrogen is better for Coarse Cereal.

9. Use R to test the given data and interpret the results.

In a health survey of school children, it is found that the mean hemoglobin level of 55 boys is 10.2 per 100ml with a SD of 2.1. Can we consider this group as taken from a population with a mean of 11.0 g/100ml?

10. In a hearing survey among 246 town school children, 36 were found with conductive hearing loss and among 349 village school children 61 were found with conductive hearing loss. Does this present any evidence that conductive hearing loss is as common among town children as among village children?
11. In an experiment to compare two types of Goat foods A and B, the following results of increase in weight were observed in Goats.

Pig No.	1	2	3	4	5	6	7	8
Increase in weight due to A	49	53	51	52	47	50	52	53
Increase in weight due to B	52	55	52	53	50	54	54	53

Assuming the two samples are independent can we conclude food B is better than food A?

12. Before an increasing in exercise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increasing in duty, 800 people were tea drinkers in a sample of 1200 people. Using SE of a proportion, state whether there is a significant decrease in consumption of tea after the increase in the exercise duty.
13. Use R for test the given data

A health status survey in a few villages revealed that the normal serum protein value of children in that locality is 7.0 g/100ml. A group of 16 children who received high protein food for a period of six months had serum protein values shown below. Can we consider that the mean serum protein level of those who were fed on high protein diet is different from that of the general population?

S.No. (Child No.)	1	2	3	4	5	6	7	8
Protein level (g%)	7.10	7.70	8.20	7.56	7.05	7.08	7.21	7.25

S.No.	9	10	11	12	13	14	15	16
-------	---	----	----	----	----	----	----	----

(Child No.)								
Protein level (g%)	7.36	6.59	6.85	7.90	7.27	6.56	7.93	8.56

14. Students were selected to training. Their performance was noted by giving a test and the marks recorded out of 50. They were given effective 6 months training and again they were given a test and marks were recorded out of 50.

Farmers	1	2	3	4	5	6	7	8	9	10
Before training	25	20	35	15	42	28	26	44	35	48
After training	26	20	34	13	43	40	29	41	36	46

By applying the t-test can it be concluded that the students have benefited by the training?

15. 100 individuals of a particular race were tested with an intelligence test and classified into two classes. Another group of 120 individuals belong to another race were administered the same intelligence test and classified into the same two classes. The following are the observed frequencies of the two races:

Race	Intelligence		
	Intelligent	Non-intelligent	Total
Race I	42	58	100
Race II	55	65	120
Total	97	123	220

Test whether the intelligence is anything to do with the race.

16. Obtain the correlation coefficient between the heights of father(X) and of the son (Y) from the following data

X	65	66	67	68	69	70	71	72
Y	67	68	65	68	72	72	69	71

And also test its significance. Using R functions.

17. Analyse the given data for analysis of variance and interpret the same for all the possible values.

18. Consider the inbuilt data set cars.

- Find Correlation between possible variables and pairwise correlation
- Find regression line between appropriate variables
- Display the summary statistics and comment on the results

Total Hours: 30

COURSE OUTCOMES:

After completing this lab, students will be able to:

- CO1** Work on R, use its features in the field of data science.
- CO2** Understand the statistical model building and post testing.
- CO3** Understand the graphical techniques in R.

COURSE OBJECTIVE

- A database management system (DBMS) is collection of software meant to manage a Database. Many popular databases currently in use are based on the relational database model.
- RDBMSs have become a predominant choice for the storage of information in new databases used for financial records, manufacturing and logistical information, personnel data and much more

LIST OF EXPERIMENTS:

1. SQL Commands
 - a. Data Definition Language commands,
 - b. Data Manipulation Language commands,
 - c. Data Control Language commands and
 - d. Transaction Control Language commands
2. Select Statements with all clauses/options
3. Nested Queries
4. Join Queries
5. Views
6. High level programming language extensions (Control structures, Procedures and Functions)
7. Database Design and implementation (Mini Project)

Total Hours: 30**COURSE OUTCOMES:**

- CO1** Students will work on the tasks provided to them in the form of experiments and write programs to produce the desired result.

ENVIRONMENTAL STUDIES**2 0 0 2****COURSE OBJECTIVE**

- To train students to locate and comprehend relationships between the natural, social and cultural environment.
- To develop an understanding based on observation and illustration, drawn from lived experiences and physical, biological, social and cultural aspects of life, rather than abstractions.
- To create cognitive capacity and resourcefulness to make the students curious about social phenomena.

UNIT I INTRODUCTION**10**

The multidisciplinary nature of Environment of studies – Definition - Scope and Importance - Need for Public Awareness.

UNIT II NATURAL RESOURCES**10**

Natural resources and associated problem - Renewable and Non- Renewable resources:-Forest Resources-Mineral Resources-Food Resources - Energy Resources -Land Resources; Role of an individual in conservation of natural resources-Equitable use of resources of sustainable lifestyles.

UNIT III ECO SYSTEM**10**

Concepts of an Ecosystem - Structure and Functions of an Ecosystem - Procedures, Consumers and Decomposers - Energy flow in the ecosystem - Food chains, Food webs and ecological pyramids - Introduction, types, Characteristics features - Structures and functions of the following ecosystem :Forest ecosystem, Grass land ecosystem, Desert ecosystem, Aquatic ecosystem.

Total No Of Hours : 30 Hrs**COURSE OUTCOME**

At the end of the course students can,

CO1: Define basic concepts of environment

CO2: Explain the types of natural resources

CO3: Apply natural resource concept to maintain Ecosystem

CO4: Understand the need for bio diversity

CO5: Predict the causes of environmental pollution

TEXT BOOK

1. Dr. Shradha sinha, Dr.Manisha shukula, Dr. Ranjana Shukla

REFERENCE BOOK

1. P.Venugopala Rao,"Textbook of Environmental Engineering", Eastern Economy Edition, 2006.

SOFT SKILLS-II

2 0 0 2

COURSE OBJECTIVE:

- To train students in the use of English language in varied literary and non-literary context
- To teach them soft skills and strength their foundation in grammar and composition
- To elevate their comprehension skills.

Credit Hours**UNIT I – Prose****12**

- | | | |
|------------------------|---|-----------------|
| 1. Walking Tours | - | R. L. Stevenson |
| 2. All About a Dog | - | A. G. Gardinar |
| 3. No Man is an Island | - | MinnoMasani |

UNIT II - Short Stories**12**

- | | | |
|------------------------------|---|--------------|
| 1. The Man Who Likes Dickens | - | Evelyn Waugh |
| 2. Lamb to the Slaughter | - | Roald Dahl |
| 3. Buck Hears the Call | - | Jack London |

UNIT III – Drama**12**

1. Selected Scenes from Shakespeare’s Plays – Book I, Emerald Publishers
 - a) Funeral Oration (Julius Caesar)
 - b) Trial for a Pound of Flesh (The Merchant of Venice)
 - c) Patterns of Love (As You Like It)

UNIT IV**12**

1. General Essay Writing & Group Discussion
2. Persuasive Writing and Role Play

UNIT V**12**

1. Notice, Agenda, Minutes.

Total: 60 Hours**COURSE OUTCOME****At the end of this course the students will be able to,**

CO 1 Illustrate the essential of presentation skills, thoughts, structure, voice modulation, audience analysis and body language

CO 2 Utilize the psychological skills pertaining to time management, articulation, assertion and stress management

CO 3 Utilize the psychological skills pertaining to time management, articulation, assertion and stress management

CO 4 Appraise learners with varied skills needed for expose to interviews

CO 5 Categorise the nature of questions asked usually in interviews

Books Prescribed:

1. Invitation to English Prose – A. E. Varadarajan & S. Jagadisan, Orient Black Swan, Chennai

Semester – V

Syllabus

DISCIPLINE SPECIFIC ELECTIVE (DSE)-1

DSE 1A- DATA ANALYTICS USING SQL

4 1 0 5

COURSE OBJECTIVE

- To understand the basic concept of SQL Database
- To understand different types of SQL Database
- To understand different architecture of SQL Database
- To understand different ways of SQL statements and executions
- You can start with SQL basics commands
- You will understand the concept of create and Alter Table
- You will get to know about data extraction and manipulation techniques
- You will learn grouping and aggregating data along with multi query approach

UNIT I INTRODUCTION TO SQL

12

Introduction to Structure Query Language (SQL), SQL History & Evolution, Features of SQL, Understanding of SQL process, Benefits and Role of SQL along with different market forces, Types of SQL, SQL Standards, SQL and Networking, Centralized architecture, File Server Architecture, Client Server Architecture, Multitier Architecture, Understanding concept for OLAP and OLTP Applications, Difference between OLAP and OLTP, SQL and Database Management, Data warehouse Concept

UNIT II SQL STATEMENTS & EXECUTIONS

12

Types of SQL Statement, Data Definition language, Data Control language, Data Manipulation Language, Types of execution, Direct Invocation, Embedded SQL, Module Binding, Call-level interface, Data types, Constants, Numeric Constants, String Constants, Time & date Constants, Symbolic Constants, Expressions, Built in function, Null Values, Primary and Foreign Key Concept.

UNIT III STARTING WITH BASIC SQL SYNTAX

12

Types of Tables, Create Database statement, Drop database Statement, Use statement, Create table Statement, Drop table Statement, Create index Statement, Drop index Statement, Describe Statement, Truncate Statement, Alter table Statement, Insert INTO Statement, Update table Statement, Delete table Statement, Commit Statement.

Create SQL Tables, Specify Column data types, Create user Defined Types, Specify Column Default Values, Alter SQL Tables, Updating Data, Using WHERE Clause, Using Logical operations, AND operations, OR operations, Deleting SQL table

UNIT IV EXTRACTING INFORMATION & MANIPULATING DATA 12

Select Statement, Returning only Distinct Rows, Using Aliases, Filtering Results using WHERE Clause, Logical Operations and Operator Precedence, NOT operator, BETWEEN Operator, LIKE Operator, IN Operator, Ordering Results with ORDER BY

Understanding SQL Arithmetic, basic Math operations, ABS() function, POWER() function, SQRT() function, RAND() function, CEILING() function, FLOOR() function, ROUND() function, SUBSTRING() function, Case Conversion Functions, REVERSE() function, TRIM() function, LENGTH() function, SOUNDEX() function, DIFFERENCE() function, DATE() function

UNIT V GROUPING & MULTI-TABLE QUERIES 12

Grouping Results, Summarizing and Aggregating Data, Counting results, Adding Results, Averaging Results, MAX & MIN functions, using HAVING clause with GROUP BY Statements, Implicit Versus Explicit Groups, Counting DISTINCT Values

Simple Joins/ Equi-Joins, Parent / child queries, Inner Joins, Multiple Joins, Cross Joins, Self Joins, Outer Joins, Right Joins, Left Joins, Full-outer Joins, Creating joins with more than two tables, Equi-Joins Versus Non-Equi Joins, Union operations

Total No of Hours: 60

COURSE OUTCOME:

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

CO1 On successful completion of all modules students get the knowledge of create flexible data aggregations *using* pivot tables.

Students get the knowledge how to represent the data visually *using* pivot charts

TEXT BOOK

1. CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011
2. CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013

REFERENCE BOOK

1. Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008.
2. CCNA Exploration Course Booklet: Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010.

DISCIPLINE SPECIFIC ELECTIVE (DSE)-1

DSE 1B- NOSQL DATABASES

4 1 0 5

COURSE OBJECTIVE

- To understand about NoSQL databases
- To understand about basic principles and design criteria of NoSQL databases
- To understand comparisons among different types of NoSQL databases
- To understand different types of features of different NoSQL databases
- To understand internals of different NoSQL databases
- You will understand different use cases for different NoSQL databases
- You will get to know about data storage and processing techniques
- You will learn about advantages of NoSQL database over RDBMS

UNIT I INTRODUCTION TO NOSQL 12

Understanding NoSQL Databases, History of NoSQL, Features of NoSQL, Scalability, Cost, Flexibility, NoSQL Business Drivers, Classification and Comparison of NoSQL Databases, Consistency – Availability - Partitioning (CAP), Limitations of Relational Databases, Comparing NoSQL with RDBMS

Managing Different Data Types, Columnar, Key-Value Stores, Triple and Graph Stores, Document, Search Engines, Hybrid NoSQL Databases, Applying Consistency Methods, ACID, BASE, Polyglot persistence

UNIT II EVALUATING NOSQL 12

The Technical Evaluation, Choosing NoSQL, Search Features, Scaling NoSQL, Keeping Data Safe, Visualizing NoSQL, Extending Data Layer, Business Evaluation, Deploying Skills, Deciding Open Source versus commercial software, Business critical features, Security

UNIT III KEY-VALUE & DOCUMENT BASED DATABASES 12

Introduction to Key-Value Databases, Key Value Store, Essential Features, Consistency, Transactions, Partitioning, Scaling, Replicating Data, Versioning Data, How to construct a Key, Using Keys to Locate Values, Hash Functions, Store data in Values, Use Cases.

Introduction to Document Databases, Supporting Unstructured Documents, Document Databases Vs. Key-Value Stores, Basic Operation on Document database, Partition, Sharding, Features, Consistency, Transactions, Availability, Scaling, Use Cases

UNIT IV COLUMN-ORIENTED & GRAPH BASED DATABASES 12

Introduction to Column Family Database, Features, Architectures, Differences and Similarities to Key Value and Document Database, Consistency, Transactions, Scaling, Use Cases

Introduction to Graph Databases, Advantages, Features, Consistency, Transactions, Availability, Scaling, Graph & Network Modelling, Properties of Graphs and Noes, Types of Graph, Undirected and directed Graph, Flow Network, Bipartite Graph, Multigraph, Weighted Graph

UNIT V SEARCH ENGINE

12

Common Feature of Search Engine, Dissecting a Search Engine, Search versus query, Web crawlers, Indexing, Searching, indexing Data Stores, Altering, Using Reverse queries, Use Cases, Types of Search Engine, Elastic Search

Total No of Hours: 60

COURSE OUTCOME:

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

- CO1** Identify the use of unstructured data.
- CO2** Know the knowledge of features of NO SQL Data Base.
- CO3** Know the Key-Value Databases, Document Databases.
- CO4** Learn various concepts of Graph Databases .
- CO5** Analyze the advantage & disadvantages of Relational database

TEXT BOOK

1. “NoSQL for Dummies, By: Adam Fowler, Published by: John Wiley & Sons, Inc.
2. NoSQL for Mere Mortals, By: Dan Sullivan, Published by: Pearson Education, Inc.

REFERENCE BOOK

1. NoSQL Distilled, By: Pramod J. Sadalage & Martin Fowler, Published by: Pearson Education, Inc.
2. Making Sense of NoSQL, By: Dan McCreary& Ann Kelly, Published by: Manning Shelter Island

DISCIPLINE SPECIFIC ELECTIVE (DSE)-2

DSE 2A- BIG DATA ANALYTICS

4 0 0 4

COURSE OBJECTIVE:

- To understand the basic concept of BigData
- To understand different types of Data
- To understand architecture of Hadoop and YARN
- To understand about Processing and Storage Layer of Hadoop
- To understand internal concept of MapReduce
- You will understand the concept of Master and Slave Architecture
- You will get to know about data storage and processing techniques
- You will learn about cluster management using YARN

UNIT I UNDERSTANDING BIGDATA

12

Defining Data, Types of Data, Structured Data, Semi Structured Data, Unstructured Data, How data being Generated, Different source of Data Generation, Rate at which Data is being generated, Different V's, Volume, Variety, Velocity, Veracity, Value, How single person is contributing towards BigData, Significance for BigData, Reason for BigData, Understanding RDBMS and why it is failing to store BigData. Future of BigData, BigData use cases for major IT Industries.

UNIT II INTRODUCTION TO HADOOP

12

What is Hadoop, Apache Community, Cluster, Node, Commodity Hardware, Rack Awareness, History of Hadoop, Need for Hadoop, How is Hadoop Important, Apache Hadoop Ecosystem, Different Hadoop offering , Hadoop 1.x Architecture, Apache Hadoop Framework, Master- Slave Architecture, Advantages of Hadoop.

UNIT III STORAGE UNIT

12

Hadoop Distributed File System, Design of HDFS, HDFS Concept, How files are stored in HDFS, Hadoop File system, Replication factor, Name Node, Secondary Name Node, Job Tracker, Task tracker, Data Node, FS Image, Edit-logs, Check-pointing Concept, HDFS federation, HDFS High availability

Architectural description for Hadoop Cluster, When to use or not to use HDFS, Block Allocation in Hadoop Cluster, Read operation in HDFS, Write operation in HDFS, Hadoop Archives, Data Integrity in HDFS, Compression & Input Splits

UNIT IV PROCESSING UNIT

12

What is MapReduce, History of MapReduce, How does MapReduce works, Input files, Input Format types Output Format Types, Text Input Format, Key Value Input Format, Sequence File Input Format, Input split, Record Reader, MapReduce overview, Mapper Phase, Reducer Phase, Sort and Shuffle Phase, Importance of MapReduce

Data Flow, Counters, Combiner Function, Partition Function, Joins, Map Side Join, Reduce Side Join, MapReduce Web UI, Job Scheduling, Task Scheduling, Fault Tolerance, Writing MapReduce Application, Driver Class, Mapper Class, Reducer Class, Serialization, File Based Data Structure, Writing a simple MapReduce program to Count Number of words, MapReduce Work Flows

UNIT V YARN & HADOOP CLUSTER

12

YARN, YARN Architecture, YARN Components, Resource Manager, Node Manager, Application Master, Concept of Container, Difference between Hadoop 1.x and 2.x Architecture, Execution of Job in Yarn Cluster, Comparing and Contrasting Hadoop with Relational Databases

Cluster Specification, Cluster Setup and Installation, Creating Hadoop user, Installing Hadoop, SSH Configuration, Hadoop Configuration, Hadoop daemon properties, Different modes of Hadoop, Standalone Mode, Pseudo Distributed Mode, Fully Distributed Modes,

Total No of Hours: 60

COURSE OUTCOMES:

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

- CO1** Understand the characteristics of big data.
- CO2** Explore Hadoop framework and its components.
- CO3** Use HDFS and Map Reduce to analyze various industry use cases of big data analytics.
- CO4** Understand the YARN Infrastructure.
- CO5** Learning different Sorting, Shuffling

TEXT BOOK

1. Hadoop: The Definitive Guide, By: Tom White, O'REILLY

REFERENCE BOOK

1. Hadoop for Dummies, By: Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, and Roman B. Melnyk, A Wiley brand
2. Hadoop in Action, Writer: Chuck Lam Published By: Manning Publications

DISCIPLINE SPECIFIC ELECTIVE (DSE)-2

DSE 2B- EXPLORATORY DATA ANALYSIS

4 0 0 4

COURSE OBJECTIVE

- To understand importance of data and its types in Exploratory Data Analysis.
- To understand difference between EDA and summary statistics in context of interpretation.
- To understand the importance of data pre-processing for Exploratory Data Analysis.
- To understand the significance of missing value imputations in better EDA interpretations.
- To understand the importance measure of central tendency in describing the quick view of data set.
- To understand the importance of measure of dispersion and its interpretation in spread ness of data.

UNIT I INTRODUCTION TO DATA AND ITS TYPES

12

Definition and importance of data, classification of data : based on observation – Cross Sectional, times series and panel data, based on measurement – ratio, interval, ordinal and nominal, based on availability – primary, secondary, tertiary, based on structural form – structured, semi structured and unstructured, based on inherent nature – quantitative and qualitative, concepts on sample data and population, small sample and large sample, statistic and parameter, types of statistics and its application in different business scenarios, frequency distribution of data.

UNIT II INTRODUCTION TO EXPLORATORY DATA ANALYSIS (EDA)

12

Definition of EDA, difference between EDA with classical and Bayesian Analysis, comparison of EDA with Classical data summary measures, goals of EDA, Underlying assumptions in EDA, importance of EDA in data exploration techniques, introduction to different techniques to test the assumptions involved in EDA, role of graphics in data exploration, introduction to unidimensional, bidimensional and multidimensional graphical representation of data.

UNIT III DATA PREPARATION

12

Introduction to data exploration process for data preparation, data discovery, issues related with data access, characterization of data, consistency and pollution of data, duplicate or redundant variables, outliers and leverage data, noisy data, missing values, imputation of missing and empty places, with different techniques, missing pattern and its importance, handling non numerical data in missing places.

UNIT IV UNIVARIATE DATA ANALYSIS**12**

Description and summary of data set, measure of central tendency – mean: Arithmetic, geometric and harmonic mean – Raw and grouped data, confidence limit of mean, median, mode, quartile and percentile, interpretation of quartile and percentile values, measure of dispersion, concepts on error, range, variance, standard deviation, confidence limit of variance and standard deviation, coefficient of variation, mean absolute deviation, mean deviation, quartile deviation, interquartile range, concepts on symmetry of data, skewness and kurtosis, robustness of parameters, measures of concentration.

UNIT V BIVARIATE DATA ANALYSIS**12**

Introduction to bivariate distributions, association between two nominal variables, contingency tables, Chi-Square calculations, Phi Coefficient, scatter plot and its causal interpretations, correlation coefficient, regression coefficient, relationship between two ordinal variables – Spearman Rank correlation, Kendall's Tau Coefficients, measuring association between mixed combination of numerical, ordinal and nominal variables.

Total No of Hours: 60**TEXT BOOK**

1. Exploratory Data Analysis – John W Tukey, Addison Wesley Publishing Company
2. Exploratory Data Analysis in Business and Economics - An Introduction Using SPSS, Stata and Excel – Thomas Cleff, Springer Publication

REFERENCE BOOK

1. Graphical Exploratory Data Analysis - S.H.C. du Toit A.G.W. Steyn R.H. Stumpf, Springer Publication
2. Hand book of Data Visualization – Chun-houh Chen, Wolfgang Härdle, Antony Unwin, Springer Publication.

DISCIPLINE SPECIFIC ELECTIVE (DSE)-3

DSE 3A- MULTIVARIATE STATISTICAL ANALYSIS 4 0 0 4

COURSE OBJECTIVE

- To understand the basic concepts of multivariate statistical analysis and related terminologies.
- To understand the importance of mean vector and correlation matrix in multivariate statistical analysis.
- To understand the importance of profile analysis and its estimation.
- To understand the importance of interval estimation and its application in the statistical inference.
- To understand the concepts of discriminant analysis and its practical application in classification.
- To understand the concepts of survival analysis and its prediction.

UNIT I INTRODUCTION TO MULTIVARIATE STATISTICAL ANALYSIS 12

History and introduction to multivariate statistical analysis, the domain of multivariate statistics, number of independent and dependent variables, experimental and non-experimental research, definitions and terminologies related to multivariate statistics, multivariate normal distribution, the distribution of linear combination of normally distributed variables, conditional distribution and multiple correlation coefficient, elliptically contoured distributions.

UNIT II MEAN VECTOR AND CORRELATION MATRIX 12

Introduction to mean vector and correlation matrix, Maximum Likelihood Estimators of the Mean Vector and the Covariance Matrix, distribution of the sample mean vector, inference related to mean, Theoretical Properties of Estimators of the Mean Vector, Correlation coefficient of a Bivariate Sample, Partial Correlation Coefficients; Conditional Distributions, the multiple correlation coefficients.

UNIT III PROFILE ANALYSIS 12

Introduction to profile analysis, general purpose and description of profile analysis, fundamental equation of profile analysis, difference in levels, Parallelism of Profiles, flatness, Univariate Versus Multivariate Approach to Repeated Measures, Contrasts in Profile Analysis, Parallelism and Flatness Significant, Levels Not Significant, Parallelism and Levels Significant, Flatness Not

Significant, Parallelism, Levels, and Flatness Significant, Only Parallelism Significant, Classifying Profiles, limitations of profile analysis.

UNIT IV DISCRIMINANT ANALYSIS

12

Introduction to discriminant analysis, general purpose and definition of discriminant analysis, Fundamental Equations for Discriminant Analysis, Derivation and Test of Discriminant Functions, Classification, Types of Discriminant Analyses: Direct Discriminant Analysis, Sequential Discriminant Analysis, Stepwise (Statistical) Discriminant Analysis, Criteria for Overall Statistical Significance, Stepping Methods, Number of Discriminant Functions, Interpreting Discriminant Functions, Discriminant Function Plot, Evaluating Predictor Variables, Effect Size, limitations of discriminant analysis

UNIT V SURVIVAL/FAILURE ANALYSIS AND SEM

12

Introduction to survival analysis and Structural Equation Modelling (SEM), fundamental equation of survival analysis, life tables, standard error of cumulative proportion surviving, hazard and density functions, life table plotting, different types of survival analysis, accelerated failure time models, proportionality of hazards, censored data, effect size and power, predicting survival rate, assumptions and evaluation, Cox Regression survival analysis.

Total No of Hours: 60

TEXT BOOK

1. Using Multivariate Statistics, Sixth Edition - Barbara G. Tabachnick, Linda S. Fidell, Pearson Publication

REFERENCE BOOK

1. Multivariate Statistical Quality Control Using R - Edgar Santos-Fernández, Springer, 2012
2. Multivariate Statistical Analysis, Second Edition - Narayan C. Giri, MARCEL DEKKER, INC.
3. An Introduction to Multivariate Statistical Analysis, Third Edition - T. W. ANDERSON, A JOHN WILEY & SONS, INC., PUBLICATION
4. Applied Multivariate Statistical Analysis, Second Edition - Wolfgang Härdle, Léopold Simar, Springer.

DISCIPLINE SPECIFIC ELECTIVE (DSE)-3

DSE 3B- DESIGN AND ANALYSIS OF EXPERIMENTS 4 0 0 4

COURSE OBJECTIVE

- To understand basic concepts and terminologies in design of experiments.
- To understand fixed effect model and parameter estimation of fixed effect model.
- To understand the significance parametric and non-parametric design of experiments.
- To understand the importance block effects and design related with blocking effect.
- To understand the mechanism of factorial design and difference between blocking effect and factorial effect.

UNIT I INTRODUCTION TO DESIGN OF EXPERIMENTS (DOE) 12

Definition of DOE, brief history of design of experiments, observational vs. experimental data, strategy of experimentations, one factor at a time, effect, experimental units, factor, levels of factor, fixed model, random model, interaction effect, typical application of designed experiments, basic principles of design of experiments : replication, randomization and local control, guidelines for designing experiments, cause and effect.

UNIT II ANALYSIS OF VARIANCE (ANOVA) – 1 12

Description of Analysis of Variance, analysis of fixed effect model, decomposition of the total sum of square, statistical analysis, estimation of the model parameters, unbalanced data, model adequacy checking : the normality assumptions, plot of residuals in time sequence, plot of residuals and fitted values, practical interpretation of results : a regression model, comparison among treatment means, contrasts, orthogonal contrasts, Scheffe's method, comparing pairs of treatment means, comparing treatment means with control.

UNIT III ANALYSIS OF VARIANCE (ANOVA) – 2 12

Introduction to sample and sample size in designed experiments, operating characteristic curves, specifying a standard deviation increase, confidence interval estimation method, random effect model, single random factor, analysis of variance for the random effect model, estimating the parameters, regression approach to ANOVA: least square estimation of the model parameters, non-parametric method in analysis of variance: The Kruskal-Wallis test, rank transformation.

UNIT IV EXPERIMENTS WITH BLOCK EFFECTS**12**

Introduction to blocks and plots, randomized completely block design, statistical analysis of RCBD, model adequacy checking, other aspects of randomized complete block design, estimating the parameters and general regression significance test, the Latin Square design, the Graeco-Latin Square design, concepts on complete and incomplete design, balanced incomplete block design, statistical analysis of BIBD, least square estimation of parameters,

UNIT V EXPERIMENTS WITH MORE THAN ONE FACTORS**12**

Introduction to factorial design, basic definition and principles, advantages of factorial designs, the two factorial design, statistical analysis of fixed effect model, model adequacy checking, estimating the model parameters, choice of sample size, assumptions of no interaction in a two factor model, the general factorial design, fitting response curves and surfaces, blocking in a factorial design.

Total No of Hours: 60**TEXT BOOK**

1. Design and Analysis of Experiments, Eighth Edition – Douglas C. Montgomery, Wiley

REFERENCE BOOK

1. Design and Analysis of Experiments, Volume 2, Advanced Experimental Design - Klaus Hinkelmann, Oscar Kempthorne, John Wiley & Sons, Inc., Publication

DISCIPLINE SPECIFIC ELECTIVE (DSE)-4

DSE 4A- SAMPLING METHODS

4 0 0 4

COURSE OBJECTIVE

- To understand the basic concepts and importance of sampling over complete enumeration.
- To understand the procedure for proportions and percentage in selecting samples.
- To understand the importance and estimation of mean and variance of simple random sampling.
- To understand the importance and estimation of mean and variance of stratified and systemic random sampling.
- To understand the importance and estimation of mean and variance of cluster sampling for equal and unequal clusters.

UNIT I INTRODUCTION TO SAMPLING

12

Introduction, important terminologies related with sampling methods: samples, population, standard error, sampling distribution, sample size, need for sampling, advantages and disadvantages of sampling, important principle steps in sample survey, sample survey vs complete enumeration, the role of sampling theory, probability sampling, alternative to probability sampling, importance of normal distribution in sampling theory, bias and its effects in sampling process, role of mean square error in sampling theory.

UNIT II SAMPLING PROPORTIONS AND PERCENTAGES

12

Introduction, Qualitative characteristics of samples, variances of the sample estimates, the effect of P on the standard errors, probability distribution function: the binomial probability distribution, the hypergeometric distribution, confidence limits, classification into more than two classes, confidence limits with more than two classes, the conditional distribution of p, proportions and totals over subpopulation, comparison between different domains.

UNIT III SIMPLE RANDOM SAMPLING

12

Introduction, need for simple random sampling, overview and definition of simple random sampling with and without replacement, selection of a simple random sample, definitions and notations conventions in simple random sampling, properties of the estimates, variances of the estimates, the finite population correction, estimation of standard error from the samples, confidence limits, estimation of a ratio, estimates of means over subpopulation, estimates of totals over sub population, comparison between domain means, validity of normal approximation, linear estimates of the population mean.

UNIT IV STRATIFIED AND SYSTEMIC RANDOM SAMPLING

12

Definition and overview of stratified and systemic random sampling, properties of the estimates, estimated variance and confidence limits, proportional allocation, optimum allocation, Neyman Allocation, relative precision of stratified sampling over simple random sampling, allocation requires more than 100 percent sampling, , Choice of Sample Sizes in Different Strata, advantages and disadvantages of stratified sampling, Systematic Sampling: The Sample Mean and its Variance, Comparison of Systematic with Random Sampling, Comparison of Systematic with Stratified Random Sampling, Estimation of the Variance, two stage sample with equal and unequal units.

UNIT V CLUSTER SAMPLING

12

Equal Clusters: Introduction, definition, efficiency of cluster sampling, Efficiency of Cluster Sampling in Terms of Intra-Class Correlation, Estimation from the Sample of the Efficiency of Cluster Sampling, Relationship between the Variance of the Mean of a Single Cluster and its Size, Optimum Unit of Sampling and Multipurpose Surveys, Unequal Clusters: Estimates of the Mean and their Variances, Probability Proportional to Cluster Size: Estimate of the Mean and its Variance, Probability Proportional to Cluster Size: Efficiency of Cluster Sampling, Probability Proportional to Cluster Size: Relative Efficiency of Different Estimates.

Total No of Hours: 60

COURSE OUTCOMES:

After completion of the course the student will be able:

CO1 Understand the important terminologies and need for sampling over complete enumeration.

CO2 Understand the need for learning and sampling proportion in sampling theory.

CO3 Estimate the mean and variance of the samples drawn using simple random sampling with and without replacement.

CO4 Estimate the mean and variance of the samples drawn using stratified and systematic random sampling.

CO5 Estimate the mean and variance of the samples drawn using cluster sampling

TEXT BOOK

1. Sampling Theory of Survey with Applications – Pandurang V Sukhatme, Indian society of Agricultural Statistics, New Delhi.
2. Sampling Techniques, Third Edition - William G. Cochran, Wiley Publications.

REFERENCE BOOK

1. Large Sample Techniques - Jiming Jiang, Springer.
2. Sampling Methods: Exercises and Solutions - Pascal Ardilly Yves Tillé, Springer.

DISCIPLINE SPECIFIC ELECTIVE (DSE)-4

DSE 4B- OPTIMIZATION TECHNIQUES

4 0 0 4

COURSE OBJECTIVE

- To understand the basic concepts of linear programming and its applications
- To understand the importance of simplex method in solving the linear programming problems.
- To understand the applicability of sensitivity analysis in solving the linear programming problems.
- To understand the importance of linear programmes in solving transport and shipment problems.
- To understand the importance of integer programming in optimization problems.
- To understand the importance of game theory in business optimization problems.

UNIT I LINEAR ALGEBRA AND LINEAR PROGRAMMING

12

Introduction to vector spaces and matrices, system of linear equation, The Gauss-Jordan Method for Solving Systems of Linear Equations, Eigen values and Eigen vectors, Linear Independence and Linear Dependence, inverse of matrix and determinants, Definition of linear programming, linear programming model, assumptions involved in linear programming, the graphical solution of two variables linear programming problems, production process model, linear programming to solve multiperiod decision problem using inventory model.

UNIT II OPTIMIZATION TECHNIQUE – INTRODUCTION AND SIMPLEX ALGORITHM

12

Introduction, unconstrained optimization: optimizing single variable functions, conditions for local minimum and maximum value, optimizing multivariate functions, constrained multivariate optimization with equality constraints: direct substitute method, lagrange multipliers method, constrained multivariable optimization with inequality constraints : Kuhn-Tucker necessary and sufficient conditions., Conversion of Linear Programming in to standard form, preview of simplex algorithm, direction of unboundedness, implementation of simplex method in solving linear programming, alternatives to minimization problem, unbounded linear programming, Degeneracy

and the Convergence of the Simplex Algorithm, The Two-Phase Simplex Method, Unrestricted-in-Sign Variables, Karmarkar's method of solving linear programming.

UNIT III SENSITIVITY ANALYSIS AND DUALITY

12

Introduction to sensitivity analysis, graphical introduction to sensitivity analysis, formula related to sensitivity analysis, finding the dual of a linear programming, domain interpretation of dual problem, dual theorem and its consequences, complementary slackness, the dual simplex method, data envelopment analysis.

UNIT IV TRANSPORTATION AND NETWORK MODELS

12

Introduction to transportation, assignment, transshipment problems and network models, formulating transportation problem, finding basic feasible solutions for transportation problem, transportation simplex method, sensitivity analysis for transportation problem, definitions on network models, shortest-path problems, maximum flow problem, CPM and PERT, Minimum-Cost Network Flow Problems, Minimum Spanning Tree Problems, the Network Simplex Method.

UNIT V INTEGER PROGRAMMING AND GAME THEORY

12

Introduction of integer programming, formulation of integer programming, branch and bound method of solving pure and mixed integer programming, solving knapsack and combinatorial optimization problem by branch and bound method, implicit enumeration and cutting plane algorithm, Two-Person Zero-Sum and Constant-Sum Games: Saddle Points, Randomized Strategies, Domination, and Graphical Solution, Linear Programming and Zero-Sum Games, Two-Person nonconstant-Sum Games, Introduction to n-Person Game Theory, The Core of an n-Person Game, the Shapley Value, application of game theory.

Total No of Hours: 60

COURSE OUTCOMES:

Upon completion of the subject, students will be able to

- CO1** Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems.

CO2 Use classical optimization techniques and numerical methods of optimization.

CO3 Describe the basics of different evolutionary algorithms.

CO4 Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas.

TEXT BOOK

1. Operations Research Theory and Applications, Fifth Edition – J K Sharma, MacMillan Publishers India Ltd 2012 Security Cookbook by Rudi Bruchez, Pub: PACKT publishing, 1st ed; 2012.

REFERENCE BOOK

1. Operations Research Applications and Algorithms, Fourth Edition – Wayne L. Winston, Thomson Books/Cole
2. Introduction to Operations Research – Hillier/Lieberman, McGraw Hill Publications

DISCIPLINE SPECIFIC ELECTIVE (DSE)-2 Lab

DSE 2AL- BIG DATA ANALYTICS LAB

0 0 4 2

COURSE OBJECTIVE

- Understand the concept of BigData
- Understand the concept of Hadoop
- Understand the concept of storage layer and processing layer of Hadoop
- Understand the internals of MapReduce and YARN
- Understand the different modes and distribution of Hadoop
- Write MapReduce job for word count
- Create one node Hadoop cluster

Below experiments are to be performed on Hadoop Cluster, by creating single node cluster. Student itself have to install Hadoop cluster and perform below experiments with help of faculty and Lab experts.

1. Prepare infrastructure for setting up single node Hadoop cluster.
2. Install all the software to set up single node Hadoop cluster.
3. Configuration of single node Hadoop cluster
4. You need to find the location of below Hadoop configuration file and understand the purpose of different attributes mentioned in below xml files.

hdfs-site.xml; core-site.xml; yarn-site.xml
5. You need to perform 20 basics Hadoop commands on single node Hadoop cluster.
6. Install IDE to code and compile map reduce framework.
7. You need to program Mapper Class, Reducer Class and Driver Class for map reduce word count Job.
8. You need to find out word count job for the given input file provided by faculty.
9. You need to trouble shoot log file generated in experiment Number 08 and note all the steps involved in job execution
10. You need execute word count job based on 0 reducer, 2 reducer, Default reducer & 4 reducer and observe different outputs.

COURSE OUTCOME:

After completing this lab, students will be able to:

CO1 Work on big data analytics; use its features in the field of data science.

DISCIPLINE SPECIFIC ELECTIVE (DSE)-2 Lab

DSE 2BL- EXPLORATORY DATA ANALYSIS **0 0 4 2**

COURSE OBJECTIVE

- Understand the data and its types for the appropriate exploratory data analysis.
- Understand the importance of Exploratory Data Analysis over summary statistics.
- Understand the importance Univariate statistics in EDA
- Plot Univariate statistical graphs for the better representation and interpretation.
- Plot bivariate statistical graphs for the better representation and interpretation.

List of Experiments:

Exercise – 1:

1. Managing Data Frames with the dplyr package
2. Use dplyr Grammar for inbuilt data set *car*.
3. Use group by(), %>% ,mutate(), rename(),arrange(), filter(), select()
4. Use the data set air quality from inbuilt data sets library.
 - a. Use summary statistics and find the important key values from the output
 - b. Use boxplot and find the interquartile range. Interpret the boxplot and inner and outer fencing of outliers.
 - c. Check the missing value in the data set and find the suitable solution for the missing values.
 - d. Using histogram, find the distribution of data and give proper comment over the dataset.
5. Use bar plot and identify the difference between bar plot and histograms. Conclude the appropriate use of bar plot and histogram.

Exercise – 2:

1. Explore the two dimensional data
2. Scatter plot between two variables
3. Five number summary in exploratory data analysis
4. Multiple histogram and multiple boxplots
5. Multiple scatter plots and coloring the graph
6. Lattice system in R environment
7. Graphical window in R and its uses.

COURSE OUTCOME:

After completing this lab, students will be able to:

CO1 Work on exploratory data analysis; use its features in the field of data science.

GENERIC ELECTIVE (GE)-1

GE 1A – WEB TECHNOLOGY FUNDAMENTALS 2 0 0 2

COURSE OBJECTIVE

- To introduce students to web technologies such as HTML, CSS, XML, Java Script teach them to create static and simple dynamic web pages or applications using these technologies and to understand web application deployment and software architectures.
- Students will learn basic web application design, development and testing skills.
- On completion of this course the learner should be able to design and implement a variety of dynamic Website

UNIT I INTRODUCTION TO THE INTERNET AND THE WORLD WIDE WEB 6

Introduction, History of internet, Internet Design Principles, Internet Protocols - FTP, TCP/IP, SMTP, Telnet, etc., Client Server Communication, Web System architecture - Evolution of the Web, Web architectures, Web clients and servers, Static and Dynamic Web Applications, Front end and back end web development - HTML, CSS, JS, XML, Servlet & JSP, PHP and Ajax; HTTP, secure HTTP; URL, Web Services – SOAP, REST.

UNIT II HTML **6**

Introduction to Html, Html Document structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button, Images.
Introduction to CSS: Syntax, Selectors, Embedding CSS to Html, Formatting fonts, Text & background colour, Inline styles, External and Internal Style Sheets, Borders & boxing

UNIT III JAVASCRIPT **6**

Introduction to JS, Embedding JS into Html, Variables, Data types, Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects, Event Handling.

UNIT IV XML

6

Introduction to XML, Difference b/w Html & XML, XML editors, XML Elements & Attributes XML DTD, XML Schema, XML Parser, Document Object Model (DOM), XML DOM.

HTML 5 & CSS3: Introduction to HTML5, CSS3, New features, Local storage, Web SQL database, Web Sockets, Server events, Canvas, Audio & Video, Geolocation, Microdata, Drag and Drop. Browser life cycle and browser rendering stages. Service workers.

UNIT V PRACTICAL WEBSITE DEVELOPMENT

6

Commonly used Web Servers and browsers, setting up a server and domain name, website types and structures, web authoring tools, Web hosting, website maintenance, generating traffic to your website

Total No of Hours: 30

COURSE OUTCOME:

After Completion of this course Students will be able to

- CO1 Outline the history of the web, and technologies that makes the web pages and publishing them
- CO2 Make the web pages more dynamic and interactive.
- CO3 Design to create structure of web page, to store the data in web document, and transport information through web.
- CO4 Design to be reusable the software components in a variety of different environments.
- CO5 Install Tomcat Server and execution of programs on server side.
- CO6 Identify the problems in Servlets and overcome those using Java Server Pages also develop JSP applications with Model View Control architecture.

CO7 Establish the Connection between Java Application and database to insert, retrieve and modify the data in tables.

TEXT BOOK

1. Practical Web Design for Absolute Beginners, Adrian W. West. Apress 2016
2. Jorg Krause, “Introducing Web Development”, APress Publications, 2017.

REFERENCE BOOK

1. Thomas Powell, “HTML & CSS: The Complete Reference”, McGraw Hill, Fifth Edition, 2010
2. Mathew Macdonald, “Creating a Website: The Missing Manual”, O’Reilly Publications, 2012, 3rd Edition.

Introduction, Addition and Subtraction, Multiplication Algorithms (Booth algorithm), Division Algorithms, Input – Output Organization: Peripheral devices, Input – Output interface, Introduction of Multiprocessors: Characteristics of multi-processors

UNIT V MODES OF DATA TRANSFER AND MEMORY ORGANIZATION 6

Modes of Data Transfer: Priority Interrupt, Direct Memory Access, Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory

Total No of Hours: 30

COURSE OUTCOME:

After Completion of this course Students will be able to

- CO1** Classify and compute the performance of machines.
- CO2** Understand how to implement memory chips, boards, modules and caches.
- CO3** Relate to arithmetic for ALU implementation.
- CO4** Understand the basics of hardwired and micro-programmed control of the CPU
- CO5** Design and analyze solutions in the area of computer architecture. (Analyzing, Creatin
- CO6** identify, compare and assess issues related to ISA, memory, control and I/O functions.
(Applying, Analyzing, Evaluating

TEXT BOOK

1. Computer System Architecture by Morris Mano, PHI
2. Computer Organization and Architecture by William Stallings, PHI
3. Digital Computer Electronics: An Introduction to Microcomputers by Malvino, TMH
4. PC Hardware in a Nutshell by Barbara Fritchman Thompson, Robert Bruce Thompson, O'Reilly, 2nd Edition , 2010

REFERENCE BOOK

1. Fundamentals of Computer Organization and Architecture by Mostafa AB-EL-BARR and Hesham EL-REWNI, John Wiley and Sons

2. Fundamental Of computer Organization by Albert Zomaya, 2010

GENERIC ELECTIVE (GE)-1

GE 1C – SERVER SIDE SCRIPTING LANGUAGE

2 0 0 2

COURSE OBJECTIVE

- To learn the server side scripting languages and their applications. To understand complementarity of the class of languages to systems languages, their strengths and weaknesses.
- To learn Frameworks and CMS. To get knowledge about server side scripting language python and ruby. Regular expressions, text processing, client- and server-level scripting and CGI, GUI programming using Python.
- Basic concepts: scripts and scripting, scripting versus programming, scriptable objects and component ware, Ajax.

UNIT I INTRODUCTION TO SERVER-SIDE SCRIPTING LANGUAGE

6

Server-side Scripting, Different Scripting Languages, Web services, Web application frameworks – MVC, General purpose frameworks – e.g., Django, RoR; Discussion forums, Wikis, Weblogs, Content management system (CMS).

UNIT II INTRODUCTION TO PYTHON

6

How to set up the environment, Lexical conventions and Syntax, Variables, Data Types, Operators, Statements and Expressions, Decision making, Loops, Strings, Tuples, Lists, Dictionary, Recursion, Date and Time, Functions, Modules – math, random; Files I/O, Exceptions

UNIT III CGI AND GUI PROGRAMMING IN PYTHON

6

Classes and Objects, Regular Expressions, CGI Programming, Database Access Networking, Sending Email, Multithreading, XML Processing, GUI Programming, Extending and Embedding Python.

UNIT IV INTRODUCTION TO RUBY ON RAILS

6

MVC Architecture, How to install, Framework, Directory structure, Features, Basic Rails Application

UNIT V ADVANCED RAILS APPLICATIONS

6

Setting up the database, Active records, Migrations, Controllers, Routes, Views, Layouts, Scaffolding, AJAX, Uploading files, sending Email

Total No of Hours: 30

COURSE OUTCOME:

After Completion of this course Students will be able to

- CO1** After completing this course, students will be able to apply various features and components of Python programming in the field of data science.
- CO2** Student will learn how to design and program Python applications.
- CO3** Student will learn how to use lists, tuples, and dictionaries in Python programs.
- CO4** Student will learn how to identify Python object types.
- CO5** Develop server-side Ruby scripts for publishing on the Web.
- CO6** Explain object-oriented programming and input/output processing and apply these concepts to develop dynamic interactive Ruby applications.

TEXT BOOK

1. Python: Essential Reference, by David M. Beazley
2. Core Python Programming, by Wesley J. Chun, Prentice Hall
3. Python Programming: An Introduction to Computer Science, by John M. Zelle, Franklin – Beedle and Associates.

REFERENCE BOOK

1. Professional Ruby on Rails by Noel Rappin, Wiley India Pvt Ltd
2. Learn Ruby on Rails: Book one, by Daniel Kehoe

GENERIC ELECTIVE (GE)-1

GE 1D – ADVANCED EXCEL

2 0 0 2

- To make the student understand the special concepts in MS EXCEL.
- To practice the students how to work in list, data forms and records.
- To understand the concepts of filtering data.

UNIT I ADVANCED EXCEL

10

Uses of Advance Excel Formulas -VLOOKUP, HLOOKUP, SUMIF, SUMIFS, SUMPRODUCT, SUM, COUNTIF, COUNTIFS, IF, IFERROR, ISERROR, ISNA, ISNUMBER, ISNONTEXT, OR, AND, SEARCH, INDEX

UNIT II CONDITIONALS

10

Various Methods and Uses of IF Conditions, When should use the "IF" Conditions? , Creation of Multiple IF Conditions in One Cell, Use the IF Conditions with the Other Advance Functions, How to use nested IF statements in Excel with AND, OR Functions. Sorting, Data Forms, Adding Data Using the Data Form, Finding Records Using Criteria

UNIT III FILTERING AND SORTING

10

Filtering Data, AutoFilter, Totals and Subtotals Total, Row, Various Methods of Filter and Advance Filter options, Creating and Updating Subtotals, Various Method of Sorting Data ,Creating, Formatting and Modifying Chart.

Total No of Hours: 30

COURSE OUTCOMES:

Upon completion of the course students will be able to:

- CO1** Use Microsoft Excel to create personal and/or business spreadsheets following current professional and/or industry standards
- CO2** Use critical thinking skills to design and create spreadsheets
- CO3** Communicate in a business setting using spreadsheet vocabulary.

TEXT BOOK

1. Jordan Goldmeyer, "Advanced Excel Essentials", A Press, 2015 edition.

REFERENCE BOOK

- 1 .John Walkenbach , "Microsoft Excel 2013 Bible" ,Wiley Publications ,2013

SKILLS ENHANCEMENT COURSE (SEC)

SEC 1 – PERSONALITY DEVELOPMENT

2 0 0 2

COURSE OBJECTIVES

- To make students understand the concept and components of personality, thereby to apply the acquired knowledge to themselves and to March towards excellence in their respective academic careers.
- To enable students to keep themselves abreast of general knowledge and current information.

UNIT I INTRODUCTION

10

Definition of Personality - Determinants of Personality- biological, psychological and socio-cultural factors. - Misconceptions and clarifications - Need for personality development

UNIT II SELF-AWARENESS AND SELF MOTIVATION

10

Self-analysis through SWOT and Johari window - Elements of motivation - Seven rules of motivation - Techniques and strategies for self-motivation - Motivation checklist and Goal setting based on principle of SMART - Self motivation and life - Importance of self-esteem and enhancement of self-esteem.

UNIT III MEMORY AND STUDY SKILLS

10

Definition and importance of memory - Causes of forgetting - How to forget (thought stopping), how to remember (techniques for improving memory) - The technique of passing exams- management of examination fear.

Total No of Hours : 30

COURSE OUTCOMES:

Upon completion of the course students will be able to:

- CO1** Explain the concept and components of personality, thereby to apply the acquired knowledge to themselves and to March towards excellence in their respective academic careers.
- CO2** Will be able to to keep themselves abreast of general knowledge and current information.

TEXT BOOKS

1. Mile, D.J (2004). Power of positive thinking. Delhi: Rohan Book Company.
2. Pravesh Kumar (2005). All about self- Motivation. New Delhi: Goodwill Publishing House.

REFERENCE BOOK

1. Dudley, G.A. (2004). Double you're learning power. Delhi: Konark Press. Thomas Publishing Group Ltd.

Semester – VI

Syllabus

DISCIPLINE SPECIFIC ELECTIVE (DSE)-5

DSE 5A- DATA VISUALIZATION

4 1 0 5

COURSE OBJECTIVE

- To understand the importance of data visualization in the business and engineering
- To understand the application and role of visualization tools in creating the advanced techniques.
- To understand the importance of vector visualization in multivariate data analysis
- To understand the impact of visualization techniques in ease the analytics decision making process.

UNIT I INTRODUCTION TO DATA VISUALIZATION

12

Brief history of data visualization, scientific design choices in data visualization- choice of graphical form, grammar of graphical techniques of large amount of data, crucial need of visualization techniques, challenges in visualization techniques, classification of visualization techniques for qualitative and quantitative data, power of visualization techniques, introduction to different visualization techniques

UNIT II STATIC GRAPHICAL TECHNIQUES –I

12

Introduction to bar graph, basic understanding of making basic bar graph, grouping bars together, bar graphs on counts, customization of bar graphs by changing colour, size, title, axis units, changing width and spacing of the bar chart, adding labels to bar graph, application of bar graph in business.

UNIT III MULTIVARIATE GRAPHICAL TECHNIQUES

12

Introduction to correlation matrix, application of correlation matrix in the multivariate analysis, network graph, basics of heat map, difference between heat map and tree map, introduction to higher dimensional scatter plot, axis adjustment in the higher dimensional scatter plot, addition of prediction surface of higher dimensional scatter plot.

UNIT IV GRAPHICAL VALIDATION

12

Basics of multivariate statistical visual representations and its results, dendrogram, importance of dendrogram in grouping (cluster analysis), Scree Plot, importance of Scree Plot, application of Scree Plot in determining number of clusters and factors, QQ plot, importance of QQ plot in distribution of data for the further quantitative analysis, PP plot, applications and usage of PP Plot for distribution detection.

UNIT V CUSTOMIZATION

12

Introduction to annotations – adding : text, mathematical expression , lines, arrows, shaded shapes, highlighting the texts and items, adding error bars, introduction to axis, swapping x and y axis, changing the scaling ration in the axis, positioning of axis and arranging tick marks and labels, changing the appearance of axis labels, circular graphs, using themes, changing the appearance of theme elements, creating the own themes, legends : removing the legends, position of legends, legend title, labels in legends.

Total No of Hours: 60

COURSE OUTCOMES:

Upon completion of the course students will be able to:

- CO1** Design and create data visualizations.
- CO2** Conduct exploratory data analysis using visualization.
- CO3** Craft visual presentations of data for effective communication.
- CO4** Use knowledge of perception and cognition to evaluate visualization design alternatives.
- CO5** Design and evaluate color palettes for visualization based on principles of perception.
- CO6** Apply data transformations such as aggregation and filtering for visualization.
- CO7** Identify opportunities for application of data visualization in various domain

TEXT BOOK

1. Data Visualization Principles And Practice, Second Edition - Alexandru Telea, CRC Press.
2. Hand book of Data Visualization – Chun-houh Chen, Wolfgang Härdle, Antony Unwin, Springer Publication.

REFERENCE BOOK

1. R Graphics Cook Book, Winston Chang, First Edition, O'Reilly Publication.
2. ggplot2 Elegant Graphics for Data Analysis – Hadley Wickham, Springer Publication

DISCIPLINE SPECIFIC ELECTIVE (DSE)-5

DSE 5B- DIMENSION REDUCTION AND MODEL VALIDATION TECHNIQUES

4 1 0 5

COURSE OBJECTIVE

- To understand the importance of dimensionality reduction in data science.
- To know the different data dimension reduction techniques and its appropriate uses.
- To understand the importance of principle component analysis in data dimension reduction.
- To understand the difference between factor and principle component analysis in variable reduction technique.
- To understand the essentials of model validation for better prediction with minimal errors.
- To understand the concepts of hypothesis testing in regression analysis for goodness of fit.

UNIT I INTRODUCTION TO DIMENSIONALITY REDUCTION 12

Introduction to dimensionality reduction – basic concepts of dimensionality reduction, linearity of variables, assumptions of linearity among variables, correlation, important techniques to data dimension reduction techniques: missing values, lower variance, decision trees, decision tree ensembles, high correlation and backward feature elimination, forward feature construction, factor analysis, principle component analysis, importance of data dimension reduction technique in data science.

UNIT II DIMENSIONALITY REDUCTION – II 12

General purpose and description of principle component analysis, extraction of principle components, meaning of eigen values and Eigen vectors in principle component analysis, extraction techniques, orthogonal and oblique rotation of linear combination of variables, determination of number of principle components: cumulative per cent variance explained, average method, Kaisers rule, Broken stick method, Scree plot, using all the preliminaries of PCA for dimension reduction.

UNIT III DIMENSIONALITY REDUCTION – II 12

Random forest and its importance in reducing dimension reduction, fundamental equation of factor analysis, factor model estimation and application in dimension reductions, extraction of factors, orthogonal rotations, communality, variance and covariance, factor scores and importance of factor score in deciding the number of factors, oblique rotation, difference between orthogonal and oblique rotation, application of factor analysis for dimension reduction, linear discriminant analysis, general

purpose and description, non-linear dimensionality reduction, Geodesic distance and graph distances, Isomap, Curvilinear distance analysis.

UNIT IV ASSESSMENT AND EFFICIENCY OF MODEL – I

12

Analysis of Model Coefficients and Predicted Values, model fit using R Square and adjusted R Square, data splitting, double cross validation, variance inflation factors, stepwise regression - forward selection and backward eliminations, significance level for variable selection, collective significance of regression coefficients, partial t test for individual regression coefficients, Residual analysis – Press Statistic and Cooks Statistics.

UNIT V ASSESSMENT AND EFFICIENCY OF MODEL – II

12

Introduction to cross validation of different classification algorithms, cross validation and resampling methods : K-fold cross validation, 5X2 cross validation, bootstrapping method, bagging, measurement of error in predictions, confidence interval for the predicted values, confusion matrix and its interpretation, balanced accuracy in confusion matrix, ROC curve for classification algorithms, importance of ROC curve in model accuracy and fit, complexity parameter and its table, pruning using complexity parameter, Comparison of two classification algorithms, ANOVA for comparing more than two classification algorithms.

Total No of Hours: 60

COURSE OUTCOMES:

Upon completion of the course students will be able to:

- CO1** Dimensionality reduction seeks a lower-dimensional representation of numerical input data that preserves the salient relationships in the data.
- CO2** There are many different dimensionality reduction algorithms and no single best method for all datasets.
- CO3** How to implement, fit, and evaluate top dimensionality reduction in Python with the scikit-learn machine learning library.

TEXT BOOK

1. Dimensionality Reduction with Unsupervised Nearest Neighbors, Volume 51 - Oliver Kramer, Springer Science + Business Media, LLC.
2. Nonlinear Dimensionality Reduction - John A. Lee Michel Verleysen, Springer Science + Business Media, LLC.
3. Introduction to Linear Regression Analysis, Fifth Edition - Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining, A John Wiley & Sons, Inc., Publication
4. Using Multivariate Statistics, Sixth Edition - Barbara G. Tabachnick, Linda S. Fidell, Pearson Education

REFERENCE BOOK

1. Applied Regression Analysis, Third Edition – Norman R Draper, Harry Smith, Wiley Publication.
2. Introduction to Linear Regression Analysis, Fifth Edition - Douglas C. Montgomery, Elizabeth A. Peck, G. Geoffrey Vining, A John Wiley & Sons, Inc., Publication
3. Goodness-of-Fit Tests and Model Validity - C. Huber-Carol, N. Balakrishnan , M.S. Nikulin M. Mesbah , Springer Science + Business Media, LLC
4. Fundamentals of mathematical statistics – SC Gupta and VK Kapoor, Sultan Chand & Sons Publication, New Delhi

DISCIPLINE SPECIFIC ELECTIVE (DSE)-6

DSE 6A- ADVACNED BIG DATA ANALYTICS **5 0 0 5**

COURSE OBJECTIVE:

- To understand the advance concept of BigData Analytics
- To understand different types of Data Processing Tools
- To understand architecture of different tools in Hadoop Cluster
- To understand about ETL process in Hadoop Cluster
- To understand internal concept Hive, Pig, Sqoop, Hbase
- You will understand the concept zookeeper
- You will get to know about different data processing techniques
- You will learn about automating jobs in Hadoop Cluster

UNIT I APACHE PIG **12**

Apache Pig, Pig on Hadoop, Pig Latin, Pig Philosophy, Pig's History, Local Mode and MapReduce Mode, Pig's Data Model, Scalar, Complex, Load, Dump, Store, Foreach, Filter, Join, group, Order by, Distinct, Limit, Sample, Parallel, User Defined Function

Advanced Relational Operations, Using different Join Implementations, Co-group, Union, Cross, Nonlinear Data flows, Controlling Executions, Parameter Substitutions, Program for Word Count Job, Comparison Apache Pig and MapReduce

UNIT II APACHE HIVE **12**

Apache Hive, Features of Apache Hive, Command Line Interface, History of Apache Hive, Hadoop dfs commands from Inside Hive, Hive Data Types & Files Formats, Databases in hive, Alter Database, Creating Managed Table, External Table, Partitioned Table, Dropping Tables, Alter Table

Loading data into Managed Table, Inserting Data into Tables from Queries, Dynamic Partitions inserts, Exporting data, SELECT from clauses, WHERE Clauses, GROUP BY Clauses, JOIN Statements, ORDER BY, SORT BY, DISTRIBUTE BY, CLUSTER BY, bucketing, UNION ALL, Hive Metastore

UNIT III SQOOP & FLUME **12**

Apache Sqoop, Sqoop Architecture, Sqoop Features, Need for Apache Sqoop, Sqoop Connectors, Import Function, Incremental Import, Direct Mode Import, Performing Export Function, Import to Hive, Exports and Transactionality

Apache Flume, Flume Architecture, Features of Apache Flume, Need for Apache Flume, Transactions & Reliability, Source, Sink, Channel , HDFS Sink, Partitioning & Interceptors, File Formats, FAN Out, Integrating Flume with Applications

UNIT IV HBASE

12

Apache Hbase, Understanding Hbase Data Model, Hbase Architecture, HFile, HCatalog, Features of Hbase, Comparing Hbase versus RDBMS, Creating table, Loading Data, Basic Hbase Commands, Alter Table, Deleting Table

UNIT V APACHE OOZIE & ZOOKEEPER

12

Apache Oozie, Features of Apache Oozie, Need for Apache Oozie, Workflow.xml, Coordinator, Job properties, Apache Zookeeper, Features and Application of Zookeeper, Understanding Concept of Zookeeper

Total No of Hours: 60

COURSE OUTCOMES:

After completion of the course the student will be able:

- CO1** Understand the concept of Hadoop Cluster
- CO2** Understand the concept of Different Processing Tool
- CO3** Understand the concept of ETL process
- CO4** Understand the internals Pig, Hive, Sqoop, Oozie, Flume
- CO5** Understand the entire Hadoop Ecosystem
- CO6** Work on Hadoop Cluster using different processing tools

TEXT BOOK

1. Hadoop: The Definitive Guide, By: Tom White, O'REILLY
2. Programming Hive, By: Edward Capriolo, Dean Wampler & Jason Rutherglen, Published by O'REILLY
3. Programming Pig, By: Alan Gates, Published by O'REILLY

REFERENCE BOOK

1. Hadoop for Dummies, By: Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, and Roman B. Melnyk, A Wiley brand
2. Hbase The Definitive Guide, By: Lars George, Published by O'REILLY.

DISCIPLINE SPECIFIC ELECTIVE (DSE)-6

DSE 6B- REAL TIME DATA PROCESSING

5 0 0 5

COURSE OBJECTIVE

- To understand the advanced processing of Real time Data
- To understand different types of Real time Processing Tool
- To understand architecture of Apache Spark
- To understand about Deploying Apache Spark and its components
- To understand different available services for Apache Spark
- You will understand the processing and Storing Challenges for Real time Architecture
- You will get to know about data storage and processing techniques
- You will learn about GraphX and Mlib

UNIT I STREAMING DATA & ARCHITECTURES

12

Sources of Streaming Data, Operational Monitoring, Web Analytics, Online Advertising, Social Media, Mobile Data and the Internet of Things, Why Streaming Data is Different, Loosely Structured, Highly-Cardinality Storage

Real-Time Architecture Components, Collection, Data Flow, Processing, Storage, Delivery, Features of a Real-Time Architecture, High Availability, Low Latency, Horizontal Scalability, Languages for Real-Time Programming, Understanding MapReduce Failure for Streaming Data.

UNIT II INTRODUCING REAL-TIME PROCESSING TOOL

12

Apache Spark, Why Apache Spark, Evolution of Apache Spark, Architecture Apache Spark, Features of Apache Spark, Spark Deployment, Standalone, Hadoop YARN, Spark MapReduce, Components of Apache Spark, Spark core, Spark SQL, Spark Streaming, Spark Machine Learning, Spark GraphX, Spark Shell, Resilient Distributed Dataset (RDD) Basic, Spark Context, RDD Transformations, Creating RDDs, RDD Operations, Programming with RDD, Transformations, Actions, Lazy Evaluation, Converting between RDD Types.

UNIT III DATA PROCESSING USING R & MLL

12

Spark Data Frame, Starting Session, Creating Data Frames, Spark Data Frame Operations, Rows, Columns, Grouping and Aggregations, Operating on Columns, User defined Functions, Data type mapping between R and Spark, Structured Streaming

Architecture, Data types, Classification and Regression, Development Environment, Classification with Naïve Bayes, Theory, Clustering with K-Means, Theory, Artificial Neural Networks, Theory, Use Cases.

UNIT IV PROCESSING LIVE DATA STREAMS & SQL

12

Streaming overview, Basic Concepts, Linking, Streaming Context, Discretized Streams, Input DStreams and Receivers, Streaming Sources, TCP streams, File streams, Transformations on DStreams, Operations, DataFrame and SQL Operations, Check pointing, Memory Tuning Fault Tolerance

SQL Context Datasets, DataFrame, Data Sources, , Importing, Processing Text Files, Processing JSON Files, Processing Parquet Files, Using SQL, User Defined Functions, Using Hive, Performance tuning, Distributed SQL Engine, Compatibility with Apache hive

UNIT V DATA PROCESSING USING GRAPHX

12

Overview, Getting Started, Property Graph, Graph operations, Summary List, Property Operator, Structural Operator, Join, Neighbourhood Aggregations, Pregel API, Graph Builders, Vertex and Edge RDDs, Optimized Representation, Graph Algorithm

Total No of Hours: 60

COURSE OUTCOMES:

- CO1** The students will learn some of the most popular real-time data processing frameworks.
- CO2** The students will be explain about streaming data and different architectures.
- CO3** The students analyze the live data streams and process SQL data
- CO4** The students process data using graphix

TEXT BOOK

1. Real-Time Analytics, By Byron Ellis, Wiley publication

REFERENCE BOOK

1. Mastering Apache Spark, By Mike Frampton, Packt Publishing

2. Learning Spark, By Holden Karau, Andy Kowinski & Matei Zaharia, Published by O'Reilly Media, Inc
3. <https://spark.apache.org/docs/latest/streaming-programming-guide.html>
4. <https://spark.apache.org/docs/latest/graphx-programming-guide.html>
5. <https://spark.apache.org/docs/latest/sparkr>.

GENERIC ELECTIVE (GE)-2

GE 2A – PYTHON PROGRAMMING

2 0 0 2

- To understand why Python is a useful scripting language for developers.
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To learn how to identify Python object types.
- To learn how to use indexing and slicing to access data in Python programs.
- To define the structure and components of a Python program.
- To learn how to write loops and decision statements in Python.
- To learn how to write functions and pass arguments in Python

UNIT I INTRODUCTION

6

Introduction, What is Python, Origin, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples, Dictionaries, if Statement, while Loop, for Loop and the range() Built-in Function, Files and the open() Built-in Function, Errors and Exceptions, Functions, Classes, Modules Syntax and Style Statements and Syntax, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management, Python Application Examples.

UNIT II PYTHON OBJECTS

6

Types: Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types. **Numbers and Strings:** Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions. **Sequences:** Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings.

UNIT III FUNCTIONS AND DICTIONARIES

6

Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples. Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys, **Conditionals and Loops:** if

statement, else Statement, elif Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement.

UNIT IV FILES AND INPUT / OUTPUT

6

File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.

UNIT V EXPRESSIONS AND EXCEPTIONS

6

Introduction/Motivation: Special Symbols and Characters for REs, REs and Python. **Exceptions:** What Are Exceptions? Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.

COURSE OUTCOMES:

CO1 After completing this course, students will be able to apply various features and components of Python programming in the field of data science.

CO2 Student will learn how to design and program Python applications.

CO3 Student will learn how to use lists, tuples, and dictionaries in Python programs.

CO4 Student will learn how to identify Python object types.

CO5 Student will learn how to use indexing and slicing to access data in Python programs.

CO6 Student will define the structure and components of a Python program.

CO7 Student will learn how to write loops and decision statements in Python

TEXT BOOKS

1. Chun, J Wesley, Core Python Programming, Second Edition, Pearson, 2007 Reprint 2010.

REFERENCE BOOKS

1. Barry, Paul, Head First Python, 2nd Edition, O Rielly, 2010.

2. Lutz, Mark, Learning Python, 4th Edition, O Rielly, 2009.

GENERIC ELECTIVE (GE)-2

GE 2B – INTERNET OF THINGS

2 0 0 2

COURSE OBJECTIVE

- Vision and Concept of IoT.
- History & Evolution of IoT
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Learn the fundamental concepts of how and why Cloud systems works
- Understands Cloud technologies that manifest these concepts, such as from Amazon AWS, Microsoft Azure, and Open Stack
- Learn Security issues under IoT Umbrella
- Learn Application area of IoT

UNIT – I INTRODUCTION TO IOT

6

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.

M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The International driven global value chain and global information monopolies.

UNIT - II IOT TECHNOLOGY FUNDAMENTALS & ARCHITECTURE

6

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, M2M and IoT Analytics, Knowledge Management

IoT Architecture-State of the Art – Introduction, State of the art, **Architecture Reference Model-** Introduction, Reference Model, and architecture

UNIT – III CLOUD COMPUTING BASICS

6

Cloud computing components- Infrastructure-services- storage applications-database services – Deployment models of Cloud- Services offered by Cloud- Benefits, and Limitations of Cloud Computing – Issues in Cloud security- Cloud security services and design principle.

UNIT – IV IOT-PRIVACY, SECURITY, AND GOVERNANCE

6

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

UNIT – V IOT APPLICATIONS

6

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

COURSE OUTCOMES:

- CO1** After the completion of this course, students will be able to explore IoT as the framework to link things across the globe.
- CO2** They will be able to talk about various business use cases that may be implemented in IoT.
- CO3** IoT provides the scale of data that machines require in order to learn.
- CO4** IoT will accelerate dematerialization by enabling us to work smarter.
- CO5** Student will be knowing the Consumer and enterprise use cases.
- CO6** Student can able to Apply effective techniques to create IoT based projects

TEXT BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1stEdition, PVT, 2014.

REFERENCE BOOKS:

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
2. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw Hill Edition, Fourth Reprint, 2010.
3. Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and more", Jones & Bartlett Learning Company LLC, 2013.
4. "Internet of Things Applications - From Research and Innovation to Market Deployment"
By Ovidiu Vermesan & Peter Friess, ISBN: 987-87-93102-94-1, River Publishers.

GENERIC ELECTIVE (GE)-2

GE 2C – ARTIFICIAL INTELLIGENCE

2 0 0 2

COURSE OBJECTIVE

- To familiarize students with Artificial Intelligence techniques for building well-engineered and efficient intelligent systems.
- Pattern-directed inference systems and different types of truth maintenance systems will be discussed in length from both theoretical and applied point of view.
- Some cutting edge applications of these systems will also be discussed. Introduction to Artificial Intelligence Programming using LISP will be provided to help students with the programming part of the course.

UNIT I INTRODUCTION

6

Artificial Intelligence Definition – Importance of Artificial Intelligence – Knowledge based Systems – Knowledge Representation – State space search – Production systems – Artificial Intelligence Programming Language – PROLOG – Heuristic search - Depth First Breadth first – Hill climbing – 4th algorithms – Game Playing.

UNIT II KNOWLEDGE REPRESENTATION

6

Propositional Logic – Clause form – Predicate logic – Resolution – Inference Rules – Unification – Semantic networks – frames – conceptual dependency – Scripts – Representing Knowledge using rules.

UNIT III SYMBOLIC REASONING AND UNCERTAINTY

6

Non monotonic Reasoning – Truth maintenance systems – closed world assumption – modal and temporal Logics – Bayes Theorem - certainty factors – Bayesian networks – Dempster – Shafer Theory – Fuzzy logic.

UNIT IV NATURAL LANGUAGE PROCESSING**6**

Overview of Linguistics – grammars and Languages – Basic parsing techniques – semantic Analysis and representation structures – Natural language generation – natural language systems – Distributed Reasoning systems – Intelligent agents.

UNIT V EXPERT SYSTEMS**6**

Architecture – Non production systems Architectures – Knowledge acquisition and validation – Knowledge system building tools – Types of Learning – General Learning model – Learning by induction – Generalization and specialization – Inductive bias – Explanation based Learning.

Total No Of Hours:30**COURSE OUTCOMES:**

After completing this course, students will be able to explore artificial intelligence in day to day life.

- CO1** Student will be able to identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- CO2** Student will be able to formalize a given problem in the language/framework of different AI methods.
- CO3** Implement basic AI algorithms Design and perform an empirical evaluation of different algorithms on a problem formalization
- CO4** Student can state the conclusions that the evaluation supports.
- CO5** Student will know about the virtual assistant is an exciting development in the field.

TEXT BOOKS

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, Delhi, 2001.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence" Tata McGraw Hill Pub. Co., Delhi, 2001.

REFERENCE BOOK

1. George F Luger, "Artificial Intelligence, structures and strategies for complex problem solving", Pearson Education Delhi, 2001

GENERIC ELECTIVE (GE)-2

GE 2D – DISASTER RECOVERY AND BUSINESS CONTINUITY MANAGEMENT

2 0 0 2

COURSE OBJECTIVE:

- To help students understand the importance of disaster recovery (DR) and business continuity management (BCM) in achieving the availability objective of Information Security
- To make it possible for students to learn important steps and documentation involved in developing a business continuity plan (BCP) and how BCP, DRP and BCM are inter-related
- To facilitate students to learn various recovery strategies that are useful in BCP

UNIT I BUSINESS CONTINUITY MANAGEMENT (BCP) 6

Introduction to Business Continuity Planning (BCP), Business Resumption Plan (BRP) or Disaster Recovery Plan (DRP), Common terminologies used in BCP and DRP, Business Continuity Management (BCM), NIST SP800-34 Emergency Action plan which includes the phases of Recover/Resume, Protect and Sustain, Causes of Disasters

UNIT II STAGES IN BCP 6

BCP objectives. Information Protection Environment. Security Technology and Tools. Steps involved in creating a BCP, Phase 1: Project Management and Initiation. Phase 2: Business Impact Analysis. Phase 3: Recovery Strategies, Phase 4: Plan Development and Implementation

UNIT III BUSINESS RECOVERY STRATEGIES 6

Facility and Supply Recovery strategies. User Recovery strategies. Technical Recovery strategies, Data Recovery strategies, Activation Phase- Major Disaster or Disruption, Intermediate Disaster or Disruption, Minor Disaster, Activating BC/DR Teams, Developing Triggers, Transition Trigger. Defining BC/DR Team and Key Personnel, Defining Tasks, Assigning Resources, Communication Plan.

UNIT IV TESTING, MAINTANANCE, AWARENESS & TRAINING MECHANISMS

6

Different types of tests including structured walk-through, checklist test, simulation, parallel test and full interruption test. Steps required to maintain a BCP.

UNIT V PREPARTION OF BCP

6

Requirements for BCP awareness and training, Conduct a case study of IT Organization and prepare a Business Continuity Plan for the same using the learning from this course.

Total No of Hours: 30

COURSE OUTCOMES:

After completing this course, students will be able to explain

CO1 The value of business continuity management to an organization

CO2 The business continuity management process

CO3 The impact of business disruption on an organization and how long disruption should be tolerated

CO4 The business continuity implementation process and implementation planning

CO5 Disaster recovery strategy and the importance of disaster recovery planning

CO6 Different standby systems and how these relate to recovery time

TEXT BOOKS

1. Business Continuity and Disaster Recovery Planning for IT Professionals by Susan Snedaker, Syngress; 2 edition (31 October 2013)
2. Business Continuity and Disaster Recovery Planning by Stuart Hotchkiss, BCS, The Chartered Institute for IT, 1st ed; 2011
3. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008
4. Planning for Disaster: A Business Survival Guide by Harry Flowers, CreateSpace Independent Publishing Platform; 1 edition (15 August 2015)

REFERENCE BOOK

1. Disaster Management: How to Conduct Business Continuity and Disaster Recovery During Disaster Planning, Response and Recovery: 3 (Disaster Management How To Series) by Ian Watts, CreateSpace Independent Publishing Platform; 1 edition (28 November 2016)
2. Simple Guidelines for Successful Disaster Recovery Planning: What are the steps to create an emergency response plan, and how would you utilize this plan by Harry R Fisher, CreateSpace Independent Publishing Platform (27 January 2015)
3. Business Continuity from Preparedness to Recovery: A Standards-Based Approach by Eugene Tucker, Butterworth-Heinemann; 1 edition (5 January 2015)

SKILLS ENHANCEMENT COURSE (SEC)

SEC 2 – NATIONAL SERVICE SCHEME 2 0 0 2

COURSE OBJECTIVE

- Social awareness programme
- Volunteer participation in social related campaign

UNIT I SPECIAL CAMPING PROGRAMME **10**

- A) Nature and its objectives
- B) Selection of camp site and physical arrangement
- C) Organization of N.S.S. camp through various committees and discipline in the camp.
- D) Activities to be undertaken during the N.S.S. camp.
- E) Use of the mass media in the N.S.S. activities

UNIT II CONTRIBUTION OF SOCIAL REFORMS **10**

- A) Mahatma Jotiba Phule
- B) Rajarshi Shahu Chhatrapati
- C) Dr. B. R. Ambedkar

UNIT III SOCIAL PROBLEMS **10**

- A) Water scarcity
- B) Women harassment

Total No of Hours : 30

TEXT BOOKS

1. Chhatrapati Shahu – The Pillar of Social Democracy, Ed. P. B. Salunkhe
2. National Service Scheme Manual, Govt. of India

REFERENCE BOOKS

1. Social service opportunities in Hospitals, Kapil K. Krishan, TISS
2. History of Social Reforms in Maharashtra, Ed. J. Y. Bhosale, S. U. Kolhapur.

SKILLS ENHANCEMENT COURSE (SEC)

SEC 2 –ETHICS AND VALUES

2 0 0 2

COURSE OBJECTIVE

- To increase ethical sensitivity.
- To increase ethical knowledge.
- To improve ethical judgment.

UNIT I INTRODUCTION

10

Why Value Education – Ethical Reflections – What is Ethics? Swami Vivekananda

UNIT II APPROACH TO LIFE

10

Approach to Life - Happiness as Goal - Historical Perspective – Life in the Past Economic Awareness – Economic

UNIT III KINDS OF VALUES

10

Kinds of Values S.Ignacimuthu S.J – Living Excellence Anthony Robbins – Concern for Influence of Science and Technology in Human’s Social Life Social Relevance of Science and Technology Features – Status of Women – Mass Media and Values.

Total No of Hours : 30

COURSE OUTCOME

At the end of the course students can,

CO1: Can able to name the various environment issues.

CO2: Ability to explain the role of disaster management in modern life

CO3: Analyze the cost and planning and reports.

CO4: Tell documentation and reporting of a event.

CO5: Organize workshop and seminar and camps

TEXT BOOK

1. Touchstone: Synergy of Values – University of Madras.

REFERENCE BOOK

1. In harmony- Value Education at College Level- Dept. of Ethics and Religious Studies Loyolla College, Madras.