SEMESTER - IV

MONEY AND BANKING

1. Course Description

Programme: BA   Max. Hours: 60
Course Code: U24/ECO/DSC/401   Hours per week: 4
Course Type: Core   Max. Marks: 100
No. of credits: 4

2. Course Objectives

- This course exposes students to the theory and functioning of the monetary and financial Sectors of the economy.
- This course enables the students to understand the working of the banking institutions

3. Course Outcomes

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

CO1: Gain knowledge about theories, organization, structure and role of money markets and capital markets

CO2: Understand the working of the financial sector

CO3: Illustrate the role of various Banks and evaluate their performance

CO4: Analyse Modern banking of India

4. Course Content

MODULE I - Money: meaning definition and theories   **15 Hours**

1. Money: meaning definition and types of money
2. Functions, role and attributes of money
3. Cash transactions, and cash approaches to money, value of money
4. Keynes theory of money
5. Friedman's restatement of quantity theory of money

MODULE II – Financial sector   **15 Hours**

1. Money and capital markets in India
2. Structure, functions and significance of capital markets
3. Securities and Exchange Board of India (SEBI): powers and functions;
4. Non-Bank financial intermediaries- role and significance
5. Recent financial sector Policy in India.

MODULE III– Banking   **15 Hours**

1. Banking: definitions and types of Banks - Industrial Bank of India(IDBI), Export Import Bank of India(EXIM), National housing Banks(NHB'S), Small industries bank of India (SIDBI)
2. Commercial banks their functions and credit creation
3. Central Banks: functions and methods of credit control
4. Co-operative credit societies
5. Recent monetary policy of Reserve Bank of India

MODULE IV - Modern Banking in India   **15 Hours**

1. Social Responsibility of banks
2. Innovative Banking
3. Customer Services in Banking
4. Use of Information Technology in Banking

5. References:

1. Bhatia H L, Pubic *Finance;* Sage Publications, 2008
2. H. L. Ahuja ,*Modern Economic Theory*, S. Chand and company Ltd, 2014
3. M. L. Jhingan, *Money, Banking, and International trade* , Vrinda publishers,2014
4. Musgrave and Musgrave, *Public finance Theory and practice*, McGraw-Hill Inc, 2007
5. R.R. Paul , *Money, Banking, and International trade.*, kalyani publication ,2014
6. R.K. Lekhi ,*Public finance* , kalyani publications,2015
7. Sundaram, Varsheny and Maheshwari ,*Money, Banking, and International trade* , Sultan Chand and sons
8. Misra, S.k. and Puri, V.KIndian Economy; Himalaya Publishing House..201

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
National	The students gain knowledge about the financial sector, Banking in the county and also about the modern banking system of India

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) Weightage 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	

SEMESTER IV
OBJECT ORIENTED PROGRAMMING AND GUI WITH PYTHON

1. **Course Description**

   Programme   : BSC

   Course Code : U24/ECM/DSC/401 /P

   Course Type : DSC

   No. of credits : 1

   Max. Hours   : 30

   Hours per week : 2

   Max. Marks   : 50

Course Objective:

To introduce sequences, GUI and OOP through Python programming

Course Outcomes:

CO1: Write Python programs using sequences and their methods
CO2: Apply the principles of OOP
CO3: Develop GUI programming

1. Lists and Tuples:
   a. Sequences
   b. Basic Lists
   c. List slicing
   d. Finding Items in Lists with the in Operator
   e. List Methods and Useful Built-in Functions
   f. Copying Lists
   g. Processing Lists
   h. Two-Dimensional Lists and Tuples.
2. Strings
   a. Basic String Operations
   b. String Slicing
   c. String Searching
   d. Manipulating Strings.
3. Dictionaries and Sets: Dictionaries, Sets.
4. Recursion: Problem Solving with Recursion.
5. Object-Oriented Programming:
   a. Classes
   b. Working with Instances
   c. Inheritance
   d. Polymorphism.
6. GUI Programming:
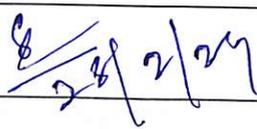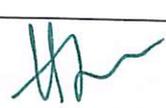
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Head
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a. Using the tkinter Module
b. Display text with Label Widgets
c. Organizing Widgets with Frames
d. Button Widgets and Info Dialog Boxes
e. Getting Input with Entry Widget
f. Using Labels as Output Fields
g. Radio Buttons
h. Check Buttons.

Prepared by Course Teacher [Name & Signature]	Checked &Verified by HoD / Programme Coordinator [Name & Signature]	Approved by the Principal
28/2/24	28/2/24	

28/2/24

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SEMESTER - IV

PUBLIC ECONOMICS (SEC-2)

1. **Course Description**

    Programme: BA   Max. Hours: 30
    Course Code: U24/ECO/SEC/401   Hours per week: 2
    Course Type: SEC   Max. Marks: 50
    No. of credits: 2

2. **Course Objectives**

    *   To orient students about the public sector and its functioning in general and issues pertaining to the public finances in particular.

3. **Course Outcomes**

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

CO1: Discuss the basic tenets of tax structure and assess associated economic issues of policy relevance

CO2: Assess the working of public expenditure and the concept of Public Debt

4. Course Content

MODULE I: Budget and Indian Tax System

1. Budget – Classification of budgets ,Types of Deficit Budget
2. Introduction to Indian Tax Structure- Central and State Government Taxes .

MODULE II: Public Expenditure and Public Debt

1. Introduction -Classification of Public Expenditure and Revenue Expenditure
2. Capital Expenditure, Trends in expenditures
3. Classification of Public Debt
4. Role of Debt Finance, Problems and Issues of Public Debt

5. References

1. Bhatia H L, Pubic *Finance;* Sage Publications, 2008
2. Musgrave and Musgrave, *Public finance Theory and practice*, McGraw-Hill Inc, 2007
3. R.K. Lekhi ,*Public finance* , Kalyani publications,2015
4. Misra, S.k. and Puri, V.K Indian Economy; Himalaya Publishing House..2014

6.Syllabus Focus

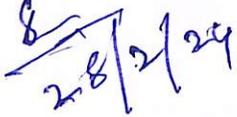a)Relevance to Local , Regional , National and Global Development Needs

Local /Regional/National /Global Development Needs	Relevance
National	The students learn about the tax structure and classification of Public expenditure and Public Debt

4. Course Content

1. Correlation: Meaning and Types – Karl Pearson's Correlation Co-efficient – Spearmen's Rank

2. Regression: direct method, arithmetic mean method and deviation method, Regression lines for equations and correlation table, Standard error of estimate

3. Index Numbers Types of Index Numbers –Methods of Index Numbers - Laspayer, Paasche and Fisher.

4. Analysis of Time Series-Components of Time Series Analysis: Secular, Seasonal, Cyclical and Irregular Variations

5. Methods of Measurement of Secular Trends: Graphic, Semi-Averages, Moving Averages

Prepared by Course Teacher [Name & Signature]	Checked &Verified by HoD / Programme Coordinator [Name & Signature]	Approved by the Principal
2.8/2/24	Head 8/2/24 Dept. of Economics St.Francis College for Women (Autonomous) Begumpet, Hyderabad-16.	

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SEMESTER - IV

REAL ANALYSIS

1. Course Description

Programme : B.Sc

Course Code : U24/MAT/DSC/401

Course Type : DSC IV

No. of credits : 4

Max. Hours : 60

Hours per week : 4

Max. Marks : 100

2. Course Objectives

- To equip students for higher study in mathematics and related fields by giving them a strong foundation in the ideas and methods of real analysis.
- Utilise real analysis principles to address issues in Computer Science, Engineering, Physics, and Economics, among other disciplines.

3. Course Outcomes

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

CO 1: Discuss the convergence and divergence of the sequences and series. (**DISCUSS**)

CO 2: Apply the concepts to find maximum and minimum values of functions and to

expand functions as power series. (**APPLY**)

CO 3: Analyse the continuous and differential functions' Mean Value Theorems. (**ANALYSE**)

CO 4: Evaluate the integral values of basic functions using fundamental theorem of calculus.

(**EVALUATE**)

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4. Course Content

MODULE I: (16 HRS)

SEQUENCES AND SERIES

Limits, Sequences, A Discussion about Proofs , Limit Theorems for Sequences, Monotone Sequences and Cauchy Sequences, Subsequences,
Series, Alternating series and Integral Tests.

<div align="right">

Sections: 7 to 11, 14, 15.
Pg No's 63-74, 90-105

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MODULE II: (16 HRS)

CONTINUITY

Continuous Functions, Properties of Continuous Functions, Uniform Continuity, Limits of Functions, Power series

<div align="right">

Sections: 17 to 20, 23
Pg No's 115 -137 and 146-156 and 171-177

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MODULE III: (15 HRS)

DIFFERENTIATION

Basic Properties of the derivative, The Mean Value Theorem, L'hospital Rule, Taylor's Theorem.

<div align="right">

Sections: 28 to 31
Pg No's 205-241

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MODULE IV: (13 HRS)

INTEGRATION

The Riemann Integral - Properties of Riemann Integral ,Fundamental Theorem of Calculus

<div align="right">

Sections: 32 to 34
Pg No's 243 – 268

</div>

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5. References

1. Kenneth A Ross, Elementary Analysis-The Theory of Calculus
2. William F. Trench, Introduction to Real Analysis
3. Lee Larson , Introduction to Real Analysis I
4. Shanti Narayan and Mittal, Mathematical Analysis
5. Brian S. Thomson, Judith B. Bruckner, Andrew M. Bruckner; Elementary Real analysis
6. Sudhir R, Ghorpade, Balmohan V, Limaye; A Course in Calculus and Real Analysis
7. B.Sc. Second Year Mathematics, Published by Telugu Akademi.

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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	Real analysis is a versatile and fundamental branch of mathematics with applications spanning a wide range of disciplines. Its rigorous methods and concepts provide a solid framework for understanding and solving real-world problems in various scientific, engineering, and economic fields.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 1: Sequences & Series	Plotting a graph using Sage Software
Employability	Module 2: Continuity of functions	Calculation of limit values of functions at a given point.
Skill Development	Module 3 : Differentiation	Verification of Mean value theorems using Sagemath.
Skill Development	Module 4 : Riemann Integration	Calculation of integral values of functions using Geogebra.

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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-1 - Written Exam	Written Exam
CO2	CIA-I(Written Exam)	
CO3	CIA-II (Skill Tests)	
CO4	CIA-II (Assignments)	

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CBCS 2024   **REAL ANALYSIS**

b) Model Question Paper- End Semester Exam

MODEL QUESTION PAPER

THEORY

Course Code: U24/MAT/DSC/401   Max. Marks : 60

No. Of Credits: 4   Max. Time : 2 Hrs

SECTION-A

I. Answer the following   4 x10 = 40 M

1. (a) Define increasing and decreasing sequences. Show that all monotone sequences are convergent.

    (b) Define Cauchy sequence .Show that the sequence $S_n = 1 + \frac{1}{4} + \frac{1}{7} + \cdots .. \frac{1}{3n-2}$ is not a Cauchy sequence.

OR

2. (a) State and prove Bolzano weiestrass theorem.

    (b) Test for the convergence of the series (a) $\sum_{n=0}^{\infty} \frac{1}{2n^3 +1}$, (b) $\sum_{n=1}^{\infty} \frac{1}{3^n +1}$

3. If f be a continuous real valued function on a closed interval [a, b]. then f is bounded function. Moreover f assumes its maximum and minimum values on [a, b].

OR

4. Define uniform continuity. If f is continuous on a closed interval [a, b] then f is uniformly continuous on [a, b].

5. (a) If f and g are differentiable functions at a point a then f + g is also differentiable at point a.

    (b) Using the definition of derivative calculate the derivative of the following functions .
       (i) $f(x) = x^3$ at x = 2,   (ii) $f(x) = x^2 cosx$ at x= 0

OR

6. (a) State and prove Rolle's Theorem,

    (b) Show that $x < tanx \ \forall \ x \in (0, \pi/2)$

7. A bounded function f on [a, b] is integrable if and only if for each $\in > 0$ there exists a partition of [a, b] such that $(f, P) - L(f, P) < \in$.

OR

8. (a) Calculate $\lim_{x \to 0} \frac{1}{x} \int_0^x e^{t^2} \ dt$.

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(b) If f be a function defined on [a, b] and a < c < b such that f is integrable on [a, c] , f is integrable on [c, b] then f is integrable on [a, b] and $\int_a^b f = \int_a^c f + \int_c^b f$

SECTION –B

II. Answer any FOUR   4 x 5 = 20 M

9. Prove using limit theorems lim $\frac{3n+7}{6n-5} = \frac{1}{2}$.

10. Using integral test show that the series $\sum \frac{1}{n^p}$ converges if p > 1.

11. If f(x) = 1 for irrational numbers of x and f(x) = 0 for irrational numbers of x, then show that f is discontinuous at every S in R.

12. Show that the equation $x \log x = 2 - x$ is satisfied by atleast one value of x lying between 1 and 2.

13. Find $\lim_{x \to \frac{\pi}{4}} tanx^{tan2x}$

14. Every monotonic function f on [a, b] is integrable.

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REAL ANALYSIS
PRACTICAL

Programme : B.SC.

Course Code : U24/MAT/DSC/401/P

Course Type : DSC IV

No. of credits : 1

Max. Hours : 30

Hours per week : 2

Max. Marks : 50

Course Outcomes:

- Test the convergence or divergence of a given sequence/series.
- Analyze the behavior of functions with regards to continuity, differentiability and integrability.

PRACTICAL SESSIONS

1. Limit of sequences and Monotone Sequences
2. Cauchy Sequences and Subsequences
3. Series.
4. Alternating Series and Integral Tests.
5. Continuous functions and Uniform Continuity.
6. Limits of functions.
7. Derivatives.
8. The Mean Value Theorems.
9. L-Hospital's Rule.
10. Riemann Integrals.

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CBCS 2024   **REAL ANALYSIS**

MODEL QUESTION PAPER
PRACTICAL

Course Code: U24/MAT/DSC/401/P   **Max. Marks : 30**

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

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

1. Determine whether it converges and if it converges, give its limit.

   (i) $a_n = \dfrac{n}{n+1}$ (ii) $b_n = \dfrac{n^2+3}{n^2-3}$

                                          OR

2. Using cauchys general principle of convergence show that the sequence
   $S_n = 1 + \dfrac{1}{2} + \dfrac{1}{3} + \cdots + \dfrac{1}{n}$ cannot converge.

3. Show that the series $\sum_{n=1}^{\infty} \dfrac{n^5}{b^n}$ is convergent if b> 1 and divergent if 0<b≤1.

                                          OR

4. Show that the series $\sum \dfrac{1}{n^p}$ converges, if p>1 and diverges if p≤1 Using Integral Test.

5. Prove that each of the following functions are continuous using $\in -\delta$ property.
   (i) $f(x) = x^2$, $x_0 = 2$
   (ii) $f(x) = \sqrt{x}$, , $x_0 = 0$

                                          OR

6. Show that if $\lim_{x \to a^+} f_1(x) = \lim_{x \to a^+} f_3(x) = L$ and if $f_1(x) \leq f_2(x) \leq f_3(x)$ for all x in some interval (a,b) then $\lim_{x \to a^+} f_2(x) = L$.

7. Let f(x) = $x\sin 1/x$ for x≠0 and f(0)=0. If f differentiable at x=0? Justify your answer.

                                          OR

8. (i) Verify Rolle's theorem for the function f(x)=2+(x-1)$^{2/3}$, x∈[0,2]
   (ii) Show that x<tanx∀x∈(0,π/2).

9. (i) Find $\lim_{x \to \frac{\pi}{4}} \tan x^{\tan 2x}$

   (ii) Find the taylor series for $\cos x$

                                          OR

10. Evaluate the integral $\int_0^1 x\sqrt{1-x^2}\,dx$ Use the change of variables.

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SEMESTER IV
STATISTICAL ANALYSIS USING SPSS

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1. Course Description

Programme: B.Sc   Max Hours: 30

Course Code: U24/STA/SEC/401   Hours per week: 2

Course Type: SEC -2   Max Marks: 50

No. of Credits : 2

2. Course Objectives

- To provide students with the knowledge and skills necessary to effectively utilize SPSS software for statistical analysis.

3. Course Outcomes

On completion of the course the student will be able to

CO1: **APPLY** fundamental statistical concepts such as measures of central tendency, variability, hypothesis testing, and inferential statistics to datasets.

CO2: **UNDERSTAND** and **APPLY** graphical techniques for data visualization in SPSS, including histograms, scatterplots, boxplots, and bar charts.

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4. Course Content:

MODULE – I: Basics of SPSS and Descriptive Statistics   (15 HOURS)

Basics of SPSS – data entry – formation of frequency tables – editing and saving – using built in functions in SPSS – importing data from EXCEL – copy and exporting to MS Word document . Diagrammatic Representation(Bar, Pie, stem & leaf and box plot) ,Graphic Representation of frequency distribution(Histogram , Frequency curve , ogive curves)

Descriptive statistics : Computation of measures of central tendency and dispersion.

MODULE – II: Hypothesis testing   (15 HOURS)

Correlation(Karl Pearson's coefficient of correlation, Rank Correlation) **,** Fitting of a straight line, parabola and exponential curve. Simple regression analysis(X on Y , Y on X).

Large sample tests: Single mean, difference of two means, single proportion, difference of two proportions.

Small sample tests

t-test (single mean, difference of means, paired t-test and correlation coefficient),
F- test for difference of two variances.
Chi-square test (single variance, independence of attributes, Goodness of fit).

5. References:

1. Richard Levin & David S.Rubin (2012): Statistics for Management,7th Edition,Pearson.
2. J K Shrma (2012) ; Business statistics , Second Edition- Pearson Education.
3. Andy field (2013) : Discovering statistics using IBM SPSS statistics ,4th Edition , SAGE
4.   Cunningham,B.J (2012) :Using SPSS : An Interactive Hands-on Approach.
5.   K.V.S. Sarma: Statistics made simple: do it yourself on PC

6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	Statistical Analysis using SPSS equips the students with the knowledge and skills necessary to conduct statistical analysis using the SPSS software, thereby enhancing their analytical capabilities and decision-making skills.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Data representation and Hypothesis testing.	Using SPSS software

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8. 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 Assignment/Problem solving	Written Exam

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b)Question Paper Pattern

STATISTICAL ANALYSIS USING SPSS

Course Code: U24/STA/SEC/401   Max. Marks: 30
Credits : 2   Time: 1 Hr.

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

1. A computer company received a rush order for as many home computers as could be shipped during a six week period. Company records provide the following daily shipments.

22 65 65 67 55 50 77 73 30 62 54 48 79 60 63 45 51 68 83 33 41 49 28 55 65 75 55 75 39 87 50 66 65 59 25 35

(a) Find mean,mode, variance and range using EXCEL and SPSS.

(b) Calculate lower and upper quartiles, P_{38} , P_{67} and P_{87} using EXCEL and SPSS.

© Consturct a box plot and stem and leaf diagram using SPSS.

2. Gillete fianancial statement summary presented the following particulars regarding sales and operating income in crores(rupees) for the years 1999-2003.

Items	Years				
	1999	2000	2001	2002	2003
Net Sales	8324	8310	8084	8453	9250
Operating income	2087	1512	1498	1009	2003

Draw a multiple bar diagram using EXCEL and SPSS.

3. Two independent groups of 12 children were tested to find how many digits could repeat from memory after hearing them. The results are as follows:

A	288	286	258	266	248	257	244	259	262	250	271	250
B	310	286	307	328	366	391	317	326	377	397	314	321

Using EXCEL, test if the difference between mean scores of the two groups is significant or not?

4. Fit a straight line trend to the following data using EXCEL.

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Value	342	350	361	375	392	351	340	320	312	308

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5. A study indicated where different age groups primarily get their news.

Media	Age group		
	Under 36	36-50	50 and above
Local TV	107	119	133
National Tv	73	102	127
Radio	75	97	109
Local newspaper	52	79	107
Internet	95	83	76

At 5% level , is there evidence of a significant relationship between the age group and where people primarily get their news. Use SPSS.

6. The following is the data pertaining to the production and export of sugar in lakh tonnes in India from 1991-2002.

Production	37.4	31.1	38.7	39.35	47.9	42.6	48.4	64.6	58.4	38.6	51.4	84
Export	3.90	1.33	1.1	4.39	9.41	9.67	3.41	2.51	8.62	9.9	6.64	6.50

Calculate correlation coefficient and regression lines between production and export using EXCEL AND SPSS.

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

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SEMESTER - IV
TESTING OF HYPOTHESIS

- **Course Description**

Programme: B.Sc   Max. Hours: 60

Course Code: U24/STA/DSC/401   Hours per week: 4 Hrs.

Course Type: DSC 4B   Max. Marks: 100

No. of credits: 4

- **Course Objectives:**

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

- To define steps of testing of hypothesis.
- To differentiate between large and small sample tests.
- To find expected frequency and test the goodness of fit.
- Differentiate between parametric and non parametric tests

Course Outcomes :

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

CO 1: **Memorize** about formulating and testing a hypothesis, using critical values to draw conclusions and **interpret** the probability of making errors in hypothesis tests.

CO2 : **Identification and application** of large sample tests and get an idea of order statistics with its applications.

CO 3 : **Identification and application** about small sample tests based on Chi-square, t and F distributions.

CO 4 : **Understand** and **apply** various methods of Non-parametric tests

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4. Course Content:

MODULE- I : Concepts Of Hypothesis   (15 HOURS)

Concepts of statistical hypothesis, Null and Alternative hypothesis, Critical region, two types of errors, Level of significance and Power of a test. One and two tailed tests, test function (non-randomized and randomized). Statement and proof of Neyman- Pearson's fundamental lemma for randomized tests. Examples in case of Binomial, Poisson, Exponential and Normal distributions and their power of the test functions.

MODULE- II : Large sample tests   (15 HOURS)

Large sample tests for single mean, difference of means, single proportion, difference of proportions and difference of standard deviations. Fisher's Z- transformation for population correlation coefficient(s) and testing the same in case of one sample and two samples. Definition of order statistics and statement of their distributions.

MODULE- III: Small sample Tests   (15 HOURS)

Tests of significance based on Chi-square, t and F distributions: Chi-square test for Population Variance, Goodness of fit & test for independence of attributes. t-test for single mean ,difference of means, paired t-test, correlation coefficients. F-test for Population Variances.

MODULE-IV : Non parametric tests   (15 HOURS)

Comparison of Parametric & Non-parametric tests, their advantages and disadvantages. Run test, Sign test and Wilcoxon Signed rank test for one sample and paired samples. Tests for independent samples: Median test, Wilcoxon Mann-Whitney U-test, Wald- Wolfowitz's runs test (small & large samples).

5. References

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I& II, 8th Edn. The World Press, Kolkata.

2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statisticswith Applications, (7th Edn.), Pearson Education, Asia.

3. V.K.Kapoor and S.C.Gupta(2010): Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi

4. William Feller: Introduction to Probability theory and its applications. Volume- I, Asian Publishing House, Bombay.

5.Hoel P.G: Introduction to mathematical Statistics(1962), Asia Publishing house.

6.Syllabus Focus

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

Local /Regional/National /Global Development Need	Relevance
Global	Hypothesis testing is applied in medical trials to assess the effectiveness of new treatments or interventions. Large sample tests are used in market research, helping the marketers to make informed decisions about product development, pricing strategies, and advertising campaigns. Small sample tests are applied in educational research. Researchers may conduct small-scale experiments with a limited number of students and use statistical tests to evaluate the impact of the interventions on learning outcomes.

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b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
ED	Testing of hypothesis	Hypothesis testing enhances employability in data analysis roles including statistical analyst, data scientist, research analyst, quality assurance control, health care and bio statistics , policy analyst, operations analyst who can effectively analyse data, draw meaningful conclusions and make evidence based decision, making proficiency in testing a valuable asset in the job market.

7. Pedagogy

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

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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/Assignment	
CO4	CIA-2 MCQ test	

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b) Model Question Paper- End Semester Exam

TESTING OF HYPOTHESIS

THEORY

Course Code: U24/STA/DSC/401   **Max. Marks:60**
Credits : 4   **Time: 2 Hrs.**

SECTION –A (Essay Questions)
I. Answer the following   **4x10=40Marks**

1. Define test function. State and prove NP Lemma in the case of continuous distribution
   OR

2. Obtain the best critical region for testing $H_o: \mu = \mu_o$ against $H_1: \mu = \mu_1$ for the normal distribution
3. Explain fisher's Z transformation and write about its applications
   OR

4. i)Explain the test procedure for testing the significance for single proportion
   (ii) A random sample of 500 apples was taken from a large consignment and 60 were found to be bad. Obtain 98% confidence limits for the percentage of bad apples in the consignment.

5. i)Explain t-test procedure for testing the significance of correlation coefficient.   (ii) A bivariate random sample of 27 pairs of observations from a normal population gave a correlation coefficient of 0.6. Is this significant of correlation in the population
   OR
6. For the 2x2 table prove that χ^2 test of independence give $\chi^2 = N(ad-bc)^2 /(a+c)(b+d)(a+b)(c+d)$, N=a+b+c+d.
7. Define a 'run' and the length of a run. Explain the Wald Wolfowitz run test for testing the equality of two distribution functions.
   OR

8. Distinguish between parametric and non parametric test. What are the assumptions of non parametric test.

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SECTION-B

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

9. If $x \geq 1$ is the critical region for testing $H_o: \theta=2$ against the alternative $\theta=1$, on the basis of the single observation from the population $f(x,\theta)=\theta e^{-\theta x}$; $0 \leq x < \alpha$, Obtain the values of type I and type II errors.
10. Explain the large sample procedure for testing correlation coefficient.
11. Explain the procedure for paired t – test.
12. Define chi square test . Explain the validity of chi square test.
13. Explain about Sign test for one sample.
14. Explain median test.

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

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SEMESTER IV
TESTING OF HYPOTHESIS PRACTICAL

1. Course Description

Programme : B.Sc

Course Code   :U24/STA/DSC/401/P

Course Type: DSC 4B

No of Credits : 1

No of Hrs allotted: 2Hrs./Week

Max . Marks: 50

2. Course Outcomes:

1. Ability to write the suitable hypothesis and **apply** appropriate testing procedure.

2. Understand the important applications of chi square test and able to **execute** different non parametric tests.

3. Course Content :

List of Practicals

1. Large Sample tests for Proportion(s).
2. Large Sample tests for mean(s), standard deviation(s) and correlation coefficient.
3. Small Sample tests for Mean(s), paired t-test and correlation coefficient.
4. Tests for Variances (Single variance - χ^2 and Equality of variances -F)
5. χ^2 test for Goodness of fit.
6. χ^2 test for Independence of Attributes.
7. Non Parametric tests for one Sample : Run test, sign test and Wilcoxon Signed Rank test.
8. Non Parametric tests for two related Samples : Sign test and Wilcoxon Signed Rank test.
9. Non Parametric tests for two independent Samples – Median test, Mann-Whitney U test, Run test.

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a) Question Paper Pattern

TESTING OF HYPOTHESIS
PRACTICAL

Course Code: U24/STA/DSC/401/P   Max. Marks: 50 (39+5+6)

Credits : 1   Time: 2 Hrs.

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

1. a) A Sample of 400 Male student is found to have a mean height of 67.47 inches. Can it be reasonably regarded as a sample from a large population with mean height 67.39 inches and SD 1.3 inches test at 5% level.

   b) An auditor claims that 10% of customers ledger accounts are carrying mistakes of posting and balancing. A random sample of 600 was taken to test the accuracy of posting and balancing and 45 mistakes were found. Are these sample results consistent with the claim of the auditor?

2. A random sample drawn from 2 metro cities gave the following data relating to heights of Adult males.

	City A	City B
Mean height (in inches)	67.42	67.25
SDs (in inches)	2.58	2.5
No. of samples	1000	1200

Examine Is the difference between i) Means ii) Standard Deviations significant or not at 5% level.

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3. a)Two random samples were drawn from two normal populations and the following results were obtained. Obtain estimates of the variances of populations and test whether the two populations have the same variance?

| Sample 1 | 20 | 16 | 26 | 27 | 23 | 22 | 18 | 24 | 25 | 19 | | |
| Sample2 | 27 | 33 | 42 | 35 | 32 | 34 | 38 | 28 | 41 | 43 | 30 | 37 |

b) A survey of 320 families with 5 children each revealed the following distribution.

No. of Boys	0	1	2	3	4	5
No. of Girls	5	4	3	2	1	0
No. of families	14	56	110	88	40	12

Is the result consistent with the Hypothesis that the Male and Female births are equally probable at 5% level.

4. The following is about noise levels recorded at two busy junctions during morning traffic. Test whether the noise level is same at both places using Mann-Whitney U- test.

Junction A : 69   74   77   59   80   59   71   65   62   79

Junction B : 59   78   53   63   67   63   59   58   64   69   74

SEMESTER - IV

VECTOR CALCULUS

1. Course Description

Programme　　: B.Sc
Course Code　: U24/MAT/SEC/401
Course Type　: SEC II
No. of credits : 2

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

2. Course Objectives

- To provide students a strong foundation in vector calculus and its applications, enabling them to pursue advanced studies in physics, engineering, mathematics, and other relevant subjects.
- To Study fundamental theorems of vector calculus such as Green's theorem, Stokes' theorem, and the divergence theorem, and understand their applications in various fields such as physics and engineering.

3. Course Outcomes

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

CO 1: Discuss gradient of a scalar function, Divergence and Curl of a vector function.

(DISCUSS)

CO 2: Apply Integral theorems- Green's , Stokes and Gauss Divergence on vector functions.

(APPLY)

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4. Course Content

MODULE I   (15 Hrs)

Gradient, Divergence and Curl

Gradient of a scalar field - Gradients, conservative fields and potentials , Physical applications of the gradient Divergence of a vector field- Physical interpretation of divergence, Laplacian of a scalar field. Curl of a vector field- Physical interpretation of curl. Relation between curl and rotation, Curl and conservative vector fields.

Sections- 3.2 - 3.2.1, 3.2.2; 3.3 - 3.3.1, 3.3.2 ; 3.4 – 3.4.1, 3.4.2, 3.4.3 Pg No's 48-64.

MODULE II   (15 Hrs)

Line and Surface Integrals

Line integrals- Introductory example: work done against a force, Evaluation of line integrals, Conservative vector fields, Other forms of line integrals.
Surface integrals- Introductory example: flow through a pipe, Evaluation of surface integrals, Other forms of surface integrals.

Sections- 2.2 – 2.2.1, 2.2.2, 2.2.3, 2.2.4 ; 2.3 – 2.3.1, 2.3.2, 2.3.3 ; Pg No's 25- 44.

5. References

1. P.C. Mattews, Vector Calculus.Springer.
2. Murray R. Spiegel, Ph. D., Seymour Lipshutz, Ph.D, Dennis Spellman, Ph. D. , Schaum's outlines , Vector Analysis(second edition).
3. B. Sc Third Year Mathematics Vector Calculus, Published by Telugu Akademi.

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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	Many domains, including physics, geophysics, computer graphics and animation, medical imaging, economics, and finance, have found extensive uses for vector calculus. It is a fundamental tool in many scientific, engineering, and technology domains due to its adaptability and wide range of applications.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 1	Using Mathematical software Geogebra show the physical interpretation of Gradient , divergence and curl.
Skill Development	Module 2	Using Integral theorems- Green,s , stoke's and Gauss Divergence evaluate the line, surface and volume integrals of the scalar and vector functions.

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7. 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

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b) Model Question Paper- End Semester Exam

VECTOR CALCULUS (SEC)

Course Code : U24/MAT/SEC/401   Max. Marks : 30M

No. Of Credits: 2   Max. Time : 1 Hour

SECTION –A

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

1. (a) Find the unit normal n to the surface $x^2 + y^2 - z = 0$ at the point $(1,1,2)$.

   (b) Show that the vector field F = $(2x + y, x, 2z)$ is conservative .

2. (a) Find the divergence of the vector field $v = (xyz, z^2, x - y)$.

   (b) Find the Laplacian '∇^2 for the scalar field $C = x^2 + xy + yz^2$.

3. Find the angle between the surfaces of the sphere $x^2 + y^2 + z^2 = 2$ and the cylinder $x^2 + y^2 = 1$ at a point where they intersect.

4. (a) Show that the curl are linear operator, i.e. $\nabla \times (c\bar{u} + d\bar{v}) = c\nabla \times \bar{u} + d\nabla \times \bar{v}$

   (b) For what values of the constants a and b such that the vector field
   $u = (y\cos x + axz, b\sin x + z, x^2 + y)$ is irrotational.

5. Evaluate the line integral $\int_C F \cdot d\bar{r}$ where $F = (5z^2, 2x, x + 2y)$ and the curve C is given by $x = t, y = t^2, z = t^2, 0 \leq t \leq 1$.

6. Evaluate the line integral $\int_C x + y^2 \, dr$ where C is the parabola $y = x^2$ in the plane z = 0 connecting the points $(0,0,0)$ and $(1,1,0)$.

7. Find the surface integral of $U = (xy, x, x + y)$ over the surface S defined by z = 0 with $0 \leq x \leq 1, 0 \leq y \leq 2$, with the normal pointing upwards.

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