SEMESTER - VI

ACTURIAL STATISTICS

- **Course Description**

Programme: B.Sc | Max. Hours: 45

Course Code: U24/STA/DSE/602 | Hours per week:3 Hrs

Course Type: DSE | Max. Marks: 100

No. of credits: 4

- **Course Objectives:**

At the end of this course students are expected to be able to,

1) Recognise the basic concepts and standard terms in actuarial sciences.
2) Apply the typical long-tailed distributions representing claim size and those representing claim number.
3) Use appropriate methods to extract relevant moment information and derive consequential information about total claim size.

3. **Course Outcomes :**

CO1: **Use** life tables to determine and manipulate the financial functions related to life insurance.
CO2: **Use** statistical models to analyze the risk factors for categories of policy holders.
CO3: **Apply** appropriate mathematical methods to get solutions for some problems in risk Theory.
CO4: **Understand** models for insurance policies and premium rates.

4. Course Content:

MODULE-I: Introductory Statistics and Insurance Applications **(10 HOURS)**

Discrete, continuous and mixed probability distributions. Insurance applications, sum of random variables. Utility theory: Utility functions, expected utility criterion, types of utility function, insurance and utility theory.

MODULE- II: Principles of Premium Calculation **(10 HOURS)**

Properties of premium principles, examples of premium principles. Individual risk models: models for individual claims, the sum of independent claims, approximations and their applications.

MODULE-III: Survival Distribution and Life Tables **(13 HOURS)**

Uncertainty of age at death, survival function, time until-death for a person, curate future lifetime, force of mortality, life tables with examples, deterministic survivorship group, life table characteristics, assumptions for fractional age, some analytical laws of mortality.

MODULE- IV: Life Insurance **(12 HOURS)**

Models for insurance payable at the moment of death, insurance payable at the end of the year of death and their relationships. Life annuities: continuous life annuities , discrete life annuities, life annuities with periodic payments. Premiums: continuous and discrete premiums.

Reference Books:

1. Dickson, C. M. D. (2005): Insurance Risk And Ruin (International Series On Actuarial Science), Cambridge University Press.

2. Bowers, N. L., Gerber, H. U., Hickman, J. C., Jones, D. A. And Nesbitt, C. J. (1997):Actuarial Mathematics, Society Of Actuaries, Itasca, Illinois, U.S.A.

3. Promislow,S.D (2006) Fundamentals of Actuarial Mathematics, John Wiley.

4. Federation of Insurance Institutes study courses: mathematical basis of Life Assurance F.I.21 (Published by Federation if Insurance Institutes, Bombay).

6.Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global	Actuarial statistics reflects the dynamic nature of the profession, driven by technological innovation, regulatory changes, evolving business needs and social trends. Actuaries continue to play a vital role in managing financial risks and promoting sustainable development in an increasingly complex and interconnected world

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Acturial statistics	Acturial statistics is a combination of technical, analytical and professional skill the areas of development of actuarial statistics are mathematical and statistical proficiency,programming skills, data analysis and modelling, problem solving skills, business acumen and ethical and professional conduct.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	MCQ test	Experiential learning
2.	Assignment	Experimental learning

8. Course Assessment Plan

a)Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA-1- Written Exam	Written Exam
CO2	CIA-1- Written Exam	
CO3	CIA-2 written test	
CO4	CIA-2 MCQ test	

b) Question Paper Pattern

ACTURIAL STATISTICS

THEORY

Course Code: U24/STA/DSE/602
Credits : 4

Max. Marks: 60
Time: 2 Hrs.

SECTION –A (Essay Questions)

I. Answer the following **4X10=40**

Marks

1.

OR

2.

3.

OR

4.

5.

OR

6.

7.

OR

8.

SECTION –B (Short Answer Questions)

II. Answer any FOUR of the following. **4x5=20 Marks**

9. (From Module-I)

10. (From Module-II)

11. (From Module-III)

12. (From Module-IV)

13. (From Module-I/II/III/IV)

14. (From Module- I/II/III/IV)

SEMESTER VI

ACTURIAL STATISTICS PRACTICAL

1. Course Description

Programme : B.Sc **No of Hrs Allotted :2hrs /week**

Course Code :U20/STA/DSE/604/P **Max . Marks: 50**

Course Type: DSE 2A

No of Credits : 1

2. Course Outcomes:

i) To **execute** risk, claims, aggregate loss, ruin probabilities, value of contract.

ii) **Interpret** premium rates of insurance schemes.

3. **Course Content :**

List of Practicals

1. Risk computation for different utility models.

2. Discrete and continuous risk calculations.

3. Calculation of aggregate claims for collective risks.

4. Calculation of aggregate claim for individual risks.

5. Computing Ruin probabilities and aggregate losses.

6. Annuity and present value of contract

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University,
HYDERABAD-07, TS

4. ABSTRACT Question Paper pattern

ACTURIAL STATISTICS

PRACTICAL

Course Code: U24/STA/DSE/502/P **Max. Marks: 50 (39+5+6)**

Credits : 1 **Time: 2 Hrs.**

Answer any THREE questions. **3X13=39 Marks**

1.

2.

3.

4.

4. CO mapping with PO's

CO	PO	Cognitive level
1	2	Apply
2	2	Apply

Prepared by	Checked &Verified by	Approved by
Name and Signature of the teaching faculty Dr. Ch. Yuganadhan	Name and Signature of HoD Dr. Ch. Yuganadhan	Name and Signature of Principal

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University,

SEMESTER - VI

APPLIED STATISTICS-II

- **Course Description**

Programme: B.Sc

Course Code: U24/STA/DSE/601

Course Type: DSE

No. of credits: 4

Max. Hours: 45

Hours per week:3Hrs

Max. Marks: 100

- **Course Objectives:**

At the end of this course students are expected to be able to

- Understand the concepts of quality control and construction of various charts.
- Compute the index numbers using various formulae.
- Determine the components of time series.

3. **Course Outcomes :**

On completion of the course the student will be able to:

CO 1: **Identify** and interpret control charts for variables and attributes.

CO2 : **Use** the notation and formulae concerning the construction of index numbers.

CO 3 : **Understand** time series data, its components and its **applications** to various fields. Fitting and plotting of growth curves, trend and also measurement of seasonal indices.

CO 4 : **Memorize** Birth and Death rates and to **apply** reproduction rates for population growth

4. Course Content:

MODULE-I: Statistical Quality Control **(13 HOURS)**

Importance of SQC in industry. Statistical basis of Stewarts control charts. Interpretation of control charts. Natural tolerance limits and specification limits, process capability index. Construction of control charts for variables (mean, range and standard deviation) and attributes (p, np, and c- charts with fixed and varying sample sizes).

MODULE-II: Index Numbers **(10 HOURS)**

Concept, Construction, uses and limitations of simple and weighted indexnumbers. Laspeyer's, Paasche's and Fisher's index numbers, Criterion of a good index number, problems involved in the construction of index numbers. Fixed and chain base index numbers. Cost of living index numbers and wholesale price index numbers. Base shifting, splicing and deflation of index numbers.

MODULE – III: Time series **(10 HOURS)**

Time series and its components with illustrations, additive, multiplicative and mixed models. Determination of trend by least squares, moving average methods. Growth curves and their fitting with reference to Modified exponential, Gompertz and Logistic curves. Determination of seasonal indices by Ratio to moving average, ratio to trend and link relative methods.

MODULE – IV: Vital Statistics **(12 HOURS)**

Introduction, definition and uses of vital statistics. Sources of vital statistics, registration method and census method. **Mortality rates:** Rates and ratios, Crude death rates, age specific death rate, standardized death rates statements of its properties. **Fertility Rates & Life Tables: C**rude birth rate, age specific fertility rate, general fertility rate, total fertility rate. Measurement of population growth, crude rate of natural increase- Pearl's vital index. Gross reproductive rate sand Net reproductive rate. Life tables, construction and uses of life tables and abridged life tables.

5. **References:**

1. 1. Montogomery, D. C. (2009): Introduction to Statistical Quality Control, 6th Edition, Wiley India Pvt. Ltd.
2. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.
3. Mukhopadhyay, P (2011): Applied Statistics, 2nd edition revised reprint, Books and Allied(P) Ltd.
4. S.C. Gupta and V.K. Kapoor (2008): Fundamentals of Applied Statistics, 4th Ed. Sultan Chand and Sons.

6.Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global	Statistical quality control , Time series analysis, Index numbers and Vital statistics have diverse applications across various sectors including manufacturing, health care, finance, environmental science, economics and social policy . These statistical concepts provide valuable insights into trends, patterns and relationships in data, enabling informed decision making and policy formulation in diverse fields.

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University,
HYDERABAD-07. TS.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Statistical quality control	SQC fosters development of a range of valuable skills essential across industries including data analysis, interpretation, statistical analysis, root cause identification, problem solving methodologies, quality assurance, control charts, visual representation.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	MCQ test	Experiential learning
2.	Assignment	Participative learning

8. Course Assessment Plan

a)Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA -40%	End Semester Examination-60%
CO1	CIA-1- Written Exam	Written Exam
CO2	CIA-1- Written Exam	
CO3	CIA-2 written test	
CO4	CIA-2 MCQ test	

b) Question Paper Pattern

APPLIED STATISTICS - II

THEORY

Course Code: U24/STA/DSE/601 **Max. Marks: 60**
Credits : 4 **Time: 2 Hrs.**

SECTION –A (Essay Questions)

I. Answer the following **4x10=40Marks**

1. Distinguish between process control and product control? Derive the control limits for $\bar{X}$-chart and R – Chart

OR

2. Explain the construction of c-chart along with its applications.
3. Why Fisher index is called Ideal ?Show that is satisfies Time Reversal Test and Factor Reversal test.

OR

4. Explain the problems involved in the construction of index numbers.
5. Define Time Series. Explain the various components of time series giving examples.

OR

6. What are Growth curves ? Explain the construction of Modified Exponential Curve.

7. Fill in the blanks of the following Life table which are marked with question marks:

Age , x	L_x	d_x	p_x	q_x	L_x	T_x	e_x^0
4	95,000	500	?	?	?	4,850,300	?
5	?	400	?	?	?	?	?

OR

8. Explain various mortality rates?

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University,
HYDERABAD-07. TS.

SECTION-B

II. Answer any FOUR of the following **4x5=20M**

9. Explain the concept of Six-sigma limits.
10. Explain the different reproduction rates?
11. Explain Life table.
12. Explain the construction of Gompertz curve.
13. Write a short notes on (i)Base shifting (ii) Splicing of index numbers.
14. Explain moving average method for measuring the trend.

c)Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	13	CO-1	2	10	2	5
2	10	CO-2	2	10	2	5
3	10	CO-3	2	10	2	5
4	12	CO-4	2	10	2	5

9. CO-PO Mapping

CO	PO	Cognitive level	Class room sessions (hrs)
1	1	Understand	13
2	1	Remember	10
3	2	Remember	10
4	2	Remember/Apply	12

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University,
HYDERABAD-07, TS

SEMESTER VI

APPLIED STATISTICS – II PRACTICAL

1. Course Description

Programme : B.Sc | **No of Hrs allotted: 2Hrs./Week**

Course Code :U24/STA/DSE/601/P | **Max . Marks: 50**

Course Type: DSE 2B

No of Credits : 1

2. Course Outcomes:

1. **Interpret** control charts for variables and attributes and to design sampling plan.
2. Ability to **demonstrate** the trend and to compute indices for the data and to compute birth and death rates.

3. Course Content :

Statistical Quality Control

1. Construction of $\bar{x}$, **R** and **σ**- charts.
2. Construction of **p** and **np** charts with fixed n and varying n.
3. Construction of **c** and **u** charts.

Time Series Analysis

4.Determination of trend by method of least squares (straight line, parabola).

5. Determination of trend by method of moving averages.

6. Determination of seasonal indices by the method of Ratio to moving averages.

7. Determination of seasonal indices by the method of Ratio to trend.

8. Determination of seasonal indices by the method of Link relatives.

Vital Statistics

9. Computation of Morality rates, Fertility rates and Reproduction rates

10. Construction of Life tables

b)Question Paper pattern

APPLIED STATISTICS – II

PRACTICAL

Course Code: U24/STA/DSE/601/P **Max. Marks: 50 (39+5+6)**

Credits : 1 **Time: 2 Hrs.**

Answer any THREE questions. **3X13=39 Marks**

1. Construct a control chart for Mean and Range for the following data pertaining to a continuous production process. Comment on the state of control. Determine the control limits for future use.

Sample	1	2	3	4	5	6	7	8	9	10	11	12
observations	25	28	19	38	49	31	28	33	18	20	32	30
	21	15	42	19	32	28	20	46	32	48	20	46
	34	25	20	27	15	26	16	18	13	43	34	30
	22	30	26	22	8	20	10	45	40	39	42	31

2(a).Given the following Table:

x	90	91	92	93	94	95	96
l_x	16090	11490	8012	5448	3607	2320	1447

Calculate the remaining entries of the table .

(b) Compute the standardised death rates in two towns A and B from the following data:

Age group (in years)	Town A		Town B	
	Population	No.of Deaths	Population	No.of Deaths
0-10	4000	36	3000	30
10-25	12000	48	20000	100
25-60	6000	60	4000	48
60 and over	8000	152	3000	60

3. (a)The number of defects in 30 television sets are observed to be
   0,1,6,5,8,3,2,1,7,9,8,4,5,6,2,4,9,8,5,3,2,7,1,1,3,5,4,6,2,3
   Draw an appropriate control chart to check whether the number of defects are in control.
4. (b) Calculate 5 yearly moving average of the data given below to obtain the trend values and give their graphical representation.

Year	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Sales	19.3	20.9	17.8	16.1	17.6	17.8	18.3	17.3	21.4	19.3	18.1	19.5	19.2	22.2	20.9	21.5	21.9

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University,
HYDERABAD-07, TS

5. Calculate seasonal indices for the following data using Link relatives method.

Year/Quarters	Q1	Q2	Q3	Q4
1980	30	40	36	34
1981	33	53	50	44
1982	40	58	54	48
1983	54	76	68	62
1984	80	92	86	82

4. CO mapping with PO's

CO	PO	Cognitive level
1	2	Apply
2	2	Apply

Prepared by	Checked &Verified by	Approved by
Name and Signature of the teaching faculty Ms. G. Priyanka Priyanka	Name and Signature of HoD Dr. Ch. Yugandhar	Name and Signature of Principal

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University,

SEMESTER - VI

COMPLEX VARIABLES

1. Course Description

Programme: B.Sc. **Max. Hours: 60**
Course Code: U24/MAT/DSE/601 **Hours per week: 4**
Course Type: DSE I **Max. Marks: 100**
No. of credits:4

2. Course Objectives

- To familiarize students with the basic notion of complex analysis, covering functions of a complex variable, limits, theorems on limits and continuity.
- To illustrate how complex analysis concepts, including derivatives, contour integrals, and the Cauchy Integral Formula, finds application in disciplines such as physics, engineering and social sciences like economics, and psychology.

3. Course Outcomes

On completion of the course the student will be able to:

CO 1: Discuss the theorems and problems on limits, continuity and derivatives.**(DISCUSS)**

CO 2: Predict a given function is analytic, using the Cauchy-Riemann (C-R) equations along with sufficient condition for differentiability.**(PREDICT)**

CO 3: Evaluate contour integrals of functions of complex variable and , Cauchy's Integral formula. **(EVALUATE)**

CO 4: Classify different types of Series and Singularities. **(CLASSIFY)**

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

4. Course Content

MODULE I **(15 HRS)**

FUNCTIONS OF COMPLEX VARIABLES:

Functions of a Complex Variable, Geometrical representation of Complex function or mapping, Extended Complex Number System, Neighbourhood of a point and Region., Limit of a Function, Continuity of a function, Derivative of f(z),Differentiation Formulae.

Section15.1 of Ch15, Section 15.2 of Ch15.

MODULE II: **(15 HRS)**

ANALYTIC FUNCTIONS:

Necessary and sufficient condition for f(z) to be analytic, Cauchy-Riemann Equations in polar form, examples, Harmonic functions and properties of analytic function- Construction of an analytic function whose real or imaginary part is given Milne-Thomson Method- examples.

Sections 15.3, 15.4 of Ch15.

MODULE III: **(15 HRS)**

CONTOUR INTEGRALS

Introduction, Contour Integral, properties of contour integrals- Examples,Simply connected domains, Multiply connected domains,Cauchy's Integral Theorem or Cauchy's Fundamental Theorem, Cauchy-Goursat Theorem (without proof), Cauchy's Integral formula, Cauchy's Integral formula for derivatives.

Sections 16.0, 16.1, 16.2, 16.3 of Ch 16.

MODULE IV: **(15 HRS)**

INTEGRALS

Talyor's Series and Laurent's Series- Talyor's Series, Laurent's Series- examples, Classification of Singularities, Residue-Methods of finding residue,Cauchy's Residue Theorem.

Sections 16.4, 16.5, 16.7 of Ch 16.

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007

5. References

1. Enginnering Mathematics by P. Sivaramakrishna Das and C. Vijayakumari
2. James Ward Brown and Ruel. V- Churchill, "Complex Variables and Applications" (8th Edition), McGraw-Hill INTERNATIONAL EDITION.
3. A. R. Vasishtha, "Complex Analysis" (Fifteenth Edition: 2012), KRISHNA Prakashan Media(P)Ltd.
4. . Daniel Alpay, "A Complex Analysis Problem Book", Brik Hauser, Springer Basel AG 2011.
5. J.N. Sharma 2013 "Functions of a Complex Variable", Krishna Prakashan Media Pvt Ltd, Meerut.

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

6.Syllabus Focus

a)Relevance to Local,Regional, National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global	Complex variables act as essential tools in math, serving as global problem-solvers. They play a key role in designing advanced technology, predicting economic trends, and understanding medical imaging and diseases. In environmental science, they contribute to climate change decisions, and in the realm of artificial intelligence, complex variables are vital for teaching computers to make smart decisions. In essence, these mathematical superheroes drive progress and problem-solving on a global scale.

b) Componentson Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 2: Analytic Functions	Working with analytic functions requires critical thinking skills to understand and apply the Cauchy-Riemann equations. It involves solving complex mathematical problems, enhancing problem-solving abilities.
Employability	Module 3: Cauchy Integral Formula	Problems involving heat conduction, fluid flow, or electromagnetic fields often apply integral formulas, enhancing employability in engineering sectors.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative Learning	Presentation
2.	Experiential Learning	Interactive Class room games/Quiz
3.	Problem solving	Research Projects

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	CIA-I(Written Exam)	End Semester Examination
CO2	CIA-I(Written Exam)	
CO3	CIA-II (Skill Tests)	
CO4	CIA-II (Assignments)	

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

b) Model Question Paper- End Semester Exam

COMPLEX VARIABLES

Course Code: U24/MAT/DSE/601 **Max Marks: 60**

Credits: 04 **Time : 2 hrs**

SECTION-A

I. Answer the following Questions: **(4x10 = 40M)**

1. Show that the function $f(z) = \bar{z}$ is continuous at the point $z = 0$ but not differentiable at $z = 0$.

OR

2. Show that $\lim_{z\to 0} f(z)$ doesn't exist, if $f(z) = \frac{z}{\bar{z}}$.

3. Show that the function defined by $f(z) = \sqrt{|xy|}$ is not analytic at origin, although C-R equations are satisfied.

OR

4. Find the values of a and b such that the function $f(z) = x^2 + ay^2 - 2xy + i(bx^2 - y^2 + 2xy)$ is analytic. Also find f '(z).

5. Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)}\, dz$, where Cis $|z| = 3$.

OR

6. Using Cauchy's integral formula evaluate $\int_C \frac{7z-1}{z^2-3z-4}\, dz$, where C is the ellipse $x^2 + 4y^2 = 4$.

7. Expand $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ as a Laurent's series if (i) 2 < | z | < 3, (ii) | z | >3.

OR

8. Evaluate $\int_C \frac{z-1}{(z+1)^2(z+2)}\,dz$ where C is the circle $|z-i|=2$ using Cauchy's residue theorem.

SECTION –B

II. Answer any FOUR of the following Questions: **(Marks:4x5=20)**

9. Show that $\lim_{z\to 1} f(z) = \frac{i}{2}$, if $f(z) = \frac{i\bar{z}}{2}$ in the open disk $|z|<1$, the point 1 being in the boundary of the domain of definition of f.

10. If $f(z)$ and $\overline{f(z)}$ are analytic functions prove that $f(z)$ is a constant.

11. Evaluate $\int_C \frac{e^{iz}}{z^3}dz$ where C is | z | = 2 using Cauchy's integral formula.

12. Find the Laurent's series of the function $f(z) = z^2 e^{1/z}$ about z=0.

13. Show that the function $u(x,y) = 3x^2y + 2x^2 - y^3$ is harmonic. Find the conjugate harmonic function v and express u + iv as an analytic function of z.

14. Evaluate $\int_C \frac{\tan\frac{z}{2}}{(z-1-i)^2}\,dz$, where C is the boundary of the square whose sides are the lines $x = \pm 2$ and $y = \pm 2$.

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

COMPLEX VARIABLES

PRACTICAL

Programme : B.Sc.
Course Code : U24/MAT/DSE/601
Type Of Course : DSE I
No. Of Credits : 1

Max.Hours : 30
Hours Per Week : 2
Max.Marks : 50

Course Outcomes:

- To develop proficiency in calculating limits, applying Cauchy-Riemann equations, and evaluating contour integrals.
- To cultivate the ability to solve complex problems in derivatives, analytic functions, harmonic functions, and applications of Cauchy's theorems.

PRACTICAL SESSIONS

Practical 1: Limits & Continuity.

Practical 2: Derivatives.

Practical 3: Analytic Functions.

Practical 4:Cauchy-Riemann Equations.

Practical 5: Harmonic Functions& Properties of Analytic Functions.

Practical 6: Contour Integrals&Cauchy-Goursat Theorem.

Practical 7: Cauchy's Integral Formula& Cauchy's Integral Formula for Derivatives.

Practical 8: Taylor's & Laurent's Series.

Practical 9: Classification of Singularities.

Practical 10: Methods of finding residue & Cauchy's Residue Theorem.

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

MODEL QUESTION PAPER
PRACTICAL

Course Code: U24/MAT/DSE/601/P **Max. Marks:30**

No. Of Credits: 1 **Time: 2 Hrs.**

I. Answer the following. **6 x 5= 30 M**

1. Show that $\lim_{z\to 0} f(z)$ doesn't exist, if $f(z) = \frac{z}{\bar{z}}$.

OR

2. Show that the function $f(z) = \bar{z}$ is continuous at the point $z = 0$ but not differentiable at $z = 0$.

3. Find the analytic function $f(z) = u + iv$ given that $2u + 3v = e^x(\cos y - \sin y)$.

OR

4. If $f(z) = \begin{cases} \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2} & , z \neq 0 \\ 0 & 'z = 0 \end{cases}$, Prove that f(z) is continuous and the C-R equations are satisfied at z=0 , yet f '(0) does not exist.

5. Show that the function $u(x, y) = 3x^2y + 2x^2 - y^3$is harmonic. Find the conjugate harmonic function v and express u + iv as an analytic function of z.

OR

6.. Evaluate $\int_C z^2\, dz$ where C is the arc from A (1, 1) to B (2, 4) along y = 3x-2.

7. Evaluate $\int_C \frac{e^{iz}}{z^3} dz$ where C is | z | = 2 using Cauchy's integral formula.

OR

8. Find the Taylor's series to represent the function $\frac{z^2-1}{(z+2)(z+3)}$ in | z | <2.

9. Determine poles and their orders for the function$\frac{z+2}{(z+1)^2(z-2)}$.

OR

10. Calculate the residue of $f(z) = \frac{1-e^{2z}}{z^3}$

SEMESTER - VI

CYBER SECURITY

1. Course Description:

Programme: B.Sc. Computer Science **Max. Hours: 30**

Course Code: U24/CSC/SEC/601 **Hours per week: 2**

Course Type: SKILL ENHANCEMENT COURSE **Max. Marks**

No. of credits: 2

2. Course Objectives:

- To learn the foundations of Cyber security and the threat landscape.
- To equip students with the technical knowledge and skills needed to protect and defend against cyber threats.
- To expose students to responsible use of online social media networks and digital payments.

3. Course Outcomes:

This SEC paper will help students to enhance their overall skills and to

CO1: ***Discuss*** and ***outline*** cyber security and issues and challenges associated with it. (Cognitive level – 2)

CO2: ***Analyze*** privacy and security concerns on online social media and various digital payment modes and related cyber security aspects. (Cognitive level – 4)

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

4. Course Content:

MODULE I: INTRODUCTION TO CYBER SECURITY AND CYBER LAWS (15 Hrs)

Defining Cyberspace, Architecture of cyberspace, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security; Classification of cyber-crimes, Common cyber-crimes, Reporting of cyber-crimes, Remedial and mitigation measures, Legal perspective of cyber-crime.

MODULE II: SOCIAL MEDIA AND DIGITAL PAYMENT SECURITY (15 Hrs)

Introduction to Social networks. Types of social media, Social media privacy, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Introduction to digital payments, Components of digital payment and stake holders, Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Digital payments related common frauds and preventive measures.

5. References:

1. Cyber Crime Impact in the New Millennium, by R. C Mishra, Author Press. Edition 2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson, 13th November, 2001)
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd...
5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

6. Syllabus Focus:

a) Relevance to Local, Regional, National and Global Development Needs

Local/Regional/National /Global Development Needs	Relevance
Global Development	Cybersecurity is crucial because it safeguards all types of data against theft and loss. It's essential for organizations and individuals to take measures to protect their information assets from potential attacks or leaks.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	Develop a deeper understanding and familiarity with various types of cyberattacks, cyber crimes, vulnerabilities and remedies thereto. Analyse and evaluate the digital payment system security and remedial measures against digital payment frauds.

7. Course Assessment Plan:

a) Weightage of Marks in Formative and Summative Assessments

Formative Assessment - FA (40%)	Summative Assessment - SA (60%)
CIA-20 marks Mini project/Assignment/ Problem solving/Case studies	End Semester Exam – 30 Marks

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

b) Question Paper Pattern

EXTERNAL- MODEL QUESTION PAPER
PRACTICAL

Course code: U24/CSC/SEC/601 **Max Time: 1 Hr.**

Credits:2 **Max Marks: 30Marks**

Answer the following.

1. Explain the architecture of cyberspace and classify the cyber-crimes.
2. Explain the following
   a. Security issues related to social media
   b. Unified Payment Interface (UPI)
   c. e-Wallets

Prepared by	Checked & Verified by	Approved by
Ms. Afeefa Noorain Teaching Faculty	Ms. D. Sowjenya HOD	Dr. Uma Joseph Principal

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

SEMESTER – VI

DATA MINING

1. Course Description

Programme: B.Sc. **Max. Hours: 60**

Code: U24/CSC/DSE/602 **Hours per week: 4**

Course Type: DISCIPLINE SPECIFIC ELECTIVE **Max. Marks: 100**

No. of credits: 4

2. Course Objectives

- To identify the scope and essentiality of Data Warehousing and Mining.
- To develop research interest towards advances in data mining.

3. Course Outcomes

CO1: To ***Discuss*** Data Warehouse fundamentals, Data Mining Principles (Cognitive level – 2)

CO2: To ***Design*** data warehouse with dimensional modelling and apply OLAP operations (Cognitive level – 6)

CO3: To ***Identify*** appropriate data mining to solve real world problems (Cognitive level – 3)

CO4: To ***Compare*** and evaluate different data mining techniques like classification, prediction, clustering and association rule mining (Cognitive level – 4)

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

4.Course Contents

MODULE 1: INTRODUCTION & DATA PREPROCESSING (15 Hrs)

Introduction to data mining, patterns for mining, technologies used, getting to know data, data visualization, measuring similarity, data pre-processing, data cleaning and integration, data reduction, data transformation.

MODULE 2: DATA WAREHOUSING & ONLINE ANALYTICAL PROCESSING (15 Hrs)

Data warehousing and OLAP, ETL, data cube, data warehouse design and usage, data generalization, data cube technology, strategies for data cube computation, processing advanced kinds of queries, mining frequent patterns, associations, and correlations.

MODULE 3: ADVANCED PATTERN MINING & CLASSIFICATION TECHNIQUES (15 Hrs)

Advanced pattern mining, constraint-based frequent pattern mining, pattern exploration and application, classification, decision tree induction, Bayes classification methods, rule-based classification, techniques to improve accuracy, advanced classification methods, Bayesian belief networks, classification using backpropagation, frequent patterns, genetic algorithms, rough set and fuzzy set approaches

MODULE 4: CLUSTER & ADVANCED CLUSTER ANALYSIS (15 Hrs)

Cluster analysis, basic clustering methods, partitioning, hierarchical methods, density-based methods, evaluation of clustering, advanced cluster analysis, clustering high-dimensional data, clustering graph and network data, clustering with constraints.

5.References

1.Data Mining Concepts and Techniques 4E, Jiawei Han, Elsevier, 2022
2. Introduction to Data Mining by Pang -Ning Tan, Micheal Steinbach, Anuj Karpatne Vipin Kumar, Pearson, 2021
3.Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten & Eibe Frank, Elsevier, 2019

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

6.Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local/Regional/National/Global Development Needs	Relevance
Global Development	To introduce the concepts of Data Mining and Cluster analysis

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	To Understand the concept of Data mining and. data warehousing and OLAP.
EMP	Modules 3 and 4	Detailed understanding of Pattern Mining and cluster analysis.

7.Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Seminar Presentation	Participative Learning
2.	Quiz	Experiential Learning
3.	Group Discussion	Participative Learning

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

Cos	Continuous Internal Assessments – CIA (40%)	End Semester Examination - (60%)
CO1	CIA-1 Written Test	Written Exam
CO2	CIA-1 Written Test	
CO3	CIA-2 Presentation	
CO4	CIA-2 Quiz	

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

b) Model Question Paper- End Semester Exam

DATA MINING

Course Code: U24/CSC/DSE/602 **Max. Marks: 60**
No. of Credits :4 **Time: 2hrs**

SECTION-A

I. Answer the following: **4x10= 40M**

1. Describe the various approaches to data visualization.

OR

2. Describe the strategies for data reduction and transformation.

3. Describe the different techniques for cube computation.

OR

4. Describe the APRIORI algorithm for determining frequent item sets.

5. Describe the methods for mining quantitative association rules.

OR

6. Describe the decision tree method of classification.

7. Describe the partitioning methods for cluster analysis.

OR

8. Describe hierarchical methods for clustering.

SECTION-B

II. Answer any FIVE: **5 X 4 = 20 M**

9. Discuss the relationship between data mining and knowledge discovery.
10. Describe the schemas for multidimensional data modelling.
11. Write a brief note on rule-based classification.
12. Describe Bayesian belief networks for data classification.
13. Write a brief note on bolstering.
14. Describe clustering in high-dimensional data.

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

DATA MINING
PRACTICAL

1.Course Description:

Programme: B.Sc.

Course Code: U24/CSC/DSE/602/P

Course Type: DISCIPLINE SPECIFIC ELECTIVE

No. of credits: 1

Max. Hours: 30

Hours per week:2

Max. Marks: 50

2.Course Objectives

- To identify the scope and essentiality of Data Warehousing and Mining
- To develop research interest towards advances in data mining.

3.Course Outcomes

CO1: To Identify appropriate data mining to solve real world problems (Cognitive level – 3)

CO2: To Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining (Cognitive level – 4)

PRACTICAL SESSIONS

1. OLAP queries using SQL Server
2. Design and implement a data warehouse using dimensional modelling
3. Extract, transform Load
4. Building a cube
5. Classification using K nearest neighbour classification
6. decision tree-based algorithm for classification
7. K means algorithm for clustering
8. Apriori algorithm for association rule
9. Bayesian Classification
10. Mini Project

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

DATA MINING
PRACTCIAL MODEL PAPER

Course code: U24/CSC/DSE/602/P **Max. Time: 2 hrs**
No. of Credits:1 **Max. Marks: 50**

Answer any ONE from the following

1. Write a program to implement Building a cube.
2. Write OLAP queries using SQL Server

c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO-1	2	10	2	5
2	15	CO-2	2	10	2	5
3	15	CO-3	2	10	1	5
4	15	CO-4	2	10	1	5

9.C0 -PO Mapping:

CO	PO	Cognitive Level	Classroom sessions (hrs)
1	1	2	15
2	2	6	15
3	1	3	15
4	2	4	15

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

SEMESTER VI

LOGIC AND SETS

1. Course Description

Programme : B. Sc **Max. Hours : 30**
Course Code : U24/MAT/SEC/601 **Hours per week : 2**
Course Type : SEC IV **Max. Marks : 50**
No. of credits : 2

2. Course Objectives

- The objectives of set theory and logics are to provide formal frameworks for mathematical thinking and reasoning.

3. Course Outcomes

On completion of the course the student will be able to:

CO 1: Demonstrate the fundamentals of strong reasoning and inference using Logics. **(DEMONSTRATE)**

CO 2: Set theory develops the properties and structure of collections of things. **(DEVELOP)**

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

4. Course Content

MODULE I: **(15 HRS)**

Basic Connectives and truth tables, Logical equivalence: Laws of Logic, Logical Implication: Rules Inference: The use of Quantifiers, Quantifiers, and Definitions.

Sections:2.1-2.5.
Pg No's 47-116.

MODULE II: **(15 HRS)**

Sets and Subsets, Set Operations and the laws of Set Theory, Counting and Venn Diagrams, Well ordering Principle and Mathematical Induction. A first word on Probability, the axioms of probability, conditional probability, independence, discrete random variables.

Sections: 3.1-3.7.
Pg No's 123-185.

5. References

1. Ralph P Girmaldi, Discrete and Combinatorial Mathematics (5e) Pearson.
2. Kenneth H. Rosen, Discrete Mathematics and its applications, 7th edition,.
3. P R Halmos, Naïve set Theory, Springer – Verlag New York.
4. E Kamke, Theory of set Dover Publication.

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

6. Syllabus Focus

a) Relevance to Local , Regional , National and Global Development Needs

Local /Regional/National /Global Development Needs	**Relevance**
Global	The fundamental framework that logic and set theory provide for reasoning, problem-solving, and knowledge representation in a wide range of fields and disciplines makes them vital to society at large.

7. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	**Syllabus Content**	**Description of Activity**
Employability	Module 1: LOGICS Module 2: SETS	This course Bridges between Industrial tasks and Academic knowledge in the field of electronics and Computer Science

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

8. Course Assessment Plan

a)) Weightage of Marks in Formative and Summative Assessments

Formative Assessments – FA (50%)	Summative Assessments – SA (50%)
CIA- 20 Marks	End Semester Exam

b) Question Paper Pattern

EXTERNAL - MODEL QUESTION PAPER

LOGICS AND SETS

THEORY

Course Code : U24/MAT/SEC/601 **Max. Time : 1Hr**

No. Of Credits: 2 **Max. Marks: 30M**

SECTION –A

I. Answer any FIVE of the following. **5 x 6 = 30 M**

1. (a) Construct a truth tale for each of the following compound statements where p,q, r denote

   primitive statements $\sim(p\wedge\sim q)\rightarrow\sim p$.

   (b) Determine whether $[p\rightarrow(q\rightarrow r)]\rightarrow[(p\rightarrow q)\rightarrow(p\rightarrow r)$ is a tautology.

2. Find the validity of the argument

   $p\rightarrow q$

   $q\rightarrow(r\wedge s)$

   $\sim r\vee(\sim t\vee u)$

   $p\wedge t$

   $\therefore u$

3. Show that $p \leftrightarrow q \Leftrightarrow (p \rightarrow q) \wedge (q \rightarrow p)$ is logically equivalent using Truth table.
4. Define universal and existential Quantifiers. Translate the given statement into symbols using quantifiers, variables and predicate the symbols "An equilateral triangle has three angles of 60^{o}."
5. Define power set. Construct power set for the set C={1,2,3,4}.
6. Simplify the expression $\overline{\overline{(A \cup B) \cap C} \cup \bar{B}}$.
7. Let X be a random variable with the following probability distribution.

x	0	1	2	3	4
Pr(X=x)	1/8	1/4	1/4	1/4	1/8

Determine a) Pr(x≤4) b) Pr($1 \leq X \leq 3$)

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

SEMESTER - VI

NUMERICAL ANALYSIS

1. Course Description

Programme : B.Sc
Course Code : U24/MAT/DSE/602
Course Type : DSE II
No. of credits : 4

Max. Hours : 60
Hours per week : 4
Max. Marks : 100

2. Course Objectives

- Solutions to problems in science and engineering.
- To train students to choose and apply appropriate numerical techniques to solve the problem and interpret the result.

3. Course Outcomes

On completion of the course the student will be able to:

CO 1: Calculate the roots of algebraic and transcendental equations. **(CALCULATE)**

CO 2: Assess the given function by means of a polynomial. **(ASSESS)**

CO 3: Discuss various methods of numerical differentiation and integration. **(DISCUSS)**

CO 4: Analyze appropriate numerical methods and determine the solutions to ordinary Differential equations and Linear systems. **(APPLY)**

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad 500 007.

4. Course Content

MODULE I:

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS (15 HRS)

Errors and their computations, The Bisection Method, The Method of False Position, The Iteration Method, Newton-Raphson Method, Generalized Newton's Method, Muller's Method.

Sections: 1.3, 2.1 to 2.6,2.8.
Pg No's: 7 to 11, 20 to 43,44 to 46 .

MODULE II:

INTERPOLATION (17 HRS)

Introduction : Finite Differences, Forward Differences, Backward Differences, Central Differences, Symbolic Relations and Separation of Symbols, Differences of a Polynomial, Newton's Formula for Interpolation, Central Difference Interpolation Formula, Gauss's Central Difference formula,Interpolation with unevenly spaced points and Polynomial Approximation.Lagrange's Interpolation Formula, Divided Differences and their properties, Newton's General Interpolation Formula.

Sections: 3.1,3.3,3.6 to 3.7,3.9 TO 3.9.2,3.10,3.11,

Pg No's :. 63, 65-70, 72-86, 90-103.

MODULE III:

NUMERICAL DIFFERENTIATION & INTEGRATION (15 HRS)

Introduction, Least-Squares Curves Fitting Procedures, Fitting a Straight Line.
Numerical differentiation and Integration.Introduction-, Numerical differentiation, Maximum and minimum values of a tabulated function. Numerical Integration-Trapezoidal Rule ,Simpson's 1/3 Rule ,Simpsons 3/8 Rule.

Sections: 4.1 – 4.2.2, 5.1,5.2, 5.2.1,5.4-5.4.3

Pg No's . 137-143,187-201

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

MODULE IV:

NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS AND SOLUTIONS OF LINEAR SYSTEMS (13 HRS)

Introduction , Taylor's Series method, Picard's Method, Euler's method, Runge – Kutta method, Solution of Linear systems-Direct methods,Matrix Inversion method,Gauss Elimination method,Gauss-Jordan method,Iterative methods.

Sections: 7.1-7.5 ,6.3,6.3.1,6.3.2,6.3.3,6.4
Pg. No's : 295 to 308,255-261,275 to 278

5. **Reference Books:**

1. S.S.Sastry, **Introductory Methods of Numerical Analysis**,Publication: Prentice Hall India (4th Edition)
2. G.M. Philips and P. J. Taylor,**Theory and Applications of Numerical Analysis** Elsivier Publications.
3. Francis Sched, Numerical **Analysis** (2nd Edition) By, Schaum's Outlines, Tata Mcgrawhill Publications.
4. M.K Jain, S.R.K. Iyengar, R.K. Jain, **Numerical Methods For Scientific And Engineering Computation** (4th Edition) New Age International Publications.
5. James E. Miller, David G. Moursund, Charles S. Duris, **Elementary Theory And Application Of Numerical Analysis.**

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

6. Syllabus Focus

a) Relevance to Local , Regional , National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global	Numerical analysis plays a crucial role in computational physics, Finance, Computer Science i.e in Crypotography.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 1: Solution Of Algebraic And Transcendental Equations	Apply your skills to solve real-world problems that involve algebraic and transcendental equations in various fields such as engineering, physics, finance, and biology.
Employability	Module 2 Interpolation	Practice implementing interpolation algorithms in a programming language like Python, MATLAB and Sage Math.
Skill Development	Module 3: Curve Fitting	Apply your skills to solve real-world problems that involve curve fitting, such as predicting future trends, analyzing experimental data.
Skill Development	Module 4: Numerical Solutions Of Ordinary Differential Equations	Study different numerical methods for solving ODEs, such as: Euler's method and Runge-Kutta methods

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative Learning	Presentation
2.	Experiential Learning	Interactive Class room games/Quiz
3.	Problem solving	Skill test

8. Course Assessment Plan

a)Weightage of Marks in Continuous Internal Assessments and End Semester Examination

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	CIA-I(Written Exam)	End Semester Examination
CO2	CIA-I(Written Exam)	
CO3	CIA-II (Skill Tests)	
CO4	CIA-II (Assignments)	

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

b) Model Question Paper- End Semester Exam

NUMERICAL ANALYSIS

Course Code: U24/MAT/DSE/601 **Max. Marks: 60**

Credits: 4 **Time : 2 Hrs**

SECTION – A

I. Answer the following. **4 x 10 = 40 M**

1. Find a real root of the equation $x^3 - 2x - 5 = 0$using Bisection Method.

OR

2. Use the Newton –Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$.
3. From the following table find the number of students who obtained marks between 60 And 70

Marks Obtained	0- 40	40-60	60-80	80-100	100-120
No. of students	250	120	100	70	50

OR

4. Applying Lagrange's formula, Find a cubic polynomial which approximates the following data

x	y
0	-12
1	0
3	12
4	24

5. Find the values of $a_0 and\ a_1$ so that $Y = a_0 + a_1 x$ fits the data given in the table

x	Y
0	1.0
1	2.9
2	4.8
3	6.7
4	8.6

OR

6. Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{sin\theta}\, d\theta$ using Simpson's rule with h=$\frac{\pi}{12}$.
7. Given the differential equation $y'' - xy' - y = 0$ with the conditions $y(0) = 1$ and $y'(0) = 0$, Use Taylor's series method to determine the value of $y(0.1)$.

OR

8. Solve the system $2x + y + z = 10, 3x + 2y + 3z = 18, x + 4y + 9z = 16$ by Gauss Jordan Method.

SECTION-B

II. Answer any FOUR **4 x 5 = 20 M**

9. Explain the Graphical representation of Newton -Raphson method.
10. Using the method of separation of symbols show that
$\Delta^n u_{x-n} = u_x - nu_{x-1} + n(n-1)/2\, u_{x-2} + \ldots\ldots + (-1)^n u_{x-n}$.
11. Find the missing term in the following table

x	Y
0	1
1	3
2	9
3	—
4	18

Explain why the result differs from 3^3=27.

12. Explain about Numerical differentiation.
13. From the following table find x, correct to two decimal places for which y is maximum and find this value of y.

x	Y
1.2	0.9320
1.3	0.9636
1.4	0.9855
1.5	0.9975
1.6	0.9996

14. Explain Trapezoidal Rule.

NUMERICAL ANALYSIS

PRACTICAL

Programme: B.SC.

Course Code: U24/MAT/DSE/602/P

Course Type: DSE

No. of credits: 1

Max. Hours: 30

Hours per week: 2

Max. Marks: 50

Course Outcomes:

- Find numerical solutions to algebraic, transcendental and differential equations.
- Learn to fit a polynomial or curve in a given data.

PRACTICAL SESSIONS

1. Errors and Approximations , Bisection method .
2. Iteration Method and Newton – Raphson Method.
3. Newton – Raphson Method, Muller's Method.
4. Finite Difference interpolation
5. Divided differences interpolation.
6. Central Difference Interpolation and Langranges Interpolation formula.
7. Curve fitting
8. Numerical Differentiation and Integration
9. Taylor's series and Picard's method
10. Solution of Linear Systems.

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

CBCS 2024

NUMERICAL ANALYSIS

MODEL QUESTION PAPER

PRACTICAL

Course Code: U20/MAT/DSE/602/P **Max. Marks: 30**

No. Of Credits: 1 **Time : 2 Hrs**

I. Answer the following: **5 x 6 = 30 M**

1. Find a real root of the equation correct to to three decimal places using bisection method $x^3 + x^2 - 1 = 0$

OR

2. Find a root of the equation $xsinx + cosx = 0$ using Newton Raphson method
3. Find a root of the equation $x^3 - 2x - 5 = 0$ using Muller's method

OR

4. Prove that(i) $E \equiv 1 + \Delta$ (ii) $E^{-1} = 1 - \nabla$ (iii) $y = \sqrt{1 + \frac{\Delta^2}{4}}$
5. From the following table of values of x and f(x) determine (i)f(0.23) and (ii) f(0.29)

x	0.20	0.22	0.24	0.26	0.28	0.30
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

OR

6. Using Lagrange's formula explain the rational function $\frac{3x^2+x+1}{(x-1)(x-2)(x-3)}$ as a sum of partial functions.

7. Fit a straight line of the form Y=$a_0 + a_1 x$ to the data

x	1	2	3	4	6	8
y	2.4	3.1	3.5	4.2	5.0	6.0

OR

8. Evaluate $\int_{-2}^{2} \frac{t}{5+2t} dt$ using trapezoidal rule.

9. Given that $y' = \frac{y-x}{y+x}$, y(0)=1. Use Picard's method to find y(0.1).

OR

10. Solve the equations $3x + y + 2z = 3, 2x - 3y - z = -3, x + 2y + z = 4$ by Matrix Inversion Method.

SEMESTER - VI

PROJECT

1. Course Description

Programme: B.Sc. **Max. Hours:60**

Course Code: U24/CSH/PRJ/601 **Max. Marks: 100**

Course Type: PROJECT **Hours per week:4**

No. of credits: 4

2. Course Objectives

1. To improve the team building, communication and management skills of the students.
2. To enable students to gain hands on experience
3. To inculcate research spirit of enquiry into the subject

3. Course Outcomes:

CO1: Demonstrate an ability to work in teams and manage the conduct of the research study.

CO2: Formulate and propose a plan for creating a solution for the research plan identified

CO3: To develop a sample project integrating the knowledge gained during the course

Internal Evaluation of Project-40 M

Scheme of evaluation

Synopsis - Submission & Presentation	10M
Mid Term Evaluation	10 M
Project Presentations	20 M

External Evaluation of Project -60 M

Prepared by	Checked &verified by	Approved by
Ms. Ummiya Mohammedi Teaching Faculty	Ms. D. Sowjenya HOD	Dr. Uma Joseph Principal

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

SEMESTER – VI
PYTHON PROGRAMMING

1. Course Description

Programme: B.Sc. **Max. Hours: 60**

Course Code: U24/CSC/DSE/601 **Hours per week: 4**

Course Type: DISCIPLINE SPECIFIC ELECTIVE **Max. Marks: 100**

No. of credits: 4

2. Course Objectives:

- To learn and develop object-oriented programming in python.
- To focus on the applicability of different object types like lists, tuples, dictionaries and modules.

3. Course Outcomes:

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

CO1: ***Illustrate*** and ***explain*** type of branching/looping construct to solve common problems. (Cognitive level –2)

CO2: ***Design*** python programs that illustrate how functions are utilize (Cognitive level –6)

CO3: ***Choose*** and ***apply*** the correct type of Modules construct to solve common problems (Cognitive level -3)

CO4: ***Design*** Python programs that implementing OOPs concept in Python (Cognitive level –6)

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

4. Course Content

MODULE I: FUNDAMENTALS OF PYTHON PROGRAMMING **(15 Hrs)**

Introduction to Python, Installing and Writing Python Program, Data types in Python: Comments, Doc strings, Variables, Data types, Built-in data types, bool, Sequences, Sets, Literals, Characters, User-defined Data types, Constants, Identifiers, Reserved words, Naming Conventions. Operators in Python: Arithmetic, Assignment, Unary Minus, Relational, Logical, Boolean, Bitwise, Membership, Identity, Operator Precedence and Associativity, Mathematical Functions. Input and Output, Control Statements: Control Statements, if, if else, if elif else, while, for, Infinite and Nested Loops, else Suite, break, continue, pass, assert and return

MODULE II: ARRAYS, STRINGS, FUNCTIONS **(15 Hrs)**

Arrays in Python: Introduction, Creating, Importing Array Module, Indexing, Slicing, Processing, Types, Working with Arrays using numpy, Creating Arrays using array(), Mathematical Operations, Comparing, Aliasing, Viewing, Copying, Slicing and Indexing in numpy Arrays, Dimensions, Attributes, reshape and flatten methods, Multi-dimensional Arrays, Indexing and Slicing in Multi-dimensional Arrays, Matrices in numpy, Getting Diagonal Elements of a Matrix, Finding Maximum, Minimum, Sum and Average, Products of elements, Sorting and Transpose of Matrix, Matrix Addition and Multiplication, Random Numbers. Strings and Characters. Functions: Difference between a Function and a Method, Defining, Calling, Returning Results and Multiple Values, Pass by ObjectReference, Formal and Actual, Positional, Keyword, Default, Variable Length Arguments, Local and Global Variables, Recursive Functions, Anonymous Functions or Lambdas

MODULE III: LISTS, TUPLES, DICTIONARIES, FILES, AND EXCEPTIONS **(15 Hrs)**

Lists and Tuples: List, Creating Lists using range() Function, Operations on Lists, Nested Lists, List Comprehensions, Tuples, Creating Tuples, Accessing Tuple Elements, Basic Operations on Tuples, Nested Tuples, Inserting, Modifying and Deleting Elements from a Tuple. Dictionaries- Operations on Dictionaries, Dictionary Methods, Sorting using Lambdas, Converting Lists and Strings into Dictionary, Passing Dictionaries to Functions, Ordered Dictionaries. File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.

MODULE IV: OOP CONCEPTS **(15 Hrs)**

Introduction to Oops: Problems in Procedure Oriented Approach, Specialty of Python, Features of Object Oriented Programming systems (OOPS); Classes and Objects-Creating a Class, The Self Variable, Constructor, Types of Variables and Methods, Namespaces, Passing Members of One Class to Another Class, Inner Classes; Inheritance and Polymorphism: Constructors in Inheritance, Overriding Super Class Constructors and Methods, super() Method, Types of Inheritance, Polymorphism, Operator Overloading, Method Overloading, Method Overriding

5. References:

1. Python programming, Ch Satyanarayana, M Radhika mani, B N Jagadish, University Press,2018
2. Core Python Programming – 3rd edition, Dr R Nageshwar Rao, Dreamtech press,2021.

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University.

6. Syllabus Focus

a) **Relevance to Local, Regional, National and Global Development Needs**

Local /Regional/National /Global Development Needs	**Relevance**
Global Development	Python has become one of the most popular programming languages in recent years. It's been used in everything from machine learning to building websites and software testing.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	**Syllabus Content**	**Description of Activity**
SD	Module -1,2	Designing and writing python programs for given problem statements.
EMP	Module 3,4	Testing programming skills in Python, including using its libraries and troubleshooting code

7. Pedagogy

S. No	**Student Centric Methods Adopted**	**Type / Description of Activity**
1.	Seminar Presentation	Participative Learning
2.	Quiz	Experiential Learning
3.	Group Discussion	Participative Learning

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

COs	Continuous Internal Assessments - CIA (40%)	End Semester Examination - (60%)
CO1	CIA-1 Written Test	Written Exam
CO2	CIA-1 Written Test	
CO3	CIA-2 Written Assignment	
CO4	CIA-2 Lab Test	

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

b) Model Question Paper Pattern

PYTHON PROGRAMMING

Course Code: U24/CSC/DSE/601 **Max Marks: 60**

Credits: 4 **Time: 2 Hrs**

SECTION – A

I. Answer the following **4 x 10 = 40 M**

1. (a) Discuss about the Features of Python.
   (b) Explain the differences between Java and Python.

OR

2. Explain about Arithmetic Operators, Assignment Operators, Relational Operators, Logical Operators and Boolean Operators with necessary examples.
3. Explain Multi-dimensional Arrays, Indexing and Slicing in Multi-dimensional Arrays.

OR

4. Explain how to create Functions in Python and discuss about Positional arguments and Keyword arguments.
5. Explain Files and Exceptions.

OR

6. Discuss about Lists and Dictionaries in detail.
7. Explain Operator Overloading with suitable examples.

OR

8. Define Class and discuss about inheritance with an example.

SECTION B

II. Answer Any FOUR: **4 x 5 = 20 M**

9. Explain different data types in Python.
10. Explain Strings and characters.
11. Discuss about Tuples and its operations.
12. Discuss about Inner Classes.
13. Explain anonymous functions.
14. Explain about the Constructor.

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

PYTHON PROGRAMMING

PRACTICAL

1. Course Description

Programme: B.Sc. **Max. Hours: 30**

Course Code: U24/CSC/DSE/601/P **Max. Marks: 50**

Course Type: DISCIPLINE SPECIFIC ELECTIVE **Hours per week:2**

No. of credits: 1

2. Course Objective

To strive and strengthen ability to develop programs using versatile object types and OOPs concepts using Python.

3. Course Outcomes

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

CO1: To illustrate basic object types, control structures and modular programming.

CO2: To develop Object-Oriented programming using Python.

PRACTICAL SESSIONS

1. Program to illustrate Control Statements
2. Program to demonstrate Arrays
3. Program to illustrate String operations.
4. Program to create List and perform operations on it.
5. Program to illustrate Tuple operations.
6. Program to create Dictionaries and perform operations on it.
7. Program to create a User defined function.
8. Program to illustrate Positional Arguments, Keyword Arguments, Default Argument.
9. Program to illustrate Recursive Functions and Anonymous Functions.
10. Program to implement Python modules.
11. Program to implement String modules
12. Program to illustrate Classes and Objects.
13. Program to illustrate Inheritance.
14. Program to illustrate Operator overloading.
15. Program to illustrate Method Overloading.

PYTHON PROGRAMMING

PRACTICAL MODEL PAPER

COURSE CODE: U24/CSC/DSE/601/P **MAX.MARKS: 50**

Credits: 1 **EXAM DURATION: 2 hrs**

Answer any 2 questions:

1. Write a Python Program to illustrate Tuple operations.
2. Program to illustrate Recursive Functions and Anonymous Functions.
4. Program to illustrate Operator overloading.

c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO-1	2	10	2	5
2	15	CO-2	2	10	2	5
3	15	CO-3	2	10	2	5
4	15	CO-4	2	10	2	5

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

SEMESTER-VI

SOFTWARE ARCHITECTURE

1.Course Description

Programme: B.Sc. S.E(H) **Max. Hours: 60**

Course Code: U24/CSH/DSC/601 **Hours per week: 4**

Course Type: DISCIPLINE SPECIFIC CORE **Max Marks: 100**

No. of Credits: 4

2.Course Objectives

- To learn fundamentals of Software architecture.
- To learn the techniques for choosing the right architecture

3. Course Outcomes

CO1: To ***Define*** software architectural requirements and list architectural Structures and views (Cognitive level – 1)

CO2: To ***Outline*** the influence of architecture on business and technical activities. (Cognitive level – 1)

CO3: To ***Summarize*** about quality attribute scenarios for a given architecture. (Cognitive level – 2)

CO4: To ***Illustrate*** architecture in agile projects for emerging technologies. (Cognitive level – 3)

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

4.Course Content

MODULE I: INTRODUCTION AND IMPORTANCE OF ARCHITECTURE **(15 Hrs)**

Software Architecture - Introduction, Structures and Views, Patterns, Good Architecture; Importance of Software Architecture- Inhibiting/Enabling System's Quality Attributes, Reasoning and Managing Change, Predicting System Qualities, Communication Among Stakeholders, Early Design Decisions, Defining Constraints, Influencing Organizational Structure, Evolutionary Prototyping, Improving Cost And Estimates, Transferable, Reusable Model, Incorporation Of Independently Developed Components, Restricting Vocabulary Of Design Alternatives.

MODULE II: ARCHITECTURAL INFLUENCE **(15 Hrs)**

Contexts Of Software Architecture-Architecture in Technical Context, Project Life-Cycle Context, Business Context, Professional Context, Architecture Influence, Quality Attributes: Requirements, Functionality, Considerations, Specify Requirements, Achieving Quality Through Tactics, Quality Design Decisions.

MODULE III: ANALYZING QUALITY ATTRIBUTES **(15 Hrs)**

Interoperability - Scenario, Tactics, Design Checklist for Interoperability; Modifiability - Scenario, Tactics, Checklist For Modifiability; Performance - Scenario, Tactics, Checklist For Performance; Architectural Tactics And Patterns - Architecture Patterns, Overview Of Patterns, Relationships Between Tactics And Patterns, Using Tactics Together.

MODULE IV: ARCHITECTURE IN AGILE PROJECTS **(15 Hrs)**

Introduction, Agility and Architecture Methods; Guidelines Architecture and Requirements- Gathering ASRs from Requirements Documents, Interviewing Stakeholders, Understanding the Business Goals, Capturing in A Utility Tree, Tying The Methods Together.

5.References:

1. "Software Architecture In Practice" by Len Bass, Paul Clements, Rick Kazman 3rd Edition, Pearson Publications,2013.
2. Richard N. Taylor NenadMedvidovic Eric M. Dashofy,"Software Architecture: Foundations, Theory, And Practice", Wiley India Pvt Ltd, 2009
3. . Anthony J Lattanze, "Architecting Software Intensive System. A Practitioner's Guide" Auerbach Publications, 2010.
4. Paul Clements, Rick Kazman, and Mark Klein, "Evaluating software architectures: Methods and case studies.", Addison-Wesley, 2001.
5. David Garlan and Mary Shaw, "Software architecture: Perspectives on an emerging discipline", Prentice Hall, 1996.

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

6.Syllabus Focus

a) Relevance to Local, Regional, National and Global Development Needs

Local/Regional/National /Global Development Needs	Relevance
Global Development	To introduce the concepts of Software Architecture and design

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	To Understand the concept of software Architecture and its importance
EMP	Modules 3 and 4	Detailed understanding of Architectural Design and Agile Methodologies.

7.Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Seminar Presentation	Participative Learning
2.	Group Discussion	Experiential Learning
3.	Quiz	Participative Learning

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and End Semester Examination

COs	Continuous Internal Assessments – CIA (40%)	End Semester Examination (60%)
CO1	CIA-1 Written test	End Semester exam
CO2	CIA-1 Written test	
C03	CIA-2 Presentation	
C04	CIA-2 Quiz	

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

b) Model Question paper- End Semester Exam

SOFTWARE ARCHITECTURE

Course Code: U24/CSH/DSC/601 **Max Marks:60**
No. of Credits: 4 **Time: 2 hrs**

SECTION - A

I. Answer the following **4 x 10 = 40 M**

1. Define Software Architecture. What makes a good architecture?

OR

2. What are architectural structures? Explain its types.

3.Explain the existence of architecture in a business context.

OR

4.Explain the design decisions taken by a Software Architect.

5.Explain the following architectural patterns

i)Model View Controller ii) Client Server.

OR

6.Explain how performance as a Quality Attribute is analysed in a Software Architecture.

7. Explain Agile architecture.

OR

8.Discuss about gathering ASRs (architecturally significant requirement)

i)from requirement documents ii) by interviewing stakeholders.

SECTION - B

II. Answer the following. **4 x 5 = 20 M**

9.How does the component and connector structures help in architecture?

10.Write a note on stakeholders.

11.What are quality attributes? Explain any 3

12.How can a Quality Attribute be specified as a requirement?

13.How can the response of a system to a stimulus be measured?

14.What are the seven Steps of the PALM Method?

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500007.

SOFTWARE ARCHITECTURE

PRACTICAL

1. Course Description

Programme: B.Sc. SE(H) **Max. Hours: 30**

Course Code: U24/CSH/DSC/601/P **Hours per week: 2**

Course Type: DISCIPLINE SPECIFIC CORE **Max. Marks: 50**

No. of credits: 1

2. Course Objectives

- To learn fundamentals of Software architecture.
- To learn the techniques for choosing the right architecture

3. Course Outcomes

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

CO1: To outline various Diagrams required for understanding software architectural design process (Cognitive level – 1)

CO2: To Apply the various tools available for design and develop UML diagrams (Cognitive level – 3)

PRACTICAL SESSIONS

Case Studies

1. Banking System
2. Hotel management system
3. Inventory Control System
4. Library management system
5. Railway Reservation System

For the above case studies do the following exercises

1. Write the complete problem statement
2. Draw use case diagrams
3. Draw activity diagrams for all use cases
4. Draw sequence diagrams for all use cases
5. Draw collaboration diagram
6. Draw State chart diagrams.
7. Assign objects in sequence diagrams to classes and make class diagram.

Note

To draw UML diagrams using Microsoft Visio Software.

SOFTWARE ARCHITECTURE

PRACTICAL

Course Code: U24/CSH/DSC/601/P
No. of Credits: 1

Max Marks: 50
Time: 2 hrs

Answer any one:

1. Prepare Class Diagrams, Sequence Diagrams and Use case diagrams for Hotel Management System.
2. Prepare Class Diagrams, Sequence Diagrams and Use case diagrams for Library management system

b) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO-1	2	10	1	5
2	15	CO-2	2	10	1	5
3	15	CO-3	2	10	2	5
4	15	CO-4	2	10	2	5

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions(hrs)
1	1	1	15
2	1	1	15
3	5	2	15
4	5	3	15

Prepared by	Checked & verified by	Approved by the Principal
Renuka **Ms. Renuka** **Teaching Faculty**	**Ms. D. Sowjenya** **HOD**	**Dr. Uma Joseph** **Principal**

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

SEMESTER VI

STATISTICAL TECHNIQUES FOR RESEARCH METHODS

1. Course Description

Programme: B.Sc

Course Code: U24/STA/SEC/502

Course Type: SEC -4

No. of Credits : 2

Max Hours: 30

Hours per week: 2

Max Marks: 50

2. Course Objectives

This course aims to equip students with essential statistical skills necessary for conducting research across various disciplines.

3. Course Outcomes

On completion of the course the student will be able to

CO1: **UNDERSTAND** basic concepts and aspects related to research, data collection, analyses and interpretation

CO2: **CREATE** a research report on some real life situations by gaining proficiency in using statistical software packages.

4. Course Content:

MODULE I: INTRODUCTION TO RESEARCH METHODS (15 HOURS)

Meaning, objectives and motivation in research, types of research, research approach, significance of research. Research problems: definition, selection and necessity of research problems.

MODULE II: SURVEY ANALYSIS (15 HOURS)

Scaling Techniques: Comparative and Non-comparative,Develop a questionnaire, collect survey data pertaining to a research problem, interpret the results and draw inferences.

5. References:

1. Kothari, C.R. (2009): Research Methodology: Methods and Techniques, 2nd Revised Edition reprint, New Age International Publishers.

2. Kumar, R (2011): Research Methodology: A Step - by - Step Guide for Beginners, SAGE Publications.

6.Syllabus Focus

a)Relevance to Local , Regional , National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
Global	Methods for data collection, analysis, and reporting ensures comparability across studies conducted in different regions. This facilitates meta-analyses and promotes collaboration among researchers worldwide. Researchers can adopt a global approach to statistical techniques that promotes transparency, and inclusivity in research methods across the world.

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University
HYDERABAD-07, TS.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Developing a small scale research.	Proficiency in statistical techniques enhances a researcher's ability to conduct rigorous and impactful research, leading to advancements in knowledge and solutions to real-world problems.

7. Course Assessment Plan

a)Weightage of Marks in Continuous Internal Assessments and End Semester Examination

Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CIA- 20 Marks Small research project	Written Exam

b)Question Paper Pattern

STATISTICAL TECHNIQUES FOR RESEARCH METHODS

Course Code: U24/STA/SEC/502 **Max. Marks: 30**
Credits : 2 **Time: 1 Hr.**

Answer any FIVE questions out of SEVEN. **5X6=30M**

1. Briefly describe the different steps involved in a research process.
2. What is the necessity of defining a research problem? Explain.
3. Describe the different types of research.
4. Distinguish between research methods and Research methodology.
5. Write a short notes on Likert Scales.
6. What are the guidelines for constructing a Questionnaire?
7. Briefly discuss about comparative scaling techniques.

c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	COs Addressed	Section A (No. of Questions)	Total Marks
1	15	CO-1	3	15
2	15	CO-2	3	15