KAKATIYA UNIVERSITY, WARANGAL - 506 009
B.Sc. PROGRAMME
Under CBCS System
Scheme wef A.Y: 2019-20

FIRST YEAR

SEMESTER - I

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS101	AECC-1	Environmental Science	2	2	10	40	-	50
BS102	FL-1A	English	4	4	20	80	-	100
BS103	SL-1A	Second Language	4	4	20	80	-	100
BS104	DSC-1A	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS105	DSC-2A	Optional– II	4	4	20	80	25	125
		Optional – II LAB	1	3				
BS106	DSC-3A	Optional – III	4	4	20	80	25	125
		Optional – III LAB	1	3				
		TOTAL:	25	-	110	440	75	625

SEMESTER – II

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS201	AECC-2	Basic Computer Skills (Taught by: Computer Science)	2	2	10	40	-	50
BS202	FL-2B	English	4	4	20	80	-	100
BS203	SL-2B	Second Language	4	4	20	80	-	100
BS204	DSC-1B	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS205	DSC-2B	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS206	DSC-3B	Optional – III	4	4	20	80	25	125
		Optional – III LAB	1	3				
		TOTAL :	25	-	110	440	75	625

KAKATIYA UNIVERSITY, WARANGAL - 506 009
B.Sc. PROGRAMME
Under CBCS System
Scheme wef A.Y: 2020-21

SECOND YEAR

SEMESTER - III

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS 301	SEC-1	Fundamentals of Nano Technology (Taught by : Physics)	2	2	10	40	-	50
BS 302	SEC-2	Bio Statistics (Taught by : Statistics)	2	2	10	40	-	50
BS 303	FL-3 A	English	3	3	15	60	-	75
BS 304	SL-3 B	Second Language	3	3	15	60	-	75
BS 305	DSC-1C	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS 306	DSC-2C	Optional – II	4	4	20	80	25	125
		Optional– II Lab	1	3				
BS 307	DSC-3C	Optional – III	4	4	20	80	25	125
		Optional – III Lab	1	3				
		TOTAL:	25	-	110	440	75	625

SEMESTER - IV

Code	Course category	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS401	SEC-3	Fundamentals of Python (Taught by: Computer Science)	2	2	10	40	-	50
BS402	SEC-4	Remedial Methods of Pollution – Drinking Water & Soil Fertility (Taught by: Chemistry)	2	2	10	40	-	50
BS403	FL-4 A	English	3	3	15	60	-	75
BS404	SL-4 B	Second Language	3	3	15	60	-	75
BS405	DSC-1D	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS406	DSC-2D	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS407	DSC-3D	Optional – III	4	4	20	80	25	125
		Optional– III Lab	1	3				
		TOTAL :	25	-	110	440	75	625

KAKATIYA UNIVERSITY, WARANGAL - 506 009
B.Sc. PROGRAMME
Under CBCS System
Scheme wef A.Y: 2021-2022

THIRD YEAR

SEMESTER - V

Code	Course Type	Title of the Paper	No. of Credits	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS 501	FL-5 A	English	3	3	15	60	-	75
BS 502	SL-5 B	Second Language	3	3	15	60	-	75
BS 503	G.E.	Water Resources Management (Taught by: Any Science Dept.)	4	4	20	80	-	100
BS 504	DSE-1E	Optional – I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS 505	DSE-2E	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS506	DSE-3E	Optional – III	4	4	20	80	25	125
		Optional – III Lab	1	3				
		TOTAL:	25	-	110	440	75	625

SEMESTER - VI

Code	Course Type	Title of the Paper	No. of *Credits*	Hrs PW	Max. Marks			Total Marks
					Internal Exam	End Exam	Lab	
BS 601	FL-6A	English	3	3	15	60	-	75
BS 602	SL-6 B	Second Language	3	3	15	60	-	75
BS 603	P.W / Optional	Optional: Public Health & Hygiene (Taught by: Zoology / Botany / Biotechnology / Micro Biology)	4	4	20	80	-	100
BS 604	DSE-1F	Optional - I	4	4	20	80	25	125
		Optional – I Lab	1	3				
BS 605	DSE-2F	Optional – II	4	4	20	80	25	125
		Optional – II Lab	1	3				
BS 606	DSE-3F	Optional – III	4	4	20	80	25	125
		Optional – III Lab	1	3				
		TOTAL:	25	-	110	440	75	625

5. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th edn.
6. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press 1989.
7. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
9. Textbook of Inorganic Chemistry by R Gopalan.

Unit- II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruice Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai

Unit III

1. Principles of physical chemistry by Prutton and Marron.
2. Text Book of Physical Chemistry by Soni and Dharmahara..
3. Text Book of Physical Chemistry by Puri and Sharma.
4. Text Book of Physical Chemistry by K. L. Kapoor.
5. Physical Chemistry through problems by S.K. Dogra.
6. Text Book of Physical Chemistry by R.P. Verma.
7. Elements of Physical Chemistry byLewis Glasstone.

Unit IV

1. Qualitative analysis by Welcher and Hahn.
2. Vogel's Qualitative Inorganic Analysis by Svehla.
3. Text Book of Organic Chemistry by Morrison And Boyd.
4. Text Book of Organic Chemistry by Graham Solomons.
5. Text Book of Organic Chemistry by Bruice Yuranis Powla.
6. Text Book of Organic Chemistry by Soni.
7.Text Book of Physical Chemistry by Soni And Dharmahara..
8. Text Book of Physical Chemistry by Puri And Sharma.
9. Text Book of Physical Chemistry by K. L. Kapoor.

Laboratory Course

45h (3 h / week)

Paper I - Qualitative Analysis - Semi micro analysis of mixtures

Analysis of two anions (one simple, one interfering) and two cations in the given mixture.

Anions: $CO_3^{2-}, SO_3^{2-}, S^{2-}, Cl^-, Br^-, I^-, CH_3COO^-, NO_3^-, PO_4^{3-}, BO_3^{3-}, SO_4^{2-}$. .

Cations: Hg_2^{2+}, Ag^+, Pb^{2+}

$Hg^{2+}, Pb^{2+}, Bi^{3+}, Cd^{2+}, Cu^{2+}, As^{3+/5+}, Sb^{3+/5+}, Sn^{2+/4+}$

$Al^{3+}, Cr^{3+}, Fe^{3+}$

$Zn^{2+}, Ni^{2+}, Co^{2+}, Mn^{2+}$

$Ba^{2+}, Sr^{2+}, Ca^{2+}$

Mg^{2+}, NH_4^+

26/06/19 26/06/19 26/6/19 26/6/19 26/6

References

General reference: B.Sc I Year Chemistry : Semester II, Telugu Academy publication, Hyd

Unit I

1. Principles of Inorganic Chemistry by Puri, Sharma and Kalia Vishal Publications1996.
2. Concise Inorganic Chemistry by J.D. Lee 3rd edn.
3. Basic Inorganic Chemistry by F.A.Cotton, G.Wilkinson and Paul.L. Gaus 3rd edn Wiley Publishers 2001.
4. Chemistry of the elements by N.N.Greenwood and A. Earnshaw Pergamon Press1989.
5. Inorganic Chemistry by Shriver and Atkins 3rd edn Oxford Press 1999.
6. Inorganic Chemistry Principles of structure and reactivity by James E.Huhey, E.A. Keiter and R.L. Keiter 4th Edn.
7. Textbook of inorganic chemistry by R Gopalan.

Unit II

1. Organic Chemistry by Morrison and Boyd.
2. Organic Chemistry by Graham Solomons.
3. Organic Chemistry by Bruice Yuranis Powla.
4. Organic Chemistry by L. G. Wade Jr.
5. Organic Chemistry by M. Jones, Jr
6. Organic Chemistry by John McMurry.
7. Organic Chemistry by Soni.
8. General Organic chemistry by Sachin Kumar Ghosh.
9. Organic Chemistry by C N pillai

Unit III

1. Physical chemistry by P W Atkins
2. Principles of physical chemistry by Prutton and Marron.
3. Text Book of Physical Chemistry by Soni and Dharmahara.
4. Text Book of Physical Chemistry by Puri and Sharma
5. Text Book of Physical Chemistry by K. L. Kapoor
6. Physical Chemistry through problems by S.K. Dogra.
7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Material science by Kakani & Kakani

Unit IV

1. Vogel's Text Book of Quantitative Analysis by G.H.Jeffery, J.Bassett, J.Mendham and R.C. Denney 5th edn Addison Wesley Longman Inc. 1999.
2. Quantitative Analysis by Day and Underwood Prentice Hall (India) VI Edn..
3. Nano: The Essentials by T. Pradeep, McGraw-Hill Education.
4. Chemistry of nanomaterials: Synthesis, Properties and applications by CNR Rao et.al.
5. Nanostructured Materials and Nanotechnology, edited by Hari Singh Nalwa, Academic Press
6. Practical chemistry by V K Ahluwalia, Sunitha Dhingra and AdarshGulati.

Laboratory Course

45hrs (3 h / week)

Paper II- Quantitative Analysis

Acid - Base titrations

1. Estimation of Carbonate in Washing Soda.
2. Estimation of Bicarbonate in Baking Soda.
3. Estimation of Carbonate and Bicarbonate in the Mixture.

26/06/19 26/06/19 26/6/19 26/6/19 26/6

B.Sc., III YEAR CHEMISTRY

SEMESTER-V

LABORATORY COURSE

Paper –V: *Experiments in Physical Chemistry-I*

(01 Credit) **45 Hrs (03 Hrs/week)**

1. **Distribution law**
   a) Determination of molecular status and partition coefficient of benzoic acid in Toluene and water.
   b) Determination of distribution coefficient of acetic acid between n-butanol and water.
2. **Electrochemistry**
   a) Determination of cell constant of conductivity cell.
   b) Verification of Ostwald's dilution law- Determination of dissociation constant (K_a) of acetic acid by conductivity measurements.
3. **Colorimetry**
   a) Verification of Beer's - Lamberts law for $KMnO_4$
   b) Determination of the concentration of the given $KMnO_4$ solution.
4. **Adsorption**
   a) Adsorption of acetic acid on animal charcoal- Verification of Freundlich adsorption isotherm.
5. **Physical constants**
   a) Surface tension and b) Viscosity of liquids. (Demonstration Experiment)

Reference books:

1. Senior Practical Physical Chemistry, B. D Khosla, V. C. Garg , Adarsh Gulati Published by R. Chand & Co.
2. Practical Physical Chemistry, B.Vishwanathan and P.S. Raghavan. Viva Books.
3. Practicals in Physical Chemistry by P.S. Sindhu ISBN-10: 1-4039-2916-5/1403929165 ISBN-13: 978-1-4039-2916-7/9781403929167.

B.Sc., III YEAR CHEMISTRY

SEMESTER-VI

LABORATORY COURSE

Paper –V: *Experiments in Physical Chemistry-II*

(01 Credit) **45 Hrs (03 Hrs/week)**

1. **Kinetics**
   a) Determination of specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ion at room temperature.
   b) Determination rate of decomposition of hydrogen peroxide catalyzed by $FeCl_3$.
2. **Electrochemistry**

A. Potentiometry:

a) Determination of redox potential of Fe^{2+}/Fe^{3+} by potentiometric titration of ferrous ammonium sulphate vs potassium dichromate.

b) Precipitation titration of KCl vs $AgNO_3$ –Determination of given concentration of silver nitrate.

B. pH metry:

a) pH metric titration of strong acid (HCl) vs strong base- Determination of the concentration of given acid.

b) pH metric titration of strong acid (acetic acid) with strong base (NaOH)- Determination of acid dissociation constant (K_a) of weak acid.

3. **Conductometry:**
   a) Determination of overall order: Saponification of ethyl acetate with NaOH by conductance measurement

Reference books:

1. Senior practical physical chemistry, B.D.Khosla, V.C.Garg, Adarsh Guati.
2. Advanced Practical Physical chemistry, J.B.Yadav.
3. Practical Physical chemistry, B.Vishvanathan and P.S.Raghavan.
4. Practical Physical chemistry, P.S. Sindhu.

With Effect from the Academic Year 2019-2020

Programming in C **Semester -I**

Theory	4 Hours/Week	4 credit
Practical	3 Hours/Week	1 credit

Unit – I

Computer Fundamentals: Introduction of Computers, Classification of Computers, Anatomy of a Computer, Memory Hierarchy, Introduction to OS, Operational Overview of a CPU.
Program Fundamentals: Generation and Classification of Programming Languages, Compiling, Interpreting, Loading, Linking of a Program, Developing Program, Software Development.
Algorithms: Definitions, Different Ways of Stating Algorithms (Step-form, Pseudo-code, Flowchart), Strategy for Designing Algorithms, Structured Programming Concept.
Basics of C: Overview of C, Developing Programs in C, Parts of Simple C Program, Structure of a C Program, Comments, Program Statements, C Tokens, Keywords, Identifiers, Data Types, Variables, Constants, Operators and Expressions, Expression Evaluation–precedence and associativity, Type Conversions.

Unit – II

Input-Output: Non-formatted and Formatted Input and Output Functions, Escape Sequences,
Control Statements: Selection Statements – if, if-else, nested if, nested if-else, comma operator, conditional operator, switch; Iterative Statements–while, for, do-while; Special Control Statement–goto, break, continue, return, exit.
Arrays and Strings: One-dimensional Arrays, Character Arrays, Functions from ctype.h, string.h, Multidimensional Arrays.

Unit – III

Functions: Concept of Function, Using Functions, Call-by-Value Vs Call-by-reference, Passing Arrays to Functions, Score of Variables, Storage Classes, Inline Functions, and Recursion.
Pointers: Introduction, Address of Operator (&), Pointer, Uses of Pointers, Arrays and Pointers, Pointers and Strings, Pointers to Pointers, Array of Pointers, Pointer to Array, Dynamic Memory Allocation.

Unit – IV

User-defined Data Types: Declaring a Structure (Union) and its members, Initialization Structure (Union), Accessing members of a Structure (Union), Array of Structures (Union), Structures verses Unions, Enumeration Types.
Files: Introduction, Using Files in C, Working with Text Files, Working with Binary Files, Files of Records, Random Access to Files of Records, Other File Management Functions.

Text — Pradip Dey, Manas Ghosh, Computer Fundamentals and Programming in C (2e)

References
BOOKS

Ivor Horton, Beginning C
Ashok Kamthane, Programming in C
Herbert Schildt, The Complete Reference C
Paul Deitel, Harvey Deitel, C How To Program
Byron S. Gottfried, Theory and Problems of Programming with C
Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language
B. A. Forouzan, R. F. Gilberg, A Structured Programming Approach Using C

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With Effect from the Academic Year 2019-2020

C Lab **Semester -I**

Practical 3 Hours/Week 1 credit

1 Write a program to find the largest two (three) numbers using if and conditional operator.

2 Write a program to print the reverse of a given number.

3 Write a program to print the prime number from 2 to n where n is given by user.

4 Write a program to find the roots of a quadratic equation using switch statement.

5 Write a program to print a triangle of stars as follows (take number of lines from user):

```
*
***
*****
*******
*********
```

6 Write a program to find largest and smallest elements in a given list of numbers.

7 Write a program to find the product of two matrices..

8 Write a program to find the GCD of two numbers using iteration and recursion.

9 Write a program to illustrate use of storage classes.

10 Write a program to demonstrate the call by value and the call by reference concepts.

11 Write a program that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.

12 Write a program to illustrate use of data type enum.

13 Write a program to demonstrate use of string functions string.h header file.

14 Write a program that opens a file and counts the number of characters in a file.

15 Write a program to create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.

16 Write a program that opens an existing text file and copies it to a new text file with all lowercase letters changed to capital letters and all other characters unchanged.

Note Write the Pseudo Code and draw Flow Chart for the above programs.
Recommended to use Open Source Software: GCC on Linux; DevC++ (or) CodeBlocks on Windows 10.

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With Effect from the Academic Year 2019–2020

C++ Lab Semester -II

Practical 3 Hours/Week 1 credit

1 Write a program to.

a. Print the sum of digits of a given number.

b. Check whether the given number is Armstrong or not

c. Print the prime number from 2 to n where n is natural number given.

2 Write a program to find largest and smallest elements in a given list of numbers and sort the given list.

3 Write a program to read the student name, roll no, marks and display the same using class and object.

4 Write a program to implement the dynamic memory allocation and de-allocation using new and delete operators using class and object.

5 Write a program to find area of a rectangle, circle, and square using constructors.

6 Write a program to implement copy constructor.

7 Write a program using friend functions and friend class.

8 Write a program to implement constructors
§ Default Constructor, Parameterized Constructor, Copy Constructor
§ Define the constructor inside/outside of the class
§ Implement all three constructors within a single class as well as use multiple classes(individual classes)

Write a program to implement the following concepts using class and object
§ Function overloading
§ Operator overloading (unary/binary(+ and -))

Write a program to demonstrate single inheritance, multilevel inheritance and multiple inheritances.

Write a program to implement the overloaded constructors in inheritance.

Write a program to implement the polymorphism and the following concepts using class and object.
§ Virtual functions
§ Pure virtual functions

Write a program to implement the virtual concepts for following concepts
§ Constructor (not applied)
§ Destructor (applied)

Write a program to demonstrate static polymorphism using method overloading.

Write a program to demonstrate dynamic polymorphism using method overriding and dynamic method dispatch.

Write a program to implement the template (generic) concepts
§ Without template class and object
§ With template class and object

Write the Pseudo Code and draw Flow Chart for the above programs.

Recommended to use Open Source Software: GCC on Linux; DevC++ (or) CodeBlocks on Windows.

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KAKATIYA UNIVERSITY

Under Graduate Courses (Under CBCS 2020–2021 onwards)

B.Sc. Computer Science II Year

SEMESTER – III

DATA STRUCTURES USING C++ LAB

Practical 3 Hours/Week 1 Credit Marks: 25

Note:

- Programs of all the Concepts from Text Book including exercises must be practice and execute.
- In the external lab examination student has to execute two programs with compilation and deployment steps are necessary.
- External Vice-Voce is compulsory.

1. Write C++ programs to implement the following using an array
   a) Stack ADT b) Queue ADT
2. Write a C++ program to implement Circular queue using array.
3. Write C++ programs to implement the following using a single linked list.
   a) Stack ADT b) Queue ADT
4. Write a C++ program to implement Circular queue using Single linked list.
5. Write a C++ program to implement the double ended queue ADT using double linked list.
6. Write a C++ program to solve tower of Hanoi problem recursively
7. Write C++ program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from binary search tree.
   c) Search for a key in a binary search tree.
8. Write C++ programs for the implementation tree traversal technique BFS.
9. Write a C++ program that uses recursive functions to traverse a binary search tree.
   a) Pre-order b) In-order c) Post-order
10. Write a C++ program to find height of a tree.

11 Write a C++ program to find MIN and MAX element of a BST.

12 Write a C++ program to find Inorder Successor of a given node.

13. Write C++ programs to perform the following operations on B-Trees and AVL Trees.
    a) Insertion b) Deletion

14 Write C++ programs for sorting a given list of elements in ascending order using the following sorting methods.
   a) Quick sort b) Merge sort

15. Write a C++ program to find optimal ordering of matrix multiplication.
16. Write a C++ program that uses dynamic programming algorithm to solve the optimal binary search tree problem
17. Write a C++ program to implement Hash Table
18. Write C++ programs to perform the following on Heap
    a) Build Heap b) Insertion c) Deletion
19. Write C++ programs to perform following operations on Skip List
    a) Insertion b) Deletion
20. Write a C++ Program to Create a Graph using Adjacency Matrix Representation.
21. Write a C++ program to implement graph traversal techniques
    a) BFS b) DFS
22. Write a C++ program to Heap sort using tree structure.

KAKATIYA UNIVERSITY

Under Graduate Courses (Under CBCS 2020 – 2021onwords)

B.Sc. Computer Science II Year

SEMESTER – IV

DATA BASE MANAGEMENT SYSTEMS - LAB

Practical 3 Hours/Week 1 Credit Marks: 25

Note:

- Programs of all the Concepts from Text Book including exercises must be practice and execute.
- In the external lab examination student has to execute two programs with compilation and deployment steps are necessary.
- External Vice-Voce is compulsory.

1. Create a database having two tables with the specified fields, to computerize a library system of a University College.
   LibraryBooks (Accession number, Title, Author, Department, PurchaseDate, Price),
   IssuedBooks (Accession number, Borrower)

   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
   b) Delete the record of book titled “Database System Concepts”.
   c) Change the Department of the book titled “Discrete Maths” to “CS”.
   d) List all books that belong to “CS” department.
   e) List all books that belong to “CS” department and are written by author “Navathe”.
   f) List all computer (Department=”CS”) that have been issued.
   g) List all books which have a price less than 500 or purchased between “01/01/1999” and “01/01/2004”.

2. Create a database having three tables to store the details of students of Computer Department in your college.
   Personal information about Student (College roll number, Name of student, Date of birth, Address, Marks(rounded off to whole number) in percentage at 10 + 2, Phone number)
   Paper Details (Paper code, Name of the Paper)
   Student’s Academic and Attendance details (College roll number, Paper Code, Attendance, Marks in home examination).

   a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
   b) Design a query that will return the records (from the second table) along with the name of student from the first table, related to students who have more than 75% attendance and more than 60% marks in paper2.
   c) List all students who live in “Warangal” and have marks greater than 60 in paper1.
   d) Find the total attendance and total marks obtained by each student.
   e) List the name of student who has got the highest marks in paper2.

KAKATIYA UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Computer Science)
SEMESTER – V
Programming in Java Lab

Practical 3 Hours/Week 1 Credit Marks: 25

Note:

- Programs of all the Concepts from Text Book including exercises must be practice and execute.
- In the external lab examination student has to execute two programs with compilation and deployment steps are necessary.
- External Vice-Voce is compulsory.

1. Write a program to find the largest of n natural numbers.
2. Write a program to find whether a given number is prime or not.
3. Write a menu driven program for following:
   a. Display a Fibonacci series
   b. Compute Factorial of a number
4. Write a program to check whether a given number is odd or even.
5. Write a program to check whether a given string is palindrome or not.
6. Write a program to print the sum and product of digits of an Integer and reverse the Integer.
7. Write a program to create an array of 10 integers. Accept values from the user in that Array. Input another number from the user and find out how many numbers are equal to the number passed, how many are greater and how many are less than the number passed.
8. Write a program that will prompt the user for a list of 5 prices. Compute the average of the prices and find out all the prices that are higher than the calculated average.
9. Write a program in java to input N numbers in an array and print out the Armstrong numbers from the set.
10. Write java program for the following matrix operations:
    a. Addition of two matrices
    b. Transpose of a matrix
11. Write a java program that computes the area of a circle, rectangle and a Cylinder using function overloading.
12. Write a Java program for the implementation of multiple inheritance using interfaces to calculate the area of a rectangle and triangle.
13. Write a java program to create a frame window in an Applet. Display your name, address and qualification in the frame window.
14. Write a java program to draw a line between two coordinates in a window.
15. Write a java program to display the following graphics in an applet window.
    a. Rectangles b. Circles
    c. Ellipses d. Arcs e. Polygons
16. Write a program that reads two integer numbers for the variables a and b. If any other character except number (0-9) is entered then the error is caught by NumberFormatException object. After that ex.getMessage () prints the information about the error occurring causes.
17. Write a program for the following string operations:
    a. Compare two strings b. concatenate two strings c. Compute length of a string
18. Create a class called Fraction that can be used to represent the ratio of two integers. Include appropriate constructors and methods. If the denominator becomes zero, throw and handle an exception.

KAKATIYA UNIVERSITY
FACULTY OF SCIENCE
B.Sc. (Computer Science)
SEMESTER – VI
Web Technologies Lab

Practical 3 Hours/Week 1 Credit Marks: 25

1. Write a HTML program using basic text formatting tags, <p>,
, <pre>.
2. Write a HTML program by using text formatting tags.
3. Write a HTML program using presentational element tags <b>, <i>, <strike>, <sup>, <sub>, <big>, <small>, <hr>
4. Write a HTML program using phrase element tags <blockquote>, <cite>, <abbr>, <acronym>, <kbd>, <address>
5. Write a HTML program using different list types.
6. Create a HTML page that displays ingredients and instructions to prepare a recipe.
7. Write a HTML program using grouping elements and .
8. Write a HTML Menu page for Example cafe site.
9. Write a HTML program using images, audios, videos.
10. Write a HTML program to create your time table.
11. Write a HTML program to create a form using text inputs, password inputs, multiple line text input, buttons, check boxes, radio buttons, select boxes, file select boxes.
12. Write a HTML program to create frames and links between frames.
13. Write a HTML program to create different types of style sheets.
14. Write a HTML program to create CSS on links, lists, tables and generated content.
15. Write a HTML program to create your college web site using multi column layouts.
16. Write a HTML program to create your college web site using for mobile device.
17. Write a HTML program to create login form and verify username and password.
18. Write a JavaScript program to calculate area of rectangle using function.
19. Write a JavaScript program to wish good morning, good afternoon, good evening depending on the current time.
20. Write a JavaScript program using switch case?
21. Write a JavaScript program to print multiplication table of given number using loop.
22. Write a JavaScript programs using any 5 events.
23. Write a JavaScript program using JavaScript built in objects.
24. Write a JavaScript program to create registration Form with Validations.
25. Write a XML Program to represent Student Data using DTD.
26. Write a XML Program to represent Data using XML Schema Definition.

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DEPARTMENT OF B.SC (DATA SCIENCE)

1	B.SC	**DSC-A** PROGRAMMING WITH C
2	B.SC	**DSC-B** PROBLEM SOLVING AND PYTHON PROGRAMMING
3	B.SC	**DSC-C** DATA ENGINEERING WITH PYTHON
4	B.SC	**DSC-D** MACHINE LEARNING
5	B.SC	**DSE-A** NATURAL LANGUAGE PROCESSING
6	B.SC	**DSE-A** NO SQL DATA BASES
7	B.SC	**DSE-B** BIG DATA
8	B.SC	**DSE-B** DEEP LEARING

Dr A. Sheshachalam
PRINCIPAL
Principal
Vaagdevi Degree & P.G. College
Kishanpura, Hanamkonda

KAKATIYA UNIVERSITY, WARANGAL – 506 009
B.Sc. PROGRAMME Under CBCS System
Scheme with effect from Academic Year: 2022 – 2023
B.Sc. (DATA SCIENCE)

Year	Semester	Theory / Practical	Paper Title	Work Load (Hrs/Week)	# Credits	Marks
I	FIRST	Paper – I (DSC – A)	Programming with C	4	4	100
		Practical - 1	*Programming with C (Lab)*	*3*	*1*	*25*
	SECOND	Paper – II (DSC – B)	Problem Solving and Python Programming	4	4	100
		Practical - 2	*Problem Solving and Python Programming (Lab)*	*3*	*1*	*25*
II	THIRD	SEC - 1	Mini Project - 1 (Lab)	2	2	50
		SEC - 2	University Specified Course **Bio Statistics** (Taught by: Statistics)	2	2	50
		Paper – III (DSC – C)	Data Engineering with Python	4	4	100
		Practical - 3	*Data Engineering with Python (Lab)*	*3*	*1*	*25*
	FOURTH	SEC – 3	Mini Project - 2 (Lab)	2	2	50
		SEC – 4	University Specified Course **Remedial Methods of Pollution – Drinking Water & Soil Fertility** (Taught by: Chemistry)	2	2	50
		Paper – IV (DSC – D)	Machine Learning	4	4	100
		Practical - 4	*Machine Learning (Lab)*	*3*	*1*	*25*
III	FIFTH	Paper – V (A) (DSE – A)	Natural Language Processing	4	4	100
		Paper – V (B) (DSE – A)	No SQL Databases	4	4	100
		Practical – 5 (A)	*Natural Language Processing (Lab)*	*3*	*1*	*25*
		Practical – 5 (B)	*No SQL Databases (Lab)*	*3*	*1*	*25*
		Paper VI - GE	Data Structures and Algorithms	4	4	100
	SIXTH	Paper – VII (A) (DSE – B)	Big Data	4	4	100
		Paper – VII (B) (DSE – B)	Deep Learning	4	4	100
		Practical – 7 (A)	*Big Data (Lab)*	*3*	*1*	*25*
		Practical – 7 (B)	*Deep Learning (Lab)*	*3*	*1*	*25*
		Paper VIII (Project)	Major Project	4	4	100

KAKATIYA UNIVERSITY WARANGAL

Under Graduate Courses (Under CBCS AY: 2020-2021 on words)

B.Sc. DATA SCIENCE

I Year: Semester-I

Paper – I: Fundamentals of Information Technology

[4 HPW:: 4 Credits :: 100 Marks (External: 80, Internal:20)]

Objectives:

1. **To deal with the basic concepts of computers.**
2. **To discuss about the computer hardware, its components and basic computer architecture.**
3. **To understand the basic computer software including the operating system and its concepts.**
4. **To introduce the software development process**
5. **To introduce the basic concept of programming**

Outcomes:

Students should be able to

1. Identify the components of a computer and their functions.
2. Understand the concept of networking, LAN, Internet, and working of www.
3. Understand the notion of problem solving using computer by programming
4. Understand the notion of Software Project and the Process of software development

Unit-I

Data and Information: Introduction, Types of Data, Simple Model of a Computer, Data Processing Using a Computer, Desktop of Computers, Classification of Computers, Anatomy of a Computer, Structure of a Central Processing Unit, Specifications of a CPU, Interconnection of CPU with Memory and I/O Units, **Input Output Devices**: Introduction, Keyboard, Video Display Devices, Touch Screen Display, E-Ink Display, Printers, Audio Output, Memory Hierarchy, Embedded Processors **Acquisition of Numbers and Textual Data**: Introduction, Input Units, Internal Representation of Numeric Data, Representation of Characters in Computers, Error-Detecting Codes

Unit-II

Computer Networks: Introduction, Local Area Network (LAN), Applications of LAN, Wide Area Network (WAN), Internet, Naming Computers Connected to Internet, Future of Internet Technology **Computer Software**: Introduction, Operating System, Programming Languages, Classification of Programming Languages, Classification of Programming Languages Based on Applications **The Software Problem**: Cost, Schedule, and Quality, Scale and Change **Software Processes**: Process and Project, Component Software Processes, Software Development Process Models **Programming Principles and Guidelines**: Structured Programming, Information Hiding, Some Programming Practices, and Coding Standards

Unit – III

Algorithms: Definitions, Different Ways of Stating Algorithms (Step-form, Pseudo-code, Flowchart), Strategy for Designing Algorithms, Structured Programming Concept.

Basics of C: Overview of C, Developing Programs in C, Parts of Simple C Program, Structure of a C Program, Comments, Program Statements, C Tokens, Keywords, Identifiers,

Data Types, Variables, Constants, Operators and Expressions, Expression Evaluation–precedence and associativity, Type Conversions. Input-Output: Non-formatted and Formatted Input and Output Functions, Escape Sequences, Control Statements: Selection Statements – if, if-else, nested if, nested if-else, comma operator, conditional operator, switch; Iterative Statements–while, for, do-while; Special Control Statement–goto, break, continue, return, exit.

Unit – IV

Arrays and Strings: One-dimensional Arrays, Character Arrays, Functions from ctype.h, string.h, Multidimensional Arrays. Functions: Concept of Function, Using Functions, Call-by-Value Vs Call-by-reference, Passing Arrays to Functions, Score of Variables, Storage Classes, and Recursion. Pointers: Introduction, Address of Operator (&), Pointer, Uses of Pointers, Arrays and Pointers, Pointers and Strings, Pointers to Pointers, Structures and Unions.

References

1. V Raja Raman. Introduction to Information Technology, 3rd Edition, PHI Learning Private Limited, 2018
2. Pankaj Jalote. Concise Introduction to Software Engineering, Springer, 2011
3. B. A. Forouzan, R. F. Gilberg, A Structured Programming Approach Using C
4. Fundamentals of Computers, by Rema Tharaja, Oxford University Press India

Practical-1: Fundamentals of Information Technology

[3 HPW:: 1 Credit :: 25 Marks]

Objective

The main objective of this laboratory is to familiarize the students with the basic hardware and software in computers

Exercises

1. Assembly and disassembly of a system box and identifying various parts inside the system box to recognize various parts of a typical computer system
2. Assembly and disassembly of peripheral devices- keyboard and mouse and study of their interface cables, connectors and ports.
3. Installation of Operating Systems-Windows and Linux
4. Disk defragmentation using system tool.
5. Procedure of disk partition and its operation (Shrinking, Extending, Delete, Format).
6. Installing and uninstalling of device drivers using control panel.
7. Working practice on Linux operating system: creating file, folder. Copying, moving, deleting file, folder
8. User Account creation and its feature on Windows Operating System and Changing resolution, color, appearances, and Changing System Date and Time.
9. Installation and using various wireless input devices (Keyboard/Mouse/Scanners etc.,)under Windows/Linux.
10. Partition and formatting of hard disk.
11. Installation of scanner, modem and network cards in Windows/Linux.
12. Assembly and disassembly of printer, installing a printer, taking test page, and using printer under Windows/Linux.
13. Installation of application software's – Office Automation, Anti-Virus.
14. Demonstrate the usage of Word and Power point in Windows and Linux
15. Configure Internet connection, Email Account creation, reading, writing and sending emails with attachment.
16. Programs related to the concepts of C-programming

Paper – II: Problem Solving and Python Programming

[4 HPW:: 4 Credits :: 100 Marks (External:80, Internal:20)]

Objectives
The main objective is to teach Computational thinking using Python.

- To know the basics of Programming
- To convert an algorithm into a Python program
- To construct Python programs with control structures.
- To structure a Python Program as a set of functions
- To use Python data structures-lists, tuples, dictionaries.
- To do input/output with files in Python.
- To construct Python programs as a set of objects.

Outcomes:
On completion of the course, students will be able to:

1. Develop algorithmic solutions to simple computational problems.
2. Develop and execute simple Python programs.
3. Develop simple Python programs for solving problems.
4. Structure a Python program into functions.
5. Represent compound data using Python lists, tuples, and dictionaries.
6. Read and write data from/to files in Python Programs

Unit-I

Introduction to Computing and Problem Solving: Fundamentals of Computing – Computing Devices – Identification of Computational Problems – Pseudo Code and Flowcharts – Instructions – Algorithms – Building Blocks of Algorithms.
Introduction to Python Programming: Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements, Reading Input, Print Output, Type Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language.
Control Flow Statements: The if, The if…else, The if…elif…else Decision Control Statements, Nested if Statement, The while Loop, The for Loop, The continue and break Statements.

Unit-II

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.
Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Unit-III

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list Parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

Unit-IV

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance The Polymorphism.
Functional Programming: Lambda. Iterators, Generators, List Comprehensions.

References:

1. Introduction to Python Programming. Gowrishankar S, Veena A. CRC Press, Taylor & Francis Group, 2019
2. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/)

Suggested Reading:

1. Learning To Program With Python. Richard L. Halterman. Copyright © 2011
2. Python for Everybody, Exploring Data Using Python 3. Dr. Charles R. Severance. 2016

Practical- 2: Problem Solving and Python Programming (Lab)

[3 HPW: 1 Credit: 25 Marks]

Objective

The main objective of this laboratory is to put into practice computational thinking. The students will be expected to write, compile, run and debug Python programs to demonstrate the usage of

- variables, conditionals and control structures
- functions (both recursive and iterative)
- basic data types as well as compound data structures such as strings, lists, sets, tuples, dictionaries
- object-oriented programming

Exercises

I. Programs to demonstrate the usage of operators and conditional statements

1. Write a program that takes two integers as command line arguments and prints the sum of two integers.
2. Program to display the information:
   Your name, Full Address, Mobile Number, College Name, Course Subjects
3. Program to find the largest number among ‘n’ given numbers.
4. Program that reads the URL of a website as input and displays contents of a webpage.

II. Programs to demonstrate usage of control structures

5. Program to find the sum of all prime numbers between 1 and 1000.
6. Program that reads set of integers and displays first and second largest numbers.
7. Program to print the sum of first ‘n’ natural numbers.
8. Program to find the product of two matrices.
9. Program to find the roots of a quadratic equation

III. Programs to demonstrate the usage of Functions and Recursion

10. Write both recursive and non-recursive functions for the following:
    a. To find GCD of two integers
    b. To find the factorial of positive integer
    c. To print Fibonacci Sequence up to given number ‘n’
    d. To convert decimal number to Binary equivalent
11. Program with a function that accepts two arguments: a list and a number ‘n’. It should display all the numbers in the list that are greater than the given number ‘n’.
12. Program with a function to find how many numbers are divisible by 2, 3,4,5,6 and 7 between 1 to 1000

IV. Programs to demonstrate the usage of String functions

13. Program that accept a string as an argument and return the number of vowels and consonants the string contains.
14. Program that accepts two strings S1, S2, and finds whether they are equal are not.
15. Program to count the number of occurrences of characters in a given string.
16. Program to find whether a given string is palindrome or not

V. Programs to demonstrate the usage of lists, sets, dictionaries, tuples and files.

17. Program with a function that takes two lists L1 and L2 containing integer numbers as parameters. The return value is a single list containing the pair wise sums of the numbers in L1 and L2.
18. Program to read the lists of numbers as L1, print the lists in reverse order without Using reverse function.
22. Write a program that combines lists L1 and L2 into a dictionary.
19. Program to find mean, median, mode for the given set of numbers in a list.
20. Program to find all duplicates in the list.
21. Program to o find all the unique elements of a list.
22. Program to find max and min of a given tuple of integers.
23. Program to find union, intersection, difference, symmetric difference of given two sets.
24. Program to display a list of all unique words in a text file
25. Program to read the content of a text file and display it on the screen line wise with a line number followed by a colon
26. Program to analyse the two text files using set operations
27. Write a program to print each line of a file in reverse order.

VI. Programs to demonstrate the usage of Object Oriented Programming

28. Program to implement the inheritance
29. Program to implement the polymorphism

VII. Programs to search and sort the numbers

30. Programs to implement Linear search and Binary search
31. Programs to implement Selection sort, Insertion sort

Paper – III: Data Engineering with Python

[4 HPW:: 4 Credits :: 100 Marks (External:80, Internal:20)]

Objective: The main objective of this course is to teach how to extract raw data, clean the data, perform transformations on data, load data and visualize the data

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

- Handle different types of files and work with text data
- Use regular expression operations
- Use relational databases via SQL
- Use tabular numeric data
- Use the data structures: data series and frames
- Use PyPlot for visualization

Unit – I

Data Science: Data Analysis Sequence, Data Acquisition Pipeline, Report Structure [Reference 1(Chapter 1-Unit1 to Unit 3)]]
Files and Working with Text Data: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os. Path Modules. [Reference 2, Chapter 9)]
Working with Text Data: JSON and XML in Python[Reference 2, Section12.2]

Unit – II

Working with Text Data: Processing HTML Files, Processing Texts in Natural Languages [Reference 1(Chapter3 –Unit 13, and Unit16)
Regular Expression Operations: Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with *glob* Module [Reference 2-Chapter 10]

Unit – III

Working with Databases: Setting Up a MySQL Database, Using a MySQL Database: Command Line, Using a MySQL Database, Taming Document Stores: MongoDB [Reference 1(Chapter4-Unit17toUnit20)]
Working with Tabular Numeric Data(Numpy with Python): NumPy Arrays Creation Using *array()* Function, Array Attributes, NumPy Arrays Creation with Initial Placeholder Content, Integer Indexing, Array Indexing, Boolean Array Indexing, Slicing and Iterating in Arrays, Basic Arithmetic Operations on NumPy Arrays, Mathematical Functions in NumPy, Changing the Shape of an Array, Stacking and Splitting of Arrays, Broadcasting in Arrays. [Reference 2: Section 12.3)]

Unit – IV

Working with Data Series and Frames: Pandas Data Structures, Reshaping Data, Handling Missing Data, Combining Data, Ordering and Describing Data, Transforming Data, Taming Pandas File I/O [Reference 1 (Chapter 6-Unit 31 to Unit 37)]
Plotting: Basic Plotting with PyPlot, Getting to Know Other Plot Types, Mastering Embellishments, Plotting with Pandas [Reference 1(Chapter8-Unit 41 to Unit 44)]

References:

1. Data Science Essentials in Python: Collect, Organize, Explore, Predict, Value. Dmitry Zinoriev,The Pragmatic Programmers LLC, 2016
2. Introduction to Python Programming**.** Gowrishankar S., Veena A. CRC Press, Taylor & Francis Group, 2019

Suggested Reading

3. Python for Everybody: Exploring Data Using Python 3. Charles R Severance, 2016
4. Python Data Analytics – Data Analysis and Science using Pandas, matplotlib and the Python Programming Language. Fabio Nelli, Apress, 2015
5. Website Scraping with Python. Using BeautifulSoup and Scrapy. GáborLászlóHajba, Apress, 2018
6. Machine Learning with Python Cookbook:.Practical Solutions from Preprocessing to Deep Learning. Chris Albon, O'Reilly 2018

Practical- 3: Data Engineering with Python (Lab)

[3 HPW:: 1 Credit :: 25 Marks]

Objective:
The main objective of this laboratory is to put into practice the ETL (extract, transform, load) pipeline which will extract raw data, clean the data, perform transformations on data, load data and visualize the data.

This requires mentoring by TCS.

Libraries
In this course students are expected to extract, transform and load input data that can be text files, CSV files, XML files, JSON, HTML files, SQL databases, NoSQL databases etc.,. For doing this, they should learn the following Python libraries/modules:
pandas, numpy, BeautifulSoup, pymysql, pymongo, nltk, matplotlib

Datasets
For this laboratory, appropriate publicly available datasets, can be studied and used. Example:
MNIST (http://yann.lecun.com/exdb/mnist/),
UCI Machine Learning Repository (https://archive.ics.uci.edu/ml/datasets.html),
Kaggle (https://www.kaggle.com/datasets)
Twitter Data

Exercises
1. Write programs to parse text files, CSV, HTML, XML and JSON documents and extract relevant data. After retrieving data check any anomalies in the data, missing values etc.
2. Write programs for reading and writing binary files
3. Write programs for searching, splitting, and replacing strings based on pattern matching using regular expressions
4. Design a relational database for a small application and populate the database. Using SQL do the CRUD (create, read, update and delete) operations.
5. Create a Python MongoDB client using the Python module pymongo. Using a collection object practice functions for inserting, searching, removing, updating, replacing, and aggregating documents, as well as for creating indexes
6. Write programs to create numpy arrays of different shapes and from different sources, reshape and slice arrays, add array indexes, and apply arithmetic, logic, and aggregation functions to some or all array elements
7. Write programs to use the pandas data structures: Frames and series as storage containers and for a variety of data-wrangling operations, such as:
    - Single-level and hierarchical indexing
    - Handling missing data
    - Arithmetic and Boolean operations on entire columns and tables
    - Database-type operations (such as merging and aggregation)
    - Plotting individual columns and whole tables
    - Reading data from files and writing data to files

KAKATIYA UNIVERSITY WARANGAL

Under Graduate Courses (Under CBCS AY: 2021-2022 on words)

B.Sc. DATA SCIENCE

II Year: Semester-IV

Paper – IV: Machine Learning

[4 HPW:: 4 Credits :: 100 Marks (External:80, Internal:20)]

Objectives: The main objective of this course is to teach the principles and foundations of machine learning algorithms

Outcomes:

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

- Basics of Machine Learning and its limitations
- Machine Learning Algorithms: supervised, unsupervised, bio-inspired
- Probabilistic Modeling and Association Rule Mining

Unit-I

Introduction: What does it mean to learn, Some canonical Learning Problems, The Decision Tree Model of Learning, Formalizing the Learning Problem ID3 Algorithm [Reference1, 2]
Limits of Learning: Data Generating Distributions, Inductive Bias, Not Everything islearnable, Under fitting and Overfitting, Separation of training and test Data, Models, parameters and Hyperparameters, Real World Applications of Machine Learning **Geometry and Nearest Neighbours:** From Data to Feature Vectors, k-Nearest Neighbours, Decision Boundaries, k-means Clustering, High Dimensions [Reference 1]

Unit-II

The Perceptron: Bio-inspired Learning, The Perceptron Algorithm, Geometric Interpretation, Interpreting Perceptron Weights, Perceptron Convergence and Linear Separability, Improved Generalization, Limitations of the Perceptron
Practical Issues: Importance of Good Features, Irrelevant and Redundant Features, Feature Pruning and Normalization, Combinatorial Feature Explosion, Evaluating Model Performance, Cross Validation, Hypothesis Testing and Statistical Significance, Debugging Learning Algorithms, Bias Variance tradeoff
Linear Models: The Optimization Framework for Linear Models, Convex Surrogate Loss Functions, Weight Regularization, Optimization and Gradient Descent, Support Vector Machines [Reference 1]

Unit-III

Probabilistic Modelling: Classification by Density Estimation, Statistical Estimation, Naïve Bayes Models, Prediction [Reference 1]
Neural Networks: Bio-inspired Multi-Layer Networks, The Back-propagation Algorithm, Initialization and Convergence of Neural Networks, Beyond two layers, Breadth vs Depth, Basis Functions [Reference 1]

Unit IV

Unsupervised Learning: Clustering Introduction, Similarity and Distance Measures,Agglomerative Algorithms, Divisive Clustering, Minimum Spanning Tree [Reference 2]
Association Rules: Introduction, large Itemsets, Apriori Algorithm [Reference 2]

References:

1. A Course in Machine Learning (CIML). Hal Daume III, 2017 (freely available online) http://ciml.info/
2. Data Mining: Introductory and Advanced Topics. Margaret H Dunham, Pearson Education, 2003

Suggested Reading:

3. Hands on Machine Learning with SciKit-Learn, Keras and Tensor Flow. AurélienGéron. O'Reily, 2019
4. Machine Learning with Python Cookbook. Chris Albo, O'Reily, 2018
5. Introduction to Machine Learning with Python: A guide. Andreas C Miller, Sarah Guido. O'Reily, 2017

Practical- 4: Machine Learning (Lab)

[3 HPW:: 1 Credit :: 25 Marks]

Objective:
The main objective of this laboratory is to put into practice the various machine learning algorithms for data analysis using Python and Weka.

ML Toolkits
Students are expected to learn
1. Scikit-learn(https://scikit-learn.org/) an open source machine learning Python library that supports supervised and unsupervised learning. It also provides various tools for model fitting, data preprocessing, model selection and evaluation, and many other utilities.
2. Weka (http://www.cs.waikato.ac.nz/ml/weka/)is another widely used ML toolkit.

Datasets
1. The sklearn datasets package embeds small toy datasets. It includes utilities to load these datasets. It also includes methods to load and fetch popular reference datasets and features some artificial data generators. Students are expected to study and make use of these datasets
2. Weka also has provides various data sets.

References:
1. Scikit-learn user guide.https://scikit-learn.org/stable//_downloads/scikit-learn-docs.pdf
2. Ian Witten, Eibe Frank, and Mark Hall, Chris Pal. DATA MINING: Practical Machine Learning Tools and Techniques, 4th Edition. Morgan Kaufmann.

Exercises
1. Write a Python program using Scikit-learn to split the iris dataset into 70% train data and 30% test data. Out of total 150 records, the training set will contain 120 records and the test set contains 30 of those records. Print both datasets
2. Write Python program to use sklearn's Decision Tree Classifier to build a decision tree for the sklearn's datasets. Implement functions to find the importance of a split (entropy, information gain, gini measure)
3. Write a Python program to implement your own version of the K-means algorithm. Then apply it to different datasets and evaluate the performance.
4. Design a perceptron classifier to classify handwritten numerical digits (0-9). Implement using scikit or Weka.
5. Write a Python program to classify text as spam or not spam using the Naïve Bayes Classifier
6. Use WEKA and experiment with the following classifiers: Association Rule Mining (Apriori), Agglomerative and Divisive Clustering.

Paper – V (A): Natural Language Processing

[4 HPW :: 4 Credits :: 100 Marks (External:80, Internal:20)]

Objective: The main objective of this course is to give a practical introduction to NLP. It deals with morphological processing, syntactic parsing, information extraction, probabilistic NLP and classification of text using Python's NLTK Library.

Outcomes:

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

- Write Python programs to manipulate and analyze language data
- Understand key concepts from NLP and linguistics to describe and analyze language
- Understand the data structures and algorithms that are used in NLP
- Classify texts using machine learning and deep learning

Unit-I

Language Processing and Python: Computing with Language: Texts and Words, A Closer Look at Python: Texts as Lists of Words, Computing with Language: Simple Statistics, Back to Python: Making Decisions and Taking Control, Automatic Natural Language Understanding [Reference 1]

Accessing Text Corpora and Lexical Resources: Accessing Text Corpora, Conditional Frequency Distributions, Lexical Resources, WordNet [Reference 1]

Unit-II

Processing Raw Text: Accessing Text from the Web and from Disk, Strings: Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation, Formatting: From Lists to Strings. [Reference 1]

Categorizing and Tagging Words: Using a Tagger, Tagged Corpora, Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging, How to Determine the Category of a Word [Reference 1]

Unit-III

Learning to Classify Text: Supervised Classification, Evaluation, Naive Bayes Classifiers [Reference 1]

Deep Learning for NLP: Introduction to Deep Learning, Convolutional Neural Networks, Recurrent Neural Networks, Classifying Text with Deep Learning [Reference 2]

Unit-IV

Extracting Information from Text

Information Extraction, Chunking, Developing and Evaluating Chunkers, Recursion in Linguistic Structure, Named Entity Recognition, Relation Extraction. [Reference 1]

Analyzing Sentence Structure
Some Grammatical Dilemmas, What's the Use of Syntax. Context-Free Grammar, Parsing with Context-Free Grammar, [Reference 1]

References:

1. Natural Language Processingwith Python. Steven Bird, Ewan Klein, and Edward Lope, O'Reily, 2009
2. Natural Language Processing Recipes: Unlocking Text Data with Machine Learning and Deep Learning using Python. AkshayKulkarni,AdarshaShivananda, Apress, 2019

Suggested Reading:

3. Allen James, Natural Language Understanding, Benjamin/Cumming,1995.
4. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.

Practical – 5(A): Natural Language Processing (Lab)

[3 HPW:: 1 Credit :: 25 Marks]

Objective: The main objective of this laboratory is to write programs that manipulate and analyze language data using Python

This lab requires mentoring sessions from TCS.

Python Packages

Students are expected to know/ learn the following PythonNLP packages

- NLTK (www.nltk.org/ (http://www.nltk.org/))
- Spacy (https://spacy.io/)
- TextBlob (http://textblob.readthedocs.io/en/dev/
- Gensim (https://pypi.python.org/pypi/gensim)
- Pattern (https://pypi.python.org/pypi/Pattern)

Datasets:

1. NLTK includes a small selection of texts from the Project Gutenberg electronic text archive, which contains some 25,000 free electronic books, hosted at *http://www.gutenberg.org/*.
2. The Brown Corpus contains text from 500 sources, and the sources have been categorized by genre, such as *news*, *editorial*, and so on (*http://icame.uib.no/brown/bcm-los.html*).
3. Wikipedia Articles Or any other dataset of your choice

Reference:

Jacob Perkins. Python 3 Text Processing with NLTK 3 Cookbook. Packt Publishing. 2014

Exercises:

1. Text segmentation: Segment a text into linguistically meaningful units, such as paragraphs, sentences, or words. Write programs to segment text (in different formats) into tokens (words and word-like units) using regular expressions. Compare an automatic tokenization with a gold standard
2. Part-of-speech tagging: Label words (tokens) with parts of speech such as noun, adjective, and verb using a variety of tagging methods, e.g., default tagger, regular expression tagger, unigram tagger, and n-gram taggers.
3. Text classification: Categorize text documents into predefined classes using Naïve Bayes Classifier and the Perceptron model
4. Chunk extraction, or partial parsing: Extract short phrases from a part-of-speech tagged sentence. This is different from full parsing in that we're interested in standalone chunks, or phrases, instead of full parse trees
5. Parsing: parsing specific kinds of data, focusing primarily on dates, times, and HTML. Make use of the following preprocessing libraries:
   - dateutil which provides datetime parsing and timezone conversion
   - lxml and BeautifulSoup which can parse, clean, and convert HTML
   - charade and UnicodeDammit which can detect and convert text character encoding
6. Sentiment Analysis: Using Libraries TextBlob and nltk, give the sentiment of a document

(B): NoSQL Data Bases

[4 HPW :: 4 Credits :: 100 Marks (External:80, Internal:20)]

Objective: The main objective of this course is to cover core concepts of NoSQL databases, along with an example database for each ofthe key-value, document, column family, and graph databases

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

- Understand the need for NoSQL databases and their characteristics
- Understand the concepts of NoSQL databases
- Implement the concepts of NoSQL databases using four example databases: Redis for key-value databases, MongoDB for document databases, Cassandra for column-family databases, and Neo4J for graphdatabases.

Unit-I

Why NoSQL: The Value of Relational Databases, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL
Aggregate Data Models: Aggregates, Column-Family Stores, Summarizing Aggregate-Oriented Databases
More Details on Data Models: Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access

Unit-II

Distribution Models: Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication
Consistency: Update Consistency, Read Consistency, Relaxing Consistency, Relaxing Durability, Quorums
Version Stamps: Business and System Transactions, Version Stamps on Multiple Nodes
Map-Reduce: Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations

Unit-III

Key-Value Databases: What Is a Key-Value Store, Key-Value Store Features, Suitable Use Cases, When Not to Use
Document Databases: What Is a Document Database, Features, Suitable Use Cases, When Not to Use

Unit-IV

Column-Family Stores: What Is a Column-Family Data Store, Features, Suitable Use Cases, When Not to Use
Graph Databases: What Is a Graph Database, Features, Suitable Use Cases, When Not to Use

Reference:

1. Pramod J. Sadalage, Martin Fowler. NoSQL Distilled, Addison Wesley 2013

Suggested Reading

2. Luc Perkins, Eric Redmond, Jim R. Wilson. Seven Databases in Seven Weeks. The Pragmatic Bookshelf, 2018
3. Guy Harrison. Next GenerationDatabases: NoSQL, NewSQL, and Big Data. Apress, 2015

Practical – 5(B) : NoSQL Data Bases (Lab)

[3 HPW :: 1 Credit :: 25 Marks]

Objective: The main objective of this lab is to become familiar with the four NoSQL databases: Redis for key-value databases, MongoDB for document databases, Cassandra for column-family databases, and Neo4J for graphdatabases

NoSQL Databases:
Redis (http://redis.io)
MongoDB (http://www.mongodb.org)
Cassandra (http://cassandra.apache.org)
Neo4j (http://neo4j.com)

Exercises:
1. Installation of NoSQL Databases: Redis,MongoDB, Cassandra, Neo4j on Windows & Linux
2. Practice CRUD (*Create*, *Read*, *Update*, and *Delete)* operations on the four databases: Redis,MongoDB, Cassandra, Neo4j
3. Usage of Where Clause equivalent in MongoDB
4. Usage of operations in MongoDB – AND in MongoDB, OR in MongoDB, Limit Records and Sort Records. Usage of operations in MongoDB – Indexing, Advanced Indexing, Aggregation and Map Reduce.
5. Practice with ' macdonalds ' collection data for document oriented database. Import restaurants collection and apply some queries to get specified output.
6. Write a program to count the number of occurrences of a word using MapReduce

Paper – VI - GE: Data Structures and Algorithms

[4 HPW:: 4 Credits :: 100 Marks]

Objectives:

- To introduce the time and space complexities of algorithms.
- To discuss the linear and non-linear data structures and their applications.
- To introduce the creation, insertion and deletion operations on binary search trees and balanced binary searchtrees.
- To introduce various internal sorting techniques and their time complexities

Outcomes:

Students will be

- Able to analyze the time and space complexities of algorithms.
- Able to implement linear, non-linear data structures and balanced binarytrees
- Able to analyze and implement various kinds of searching and sorting techniques.
- Able to find a suitable data structure and algorithm to solve a real world problem.

UNIT–I

Performance and Complexity Analysis: Space Complexity, Time Complexity, Asymptotic Notation (Big-Oh), Complexity Analysis Examples.

Linear List-Array Representation: Vector Representation, Multiple Lists Single Array. **Linear List-Linked Representation:** Singly Linked Lists, Circular Lists, Doubly Linked Lists, Applications (Polynomial Arithmetic).

Arrays and Matrices: Row and Column Major Representations, Sparse Matrices.

Stacks: Array Representation, Linked Representation, Applications (Recursive Calls, Infix to Postfix, Postfix Evaluation).

Queues: Array Representation, Linked Representation. **Skip Lists and Hashing:** Skip Lists Representation, Hash Table Representation, Application- Text Compression.

UNIT- II

Trees: Definitions and Properties, Representation of Binary Trees, Operations, Binary TreeTraversal.
Binary Search Trees: Definitions, Operations on Binary Search Trees.

Balanced Search Trees: AVL Trees, and B-Trees.

UNIT –III

Graphs: Definitions and Properties, Representation, Graph Search Methods (Depth First Search and Breadth First Search)
Application of Graphs: Shortest Path Algorithm (Dijkstra), Minimum Spanning Tree (Prim's and Kruskal's Algorithms).

UNIT –IV

Searching : Linear Search and Binary Search Techniques and their complexity analysis.
Sorting and Complexity Analysis: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, and Heap Sort.Algorithm Design Techniques: Greedy algorithm, divide-and-conquer, dynamic programming.

Suggested Reading:

1. Michael T. Goodrich, Roberto Tamassia, David M. Mount, *Data Structures and Algorithms Python* John Wiley & Sons, 2013.
2. Problem Solving with algorithams and Data Structures Using Python by Miller and David L. Ranum
3. Algorithmic Problem Solving with Python by John B. Schneider

Paper – VII (A): Big Data

[4 HPW :: 4 Credits :: 100 Marks (External:80, Internal:20)]

UNIT – I

Getting an overview of Big Data: Introduction to Big Data, Structuring Big Data, Types of Data, Elements of Big Data, Big Data Analytics, and Advantages of Big Data Analytics.

Introducing Technologies for Handling Big Data: Distributed and Parallel Computing for Big Data, Cloud Computing and Big Data, Features of Cloud Computing, Cloud Deployment Models, Cloud Services for Big Data, Cloud Providers in Big Data Market.

UNIT – II

Understanding Hadoop Ecosystem: Introducing Hadoop, HDFS and MapReduce, Hadoop functions, Hadoop Ecosystem. **Hadoop Distributed File System**- HDFS Architecture, Concept of Blocks in HDFS Architecture, Namenodes and Datanodes, Features of HDFS. MapReduce.

Introducing HBase- HBase Architecture, Regions, Storing Big Data with HBase, Combining HBase and HDFS, Features of HBase, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie.

UNIT- III

Understanding MapReduce Fundamentals and HBase: The MapReduceFramework ,Exploring the features of MapReduce, Working of MapReduce, Techniques to optimize MapReduce Jobs, Hardware/Network Topology, Synchronization, File system, Uses of MapReduce, Role of HBase in Big Data Processing- Characteristics of HBase.

Understanding Big Data Technology Foundations: Exploring the Big Data Stack, Data Sources Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, Security Layer, Monitoring Layer, Visualization Layer.

UNIT – IV

Storing Data in Databases and Data Warehouses: RDBMS and Big Data, Issues with Relational Model, Non – Relational Database, Issues with Non Relational Database, Polyglot Persistence, Integrating Big Data with Traditional Data Warehouse, Big Data Analysis and Data Warehouse.

NoSQL Data Management: Introduction to NoSQL, Characteristics of NoSQL, History of NoSQL, Types of NoSQL Data Models- Key Value Data Model, Column Oriented Data Model, Document Data Model, Graph Databases, Schema-Less Databases, Materialized Views, CAP Theorem.

Reference

1. BIG DATA, Black Book TM, DreamTech Press, 2016 Edition.

Suggested Reading:

2. Seema Acharya, SubhasniChellappan , "BIG DATA and ANALYTICS", Wiley publications, 2016
3. Nathan Marz and James Warren, "BIG DATA- Principles and Best Practices of Scalable Real-Time Systems", 2010

Practical – 7(A): Big Data (Lab)

[3 HPW:: 1 Credit :: 25 Marks]

Objectives:

- Installation and understanding of working of HADOOP
- Understanding of MapReduce program paradigm.
- Writing programs in Python using MapReduce
- Understanding working of Pig, Hive
- Understanding of working of Apache Spark Cluster

1. Setting up and Installing Hadoop in its two operating modes:
   - Pseudo distributed,
   - Fully distributed.
2. Implementation of the following file management tasks in Hadoop:
   - Adding files and directories
   - Retrieving files
   - Deleting files
3. Implementation of Word Count Map Reduce program
   - Find the number of occurrence of each word appearing in the input file(s)
   - Performing a MapReduce Job for word search count (look for specific keywords in a file)
4. Map Reduce Program for Stop word elimination:
   - Map Reduce program to eliminate stop words from a large text file.
5. Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented. Data available at: https://github.com/tomwhite/hadoop-book/tree/master/input/ncdc/all.
   - Find average, max and min temperature for each year in NCDC data set?
   - Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.
6. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
7. Write a Pig Latin script for finding TF-IDF value for book dataset (A corpus of eBooks available at: Project Gutenberg)
8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
9. Install, Deploy & configure Apache Spark Cluster. Run apache spark applications using Scala.
10. Perform Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.

Paper – VII (B) :Deep Learning

[4 HPW:: 4 Credits :: 100 Marks (External:80, Internal:20)]

Objective: The main objective of this course is to give a practical introduction to Deep Learning using Keras. It covers the concepts of deep learning and their implementation.

Outcomes:

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

1. Understand the basics of deep learning
2. Understand the usage of tensors in deep learning
3. Use Python deep-learning framework Keras, with Tensor-Flow as a backend engine.

Unit-I

Introduction: History, Hardware, Data, Algorithms

Neural Networks, Data representations for neural networks, Scalars (0D tensors), Vectors (1D tensors), Matrices (2D tensors), 3D tensors and higher-dimensional tensors, Key attributes,. Manipulating tensors in Numpy, The notion of data batches, Real-world examples of data tensors, Vector data, Time series data or sequence data, Image data, Video data

Unit-II

Tensor operations: Element-wise operations, Broadcasting, Tensor dot, Tensor reshaping, Geometric interpretation of tensor operations, a geometric interpretation of deep learning,

Unit-III

Gradient-based optimization, Derivative of a tensor operation, Stochastic gradient descent,. Chaining derivatives: the Backpropagation algorithm

Neural networks: Anatomy, Layers, Models, Loss functions and optimizers

Unit-IV

Introduction to Keras, Keras, TensorFlow, Theano, and CNTK

Recurrent neural networks: A recurrent layer in Keras, Understanding the LSTM and GRU layers

Reference:

1. FrançoisChollet. Deep Learning with Python. Manning Publications, 2018

Suggested Reading:

2. AurélienGéron. Hands on Machine Learning with SciKit-Learn, Keras and Tensor Flow. O'Reily, 2019
3. Andrew W. Trask. Grokking Deep Learning.Manning Publications, 2019

Practical – 7(B): Deep Learning (Lab)

[3 HPW :: 1 Credit :: 25 Marks]

Objectives: The main objective of this lab is to develop deep learning models using Keras

Deep Learning Tools
Students are expected to learn Keras deep-learning framework (https://keras.io), which is open source and free to download. They should have access to a UNIX machine; though it's possible to use Windows, too. It is also recommended that they work on a recent NVIDIA GPU

Note: The exercises should following **Keras workflow** consisting of four steps
1. Define your training data: input tensors and target tensors
2. Define a network of layers (or *model*) that maps your inputs to your targets
3. Configure the learning process by choosing a loss function, an optimizer, and some metrics to monitor
4. Iterate on your training data by calling the fit() method of your model

Exercise 1:
Dataset:
IMDB dataset, a set of 50,000 highly polarized reviews from the Internet Movie Database. They're split into 25,000 reviews for training and 25,000 reviews for testing, each set consisting of 50% negative and 50% positive reviews. the IMDB dataset comes packaged with Keras
Binary Classification Task:
Build a network to classify movie reviews as positive or negative, based on the text content of the reviews.

Exercise 2:
Dataset:
Reuters dataset, a set of short newswires and their topics, published by Reuters in 1986. It's a simple, widely used toy dataset for text classification. There are 46 different topics; some topics are more represented than others, but each topic has at least 10 examples in the training set. Reuters dataset comes packaged as part of Keras.
Single-label Multi class Classification Task:
Build a network to classify Reuters newswires into 46 mutually exclusive topics. Each data point should be classified into only one category (in this case, topic),. The problem is more specifically an instance of *single-label, multiclass classification*.

Exercise 3:
Dataset:
The Boston Housing Price dataset has an interesting difference from the two previous examples. It has relatively few data points: only 506, split between 404 training samples and 102 test samples. And each *feature* in the input data (for example, the crime rate) has a

different scale. For instance, some values are proportions, which take values between 0 and 1; others take values between 1 and 12, others between 0 and 100, and so on.

Regression Task:

The two previous examples were classification problems, where the goal was to predict a single discrete label of an input data point. Another common type of machine-learning problem is *regression*, which consists of predicting a continuous value instead of a discrete label. You'll attempt to predict the median price of homes in a given Boston suburb in the mid-1970s, given data points about the suburb at the time, such as the crime rate, the local property tax rate, and so on.

4. More exercises can be defined on similar lines.

KAKATIYA UNIVERSITY, WARANGAL – 506 009
B.Sc. PROGRAMME Under CBCS System
Scheme with effect from Academic Year: 2022 – 2023
B.Sc. (DATA SCIENCE)

Year	Semester	Theory / Practical	Paper Title	Work Load (Hrs/Week)	# Credits	Marks
I	FIRST	**Paper – I (DSC – A)**	**Programming with C**	**4**	**4**	**100**
		Practical - 1	*Programming with C (Lab)*	*3*	*1*	*25*
	SECOND	**Paper – II (DSC – B)**	**Problem Solving and Python Programming**	**4**	**4**	**100**
		Practical - 2	*Problem Solving and Python Programming (Lab)*	*3*	*1*	*25*
II	THIRD	**SEC - 1**	**Mini Project - 1 (Lab)**	**2**	**2**	**50**
		SEC - 2	**University Specified Course** **Bio Statistics** **(Taught by: Statistics)**	**2**	**2**	**50**
		Paper – III (DSC – C)	**Data Engineering with Python**	**4**	**4**	**100**
		Practical - 3	*Data Engineering with Python (Lab)*	*3*	*1*	*25*
	FOURTH	**SEC – 3**	**Mini Project - 2 (Lab)**	**2**	**2**	**50**
		SEC – 4	**University Specified Course** **Remedial Methods of Pollution – Drinking Water & Soil Fertility** **(Taught by: Chemistry)**	**2**	**2**	**50**
		Paper – IV (DSC – D)	**Machine Learning**	**4**	**4**	**100**
		Practical - 4	*Machine Learning (Lab)*	*3*	*1*	*25*
III	FIFTH	**Paper – V (A) (DSE – A)**	**Natural Language Processing**	**4**	**4**	**100**
		Paper – V (B) (DSE – A)	**No SQL Databases**	**4**	**4**	**100**
		Practical – 5 (A)	*Natural Language Processing (Lab)*	*3*	*1*	*25*
		Practical – 5 (B)	*No SQL Databases (Lab)*	*3*	*1*	*25*
		Paper VI - GE	**Data Structures and Algorithms**	**4**	**4**	**100**
	SIXTH	**Paper – VII (A) (DSE – B)**	**Big Data**	**4**	**4**	**100**
		Paper – VII (B) (DSE – B)	**Deep Learning**	**4**	**4**	**100**
		Practical – 7 (A)	*Big Data (Lab)*	*3*	*1*	*25*
		Practical – 7 (B)	*Deep Learning (Lab)*	*3*	*1*	*25*
		Paper VIII (Project)	**Major Project**	**4**	**4**	**100**

B.Sc. ELECTRONICS SYLLABUS
B.Sc. I YEAR Semester – I
DSC- Paper – I : Circuit Analysis

Total number of hours : 56
No of hours per week : 4
Credits : 4

UNIT - I

AC Fundamentals : The sine wave –average and RMS values – The J Operator – Polar and Rectangular forms of complex numbers – Phasor diagram-Complex impedance and admittance.

Kirchhoff's Current and Voltage Laws: Concept of Voltage and current sources-KVL and KCL- application to simple circuits (AC and DC) consisting of resistors and sources – Node voltage analysis and Mesh analysis.

UNIT-II

Network Theorems (DC and AC): Superposition Theorem ,Thevenin's Theorem, Norton's Theorem, Maximum power transfer Theorem, Reciprocity Theorem, Milliman's Theorem, Application to simple Networks.

UNIT-III

RC and RL Circuits : Transient Response of RL and RC Circuits with step input, Time constants. Frequency response of RC and RL circuits , Types of filters – Low pass filter and High pass filter- frequency response, passive differentiating circuit and passive integrating circuit.

UNIT-IV

Resonance : RLC Series and parallel resonance circuits –Resonant frequency –Q Factor- Bandwidth-Selectivity.

Cathode Ray Oscilloscope: Cathode Ray Tube (CRT) and its working, electron gun focusing, deflection sensitivity, florescent screen. Measurement of Time period, Frequency , Phase and amplitude.

Text Books:

1) Basic Electronics-Grob 10th edition(TMH)
2) Circuit Analysis-P.Gnanaswam pearson Education.
3) Circuit and Networks-A. Sudhakar & S. Pallri(TMH)
4) Pulse, digital & switching waveforms-Milliman &Taub.
5) Networks, Lines and Fields-John Ryder (PHI)
6) Network theory-Smarajit Ghosh(PHI)

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DEPARTMENT OF PHYSICS
KAKATIYA UNIVERSITY
WARANGAL-506 009 (A.P.)

B.Sc. I Year, Semester – I : Electronics Practical

Paper – I : Circuit Analysis Lab

No. of hours per week : 3

1. Measurement of peak voltage, frequency using CRO.
2. Measurement of phase using CRO.
3. Thevenin's theorem and Norton's theorem – verification.
4. Maximum power transfer theorem – verification.
5. CR circuit – Frequency response - (Low pass and High pass).
6. CR and LR circuits – Differentiation and integration – tracing of waveforms.
7. LCR – Series resonance circuit – frequency response – Determination of f_o, Q and band width.
8. Simulation: i) verification of KVL and KCL.
   ii) study of network theorems.
   iii) study of frequency response (LR).

Note: Student has to perform minimum of <u>Six</u> experiments.

Reference Books:

1) Lab manual for Electronic Devices and Circuits – 4th Edition. By David A Bell – PHI
2) Basic Electronics – A Text Lab Manual –Zbar, Malvino, Miller.

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WARANGAL-506 009 (A.P.)

B.Sc. I Year, Semester – II : Electronics Practical
Paper – II : Electronic Devices Lab

No. of hours per week: 3

1. To draw volt- ampere characteristics of Junction diode and determine the cut – in voltage, forward and reverse resistances.
2. Zener diode V – I Characteristics – Determination of Zener breakdown voltage.
3. Voltage regulator (line and load) using Zener diode.
4. BJT input and output characteristics (CE configuration) and determination of 'h' parameters.
5. FET – Characteristics and determination of FET parameters.
6. UJT characteristics – determination of intrinsic standoff ratio.
7. UJT as relaxation oscillator.
8. Characteristics of LDR/Photo diode/Photo transistor/Solar cell.

Note: Student has to perform minimum of Six experiments.

Reference Books:

1) Lab manual for Electronic Devices and Circuits – 4th Edition. By David A Bell - PHI

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KAKATIYA UNIVERSITY - WARANGAL - TELANGANA

Under Graduate Courses (Under CBCS 2019– 2022)

B.Sc. ELECTRONICS II Year

SEMESTER – III

PAPER – III:: ANALOG CIRCUITS PRACTICALS

(DSC-3: Compulsory)

Practical: 3 Hours/Week Credits: 1 Marks: 25

1. Study of Half-wave, full-wave and bridge rectifier and determination of ripple factor.
2. Series inductor, shunt capacitor, L-section and π-section filters: Determination of ripple factor using Full wave Rectifier.
3. Study of voltage regulator using ICs: 78XX & 79XX.
4. Colpitt's oscillator – determination of frequency.
5. RC Phase shift oscillator - determination of frequency
6. Astable multivibrator – determination of time period and duty cycle.
7. RC-coupled amplifier – Study of frequency response
8. **Simulation experiments ::**

   i) Rectifiers

   ii) RC-coupled amplifier

   iii) Wein's bridge oscillator

   iv) Colpitt's oscillator

   v) RC phase shift oscillator

   vi) Astable multivibrator

Note: Student has to perform minimum of six experiments

Suggested Books:

1) Lab manual for Electronic Devices and Circuits – David A Bell, 4th Edition, PHI
2) Basic Electronics – A Text Lab Manual – Zbar, Malvino, Miller.

SCHEME OF QUESTION PAPER

KAKATIYA UNIVERSITY, WARANGAL
B.Sc. (Electronic) I/II/III Year Examination
Semester: I/II/III/IV/V/VI
Paper:
(For DSC, DSE, GE & Paper in lieu of project)

Time: 3 Hours] **[Marks: 80**

SECTION A: SHORT ANSWER QUESTIONS (8 X 4 = 32)

Answer Any EIGHT questions. Each question carries equal marks

1. From Unit 1
2. From Unit 1
3. From Unit 1 (Problem)
4. From Unit 2
5. From Unit 2
6. From Unit 2 (Problem)
7. From Unit 3
8. From Unit 3
9. From Unit 3 (Problem)
10. From Unit 4
11. From Unit 4
12. From Unit 4 (Problem)

SECTION B: ESSAY TYPE ANSWER QUESTIONS (4 X 12 = 48)

Answer Any FOUR questions. All questions carry equal marks

13. (a) From Unit 1
    OR
    (b) From Unit 1

14. (a) From Unit 2
    OR
    (b) From Unit 2

15. (a) From Unit 3
    OR
    (b) From Unit 3

16. (a) From Unit 4
    OR
    (b) From Unit 4

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA

Under Graduate Courses (Under CBCS 2019– 2022)

B.Sc. ELECTRONICS II Year

SEMESTER – IV

LINEAR INTEGRATED CIRCUITS & BASICS OF COMMUNICATION PRACTICALS

PAPER – IV:: (DSC-4: Compulsory)

Practical: 3 Hours/Week Credits: 1 Marks: 25

Using IC 741 Op-Amp and IC 555 Timer:

1. Op amp as inverting Amplifier- Determination of Gain (With AC and DC)
2. Op amp as non-inverting Amplifier- Determination of Gain (With AC and DC)
3. OP Amp as Summing amplifier and comparator (Zero crossing detector)
4. Astable multivibrator – determination of time period and duty cycle.
5. Monostable multivibrator- determination of gate width.
6. Integrator/ Differentiator – study of wave forms.
7. Astable multivibrator using IC 555
8. Monostable multivibrator using IC 555.
9. AM modulator and detector
10. FM modulator and detector

Simulation of all the above experiments:

1. Inverting and Non inverting amplifiers and comparator
2. Integrator/ Differentiator using op amp
3. Wein's bridge oscillator
4. Astable multivibrator using Op Amp
5. Astable multivibrator using IC 555

Note: Student has to perform minimum of six experiments

1) Lab manual for Electronic Devices and Circuits – 4th Edition. By David A Bell – PHI
2) Basic Electronics – A Text Lab Manual –Zbar, Malvino, Miller.

SCHEME OF QUESTION PAPER

B.Sc. (Electronics)
Internal Assessment Examination - I
Semester: I/II/III/IV/V/VI
Paper:
(For DSC, DSE, GE & Paper in lieu of project)

Time: 90 Min] **[Marks: 20**

Answer ALL questions. Each question carries equal marks (2 x 10 = 20)

1. From Unit 1
2. From Unit 1
3. From Unit 1
4. From Unit 1
5. From Unit 1
6. From Unit 2
7. From Unit 2
8. From Unit 2
9. From Unit 2
10. From Unit 2

B.Sc. (Electronics) - III Year
Semester – V
Paper – V: (A) Digital Electronics & Microprocessor Practical's
(DSE-1: Compulsory)

1. Verification of truth tables of AND, OR, NOT, NAND, NOR, XOR Gates using IC 74XX series.
2. Construction of basic gates using NAND and NOR gates.
3. Construction of Half Adder using gates. Verification of truth table.
4. Construction of Full Adder using gates and verification of truth table.
5. Verification of truth tables of flip flops: RS, D, and JK using IC's.
6. Binary addition (8 bit and 16 bit) and subtraction (8 bit).
7. Decimal Addition (DAA).
8. Multiplication and Division (8 bit).
9. Picking of largest/Smallest number from the given data.
10. Arranging the given data in ascending/descending order.
11. Time Delay generation.

Simulation experiments:

1. 4 bit parallel adder using Full adders.
2. Decade counter using JK flip flops.
3. Up/Down counters using JK flip flops.
4. Multiplexer/De-Multiplexer.
5. Encoder.

Note: Student has to perform minimum of eight experiments

1. Lab manual for Electronic Devices and Circuits – David A Bell, 4th Edition – PHI
2. Basic Electronics – A Text Lab Manual – Zbar, Malvino, Miller.

B.Sc. (Electronics) - III Year
Semester – V
Paper – V: (B) Electronic Instrumentation Practical's
(DSE-1: Compulsory)

1. Temperature transducer (Thermocouple/ Thermistor)
2. Pressure Transducer- Strain gauge
3. Displacement Transducer- LVDT (Linear Variable Differential Transformer)
4. Ultrasonic Transducer - Ultrasonic Sensor
5. Flow Transducer- Flow meter
6. Force Transducer- Dynamometer
7. Acceleration Transducer- Accelerometer
8. Photovoltaic cell (Solar cell)
9. Passive Transducers- Photocells (LDR)
10. CRO Characteristics
11. DC Voltmeter/ DC Current Meter
12. AC Voltmeter /AC current Meter
13. Multimeter

B.Sc. (Electronics) - III Year
Semester – VI
Paper – VI: (A) Microcontroller & Applications Practical's
(DSE-2: Compulsory)

Experiments using 8051 microcontroller:

1. Multiplication of two numbers using MUL command (later using counter method for repeated addition).
2. Division of two numbers using DIV command (later using counter method for repeated subtraction).
3. Pick out the largest/smallest number among a given set of numbers.
4. Arrange the given numbers in ascending/descending order.
5. Generate a specific time delay using timer/counter.
6. Interface ADC and a temperature sensor to measure temperature.
7. Interface DAC and generate a staircase wave form with a step duration and number of steps as variables.
8. Flash a LED connected at a specified out port terminal.
9. Interface stepper motor to rotate clock wise / anti clock wise through a given angle steps.

Experiments with Keil Software:

1. Write a program to pick out largest/smallest number among a given set of number.
2. Write a program to arrange a given set of numbers in ascending/descending order.
3. Write a program to generate a rectangular/square wave form at specified port.
4. Write a program to generate a time delay using timer registers.

Note: Student has to perform minimum of Six Experiments

B.Sc. (Electronics) - III Year
Semester – VI
Paper – VI: (B) Digital communication Practical's
(DSE-2: Compulsory)

I. Study of

1. Pulse Amplitude modulation
2. Pulse code modulation
3. pulse width modulation
4. PulsePhase modulation
5. Amplitude Shift Key
6. Frequency shift key
7. Delta Modulation
8. Pulse shift keying

II. Experiments in Data Communication.

1) Study of serial communication.
2) Study of protocol in communications.
3) Study of Fiber optic communications.
4) Study of wireless communications.
5) Study of parallel communication.

Note: Minimum of 8 experiments to be performed.

KAKATIYA UNIVERSITY, WARANGAL
B.Sc. (PHYSICS)
SCHEME FOR CHOICE BASED CREDIT SYSTEM
YEAR- & SEMESTER-WISE SCHEME OF HPW, CREDITS & MARKS

Yr	SEM	Course/Paper	Course Type*	Hrs / Week	No. of Credits	Marks		
						Internal	SEM End	Total
FIRST	I	Mechanics & Oscillations	DSC-1	4	4	20	80	100
		Mechanics & Oscillations Lab (Pr)	DSC-1(Pr)	3	1	-	25	25
	II	Thermal Physics	DSC-2	4	4	20	80	100
		Thermal Physics Lab (Pr)	DSC-2(Pr)	3	1	-	25	25
SECOND	III	Electromagnetic Theory	DSC-3	4	4	20	80	100
		Electromagnetic Theory Lab (Pr)	DSC-3(Pr)	3	1	-	25	25
		1) Experimental methods & Error analysis 2) Electrical circuits & Networking	SEC-1 SEC-2	2 2	2 2	10 10	40 40	50 50
	IV	Waves & Optics	DSC-4	4	4	20	80	100
		Waves & Optics Lab (Pr)	DSC-4(Pr)	3	1	-	25	25
		1) Basic Instrumentation 2) Digital Electronics	SEC-3 SEC-4	2 2	2 2	10 10	40 40	50 50
THIRD	V	(A) Modern Physics Or (B) Computational Physics	DSE-1	4	4	20	80	100
		(A) Modern Physics Lab (Pr) Or (B) Computational Physics Lab (Pr)	DSE-1 (Pr)	3	1	-	25	25
		Renewable energy & Energy harvesting	GE	4	4	20	80	100
	VI	(A) Electronics Or (B) Applied Optics	DSE-2	4	4	20	80	100
		(A) Electronics Lab (Pr) Or (B) Applied Optics Lab (Pr)	DSE-2 (Pr)	3	1	-	25	25
		Nanoscience	Project / Course in lieu of project	4	4	20	80	100
Total					**30 + 16**	**120+80**	**630+320**	**750 + 400**

*DSC: Discipline Specific Course (Core); DSE: Discipline Specific Elective (Elective); Pr: Practical
SEC: Skill Enhancement Course; GE: Generic Elective

B.Sc. (Physics)- I Year
Semester – I
Paper – I::Mechanics and Oscillations
(DSC-1: Compulsory)

Total: 56 hrs
(4 Hrs / week)

Unit – I

1. Vector Analysis (14)

Scalar and Vector fields, Gradient of a Scalar field and its physical significance. Divergence and Curl of a Vector field and related problems. Vector integration, line, surface and volume integrals. Stokes', Gauss's and Green's theorems- simple applications.

Unit – II

2. Mechanics of Particles (7)

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section.

3. Mechanics of Rigid Bodies (7)

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope.

Unit – III

4. Central Forces (8)

Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws.

5. Special theory of Relativity (8)

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

Unit – IV

6. Oscillations (12)

Simple harmonic oscillator and solution of the differential equation – Physical characteristics of SHM, Torsion pendulum – Measurement of rigidity modulus, Compound pendulum - Measurement of 'g', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures.

Damped harmonic oscillator, Solution of the differential equation of damped oscillator. Energy considerations, Logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance.

Note: *Problems should be solved at the end of every chapter of all units.*

Suggested Books

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008.*

2. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007*.
3. **First Year Physics** - *Telugu Academy*.
4. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill*.
5. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition, 2008.
6. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005.*
7. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition.*
8. **An introduction to Mechanics** by Daniel Kleppner& Robert Kolenkow. *The McGraw Hill Companies.*
9. **Mechanics**. Hans &Puri. *TMH Publications.*
10. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications.*
11. **The Feymman Lectures in Physics, Vol.-1**, R P Feymman, RB Lighton and M Sands, BI Publications,
12. **Mechanics-**P.K. Srivastava - New Age International.

B.Sc. (Physics) – I year
Semester - I
Paper – I:: Mechanics and Oscillations Practicals
(DSC-1: Compulsory)

1. Measurement of errors – Simple Pendulum.
2. Calculation of slope and intercept of Y= mX +C graph by theoretical method (simple pendulum experiment)
3. Study of a compound pendulum- determination of 'g' and 'k'.
4. Y' by uniform Bending
5. Y by Non-uniform Bending.
6. Moment of Inertia of a fly wheel.
7. Rigidity modulus by Torsion Pendulum.
8. Determination of surface tension of a liquid through capillary rise method.
9. Determination of Surface Tension of a liquid by any other method.
10. Determination of Viscosity of a fluid.
11. Observation of Lissajous figures from CRO- Frequency ratio. Amplitude and phase difference of two waves.
12. Study of oscillations of a mass under different combination of springs- Series and parallel
13. Study of Oscillations under Bifilar suspension- Verification of axis theorems

***Note**: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastava.

B.Sc. (Physics)- I Year
Semester – II
Paper – II:: Thermal Physics
(DSC-2: Compulsory)

Total: 56 hrs
(4 Hrs / week)

Unit – I

1. Kinetic theory of gases: (6)

Introduction – Deduction of Maxwell's law of distribution of molecular speeds, Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.

2. Thermodynamics: (8)

Basics of Thermodynamics - Carnot's engine (qualitative) - Carnot's theorem - Kelvin's and Clausius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature- Entropy (T-S) diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.

Unit – II

3. Thermodynamic potentials and Maxwell's equations: (7)

Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations – Clausius-Clayperon's equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.

4. Low temperature Physics: (7)

Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour compression type.

Unit – III

5. Quantum theory of radiation: (14)

Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Wein's displacement law, Wein's law, Rayleigh-Jean's law – Quantum theory of radiation - Planck's law – deduction of Wein's law, Rayleigh-Jeans law, Stefan's law from Planck's law.Measurement of radiation using pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

Unit – IV

6. Statistical Mechanics: (14)

Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles ,classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann's distribution law -Molecular energies in an ideal gas- Maxwell-Boltzmann's velocity distribution law, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws.

NOTE: *Problems should be solved at the end of every chapter of all units.*

Suggested books

1. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007.*
2. **Second Year Physics** – *Telugu Academy.*

3. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co*.
4. **Modern Physics** by G. Aruldhas and P. Rajagopal, *Eastern Economy Education.*
5. Berkeley Physics Course. Volume-5. **Statistical Physics** by F. Reif. *The McGraw-Hill Companies.*
6. **An Introduction to Thermal Physics** by Daniel V. Schroeder.*Pearson Education Low Price Edition*.
7. **Thermodynamics** by R.C. Srivastava, Subit K. Saha& Abhay K. *Jain Eastern Economy Edition.*
8. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand& Co. Publications.*
9. **Feyman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications.*
10. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
12. B.B. Laud **"Introduction to statistics Mechanics"**(Macmillan 1981)
13. F.Reif**:"Statistical Physics "**(Mcgraw-Hill,1998)
14.K.Haung: "**Statistical Physics "**(Wiley Eastern 1988)

B.Sc. (Physics) – I year
Semester - II
Paper – II:: Thermal Physics Practicals
(DSC-2: Compulsory)

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measurement of Stefan's constant.
3. Specific heat of a liquid by applying Newton's law of cooling correction.
4. Heating efficiency of electrical kettle with varying voltages.
5. Calibration of thermo couple
6. Cooling Curve of a metallic body
7. Resistance thermometer
8. Thermal expansion of solids
9. Study of conversion of mechanical energy to heat.
10. Determine the Specific of a solid (graphite rod)

***Note**: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastava

B.Sc. (Physics)- II Year
Semester – III
Paper – III:: Electromagnetic Theory
(DSC-3: Compulsory)

Total: 56 hrs
(4 Hrs / week)

Unit I : Electrostatics (14 Hrs)

Electric Field:- Concept of electric field lines and electric flux, Gauss's law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field 'E', Irrotational field. Electric potential:- Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

Unit II : Magnetostatics (14 Hrs)

Concept of magnetic field 'B' and magnetic flux, Biot-Savart's law, B due to a straight current carrying conductor. Force on a point charge in a magnetic field. Properties of B, curl and divergence of B, solenoidal field. Integral form of Ampere's law, Applications of Ampere's law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance. Magnetic force between two current carrying conductors. Magnetic field intensity. Ballistic Galvanometer:- Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

Unit III: Electromagnetic Induction and Electromagnetic waves (14)

Faraday's laws of induction (differential and integral form), Lenz's law, self and mutual Induction. Continuity equation, modification of Ampere's law, displacement current, Maxwell equations.Maxwell's equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium. Poynting's theorem.

UNIT IV:

Varying and alternating currents (7 Hrs)

GrowthanddecayofcurrentsinLR,CRandLCRcircuits-Critical damping. Alternating current, relation between current andvoltage in pure R, C and L-vector diagrams - Power in ac circuits. LCR seriesandparallelresonantcircuit-Q-factor.AC&DCmotors-single phase, three phase (basicsonly).

Network Theorems (7 Hrs)

Passive elements, Power sources, Active elements, Network models: T and π Transformations, Superposition theorem, Thevenin's theorem, Norton's theorem. Reciprocity theorem and Maximum power transfer theorem (Simple problems).

Suggested Books:

1. Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968)
2. Electricity and magnetism by J.H.Fewkes& John Yarwood. Vol.I (Oxford Univ. Press, 1991).
3. Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin Cummings,1998).
4. Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)
5. Electricity and magnetism. By D C Tayal (Himalaya Publishing House,1988)
6. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata McGraw Hill, 2006).

B.Sc. (Physics) – II year
Semester - III
Paper – III:: Electromagnetic Theory Practicals
(DSC-3: Compulsory)

1. To verify the Thevenin Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster's bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty's bridge.
9. To determine self-inductance of a coil by Anderson's bridge using AC.
10. To determine self-inductance of a coil by Rayleigh's method.
11. To determine coefficient of Mutual inductance by absolute method.

Note: Minimum of eight experiments should be performed.
Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books:

1. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.
2. InduPrakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal

B.Sc. (Physics) - II Year
Semester – IV
Paper – IV:: Waves and Optics
(DSC-4: Compulsory)

Total: 56 Hrs
(4 Hrs / week)

Unit-I: Waves (14 Hrs)

Fundamentals of Waves -Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance.

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the midpoint iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuningfork.

Unit II: Interference: (14 Hrs)

Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light.

Interference by division of wave front: Fresnel's biprism – determination of wave length of light. Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd's mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non-reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate, Newton's rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium D_1,D_2 lines and thickness of a thin transparent plate.

Unit III: Diffraction: (14 Hrs)

Introduction – Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhofer diffraction due to double slit – Fraunhofer diffraction pattern with N slits (diffraction grating).

Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction-Fresnel's half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – difference between interference and diffraction.

Unit IV: Polarization (14 Hrs)

Polarized light : Methods of Polarization, Polarizatioin by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewster's law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) – Quarter wave plate, Half wave plate – Babinet's compensator – Optical activity, analysis of light by Laurent's half shade polarimeter.

NOTE: *Problems should be solved at the end of every chapter of all units.*

Suggested books

1. **Optics** by AjoyGhatak. *The McGraw-Hill companies.*

2. **Optics** by Subramaniyam and Brijlal. *S. Chand & Co*.
3. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007*.
4. **Optics and Spectroscopy**. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co.*
5. **Second Year Physics** – *Telugu Academy.*
6. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand& Co. Publications.*
7. **Feyman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications.*
8. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
9. K. Ghatak, **Physical Optics'**
10. D.P. Khandelwal, **Optical and Atomic Physics'** (Himalaya Publishing House, Bombay,1988)
11. Jenkins and White: **'Fundamental of Optics'** (McGraw-Hill)
12. Smith and Thomson: **'Optics'** (John Wiley and sons).

B.Sc. (Physics) – II year
Semester - IV
Paper – IV:: Waves and Optics Practicals
(DSC-4: Compulsory)

1. Thickness of a wire using wedge method.
2. Determination of wavelength of light using Biprism.
3. Determination of Radius of curvature of a given convex lens by forming Newton's rings.
4. Resolving power of grating.
5. Study of optical rotation-polarimeter.
6. Dispersive power of a prism
7. Determination of wavelength of light using diffraction grating minimum deviation method.
8. Wavelength of light using diffraction grating – normal incidence method.
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).
11. Pulfrich refractometer – determination of refractive index of liquid.
12. Wavelength of Laser light using diffraction grating.
13. Verification of Laws of a stretched string (Three Laws).
14. Velocity of Transverse wave along a stretched string
15. Determination of frequency of a bar- Melde‟s experiment

***Note**: Minimum of eight experiments should be performed Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastav.

B.Sc. (Physics)- III Year
Semester – V
Paper – V:: (A) Modern Physics
(DSE-1: Elective)

Total : 56 Hrs
(4 Hrs / week)

UNIT - 1 : SPECTROSCOPY (14 Hrs)

Atomic Spectra: Introduction - Drawbacks of Bohr's atomic model - Sommerfeld's elliptical orbits - relativistic correction (no derivation). Stern & Gerlach experiment, Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selectionrules,intensityrules-spectraofalkaliatoms,doubletfine structure, Zeeman Effect, Paschen-Back Effect and Stark Effect (basicidea).

Molecular Spectroscopy:Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule. Determination of inter nuclear distance.Vibrational energies and spectrum of diatomic molecule. Raman effect,classicaltheoryofRamaneffect.Experimentalarrangement for Raman effect and itsapplications.

UNIT – II :Quantum Mechanics (14 Hrs)

Inadequacy of classical Physics: Spectral radiation - Planck's law (only discussion). Photoelectric effect - Einstien's photoelectric equation. Compton's effect - experimental verification.

Matter waves & Uncertainty principle: de Broglie's hypothesis - wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de Brogile waves of electron in Bohr orbits.Heisenberg's uncertainty principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Complementary principle ofBohr.

Schrodinger Wave Equation

Schrodinger time independent and time dependent wave equations. Wave function properties - Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values.

Unit - III : Nuclear Physics (14 Hrs)

Nuclear Structure: Basic properties of nucleus - size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p, n-n, and n-p scattering (concepts), nuclear forces. Nuclear models - liquid drop model, shellmodel.

Alpha and Beta Decays: Range of alpha particles, Geiger - Nuttallaw. Gammow's theory of alpha decay. Geiger - Nuttallaw from Gammow's theory. Beta spectrum - neutrino hypothesis,

Particle Detectors:GMcounter,proportionalcounter,scintillationcounter.

UNIT:IV:Solid State Physics &Crystalography (14 Hrs)

Crystal Structure: Crystalline nature of matter, Crystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, FCC, CsCl, NaCl, diamond and ZincBlende)

X-ray Diffraction: Diffraction of X -rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method.

Bonding in Crystals: Types of bonding in crystals - characteristics of crystals with different bondings. Lattice energy of ionic crystals- determination of Madelung constant for NaCl crystal, Calculation of Born Coefficient and repulsive exponent. Born-Haber cycle.

Suggested books:

1. Modern Physics by G. Aruldhas&P.Rajagopal.Eastern Economy Edition.
2. Concepts of Modern Physics by ArthurBeiser.Tata McGraw-Hill Edition.
3. Modern Physics by R. Murugeshan and Kiruthiga SivaPrasath.S. Chand & Co.
4. Nuclear Physics by D.C. Tayal, Himalaya PublishingHouse.
5. Molecular Structure and Spectroscopy by G.Aruldhas.Prentice Hall of India, New Delhi.
6. Spectroscopy -Atomic and Molecular by Gurdeep R Chatwal and Shyam Anand -Himalaya PublishingHouse.
7. Third Year Physics - TeluguAcademy.
8. Elements of Solid State Physics by J.P. Srivastava. (for chapter on nanomaterials)-Prentice-hall of India Pvt.Ltd.

B.Sc. (Physics) – III year
Semester – V
Paper: V: (A) Modern Physics Practicals
(DSE-1: Elective)

1. Measurement of Planck's constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck's constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. To show the tunneling effect in tunnel diode using I-V characteristics.
9. To determine the wavelength of laser source using diffraction of single slit.
10. To determine the wavelength of laser source using diffraction of double slits.
11. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
12. To determine the value of e/m for electron by long solenoid method.
13. Photo Cell – Determination of Planck's constant.
14. To verify the inverse square law of radiation using a photo-electric cell.
15. To find the value of photo electric work function of a material of the cathode using a photo-electric cell.
16. Measurement of magnetic field – Hall probe method.
17. To determine the dead time of a given G.M. tube using double source.
18. Hydrogen spectrum – Determination of Rydberg's constant
19. Energy gap of intrinsic semi-conductor
20. G. M. Counter – Absorption coefficients of a material.
21. To draw the plateau curve for a Geiger Muller counter.
22. To find the half-life period of a given radioactive substance using a G.M. Counter.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011,Kitab Mahal

Note: Minimum of eight experiments should be performed.

B.Sc. (Physics) - III Year
Semester – V
Paper – V:: (B) Computational Physics
(DSE-1: Elective)

Total: 56 hrs
(4 Hrs / week)

UNIT I: Programming in C (14 Hrs)
Flow charts, algorithms, Integer and floating-point arithmetic, precision, variable types, arithmetic statements, input and output statements, control statements, executable and non-executable statements, arrays, Repetitive and logical structures, Subroutines and functions, operation with files, operating systems, Creation of executable programs.

UNIT II: Numerical methods of Analysis (14 Hrs)
Solution of algebraic and transcendental equation, Newton Ramphan method, Solution of simultaneous linear equations. Matrix inversion method, Interpolation, Newton and Lagrange formulas, Numerical differentiation. Numerical integration, Trapezoidal, Simpson and gaussian quadrature methods, Least square curve fitting, Straight line and Polynomial fits.

UNIT III: Numerical solution of ordinary differential equations (14 Hrs)
Eulars and Runge kutta methods, simulation. Generation of uniformly distributed random integers, statistical tests of randomness. Monte-Carlo evaluation of integrals and error analysis, Non-uniform probability distributions, Importance sampling, Rejection method.

UNIT IV: Computational methods (14 Hrs)
Metropolis algoritham, Molecular diffusion and Brownian motions, Random walk problems and their Montecarlo simulation. Finite element and Finite difference methods. Boundary value and initial value problems, density functional methods.

Note: Problems should be solved at the end of every chapter of all units

Suggested Books:

1.Computational methods in Physics and Engineering: Wong
2. Computer Oriented Numerical methods:Rajaraman
3. Computer Programming in Fortran 77: Rajaraman
4.Applied Numerical Analysis: Gerald
5. A Guide to Manto -Carlo simulationsi Statistical Physics: Land

B.Sc. (Physics) – III year
Semester – V
Paper: V:: (B) Computational Physics Practicals
(DSE-1: Elective)

1. Jacobi Method of Matrix diagonalization
2. Solution of Transcendental or Polynomial equations by the Newton Raphson metho
3. Linear curve fitting and calculation of linear correlation coefficients
4. Matrix Simulation: Subtraction and Multiplication.
5. Matrix Inversion and solution of simultaneous equations
6. Lagrange interpolation based on given input data
7. Numerical integration using the Simpsons method.
8. Numerical integration using the Gaussian quadrature method.
9. Solution of first order Differential Equation using Runge-kutta method.
10. Numerical first order differentiation of a given function.
11. Fast Fourier transform
12. Monte Carlo Integration
13. Use of a package for data generation and graph plotting.
14. Test of Randomness for random numbers generators.

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

B.Sc. (Physics) - III Year
Semester – VI
Paper – VI :: (A) Electronics
(DSE-2: Elective)

Total: 56 hrs
(4 Hrs / week)

Unit - I: (14 Hrs)

1. Band theory of P-N junction: Energy band in solids (band theory), valence band, conduction band and forbidden energy gap in solids, insulators, semi conductors and pure or intrinsic semiconductors and impure or extrinsic semi-conductors. N-type semi-conductors, P-type semi-conductors, Fermi level, continuity equation.
2. Diodes: P-N junction diode, Half-wave, full-wave and bridge rectifier. Zener diode & its characteristics. Zener diode as voltage regulator.

Unit-II: (14 Hrs)
1. Bipolar Junction Transistor (BJT) – p-n-p and n-p-n transistors, current components in transistors, CB, CE and CC configurations – transistor as an amplifier -RC coupled amplifier – Frequency response (Qualitative analysis).
2. Feedback concept & Oscillators: Feedback, General theory of feedback–Concepts of oscillators, Barkhausen's criteria, Phase shift oscillator – Expression for frequency of oscillation.

Unit-III: (14 Hrs)
Special devices- Construction and Characteristics: Photo diode - Shockley diode -Solar cell, Opto-couplers - Field Effect Transistor (FET) - FET as an Amplifier - Uni Junction Transistor (UJT), UJT as a relaxation oscillator - Silicon controlled rectifier (SCR) - SCR as a switch.

Unit-IV: (14 Hrs)
1. Digital Electronics
Binary number system, conversion of binary to decimal and vice-versa.Binary addition and subtraction (1's and 2's complement methods).Hexadecimal number system.Conversion from binary to hexadecimal and vice-versa, Decimal to hexadecimal and vice-versa.
2. Logic gates:
OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate (EX-OR). De Morgan's Laws – Verification.

NOTE: Problems should be solved from every chapter of all units.

Suggested Books:

1. Electronic devices and circuits – Millman and Halkias. *Mc.Graw-Hill Education.*
2. Principles of Electronics by V.K. Mehta – *S. Chand & Co.*
3. Basic Electronics (Solid state) – B. L. Theraja , S. Chand & Co.
4. A First Course in Electronics- Anwar A. Khan&Kanchan K. Dey, PHI.
5. Physics of Semiconductor Devices- S. M. Sze
6. Physics of Semiconductors- Streetman.
7. Basic Electronics – Bernod Grob.
8. Basic Electronics for B.Sc (Physics) III Year, 2019, Telugu Academy
9. Digital Principles & Applications – A.P. Malvino and D.P. Leach

B.Sc. (Physics) – III year
Semester – VI
Paper: VI:: (A) Electronics Practicals
(DSE-2: Elective)

1. Construction of logic gates (AND, OR, NOT, gates) with discrete components– Truth table Verification
2. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
3. Constructionof NAND and NOR gates with discrete components and truth table verification
4. Characteristics of a Transistor in CE configuration
5. R.C. coupled amplifier – frequency response.
6. Verification of De Morgan's Theorem.
7. Zener diode V-I characteristics.
8. P-n junction diode V- I characteristics.
9. Zener diode as a voltage regulator
10. Construction of a model D.C. power supply
11. R C phase shift Oscillator –determination of output frequency

Note: Minimum of eight experiments should be performed.

Suggested Books:

1. B.Sc. Practical Physics – C. L. Arora – S. Chand & Co.
2. Viva-voce in Physics – R.C. Gupta, Pragathi Prakashan, Meerut.
3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.
5. B.Sc. practical physics – Subbi Reddy.

B.Sc. (Physics)- III Year
Semester – VI
Paper – VI:: (B) APPLED OPTICS
(DSE-2: Elective)

Total: 56 Hrs
(4 Hrs / week)

Unit I: Principles of LASER (14 Hrs)
Emission and absorption of Radiation, -Einstein Relations- Pumping Mechanism- optical feedback- Laser rate equation for two, three and Four level Lasers, pumping threshold condition- Principle of Lase beams. Classification of LASER Systems- Gas, Liquid and Solid Lasers He-Ne and Argon Lasers, their energy level schemes- Ruby Laser and YAG laser, GA-As Laser and their applications in various fields.

Unit II: Holography (14 Hrs)
Basic principle of Holography- Recording of amplitude and phase. The recording medium- reconstruction of original wave front- Image formation by wave front reconstruction- Gaber Hologram- limitations of Gaber Hologram-Fourier Transform Hologram-Volume Hologram- Applications of holograms.

Unit III: (14 Hrs)
Fourier and Non-Linear Optics: Thin lens as phase transformation-thickness function-various types of lenses- Fourier transforming properties of lenses-Object placed Infront of the lens- Object placed behind the lens.
Non-Linear Optics: harmonic generation- second hormonic generation-phase matching condition- Optical mixing- parametric generation of Light- Self focusing of light.

Unit IV: Optical Fibers (14 Hrs)
Fiber types and their structures.Ray optic representation, Acceptance angle and numerical aperture. Step index and graded index fibers. Sigle mode and multi-mode fibers. Fiber materials for glass fibers and plastic fibers. Signal attenuation in optical fibers. Absorption, Scattering and bending losses in fibers, core and cladding losses. Materialdispersion, wave guide dispersion, intermodes distortion and pulse broadening.

Note:-Problems should be solved at the end of every chapter of all units

Suggested Books:

1. Opto electronics an Introduction-Wilson & JFB Hawkes 2nd edition
2. Introduction to fourier optics-JW Goodman
3. Lasers and Non linear Optics--BB Laud
4. Optical electronics – Ghatak and Thyagarajan
5. Principles of Lasers- O.Svelto
6. Optical fiber communication -By Geradkeiser
7. Optical fiber communication-by John M Senior(PHI)

B.Sc. (Physics) – III year
Semester – VI
Paper: VI:: (B) Applied Optics Practicals
(DSE-2: Elective)

1. Study of the Profile of a laser beam
2. Determination of the diameter of a thin wire using laser
3. Determination of wavelength of He-Ne laser by transmission grating
4. Construction and recording of a Hologram
5. Study of Fourier transforming properties of lenses
6. Study of second harmonic generation by KDP crystal
7. Measurement of numerical aperture of an optical fiber
8. Measurement of coupling losses in optical fiber
9. Measurement of bending losses in optical fiber
10. Study of audio signal transmission through optical fiber
11. To study the interference of light using optical fiber

Note: Minimum of eight experiments should be performed.

Suggested Books:

1. Introduction to fourier Optics- J Goodman
2. Optical Fiber Communication- john M senior
3. Principles of Lasers-by O.Svelto
4. Modern Optics by Grant Fowles
5. Principles of Optics byBorn & Wolf
6. Fundamentals of Optics by Jekins& White

B.Sc. (Physics) - II Year
Semester – III
Experimental methods & Error analysis
(SEC - I)

Total: 28 Hrs
(2 Hrs / week)

Unit I: Experimental Methods (14 Hrs)

Least count of an instruments, Instruments for measuring mass, length, time, angle, current, voltage. Fundamental Units. Precession and accuracy of measurements, source of error in measurements, necessity of estimating errors, types of errors, reading error of instrument, Calibration error, random error, system error, Significantdigits, order of magnitude and rounding of numbers, rounding error, absolute and relative error. Errors of computation- addition, subtraction, multiplication, division error in power and roots, propagationerrors, analysis of data, standard deviation, calculation of mean value.

Unit II: I Statistical analysis of errors (14 Hrs)

Mean, mode and standard deviation, Standard deviation of mean, Least squares fitting, Normal distribution, covariance and correlation, Binomial distribution, passion distribution, chi-square test.

Note:-Problems should be solved at the end of every chapter of all units

Suggested Book:

1. The theory of errors in Physical Measurements JC Pal New central book agency -2010

B.Sc. (Physics)- II Year
Semester – III
Electrical circuit Networking
(SEC - II)

Total: 28 Hrs
(2 Hrs / week)

Unit I: (16 Hrs)

Basic electricity principles: Voltage, current, resistance and power – Ohm's law – Series, parallel and series-parallel combinations of resistances – AC electricity and DC electricity – Familiarization with multimeter, voltmeter and ammeter

Electrical circuits: Main electric circuit elements and their combination – Rules to analyze DC sourced electrical circuits – current and voltage drop across the DC circuit elements – single-phase and three-phase alternating current sources – Rules to analyze AC sourced electrical circuits – Real, imaginary and complex power components of AC source – Power factor – saving energy and money

Electrical drawing and symbols: Drawing symbols – Blueprints – Reading schematics – Ladder diagrams

Electrical schematics: Power circuits – Control circuits – Reading of circuit schematics – Tracking the connections of elements and identification of current flow and voltage drop

Generators and Transformers: DC power sources, AC/DC generators – Inductance, capacitance and impedance – Operation of transformers.

Electric motors: Single-phase, three phase & DC motors-Basic design – Interfacing DC or AC sources to control heaters and motors – Speed & power of AC motor

Solid state devices: Resistors, inductors and capacitors – Diode and rectifiers – Components in series or parallel – Response inductors and capacitors with DC or AC sources

Unit-II: (12 Hrs)

Electrical protection: Relays, fuses and disconnect switches – Circuit breakers – Overload devices – Ground-fault protection – Grounding and isolating – Phase reversal – Surge protection – Interfacing DC or AC sources to control elements (Relay protection device)

Electrical wiring: Different types of conductors and cables – Basics of wiring – Star and Delta connection – voltage drop and losses across cables and conductors – Instruments too measure current, voltage and power in DC and AC circuits – Insulation – Solid and stranded cable, conduit, cable trays – Splices: wire nuts, crimps, terminal blocks, split bolts and solder – Preparation of extension board.

Note: Problems should be solved at the end of every chapter of all units

Suggested Books:

1. A text book in electrical technology – B. L. Thereja – S. Chand & Co.
2. A text book of electrical technology – A. K. Thereja
3. Performance and design of AC machines – M. G. Say – ELBS Edn

B.Sc. (Physics)- II Year
Semester – IV
Basic Instrumentation
(SEC - III)

Total: 28 Hrs
(2 Hrs / week)

Unit I: (14 Hrs)

Basics of measurement: Instruments accuracy, precision, sensitivity, resolution, range, etc – Errors in measurements and loading effects – Multimeter: Principles of measurement of dc voltage and dc current, ac voltage and ac current, resistance – Specifications of a multimeter and their significance

Electronic voltmeter: Advantage over conventional multimeter for voltages measurement with respect to input impedance and sensitivity – Principles of voltage measurement (Block diagram only) – Specifications of an Electric voltmeter, multimeter and their significance - AC millivoltmeter: Types of AC milliviltmeters – Block diagram of AC millivoltmeter Amplifier-rectifier and Rectifier-amplifier – Specifications and their significance

Cathode Ray Oscilloscope (CRO): Block diagram of CRO – construction of CRT – electron gun – electrostatic focusing and acceleration (Qualitative only) – Brief description of screen phosphor, visual persistence and chemical composition – Time-base operation – synchronization – front panel controls – specifications of CRO and their significance – Use of CRO for the measurement of voltage dc and ac frequency, time period – Special features of dual trace – Introduction to digital oscilloscope – Probes – Digital storage oscilloscope: Block diagram and principle of working

Unit II: (14 Hrs)

Signal generators and Analysis instruments: Block diagram, explanation and specifications of low frequency signal generator, pulse generator and function generator – Concept of testing – Specifications – Distortion factor meter – wave analysis.

Impedance Bridges & Q-meters: Block diagram of bridge – working principles of basic (balancing type) RLC bridge – Specifications of RLC bridge – Block diagram & working principles of a Q-meter – Digital LCR bridges

Digital Instruments: Principle and working of digital meters – Comparison of analog & digital instruments – characteristics of digital meter – working principles of digital voltmeter.

Digital multimeter: Block diagram and working of digital multimeter – working principle - time interval, frequency and period measurement using universal counter/frequency counter – time-base stability, accuracy and resolution.

Note: *Problems should be solved at the end of every chapter of all units.*

Suggested Books:

1. A text book in electrical technology – B. L. Thereja – S. Chand & Co.
2. Performance and design of AC machines – M. G. Say – ELBS Edn
3. Digital circuits and systems – Venugopal, Tata McGraw Hill, 2011
4. Logic circuit design – Shimon P. Vingron, Springer, 2012
5. Digital electronics – Subrata Ghoshal, Cengage Learning, 2012
6. Electronic devices and circuits – S. Salivahanan & N. S. Kumar, 3rd Edn, 2012, Tata McGraw Hill
7. Electronic circuits: Hand Book of design and applications – U. Tietze & Ch. Schenk, Springer, 2012
8. Electronic devices – Thomas L. Floyd, 7th Edn., Pearson India, 2008

B.Sc. (Physics) - II Year
Semester – IV
Digital Electronics
(SEC - IV)

Total: 28 Hrs
(2 Hrs / week)

Unit I: Basic electricity principles: (14 Hrs)

Semi-conductor Theory: Energy levels - Intrinsic and extrinsic semiconductors - Mobility, diffusion and Drift current - Hall effect - Characteristics of P-N Junction diode, parameters and applications. Rectifiers: half wave and Full wave rectifier (Bridge, Central tapped) with and without filters – Ripple, regulation and efficiency - Zener diode regulator.

Bipolar Junction Transistor (BJT): BJT current components - CE, CB, CC Configurations – Characteristics - Transistor as amplifier - Analysis of CE, CB, CC amplifiers (qualitative treatment) - JFET construction and working parameters.

Unit II: (14 Hrs)

Construction and Characteristics of Photo diodes, Photo transistor, LED, LCD, SCR and UJT - Display systems - Constructional details of CRO and applications - Feedback concepts - Properties of negative feedback amplifiers - classification and parameters – Oscillators: Barkhausen Criterion - LC type, RC type Oscillators and crystal Oscillators (Qualitative treatment only) - Digital systems: Basic Logic gates, Half and Full adder and subtractors.

Suggested Books:

1. Electronic Devices and circuits - Jacob Milliman, Christos C. Haikais and satyabrata Jit, Mc Graw Hill (India) Pvt. Ltd, 2010
2. Op-Amps and Linear Integrated circuits – P. Ramakanth and Gaykward, 4th edition PHI, 2000
3. Electronic measurements and instrumentation Technology - William D cooper and Ad Helfrick, PHI, 2002
4. Electronic devices and circuits – S. Shalivahan and N. Sureshkumar 2nd Edn, Mc Graw Hill, Pvt. Ltd., 2007.
5. Basic Electronics for B.Sc (Physics) III Year, 2019, Telugu Academy

B.Sc. (Physics)- III Year
Semester – V
Renewal energy & Energy harvesting
(GE)

Total: 56 Hrs
(4 Hrs / week)

Unit I: Principles of Solar Radiation and Collection (Qualitative only) (14Hrs)

Non-renewable energy resources – Principles of power generation and transmission. A model of conventional thermal power plant. Advantages and disadvantages of conventional power plants. Role and potential of new and renewable sources, the solar energy option, environmental impact of solar power, physics of the sun, the solar constant, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

Unit II: Solar Energy Storage and Applications (14Hrs)

Solar energy collectors - Flat plate and concentration collectors, classification of concentration collectors and orientation, advanced collectors. Different sensible, latent heat and stratified storage, solar ponds. Solar Applications – solar heating/ cooling technique, solar distillation and drying, photovoltaic energy conversion.

Unit III: Wind and Bio-Mass Energy (14Hrs)

Resources and potentials, horizontal and vertical axis windmills, performance characteristics. Principles of Bio-Conversion, Energy from waste, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, LPG and CNG.

Unit IV: Geothermal and Ocean Energy (14Hrs)

Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants, land and their economics.

Suggested Books:

1. Non-Conventional Energy Sources - G.D Rai, Khanna Publishers
2. Renewable Energy Resources - Twidell & Wier, CRC Press (Taylor & Francis)
3. Renewable energy resources - Tiwari and Ghosal, Narosa.
4. Renewable Energy Technologies - Ramesh & Kumar, Narosa
5. Non-Conventional Energy Systems - K Mittal, Wheeler
6. Renewable energy sources and emerging technologies - D.P. Kothari, K.C. Singhal.

B.Sc. (Physics)- III Year
Semester – VI
Nano Science
(Paper in lieu of project)

Total: 56 Hrs
(4 Hrs / week)

Unit I: (12 Hrs)
Length scales in physics and Nano structures: 1D, 2D and 3D nano structures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at nano scale – Size effects in nano systems – Quantum confinement in 3D, 2D and 1D nano structures and its consequences

Unit II: (16 Hrs)
Synthesis of Nano structure materials: Top-down and Bottom-up approach – Photolithography – Ball milling – Gas phase condensation – Vacuum deposition – Physical vapor deposition (PVD) – Thermal evaporation – E-beam evaporation – Pulsed Laser deposition – Chemical vapor deposition (CVD) – Sol-Gel – Electro deposition – Spray pyrolysis – Hydrothermal synthesis – Preparation through colloidal methods – MBE growth of quantum dots
Characterization: X-Ray diffraction – Optical microscopy – Scanning Electron Microscope (SEM) – Transmission Electron Microscope (TEM) – Atomic Force Microscope (AFM) – Scanning Tunneling Microscope

Unit III: (14 Hrs)
Optical properties: Coulomb interaction in nano structures – concept of dielectric constant for nano structures and charging of nano structure – Quasi-particles and excitons – Excitons in direct and indirect band gap semiconductor nanocrystals – Quantitative treatment of quasi-particles and excitons – Charging effects – Radiative processes: general formalization – absorption, emission and luminescence – Optical properties of hetero structures and nano structures
Electron Transport: Carrier transport in nano structures – Coulomb blockade effect – thermionic emission – tunneling and hoping conductivity – Defects and impurities: Deep level and surface defects

Unit IV: (14 Hrs)
Applications: Applications of nano particles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells) – Single electron devices (Qualitative only) – CNT based transistors – Nano material devices: Quantum dots – hetero structure Lasers
Optical switching and optical data storage – Magnetic quantum well – magnetic dots – magnetic data storage – Micro Electromechanical Systems (MEMS), Nano Electromechanical Systems (NEMS)

Suggested Books:

1. Introduction to Nanotechnology – C.P. Poole, Jr. Frank, J. Owens – Wiley India Pvt, Ltd.
2. Nanotechnology: Principles & Practices – S.K. Kulkarni – Capital Publishing Co.)
3. Introduction to Nanoscience and Technology – K.K. Chatopadhyay, A.N. Benerjee – PHI Learning Pvt. Ltd.
4. Nanotechnology – Richard Booker, Earl Boysen – John Wiley and Sons
5. Nanoparticle Technology Handbook – M. Hosokawa, K. Nogi, M. Naita, T. Yokoyama, Elsevier, 2007.
6. Springer Handbook of Nanotechnology – Bharath Bhushan, Springer-Verlag, Berlin, 2004.

SCHEME OF QUESTION PAPER

B.Sc. (Physics)
Internal Assessment Examination - I
Semester: I/II/III/IV/V/VI
Paper:
(For DSC, DSE, GE & Paper in lieu of Project)

Time: 90 Min] **[Marks: 20**

Answer ALL questions. Each question carries equal marks (2 x 10 = 20)

1. From Unit 1
2. From Unit 1
3. From Unit 1
4. From Unit 1
5. From Unit 1
6. From Unit 2
7. From Unit 2
8. From Unit 2
9. From Unit 2
10. From Unit 2

SCHEME OF QUESTION PAPER

B.Sc. (Physics)
Internal Assessment Examination - II
Semester: I/II/III/IV/V/VI
Paper:
(For DSC, DSE, GE & Paper in lieu of Project)

Time: 90 Min] **[Marks: 20**

Answer ALL questions. Each question carries equal marks (2 x 10 = 20)

1. From Unit 3
2. From Unit 3
3. From Unit 3
4. From Unit 3
5. From Unit 3
6. From Unit 4
7. From Unit 4
8. From Unit 4
9. From Unit 4
10. From Unit 4

SCHEME OF QUESTION PAPER

B.Sc. (Physics)
Internal Assessment Examination - I
Semester: III/IV
Paper:
(For SEC)

Time: 45 Min] **[Marks: 10**

Answer ALL questions. Each question carries equal marks (2 x 5 = 10)

1. From Unit 1
2. From Unit 1
3. From Unit 1
4. From Unit 1
5. From Unit 1

SCHEME OF QUESTION PAPER

B.Sc. (Physics)
Internal Assessment Examination - II
Semester: III/IV
Paper:
(For SEC)

Time: 45 Min] **[Marks: 10**

Answer ALL questions. Each question carries equal marks (2 x 5 = 10)

1. From Unit 2
2. From Unit 2
3. From Unit 2
4. From Unit 2
5. From Unit 2

SCHEME OF QUESTION PAPER

KAKATIYA UNIVERSITY, WARANGAL
B.Sc. (PHYSICS) I/II/III Year Examination
Semester: I/II/III/IV/V/VI
Paper:
(For DSC, DSE, GE & Paper in lieu of project)

Time: 3 Hours] **[Marks: 80**

SECTION A: SHORT ANSWER QUESTIONS (8 X 4 = 32)

Answer Any EIGHT questions. Each question carries equal marks

1. From Unit 1
2. From Unit 1
3. From Unit 1 (Problem)
4. From Unit 2
5. From Unit 2
6. From Unit 2 (Problem)
7. From Unit 3
8. From Unit 3
9. From Unit 3 (Problem)
10. From Unit 4
11. From Unit 4
12. From Unit 4 (Problem)

SECTION B: ESSAY TYPE ANSWER QUESTIONS (4 X 12 = 48)

Answer Any FOUR questions. All questions carry equal marks

13. (a) From Unit 1

    OR

    (b) From Unit 1

14. (a) From Unit 2

    OR

    (b) From Unit 2

15. (a) From Unit 3

    OR

    (b) From Unit 3

16. (a) From Unit 4

    OR

    (b) From Unit 4

SCHEME OF QUESTION PAPER

KAKATIYA UNIVERSITY, WARANGAL
B.Sc. (PHYSICS) II Year Examination
Semester: III/IV
Paper:
(For SEC)

Time: 2 Hours] **[Marks: 40**

SECTION A: SHORT ANSWER QUESTIONS (4 X 4 = 16)

Answer Any FOUR questions. Each question carries equal marks

1. From Unit 1
2. From Unit 1
3. From Unit 1 (Problem)
4. From Unit 2
5. From Unit 2
6. From Unit 2 (Problem)

SECTION B: ESSAY TYPE ANSWER QUESTIONS (2 X 12 = 24)

Answer Any TWO questions. All questions carry equal marks

7. (a) From Unit 1

   OR

   (b) From Unit 1

8. (a) From Unit 2

   OR

   (b) From Unit 2

Practical-1

Descriptive Statistics and Probability

(3 HPW :: 1 Credit :: 25 Marks)

Part-1 (Using Calculator)

1. Graphical presentation of data (Histogram, frequency polygon, Ogives). s
2. Diagrammatic presentation of data (Bar and Pie).
3. Computation of non-central and central moments – Sheppard□s corrections for grouped data.
4. Computation of coefficients of Skewness and Kurtosis □ Karl Pearson's, Bowley's, β_1 and β_2.

Part-2 (Using MS-Excel)

1. Basics of Excel- data entry, editing and saving, establishing and copying formulae, built in Functions in excel, copy and paste and exporting to MS word document.
2. Graphical presentation of data (Histogram, frequency polygon, Ogives) using MS-Excel
3. Diagrammatic presentation of data (Bar and Pie) using MS-Excel
4. Computation of Measures of central tendency, dispersion, Coefficient of Variation and coefficients of Skewness, Kurtosis using MS-Excel.

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Practical-2

Probability Distributions

(3 HPW :: 1 Credit :: 25 Marks)

Part-1 (Using Calculator)

1. Fitting of Binomial distribution-Direct method.
2. Fitting of Binomial distribution-Recurrence relation Method.
3. Fitting of Poisson distribution-Direct method
4. Fitting of Poisson distribution-Recurrence relation Method.
5. Fitting of Negative Binomial distribution.
6. Fitting of Geometric distribution.
7. Fitting of Normal distribution-Areas method.
8. Fitting of Normal distribution - Ordinates method.

Part-2 (Using MS-Excel)

1. Fitting of Binomial distribution-Direct method.
2. Fitting of Poisson distribution-Direct method.
3. Fitting of Normal distribution-Areas method.
4. Fitting of Exponential distribution.
5. Fitting of Cauchy distribution.

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KAKATIYA UNIVERSITY

Under Graduate Courses (Under CBCS AY: 2020-2021 on words)

B.Sc. STATISTICS

II Year: Semester-III

Practical-3*: STATISTICAL METHODS AND THEORY OF ESTIMATION*

(3 HPW, Credits 1 and Marks 25)

Part-A (Using Calculator)

1. Generation of random samples from Uniform (0,1), Uniform (a,b), Normal and Poisson and Exponential Distributions.
2. Fitting of straight line and parabola by the method of least squares.
3. Fitting of power curves of the type $y= a\ x^b$, $y=a\ b^x$ and $y=a\ e^{bx}$ by the method of least squares.
4. Computation of Yule's coefficient of association and Pearson's, Tcherprows coefficient of contingency.
5. Computation of correlation coefficient and regression lines for ungrouped data.
6. Computation of correlation coefficient, forming regression lines for ungrouped data.
7. Computation of correlation coefficient, forming regression lines for grouped data.
8. Computation of multiple and partial correlation coefficients.
9. Computation of correlation ratio

Part-B (Using MS-Excel)

10. Simulation of random samples from Uniform (0,1), Uniform (a,b), Exponential, Normal and Poisson distributions using MS Excel.
11. Fitting of straight line and parabola by the method of least squares using MS Excel.
12. Fitting of power curves of the type $y= a\ x^b$, $y=a\ b^x$ and $y=a\ e^{bx}$ by the method of least squares using MS Excel.
13. Computation of correlation coefficient, forming regression lines using MS Excel.
14. Computation of multiple and partial correlation coefficients using MS Excel.

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Practical-4: STATISTICAL INFERENCE

[3 HPW, Credits 1 and Marks 25]

Part-A (Using Calculator)

1. Large sample tests for mean(s), proportion(s), Standard deviation(s) and correlation coefficient.
2. Small sample tests for single mean and difference of means and correlation coefficient.
3. Paired t-test.
4. Small sample test for single and difference of variances.
5. $\chi 2$ – test for goodness of fit and independence of attributes.
6. Nonparametric tests for two independent samples (Median test, Wilcoxon-Mann-Whitney U-test, Wald - Wolfowitz's runs test)

Part-B (Using MS-Excel)

7. Use of Look up and Reference functions for data analysis.
8. Creating and assigning Macros.
9. Small sample tests for mean(s), paired t-test and correlation coefficient using MS Excel.
10. Small sample test for single and difference of variances using MS Excel.
11. $\chi 2$ – test for goodness of fit and independence of attributes using MS Excel.
12. Nonparametric tests for single and related samples (sign test and Wilcoxon signed rank test) and one sample runs test.

Note: Training shall be on establishing formulae in Excel cells and deriving the results.
The Excel output shall be exported to MS-Word for writing inferences.

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KAKATIYA UNIVERSITY

B.Sc. (STATISTICS)

Practical Question Paper Pattern
Academic Years: 2019-2022

Time: 2 hours] **[Max. Marks: 25**

[Practical:15, Record:5, Viva:5]

Note: Solve any THREE problems choosing at least one from each Section

Section-A (Solve Using Calculator)

Problem. 1
Problem. 2 } From Part-I of Question Bank
Problem. 3

Section - B (Solve Using Computer Programs)

Problem. 4 } From Part-2 of Question Bank
Problem. 5

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(B) Internal Examinations:

1 Two Internal exams are to be conducted and best of two internal marks is considered.
2 First internal exam is to be conducted after completion of Unit-I &II.
3 Second internal exam is to be conducted after completion of Unit-III & IV.
4 Internal Examination duration: 1 hr 30 min.
5 Internal Theory QP consists of 20 marks.
6 10 Short questions are to be given (5Q from each of 2 Completed units).
7 All TEN questions are to be answered (10QX2m=20m).

Prof A Rajendra Prasad
Chairperson, BOS in Statistics, KU

Practical-5 (A) : Applied Statistics - I

[With 3 HPW, Credits 1 and 25 Marks]

Practical (using R-Software and MS- Excel)

R- Software : Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Running R, Packages in R, Variable names and assignment, Operators, Integers, Factors, Logical operations. Operations of Scalars, Vectors, Lists, Arrays, Matrices, Data Frames. Control structures, Functions.

1. Data Visualization using R - Frequency polygons and curves, Ogives, Histogram using R.

2. Data Visualization using R - Bar diagrams (simple, compound, percentage and multiple) and Pie diagram (single and multiple) using R.

3. Computation of Descriptive Statistics using R (Measures of Central tendencies and Dispersion, Moments, Skewness and Kurtosis) using R.

4. Computation of expected frequencies for Binomial, Poisson, Normal and Exponential distributions using R.

5. Computation of Karl Pearson's coefficient of correlation and rank correlation using R.

6. Computation of partial and multiple correlations using R.

7. Time series Analysis: Computation of Secular trend by least squares and moving averages methods using R and MS-Excel.

8. Computation of Seasonal variations by Ratio to moving averages, Ratio to trend and Link Relatives methods using R and MS-Excel.

9. Construction of control charts for variables ($\bar{x}$, **R** and σ - charts) using R and MS – Excel.

10. Construction of control charts for attributes (p, np with fixed and varying sample size, C and u charts) using R and MS- Excel.

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Practical - 5 (B): Analytical Statistics – I

[With 3 HPW, Credits 1 and 25 Marks]

Practical (using R-Software)

R- Software : Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Running R, Packages in R, Variable names and assignment, Operators, Integers, Factors, Logical operations. Operations of Scalars, Vectors, Lists, Arrays, Matrices, Data Frames. Control structures, Functions.

1. Data Visualization using R - Frequency polygons and curves, Ogives, Histogram.

2. Data Visualization using R - Bar diagrams (simple, compound, percentage and multiple) and Pie diagram (single and multiple).

3. Computation of Descriptive Statistics using R (Measures of Central tendencies and Dispersion, Moments, Skewness and Kurtosis).

4. Computation of expected frequencies for Binomial, Poisson using R.

5. Computation of expected frequencies of Normal and Exponential distributions using R.

6. Computation of Karl Pearson's coefficient of correlation and rank correlation using R.

7. Computation of partial and multiple correlations using R.

8. Analysis of Variance for one way and two way classified data using R.

9. Analysis of Variance for CRD and RBD two way classified data using R.

10. Time series Analysis: Computation of Secular trend by least squares and moving averages methods using R.

11. Computation of Seasonal variations by Ratio to moving averages, Ratio to trend and Link Relatives methods using R.

12. Construction of control charts for variables ($\bar{x}$, **R** and σ - charts) using R.

13. Construction of control charts for attributes (p, np with fixed and varying sample size, C and u charts) using R.

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Practical Question Paper Pattern
Academic Years: 2019-2022

Time: 2 hours] **[Max. Marks: 25**

[Practical:15, Record:5, Viva:5]

Note: Solve any THREE problems choosing at least one from each Section

Section-A (Solve Using Calculator)

Problem. 1
Problem. 2
Problem. 3
} From Part-I of Question Bank

Section - B (Solve Using Computer Programs)

Problem. 4
Problem. 5
} From Part-2 of Question Bank

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(B) Internal Examinations:

1 Two Internal exams are to be conducted and best of two internal marks is considered.
2 First internal exam is to be conducted after completion of Unit-I &II.
3 Second internal exam is to be conducted after completion of Unit-III & IV.
4 Internal Examination duration: 1 hr 30 min.
5 Internal Theory QP consists of 20 marks.
6 10 Short questions are to be given (5Q from each of 2 Completed units).
7 All TEN questions are to be answered (10QX2m=20m).

Prof A Rajendra Prasad
Chairperson, BOS in Statistics, KU

Practical-6(A): Applied Statistics - II

[with 3 HPW, Credits 1 and Marks 25]

Practical (using R-Software and MS-Excel)

1. Generation Random Samples from the Uniform, Binomial, Poisson, Normal and Exponential distributions using R.

2. Fitting of straight line, parabola and power curves of the type $y= ax^b$, $y=ab^x$ and $y=a\, e^{bx}$ using R.

3. Large sample tests : Testing population means, proportions, variances based on single and two samples using R.

4. Parametric Tests : Testing means, variances based on single and two samples using R.

5. Tests based on χ^2 distribution using R.

6. Nonparametric Tests : one sample run test, Sign test and Wilcoxon signed rank test for one and two samples using R.

7. Nonparametric Tests : Median test, Wilcoxon-Mann Whitney U-test, Wald-wolfowitz's runs test using R.

8. Analysis of Variance for CRD and RBD data using R and MS - Excel.

9. Analysis of Variance for RBD without and with one missing observation using R and MS - Excel.

10. Analysis of Variance for LSD without and with one missing observation using R and MS - Excel.

11. Computation of Morality rates, Fertility rates and Reproduction rates using MS-Excel.

12. Construction of life tables using MS-Excel.

***

Practical-6 (B): Analytical Statistics - II

[with 3 HPW, Credits 1 and Marks 25]

Practical (using R-Software)

1. Generation Random Samples from the Uniform, Binomial, Poisson, Normal and Exponential distributions using R.

2. Fitting of straight line, parabola and power curves of the type $y= a x^b$, $y=a b^x$ and $y=a e^{bx}$ using R.

3. Large sample tests : Testing population means, proportions, variances based on single and two samples and tests based on χ^2 distribution using R.

4. Parametric Tests : Testing means, variances based on single and two samples using R.

5. Nonparametric Tests : one sample run test, Sign test and Wilcoxon sign rank test for one and two samples, Median test, Wilcoxon Mann Whitney - U test, Wald - Wolfowitz's runs test using R.

6. Principal Component Analysis using R.

7. Factor Analysis using R.

8. Cluster analysis and Linear Discriminant analysis using R.

9. Model fitting by Simple and Multiple Linear Regression methods using R.

10. Model fitting by simple Logistic regression using R.

11. Computation of Morality rates, Fertility rates and Reproduction rates using R.

12. Construction of life tables using R.

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KAKATIYA UNIVERSITY

B.Sc. (STATISTICS)

Practical Question Paper Pattern

Academic Years: 2019-2022

Time: 2 hours] **[Max. Marks: 25**

[Practical:15, Record:5, Viva:5]

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