

SEMESTER - VI

ACTUARIAL 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.

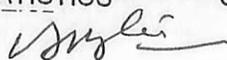
Reference Books:

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 of 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	Actuarial statistics	Actuarial 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

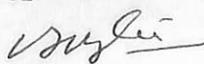
2. Course Outcomes:

- 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



4. ABSTRACT Question Paper pattern

ACTUARIAL 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
<p>Name and Signature of the teaching faculty</p> <p><i>Dr. Ch. Yuganshan</i></p>	<p>Name and Signature of HoD</p> <p><i>Dr. Ch. Yuganshan</i></p> <p><i>[Signature]</i></p>	<p>Name and Signature of Principal</p> <p><i>[Signature]</i></p>

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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 :

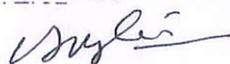
On completion of the course the student will be able to:

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 index numbers. 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:** Crude 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 and Net reproductive rate. Life tables, construction and uses of life tables and abridged life tables.

5. References:

1. 1. Montgomery, 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.

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

Credits : 4

Max. Marks: 60

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 it 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?

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

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.

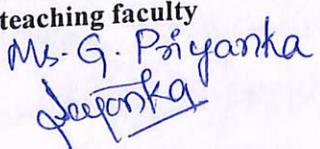
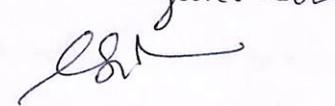
Year	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Sales	19.3	20.9	17.8	16.1	17.6	17.8	18.3	17.3	21.4	19.3	18.1	19.5	19.2	22.2	20.9	21.5	21.9

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 	Name and Signature of HoD Dr. Ch. Yugandhar 	Name and Signature of Principal 

SEMESTER - VI

COMPLEX VARIABLES

1. Course Description

Programme: B.Sc.

Course Code: U24/MAT/DSE/601

Course Type: DSE I

No. of credits:4

Max. Hours: 60

Hours per week: 4

Max. Marks: 100

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)**

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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.

Section 15.1 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**

Taylor's Series and Laurent's Series- Taylor'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.

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5. References

1. Engineering 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", Birk Hauser, Springer Basel AG 2011.
5. J.N. Sharma 2013 "Functions of a Complex Variable", Krishna Prakashan Media Pvt Ltd, Meerut.



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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)	

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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 $\lim_{z \rightarrow 0} f(z)$ 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 C is $|z| = 3$.

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 $\lim_{z \rightarrow 1} f(z) = \frac{i}{2}$, 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 $y = \pm 2$.

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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.

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**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 $\lim_{z \rightarrow 0} f(z)$ 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 $f(z) = \begin{cases} \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}, & z \neq 0 \\ z = 0 \end{cases}$, 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**DATABASE MANAGEMENT SYSTEMS PRACTICAL****1. Course Description**

Programme : BSC	Max. Hours : 30
Course Code : U24/ECM /DSE/601 /P	Hours per week : 2
Course Type : DSC	Max. Marks : 50
No. of credits : 1	

2.Course Objective:

1. This course provides the student with a study of database design and implementation

3.Course Outcomes:

- CO1:** Learn and apply structured query language (SQL) for database definition and database manipulation.
- CO2:** Implement Basic DDL, DML and DCL commands
- CO3:** Use Aggregate and group functions to summarize data
- CO4:** Join multiple tables using different types of joins.

4. Suggested Exercises:

1. Introduction to SQL – Creation of Database, DML, DDL, DCL
2. Creating Tables with Primary Key, Foreign Key and other constraints-Inserting
3. Records, Simple SELECT
4. SELECT with WHERE clause using Operators - Arithmetic, Relational, Comparison, Character, Miscellaneous and Set Operators.
5. Functions - Aggregate, Math, String & Date Functions
6. Practice on SELECT with WHERE clause using – Relational Operators, AND, OR, IN, BETWEEN, LIKE, NOT
7. ORDER BY, DISTINCT clause - Use Order by Clause to arrange the data in ascending or descending order GROUP BY with HAVING Clause
8. Altering the table structure-ALTER command and DROP command.
9. DML Commands - Updating table entries, Deleting table entries
10. JOINS - extracts information from two or more tables.
11. SUBQUERIES – extracts information from the tables



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SEMESTER - VI

ECONOMICS OF EDUCATION AND HEALTH (SEC-4)

1. Course Description

Programme:	BA	Max. Hours:	30
Course Code:	U24/ECO/SEC/601	Hours per week:	2
Course Type:	SEC	Max. Marks:	50
No. of credits:	2		

2. Course Objectives

1. Provide an understanding of the role of health economics in health care decision making.
2. Introduce and explain various concepts and dimensions of decision making in the health sector and health care management.
3. Apply various evaluation techniques to analyse the health outcomes.

3. Course Outcomes

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

CO1: Understand the working of the Education sector and Policies related to it

CO2: Understand the working of Health sector and the policies related to it.

4. Course Content

MODULE I: INTRODUCTION TO HUMAN RESOURCE DEVELOPMENT 15HRS

1. Introduction to Human Capital, meaning and Forms
2. Importance and Role of Human Resource Development
3. Education in India and development of Human Recourse
4. Education Policy in India

MODULE II: HEALTH ECONOMICS 15 HRS

1. Demand and Supply in Health care
2. Cost of Health care
3. Health care service markets
4. National Health Policy
5. Health protection schemes

5. References

7. S. K .Misra&V.K.Puri, *Indian Economy*, Himalaya publishing house
8. Dutt&Sundaram, *Indian Economy*, S Chand publishing house
9. P K Dhar, *Indian economy*, Kalyani Publishers
10. R K Mishra and V K Puri, *Indian economy its development and experience*, Himalaya publishing house
11. A N Agarwal, *Indian economy*, Sterling Publisher
12. .N.K. Anand & Shikha Goel , "Health Economics" AITBS Publishers , India
13. Dr.TusharR.Hathi "Health Economics ,vista Publisher,India.

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6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
National	The students learn about the Health and Education and its and the policies in India

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
EMP	Module I	Case Study
SD	Module 2	Presentation

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Seminar Presentation	Participative Learning
2.	Case studies	Problem Solving
3.	Group Discussion	Participative Learning

8. Course Assessment Plan

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

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	Case study	Written Exam
CO2	Presentations	

b) Model Question Paper- End Semester Exam

HEALTH AND EDUCATION

SECTION A - INTERNAL CHOICE			5 Q X 6 M = 30 M	
Question Number	Question	Question	CO	BTL(Blooms Taxonomy Level)
1	Module 1	What is meant by Human Resource and explain its forms	CO 1	BL 2
2	Module 1	Explain the role of Human resource in Development	CO 1	BL 2
3	Module 1	Write about the Education Policy in India	CO 1	BL 2
4	Module 2	Explain the demand and supply of Health care	CO 1	BL 2
5	Module 2	Explain about the Health protection schemes	CO 2	BL 2
6	Module 2	Write about the National Health Policy	CO 2	BL 2
7	Module 2	Explain the cost of Health care in India	CO 2	BL 2

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SEMESTER - VI

HISTORY OF ECONOMIC THOUGHT

1. Course Description

Programme: B.A

Course Code: U24/ECO/DSE/602

Course Type: DSE

No. of credits:4

Max. Hours: 60

Hours per week:4

Max. Marks:100

2. Course Objectives

- To Orient about of different school of Economic thoughts
- To focus on the Evolution of Indian School of Economic Thought.

3. Course Outcome :

CO1 :To provide a survey of Economic Theories

CO2: To Give Opportunity to learners to study and analysis economics Ideas

CO3 : To enable understanding of Major contributions to Economics

CO4: To understand Indian school of Economic Thought.

Course Content:**MODULE I: Genesis of Economics and Early Schools of Thought – 15 Hours**

1. Introduction to History of Economic Thought.
2. Mercantilism – Traders and trade policy, surplus, role of government
3. Physiocracy – Agriculture, land and surplus, taxation
4. Economic Ideas of Aristotle and Plateau

MODULE II: Classical School of thought 15 Hours

1. Adam Smith – Wealth of nations, Division of labour & specialization, Theory of Invisible hand and Self-interest.
2. David Ricardo – Theory of distribution & Diminishing returns.
3. R.T. Malthus – Population theory
4. J.B. Say - law of market
5. J.S. Mill – reciprocal demand

MODULE III: Socialist , Marxian and Keynes School of thought 15 Hours

1. Marxian Political Economy: stages of development
2. Theory of surplus value
3. Theory of capitalist crisis
4. Keynesian concept of Welfare State
5. Post-Keynesian developments – monetarism, rational expectation school.

MODULE IV: Indian Economic Thought 15 Hours

1. Kautilya – Role of state, Taxation, Foreign trade, Good governance.
2. D.B. Naoroji – Economic nationalism, Brain drain, Poverty.
3. B.R Ambedkar – Caste system in India & Division of Labourers, Golden path of development – Balance between Public and Private sectors.
4. M.K. Gandhi – Environmentalism, Self-reliance, Distinction between ‘Standard of living’ and ‘Standard of life’, Rural development


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5. Reference :

1. Haney ,Louise H ,*History of economic Thought* , the Macmillan Company , New York
2. Eric Roll ,*History of Economic thought* , Faber & Faber; 5 Rev Sub edition ,1992
3. AK Das Gupta, Indian Economic Thought, Deep& deep Publications Pvt. Ltd, New Delhi, 2006
4. Brue SL and RR Grant, *The evolution of Economic thought* , Dryden Pr; 5th edition,2007
5. Bhatia H.L,*History of Economic Thought*.,VikasPublishilg House .2010
6. Ganguly B.N. – Indian Economic Thought, Tata McGraw-Hill Publishing, New Delhi, 1978

6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	To Understand theoretical frame work of the Global Economic development Need .

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module III and IV	Presentations

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

8. Course Assessment Plan**a) Weight age of Marks in Continuous Internal Assessments and End Semester Examination**

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	CIA-1	End Semester examination
CO2	CIA-1	
CO3	CIA-2 Presentation	
CO4	CIA-2 Assignment	

b) Model Question Paper- End Semester Exam

SECTION A - INTERNAL CHOICE			4 Q X 10 M = 40 M	
Question Number	Question	Question	CO	BTL(Blooms Taxonomy Level)
1	Module 1	Explain Economic Ideas of Aristotle	CO 1	BL 2
2	Module 1	Illustrate with an Physiocracy – land development	CO 1	BL 2
3	Module 2	Explain Ricardian theory of Distribution.	CO 2	BL 4
4	Module 2	Analyze Malthus – Population theory	CO 2	BL 4
5	Module 3	Explain Theory of capitalist crisis	CO 3	BL 2
6	Module 3	Explain Theory of surplus value	CO 3	BL 2
7	Module 4	Explain D.B. Naoroji – Drain Theory	CO 5	BL 2
8	Module 4	Write about economic ideas of Dr. Ambedkar	CO 5	BL 2
SECTION B - ANSWER ANY 4 OUT OF 6			4Q X 5M = 20 M	
9	Module 1	Write about Ideas of Mercantilists	CO 1	BL 1
10	Module 2	J.B. Say - law of market	CO 2	BL 1
11	Module 3	Write Important ideas Veblen, and A.C. Pigou,	CO 3	BL 1
12	Module 4	Keynesian concept of Welfare State	CO 4	BL 1
13	Any Module	Difference between classical and neo-classical approach.	CO 2	BL 1
14	Any Module	Importance contributions of Adam Smith	CO 1	BL 1

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SEMESTER - VI

INTERNATIONAL ECONOMICS

1. Course Description

Programme:	BA	Max. Hours:	60
Course Code:	U24/ECO/DSE/601	Hours per week:	4
Course Type:	DSE	Max. Marks:	100
No. of credits:	4		

2. Course Objectives

- This course enables the students provides knowledge about various Trade Theories
- This course enables the student to understand Foreign Exchange and the working and present scenario of the International Economic Institutions

3. Course Outcomes

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

- CO1 Understand the theories of international trade
- CO2 Acquire knowledge about trade policies
- CO3 Examine the working of international finance
- CO4 Evaluate various economic international bodies and their performance

4. Course Content**MODULE I : Theories of International Trade****15 Hours**

1. Theory of absolute cost advantage
2. Ricardo's theory of comparative cost advantage
3. Heckscher-Ohlin theory of trade
4. Leontief paradox
5. Trade as an engine of growth

MODULE II : International Trade policy**15 Hours**

1. Terms of Trade -Net ,Gross and Income terms of trade
2. Free trade vs. restrictive trade policy
3. Barriers to trade – tariff and non-tariff barriers
4. Dumping and Anti-Dumping
5. Foreign Trade Policy

MODULE III: International Finance**15 Hours**

1. Balance of trade and Balance of payments- Current account and capital account transactions.
2. Causes for Disequilibrium in Balance of payments, effects and adjustment mechanisms.
3. Foreign exchange market- functions, Exchange rates- Fixed and Flexible Exchange Rates .exchange rate Regime and Practice
4. Exchange control: objectives and Methods of exchange control

MODULE IV: Economic Integration**15 Hours**

1. Economic Integration – Meaning and Forms
2. Customs Union- Meaning and Forms
3. International institutions: General Agreements on Trade and Tariffs (GATT), World Trade Organization(WTO), International Monetary Fund (IMF), International Bank for Reconstruction and Development (IBRD) and World Bank
4. Trading Blocks: European Union (EU), Organization of Petroleum Exporting Countries(OPEC), South Asian Association for Regional Corporation (SAARC), and Association of South East Asian Nations (ASEAN)

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5. References

1. Cherunilam, Francis; *International Economics*; Fifth Edition; Mc Graw Hill Publications.
2. Dwivedi DN, *International Economics*, Vikas Publication, Delhi, 2013
3. Mannur, H. G (1998) *International Economics*, Vikas Publication, Delhi, 2000
4. Paul R. Krugman & Maurice Obstfeld *International Economics Theory and Policy*. Pearson Education Publication New Delhi, 2009
5. Paul R. R., *Monetary Economics*, Kalyani Publications, 2005
6. Rana K. C and Verma, *International Economics*, Vishal publishing Co, 2013
7. Salvatore, D. *International Economics*, Prentice Hall, Upper Saddle, NJ. New York. 1997
8. Soderston, Bo (1991), *International Economics*, The McMillian Press Ltd. London

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	The students learn about trade policies, international Finance and international organisations

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
EMP	Module I	Case Study
SD	Module	Presentation

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

8. Course Assessment Plan**a) Weight age of Marks in Continuous Internal Assessments and End Semester Examination**

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	CIA-1	End Semester examination
CO2	CIA-1	
CO3	CIA-2 Presentation	
CO4	CIA-2 Assignment	

b) Model Question Paper- End Semester Exam

SECTION A - INTERNAL CHOICE		4 Q X 10 M = 40 M		
Question Number	Question	Question	CO	BTL(Blooms Taxonomy Level)
1	Module 1	Explain the Heckscher-Ohlin theory of trade	CO 1	BL 2
2	Module 1	Illustrate with an example the theory of comparative cost advantage	CO 1	BL 2
3	Module 2	Explain the tariff and non tariff barriers of trade	CO 2	BL 4
4	Module 2	Analyze the importance of Free trade and Restrictive trade Policy	CO 2	BL 4
5	Module 3	Interpret the adjustment Mechanism for Disequilibrium on Balance of Payments	CO 3	BL 2
6	Module 3	Support India's stand for adopting flexible exchange rate policy	CO 3	BL 2
7	Module 4	Compare the functioning of SAARC and ASEAN	CO 5	BL 2
8	Module 4	Illustrative the measures taken by WTO to regulate and facilitate international trade	CO 5	BL 2
SECTION B - ANSWER ANY 4 OUT OF 6		4Q X 5 M = 20 M		
9	Module 1	Explain trade as an engine of growth	CO 1	BL 1
10	Module 2	What is dumping and explain Anti dumping measures	CO 2	BL 1
11	Module 3	Write about the methods of exchange control	CO 3	BL 1
12	Module 4	Write about the working of IMF	CO 4	BL 1
13	Any Module	Explain the function of SAARC	CO 5	BL 1
14	Any Module	Write about the terms of trade	Applicable CO	BL 1

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SEMESTER VI

LOGIC AND SETS

1. Course Description

Programme : B. Sc
Course Code : U24/MAT/SEC/601
Course Type : SEC IV
No. of credits : 2

Max. Hours : 30
Hours per week : 2
Max. Marks : 50

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)**

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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.

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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

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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° ."
5. Define power set. Construct power set for the set $C = \{1, 2, 3, 4\}$.
6. Simplify the expression $\overline{(A \cup B) \cap C} \cup \overline{B}$.
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) $\Pr(x \leq 4)$ b) $\Pr(1 \leq X \leq 3)$

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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)**

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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

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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** Elsevier 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.**

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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 Cryptography.

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)	

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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

- Find a real root of the equation $x^3 - 2x - 5 = 0$ using Bisection Method.
OR
- Use the Newton –Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$.
- 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

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

x	y
0	-12
1	0
3	12
4	24

- Find the values of a_0 and a_1 so that $Y = a_0 + a_1x$ 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 $\Delta^n u_{x-n} = u_x - nu_{x-1} + n(n-1)/2 u_{x-2} + \dots + (-1)^n u_{x-n}$.
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.



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NUMERICAL ANALYSIS**PRACTICAL****Programme: B.SC.****Max. Hours: 30****Course Code: U24/MAT/DSE/602/P****Hours per week: 2****Course Type: DSE****Max. Marks: 50****No. of credits: 1****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.



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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 $x \sin x + \cos x = 0$ 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 $Y = a_0 + a_1x$ 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: BA
 Course Code: U24/ECO/PRJ/601
 Course Type: Project
 No. of credits: 4

Hours per week: 4
 Max. Marks: 100

2 Course Objective:

- The project provides practical experience in understanding the working of the Economy, which will inculcate a spirit of Research and enquiry among the students.

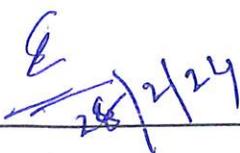
3 . Course Outcome:

Enables the students to:

CO1 Gain knowledge about the objectives, measures and the loopholes of the Economy through her practical study

CO2 Apply various statistical tools to analyze the data

- The project is on Indian Economy
- Open to all students of BA with Economics as Specialization
- Evaluation Includes: Submission of the project and viva

Prepared by	Checked & Verified by	Approved by
Name and Signature of the teaching faculty	Name and Signature of HoD	Name and Signature of Principal
		





DEPARTMENT OF ECONOMICS, ST. FRANCIS COLLEGE FOR WOMEN, HYDERABAD


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SEMESTER VI

STATISTICAL TECHNIQUES FOR RESEARCH METHODS

1. Course Description

Programme: B.Sc

Max Hours: 30

Course Code: U24/STA/SEC/502

Hours per week: 2

Course Type: SEC -4

Max Marks: 50

No. of Credits : 2

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.

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
Credits : 2

Max. Marks: 30
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