(90)

SEMESTER - V

ANALYTICAL SOLID GEOMETRY

1. Course Description

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

Course Code : U24/MAT/DSE/502 **Hours per week : 4**

Course Type : DSE II **Max. Marks : 100**

No. of credits : 4

2. COURSE OBJECTIVES:

- Introduce the student to the concepts of three dimensional coordinates.
- Train the students to identify three dimensional objects like Plane, Straight line, Sphere, Cone and Cylinder with their mathematical equations using analytical methods.
- To enhance problem solving skill.

3.COURSE OUTCOMES:

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

CO 1: Explain the basic concepts of planes, determine plane under given conditions. **(EXPLAIN)**

CO 2: Apply the concepts of equation of line to transform unsymmetrical to symmetrical form. **(APPLY)**

CO 3: Analyze the problems involving spheres and othogonality of spheres. **(ANALYSE)**

CO 4: Generate the equation of a cone, cylinder and conicoid. **(INTERPRET)**

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4. Course Content

MODULE I **(15 Hours)**

THE PLANE

Transformation to the normal form. Determination of a plane under given conditions, System of planes, Length of the perpendicular from a point to a plane, Bisectors of Angles between two planes, Orthogonal projection on a plane.

Sections: - 2.3 to 2.9, Pg No's 29-45

MODULE II **(15 Hours)**

THE LINE

Equation of a line, Transformation of unsymmetrical to symmetrical form, Angle between a line and a plane, Conditions for a given line to lie in a plane, Coplanar Lines , Condition for the Coplanarity of Lines. Number of arbitrary constants in the equations of a straight line, The Shortest distance between two lines, Length of the perpendicular from a point to a line, Intersection of three planes.

Sections: 3.1 to 3.8, Pg. No's 56-89

MODULE III **(17 Hours)**

THE SPHERE

Equation of a Sphere, General Equation of a Sphere, The Sphere through four given points, Plane Section of a sphere, Intersection of two Spheres, Equations of a circle, Sphere through a given circle, Intersection of a sphere and a line, Equation of a tangent plane, Angle of intersection of two spheres, Condition for the Orthogonality of two spheres, Radical Plane, Radical Line, Radical Centre, Co-axial System.

Sections: 6.1 to 6..8; Pg. No's 127-157

MODULE IV **(13 Hours)**

CONES, CYLINDERS

Equation of a Cone with a Conic as guiding curve , Enveloping Cone of a Sphere, Cone and a Plane through its vertex, Mutually Perpendicular Generators of a Cone, Intersection of a Line with a Cone,

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The Right Circular Cone, Equation of a Right Circular Cone, The Cylinder, Equation of a Right Circular Cylinder, The Conicoid, The Hyperboloid f one sheet.

Sections: - 7.1,7.1.1,7.1.2,7.3,7.4,7.6,7.77.8,8,8.1,8.2,8.3,

Pg No's 165-172,180-188,196-210,215-226

5. References

1. Analytical Solid Geometry, Shanti Narayan , P. K. Mittal.
2. P.K.Jain and Khaleel Ahmed, "A Text book of Analytical Geometry of Three Dimension," Wiley Eastern LTD.,1999.

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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	A major application of solid geometry is in 3D computer graphics.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module -1 Planes, Module-4 Cones & Cylinders	Explore using Mathematica Software
Skill Development	Module-2 Lines, Module-3 Spheres	Using Geo-gebra

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7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative Learning	Skill Tests
2.	Experiential Learning	Quiz
3.	Problem solving	Group Discussions, Assignments

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

ANALYTICAL SOLID GEOMETRY

Course code U24/MAT/DSE/502 **Max. Marks: 60M**
No. of credits: 4 **Time: 2 Hrs**

SECTION-A

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

1. (i) Find the equation of the plane through the points (2,2,1) and (9,3,6) and perpendicular to the plane $2x + 6y + 6z = 9$.
   (ii) Find the equation of the plane passing through the intersection of the planes $x + y + z = 6$ and $2x + 3y + 4z + 5 = 0$ and the point (1,1,1).

   OR

2. Find the bisector of the acute angle between the planes $2x - y + 2z + 3 = 0, 3x - 2y + 6z + 8 = 0$.

3. Show that the lines $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$ *and* $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$ are coplanar. Find their points of intersection and lane containing the lines.

   OR

4. Find the magnitude and the equations of the line of the shortest distance between the 2 lines $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}$, $\frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$

5. (i) Find the equation to the sphere through the points (0,0,0), (0,1,-1), (-1,2,0),(1,2,3).
   (ii) Find the equation to the sphere through the circle $x^2 + y^2 + z^2 = 9$, $2x + 3y + 4z = 5$ & the point (1,2,3).

   OR

6. (i) Obtain the equations of the sphere which passes through the circle $x^2 + y^2 + z^2 - 2x + 2y + 4z - 3 = 0, 2x + y + z = 4$ and touches the plane $3x + 4y = 14$.
   (ii) Find the equation of the sphere that passes the circle $x^2 + y^2 + z^2 - 2x + 3y - 4z + 6 = 0, 3x - 4y + 5z - 15 = 0$ and cuts the sphere $x^2 + y^2 + z^2 + 2x + 4y - 6z + 11 = 0$ orthogonally.

7. (i) Find the equations of the lines of intersection of the following planes and cones
   $3x + 4y + z = 0$, $15x^2 - 32y^2 - 7z^2 = 0$.

(ii) Find the equation of the right circular cone whose vertex is origin ,axis of the line $x = t, y = 2t, z = 3t$ and whose semi vertical angle 60°.

(OR)

8. (i)Find the right circular cylinder whose radius is 2 and axis is the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{2}$

(ii) Find the equations to the tangent planes to $7x^2 - 3y^2 - z^2 + 21=0$ which pass through the line $7x - 6y + 9 = 0 , z = 3$.

SECTION-B

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

9. Find the equation of the plane through the points P(2,2,-1) , Q(3, 4,2), R(7,0,6).
10. Find k so that the lines $\frac{x-1}{-3} = \frac{y-2}{2k} = \frac{z-3}{2}$, $\frac{x-1}{3k} = \frac{y-5}{1} = \frac{z-6}{-5}$ may be perpendicular to each other.
11. Find the image of the point (2,-1,3) in the plane $3x - 2y + z = 9$.
12. Find the centre and radius of the circle $x + 2y + 2z = 15$, $x^2 + y^2 + z^2 - 2y - 4z = 11$.
13. Find the equation of the cone whose generators pass through the point (a,b,c) and have their direction cosines satisfying the relation $al^2 + bm^2 + cn^2 = 0$.
14. Find the equation of the cylinder whose generators intersect the curve $ax^2 + by^2 = 2z$, $lx + my + nz = p$ and are parallel to the z-axis.

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ANALYTICAL SOLID GEOMETRY

PRACTICAL

Programme : B.SC
Course Code : U24/MAT/DSE/502/P
Course Type : DSE II
No. Of Credits : 1

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

Course Outcomes:

- Solve problems on differentiation and integration of functions of two variables.
- Calculate the extreme values, radius of curvature, lengths of Curves, volumes of surfaces of revolutions.

PRACTICAL SESSIONS

1. Planes
2. Bisecting of Planes
3. Coplanar Lines And Equations Of Lines In Various Forms
4. Shortest distance
5. Spheres and Tangent Planes
6. Intersection of spheres
7. Orthogonality of spheres
8. Cones and Right circular cone
9. Cylinders and Right circular cylinders
10. Conicoid

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ANALYTICAL SOLID GEOMETRY

MODEL QUESTION PAPER

PRACTICAL

Course Code: U24/MAT/DSE/502/P **Max. Marks : 30**

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

I. Answer any **6 x 5 = 30 M**

1. Find the equation of the plane through the points (2,2,1) &(9,3,6) & perpendicular to the plane $2x + 6y + 6z = 9$.
2. Find the bisector of the acute angle between the planes $2x - y - 2z + 3 = 0$, $3x - 2y + 6z + 8 = 0$.
3. Find the equation of the plane through the points (2,2,1) & (9,3,6) & perpendicular to the plane $2x + 6y + 6z = 9$.
4. Find the magnitude and the equations of the line of the shortest distance between the two lines $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}, \frac{x-1}{1} = \frac{y+7}{3} = \frac{z+2}{2}$.
5. Obtain the equation of the sphere which passes through the 3 points (1,0,0), (0,1,0), (0,0,1) & has its radius as small as possible.
6. Obtain the equations of the sphere which passes through the circle $x^2 + y^2 + z^2 - 2x + 2y + 4z - 3 = 0$, $2x + y + z = 4$ & touches the plane $3x + 4y = 14$.
7. Find the limiting points of the co-axial system defined by the spheres $x^2 + y^2 + z^2 + 3x - 3y + 6 = 0$, $x^2 + y^2 + z^2 - 6y - 6z + 6 = 0$.
8. Find the equation of the cone whose vertex is the point (1,1,0) and whose guiding curve $y=0$, $x^2 + z^2 = 4$
9. Find the euation to the cylinder whose generators are parallel to $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and the guiding curve is $x^2 + y^2 = 16$, $z = 0$
10. Find the points of intersection of the line $\frac{x-3}{-1} = \frac{y-4}{2} = \frac{z+2}{1}$, $\frac{x+5}{-3} = \frac{y-4}{1} = \frac{z-11}{7}$ with the coinicoid $12x^2 - 17y^2 + 7z^2$

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SEMESTER - V

APPLIED STATISTICS-I

- **Course Description**

Programme: B.Sc — Max. Hours: 45

Course Code: U24/STA/DSC/501 — Hours per week: 3hrs.

Course Type: DSE 1B — Max. Marks: 100

No. of credits: 4

- **Course Objectives:**

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

- to identify the design and perform analysis.
- To Design and implement surveys with the following sampling designs: simple random, systematic, stratified and To Estimate sample size for different sampling designs in order to estimate population level point estimates.

3. **Course Outcomes :**

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

CO 1: **Identify** situations where One way and Two way ANOVA is applicable and to **interpret** ANOVA table.

CO2 : **Identify** situations where One way and Two way ANOVA is applicable and to **interpret** ANOVA table.

CO 3: **Memorize** the steps to carry out a sample survey and to **remember** probability applications in sampling.

CO 4 : **Listing** out the methods of stratified and systematic sampling and to **compare** various sampling techniques

4. Course Content:

MODULE-I: Analysis Of Variance **(12 HOURS)**

Concept of Gauss- Markoff linear model with examples, Statement of Cochran's theorem, ANOVA – one-way, two-way classifications with one observation per cell, Expectation of various sums of squares, Statistical analysis.

MODULE-II : Design Of Experiments **(13 HOURS)**

Principles of experimentation analysis of Completely randomized Design (C.R.D), Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) including one missing observation, expectation of various sums of squares. Comparison of the efficiencies of above designs.

MODULE-III : Design of Sample Surveys **(10 HOURS)**

Concepts of population , sample, sampling unit, parameter, statistic, sample frame and standard error. Principal steps in sample surveys - need for sampling, census versus sample surveys, sampling and non-sampling errors, sources and treatment of non-sampling errors, advantages and limitations of sampling. Types of sampling: Subjective, probability and mixed sampling methods. Methods of drawing random samples with and without replacement.

Simple Random Sampling: Estimates of population mean, total, and proportion, their variances and the estimates of variances by Simple Random Sampling with and without replacement (SRSWR and SRSWOR).

MODULE-IV: Random Sampling Methods **(10HOURS)**

Stratified Random Sampling with proportional and Neyman allocation. Estimates of population mean, total, their variances and estimates of variances.

Comparison of efficiency with SRS and advantages and disadvantages of this method.

Systematic Random Sampling: Systematic sampling with N = nk. Estimates of population mean, total, their variances and estimates of variances. Comparison of relative efficiencies and advantages and disadvantages of above methods of sampling

5. References:

1. W.G. Cochran(1997): Sampling Techniques, John Wiley and Sons, New York
2. A.M. Goon, M.K. Gupta, and B. Dasgupta(2005): Fundamentals of Statistics (Vol. II), 8th Ed., World Press, Kolkata.
3. Cochran, W.G. and Cox, G.M. (1959): Experimental Design. Asia Publishing House.
4. Das, M.N. and Giri, N.C. (1986): Design and Analysis of Experiments. Wiley Eastern Ltd.
5. A.M. Goon, M.K. Gupta and B. Dasgupta, An Outline of Statistical Theory (Vol. II), 3rd Ed., World Press, Kolkata, 2005.

6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	ANOVA and designs of experiments are versatile statistical techniques that find applications in diverse fields such as medical research , manufacturing, manufacturing , marketing ,education, environmental studies , product development , pharmaceuticals, agriculture, chemical engineering and healthcare. These techniques enables researchers, engineers, and decision makers to systematically analyse data, identify significant factors and optimize processes for improved performance and efficiency.

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b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	ANOVA	ANOVA enhances proficiency in analysing & interpreting data. Analysing data using ANOVA develops understanding of analysis techniques, data visualization, data interpretation, designs of experiments, collaborative analysis

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	MCQ test	Experiential learning
2.	Presentations	Participative learning
3.	Field Trip	Experiential 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/Assignment	
CO4	CIA-2 MCQ test	

b)Question Paper Pattern

APPLIED STATISTICS - I

THEORY

Course Code: U24/STA/DSC/501 **Max. Marks: 60**
Credits : 4 **Time: 2 Hrs.**

SECTION –A (Essay Questions)

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

1. Explain the analysis of variance of two –way Classification

OR

2. Find the expectations of Various sum of squares in one way classification?

3. Find the efficiency of RBD over CRD.

OR

4. Explain the procedure for obtaining the estimate of one missing observation in LSD.

5. What are the main steps involved in a sample survey? Discuss them briefly.

OR

6. In SRSWOR, Show that Sample mean square is an unbiased estimate of Population mean square.
7. Define Systematic Sampling? Obtain the sampling variance of the mean based on the Systematic sample and compare the variance with that based on simple random sampling.

OR

8. Show that Var $(\bar{y}_n) \geq$ Var $(\bar{y}_{st})_{prop} \geq$ Var $(\bar{y}_{st})_{opt.}$

SECTION-B

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

9. Explain analysis of variance stating assumptions.
10. Explain Gauss Markoff linear model.
11. Write a short notes on the principles of experimental designs.

12. Prove that the probability of drawing any sampling unit at any draw is equal to its probalibity of being selected at the first draw.
13. Explain a Methods of drawing Simple Random sample?
14. Write in detail about proportional and optimum allocation.

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	12	CO-1	2	10	2	5
2	13	CO-2	2	10	2	5
3	10	CO-3	2	10	2	5
4	10	CO-4	2	10	2	5

9. CO-PO Mapping

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

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SEMESTER V

APPLIED STATISTICS – I PRACTICAL

1. Course Description

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

Course Code :U24/STA/DSE/501/P **Max . Marks: 50**

Course Type: DSE IB

No of Credits : 1

2. Course Outcomes:

1. **Interpret** the data using suitable analysis.

2. Estimate population parameters by **using** different sampling methods

Course Content :

Designs of Experiments

1. Analysis of CRD.
2. Analysis of RBD with and without missing observation. Comparison of RBD with CRD.
3. Analysis of LSD with and without missing observation. Comparison of LSD with RBD and CRD.

Sampling Techniques

4. Estimation of Population means, population totals and variances of these estimates by Simple random sampling with and without replacement. Comparison between SRSWR and SRSWOR
5. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.
6. Systematic sampling with N = nk. Comparison of Systematic sampling with Stratified and SRSWOR.

a) Question Paper pattern

APPLIED STATISTICS – I

PRACTICAL

Course Code: U24/STA/DSE/501/P **Max. Marks: 50 (39+5+6)**

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

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

1. Consider a population of 5 units with values 2, 3, 6,8,11. Write down all possible samples of size 2 with and without replacement from this sample and verify that

   (i)Sample mean is an unbiased estimator of population mean.

   (ii)Sample mean square is an unbiased estimator of population mean square.

   Also calculate sampling variance and compare it with variance of sample mean.

2. From the data given below, each column represents a systematic sample and the rows are the strata. Compare systematic sample with that of SRSWOR and stratified random sampling.

Strata	1	2	3	4	5	6	7	8	9
I	3	2	3	5	6	8	7	9	9
II	22	21	24	26	29	30	25	24	26
III	41	44	42	42	49	48	46	48	44

3. An experiment was conducted at a research station. The design adopted for the same was five randomized blocks of four plots each. The yield (in lb) per plot obtained from the experiment are

Blocks	Varieties			
	1	2	3	4
1	7.9	7.8	9.5	12.8
2	11.8	15.9	8.3	10.7
3	11.1	11.1	6.1	15.1
4	7.7	16.1	-	17.1
5	11.4	14.2	9.3	15.1

Estimate the missing observation and analyze the data.

4. The following data is obtained from a completely randomized design with four treatments. Analyze the data and draw conclusions about the equality of treatments

Treatments			
A	B	C	D
20.9	23.7	13.2	5.8
12.4	14.4	10.2	6.1
10.1	9	5.1	4.8
4.2			1.5

SEMESTER - V

Economics of Environment

1. Course Description

Programme : B.A	Max. Hours : 60
Course Code : U24/ECO/DSE/502	Hours per week : 4
Type of course: DSE	Max. Marks : 100
No. of credits : 4	

2 Course Objectives

- The course exposes the students with various issues and polices related to economic environment.
- The course enables the student's study on environmental problems and solutions for it.

3. Course Outcomes

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

CO1 Understand basic concepts and theories of environmental economics

CO2 Evaluate environment as a public good

CO3 Analyse economic environment issues

CO4 Gain Knowledge about various environment protection boards and policies.

4. Course Content

MODULE- I: Theory and Concept of Environmental Economics **15 Hours**

1. Nature and Significance of Environmental Economics
2. definition and scope of environmental economics
3. Market Failure& Externality– Theories of Environmental Economics.

MODULE- II: Environment and Economics **15 Hours**

1. Environment and Economics- Inter linkage
2. Environment as a public good – Environment vs. Economic growth
3. Population and Environment linkage –Environmental use as an allocate problem
4. Valuation of Environmental damages: land, water, air and forest.

MODULE-III: Environmental Problems **15 Hours**

1. Economic development and environmental problems –Air, Water and Soil Pollution, Natural
2. Resource Depletion, Deforestation, Industrial and Agricultural Pollution, Urbanization, Vehicular Pollution.
3. Global warming and greenhouse effect - Environmental degradation.

MODULE -IV: Environmental Pollution Control and Measures **15 Hours**

1. Choice of policy instruments in developing countries
2. Environmental Education- Environmental law
3. Sustainable development and the indicators sustainable development
4. Environmental planning and Environmental accounting.
5. Indian environment policies and performance

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6. References:

1. M. Karpagam (1993), Environmental Economics, Sterling Publishers, New Delhi.
2. 2. S. Sankaran (1994), Environmental Economics, Margham, Madras.
3. 3. N. Rajalakshmi and DhulasiBirundha (1994), Environomics, Economic Analysis of
4. Environment, Allied Publishers, Ahmedabad.
5. 4. S. Varadarajan and S. Elangovan (1992), Environmental Economics, Speed, Chennai.
6. 5. Singh G.N (Ed.) (1991) Environmental Economics, Mittal Publications, New Delhi.
7. 6. Garge, M.R. (Ed.) (1996), Environmental Pollution and Protection, Deep and Deep
8. Publications, New Delhi.

6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	Environment Economics is the need of the hour. We can understand market Failures and externalities and different policies and Laws given by the Government.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module IV	Presentation by taking Case Study of Different Environmental Issues

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
4	Field trip	Experiential Learning

8 Course Assessment Plan

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

COs	Continuous Internal Assessments – CIA (40%)	End Semester Examination (60%)
CO1	CIA-1	End Semester examination
CO2	CIA-1	
C03	Presentation	
C04	Written Exam, Assignment	

b) Question Paper Pattern

1. SECTION A - INTERNAL CHOICE			4Q X 10 M = 40 M	
Question Number	**Question**	**Question**	**CO**	**BTL**
1	Module 1	Explain the Nature and Significance of Environmental Economics.	CO 1	BL 2
2	Module 1	Illustrate with an example about Market Failure &Externalities.	CO 1	BL 2
3	Module 2	Evaluate Environmental damages land, water, air and forest.	CO 2	BL 4
4	Module 2	Analyse Environment as a public good	CO 2	BL 4
5	Module 3	Explain Relationship between Economic development and environmental problems	CO 3	BL 2
6	Module 3	Illustrate Environmental degradation with its solutions.	CO 3	BL 2
7	Module 4	Explain Sustainable development and the indicators sustainable development	CO 4	BL 2
8	Module 4	Evaluate Indian environment policies and performance	CO 4	BL 2
SECTION B - ANSWER ANY 4 OUT OF 6			4Q X 5 M = 20 M	
9	Module 1	Significance of Environment Economics	CO 1	BL 1
10	Module 2	Environmental damages- land	CO 2	BL 1
11	Module 3	Global warming	CO 3	BL 1
12	Module 4	Write about Environmental accounting.	CO 4	BL 1
13	Module 2	Environment and Economics-Inter linkage	CO 2	BL 1
14	Module	Deforestation	CO 3	BL 1

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SEMESTER - V

ELEMENTARY NUMBER THEORY

1. Course Description

Programme : B. Sc **Max. Hours : 30**
Course Code : U24/MAT/SEC/501 **Hours per week: 2**
Course Type : SEC - III **Max. Marks : 50**
No. of credits : 2

2. Course Objectives

- To equip the students with the knowledge of Elementary Number Theory and Arithmetical Functions.

3. Course Outcome

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

CO 1: Apply basic concepts of elementary number theory such as divisibility, greatest common divisor, prime and composite numbers. **(APPLY)**

CO 2: Discuss several arithmetical functions which play an important role in the study of divisibility properties of integers and distribution of primes are also discussed.(**DISCUSS)**

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4. Course Content

MODULE I: **(15 HRS)**

THE FUNDAMENTAL THEOREM OF ARITHMETIC

Introduction, Divisibility, Greatest Common Divisor, Prime Numbers, The fundamental theorem of Arithmetic, The Euclidean Algorithm

Sections 1.1-1.5, 1.7, Pg No's 13-21

MODULE II **(15 HRS)**

ARITHMETICAL FUNCTIONS

Introduction, The Mobius function $\mu(n)$, The Euler totient function $\varphi(n)$, A relation connecting φ and μ, A product formula for $\varphi(n)$

Sections 2.1-2.5, Pg No's 24-27, 46

5. Reference Books

1. Introduction to Number Theory by Tom M. Apostol Springer International Edition.
2. David M. Burton, Elementary Number Theory.
3. Gareth A. Jones and J. Mary Jones, Elementary Number Theory.
4. Martin Erickson, Anthony Vazzana, Introduction to Number Theory.
5...Joseph B. Dence, Thomas P. Dence, Elements of the Theory of Numbers.

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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	One of the most prevalent applications of number theory is in cryptography, the science of secure communication. In today's digital age, where sensitive information is transmitted over networks, ensuring the confidentiality and integrity of data is crucial. Number theory provides the foundation for many cryptographic systems, such as the RSA algorithm. The RSA algorithm utilizes the mathematical properties of prime numbers and modular arithmetic to create secure keys for encrypting and decrypting messages. Without number theory, our online transactions, private messages, and even personal information would be vulnerable to unauthorized access. Another area where number theory plays a significant role is in credit card transactions and financial security.

7. Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 1: Fundamental Arithmetic Module 2: Arithmetical Functions	Using Maple and Sage Software

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 Model Question Paper- End Semester Exam

ELEMENTARY NUMBER THEORY

Course Code: U24/MAT/SEC/301 **Max Marks: 30M**
Credits: 2 **Max. Time : 1 Hour**

Answer any Five **5 x 6 = 30M**

1. Prove that for any two integers a and b, there is a common divisor d of and b is of the form d = ax +by where x and y are integers.
2. State and prove Fundamental theorem of arithmetic.
3. State and prove the Division algorithm.
4. If (a,b) = 1 and if c|a and c|b, then (c,d)=1.
5. Prove that for n≥ 1, we have $\sum_{d/n} \varphi(d)$ = n.
6. Derive the relation that connects φ and μ.
7. Prove that for n≥ 1, $\varphi(n) = n \prod_{d/n}(1 - \frac{1}{p})$.

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SEMESTER - V

INDIAN ECONOMY

1. Course Description

Programme: B.A
Course Code: U24/ECO/DSE/501
Course Type: DSE
No. of credits: 4

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

2. Course Objectives

- This course aims at giving students a introduction to Indian economy which will concentrate on both the achievements and the issues of the economy.
- The course enables the students to understand the working and performance of the various sectors of Indian economy

3. Course Outcomes

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

CO1: Understand the nature of Indian Economy and evaluate it policies and programmes

CO2: Illustrate the working of the agriculture sector

CO 3: Understand the performance of the industrial sector

CO 4: Understand and analyze the economic planning and reform

4. Course Content

MODULE I: Structure of the Indian economy **15 Hours**

1. Basic characteristics of Indian Economy
2. Poverty – Types, Multi-Dimensional Poverty Index Causes and Poverty Alleviation program
3. Unemployment – Trend and measurement of Unemployment, Causes, major Employment program
4. Population-size and growth Trends, causes of growth of population remedies for Population growth
5. Rural urban Migration and Occupational distribution

MODULE II: Indian Agriculture **15 Hours**

1. Indian Agriculture- Nature and Importance
2. Production and productivity- trends, Reasons for low productivity and Measures to increase productivity, Green revolution
3. Agricultural finance - sources ,Cooperative credit societies, and NABARD
4. Agricultural Marketing-Government measures, agriculture price policy
5. Agricultural subsidies and food security in India

MODULE III: Indian Industry and services **15 Hours**

1. Trends in industrial production and Services in India
2. Industrial policy of 1956 and 1991, post 1991 policy reforms
3. Role of public and private sector in Indian economy
4. Role and performance of service sector in Indian economy
5. Multinational Corporation's types, factors responsible for their growth, importance of MNC's and Dangers.

MODULE IV: Economic Planning and reforms **15 Hours**

1. Genesis of NITI Aayog: structure and composition
2. Amis and objectives of NIIT Aayog
3. Differences between NIIT Aayog and planning commission.
4. NIIT Aayog role in strategic planning. Challenges ahead
5. New economic reforms – Liberalization, Privatization and Globalization in India

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References

1. Francis Cherunilam, *Global Economy and Business Environment*, Himalaya publishing house
2. S. K .Misra&V.K.Puri, *Indian Economy*, Himalaya publishing house
3. Dutt & Sundaram, *Indian Economy*, S Chand publishing house
4. P K Dhar, *Indian economy*, Kalyani Publishers
5. R K Mishra and V K Puri, *Indian economy its development and experience*, Himalaya publishing house
6. A N Agarwal, *Indian economy*, Sterling Publisher

6.Syllabus Focus

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

Local /Regional/National /Global Development Need	Relevance
National	The course will enable students to know about the working of the Economy and its sector wise distribution

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
4	Field trip	Experiential 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& CIA 2	
CO4	CIA-2 Assignment& CIA 2	

b) Model Question Paper- End Semester Exam

INDIAN ECONOMY

SECTION A - INTERNAL CHOICE				4 Q X 10 M = 40M
Question Number	**Question**	**Question**	**CO**	**BTL(Blooms Taxonomy Level)**
1	**Module 1**	Discuss the basic features of Indian Economy	CO 1	BL 2
2	**Module 1**	Illustrate the trends of unemployment and write about the measures	CO 1	BL 2
3	**Module 2**	What conclusions you draw to know the reasons for low productivity and write about the measures to solve it	CO 2	BL 4
4	**Module 2**	Analyze the role of NABARD in rural credit	CO 2	BL 4
5	**Module 3**	How would you compare the performance of public sector and private sector	CO 3	BL 2
6	**Module 3**	Explain the performance of service sector in the Indian Economy	CO 3	BL 2
7	**Module 4**	6. What do you say about NITI Aayog role in strategic planning and explain the Challenges ahead	CO 4	BL 2
8	**Module 4**	Explain liberalization and its impact on the Indian Economy	CO 4	BL 2
SECTION B - ANSWER ANY 4 OUT OF 6 (To compulsorily have **ONE** question from **each** module)				**4Q X 5M=20**
9	**Module 1**	Explain the multidimensional poverty Index	**CO 1**	BL 1
10	**Module 2**	Write a short note on corporative credit societies	**CO 2**	BL 1
11	**Module 3**	Write about factors responsible for growth of MNC's	**CO 3**	BL 1
12	**Module 4**	Write a short note on Globalization in Indian Economy	**CO 4**	BL 1
13	**Any module**	Explain the occupational distribution of India	**Any CO**	BL 1
14	**Any module**	Explain the agricultural price policy	**Any CO**	BL 1

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SEMESTER - V

LINEAR ALGEBRA

1. Course Description

Programme : B.Sc
Course Code : U24/MAT/DSE/501
Course Type : DSE I
No. of credits : 4

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

2. Course Objectives

- To equip students with a strong foundation in the fundamental concepts and techniques of linear algebra.
- To Utilise concepts from linear algebra in a variety of contexts, including quantum mechanics, computer graphics, optimisation, data analysis, and cryptography.

3. Course Outcomes

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

CO 1: Explain basic concepts of vector spaces with a matrix approach **(UNDERSTANDING)**

CO 2: Calculate the Eigen values and Eigen vectors of a given matrix **(APPLY)**

CO 3: Examine the process of diagonalization of matrices. **(EXAMINE)**

CO 4: Evaluate orthogonal basis set using Gram Schmidt's process for a vector space. **(EVALUATE)**

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4. Course Content

MODULE I: **(15 HRS)**

Vector Spaces and Subspaces, Null Spaces, Column Spaces and Linear Transformations, Linearly independent sets, Bases, Coordinate Systems, The Dimension of a Vector Space.

Sections: Text Book -1: 4.1 to 4.5
Pg No's 216 to 262

MODULE II: **(14 HRS)**

Rank, change of Basis, Eigenvectors and Eigen values, the characteristic equation.

Sections: Text Book -1: 4.6, 4.7, 5.1, 5.2
Pg No's 262 to 277, 302 to 319

MODULE III: **(15 HRS)**

Diagonalization, Eigenvectors and Linear Transformations, Complex Eigen values, Applications to Differential Equations

Sections: Text Book -1: 5.3, 5.4,5.5, 5.7
Pg No's319 to 342, 353 to 363

MODULE IV: **(16 HRS)**

Orthogonality - Inner Product, Length and orthogonality, Orthogonal sets, Orthogonal Projections, The Gram Schmidt Process. The geometry of vector spaces- Affine combinations

Sections: Text Book -1: 6.1- 6.4, 7.1
Pg No's. 375 to 409,
Text Book -2: 8.1,
Pg. No's 437 to 446

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5. Reference Books:

1. David C Lay, Linear Algebra and its Applications (4th edition)
2. David C. Lay, Steven R. Lay, Judi J. McDonald, Linear Algebra ans its applications (5th edition)
3. S Lang, Introduction to Linear Algebra
4. Gilbert Strang , Linear Algebra and its Applications
5. Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence; Linear Algebra
6. Kuldeep Singh; Linear Algebra
7. Sheldon Axler; Linear Algebra Done Right
8. B.Sc. Third 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	Worldwide, linear algebra is a vital tool for theoretical research as well as practical applications since it offers a strong mathematical framework for problem solving in a variety of fields like Computer science, Physics and Economics.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 1: Vector Spaces	Practice solving problems related to linear systems of equations, optimization, and geometric transformations.
Employability	Module 2: Rank	Determining Rank and inverse of a matrix using Sagemath and Matlab.
Skill Development	Module 3 Diagonalization	Calculate Eigen values and eigen vectors of a matrix using Sagemath and Matlab.
Skill Development	Module 4 Orthogonality	Using Sagemath and Matlab , norm of a vector is determined . orthogonality of the vectors is evaluated using SageMath.

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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-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

MODEL QUESTION PAPER

THEORY

Course Code: U24/MAT/DSC/501 **Max. Marks : 60**

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

SECTION-A

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

1. Prove that an indexed set $\{v_1, v_2, \ldots\ldots v_p\}$ of two or more vectors with $v_1 \neq 0$, is linearly dependent if and only if some v_j (with $j > 1$) is a linear combination of the preceding vectors $v_1, v_2, \ldots\ldots v_{j-1}$.

OR

2. State and prove spanning set theorem.
3. State and prove Rank theorem.

OR

4. If $v_1, v_2, \ldots\ldots v_r$ are eigenvectors corresponding to distinct Eigen values 1,2……,,r of an n x n matrix A then prove that the set $\{ v_1, v_2, \ldots\ldots v_r\}$ is linearly independent.
5. Prove that an n x n matrix A is diagonalizable if and only if A has n linearly independent eigenvectors.

OR

6. Find the Eigen values of $A = \begin{bmatrix} .5 & -.6 \\ .75 & 1.1 \end{bmatrix}$ and basis for each Eigen space.

7. Define Orthogonal Vector. State and prove the Pythagorean theorem.

OR

8. For a set of vectors $\begin{bmatrix} 2 \\ -5 \\ 1 \end{bmatrix}, \begin{bmatrix} 4 \\ -1 \\ 2 \end{bmatrix}$ is a basis for a subspace W. Use Gram-Schmidt process to produce an orthogonal basis for W.

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SECTION –B (Short Answer Questions)

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

9. For a matrix A = $\begin{bmatrix} 1 & -3 & -2 \\ -5 & 9 & 1 \end{bmatrix}$ and $u = \begin{bmatrix} 5 \\ 3 \\ -2 \end{bmatrix}$ Determine if u belongs to the null space of A.

10. Find the Eigen values of A=$\begin{pmatrix} 2 & 3 \\ 3 & -6 \end{pmatrix}$

11. If $D = \begin{bmatrix} 5 & 0 \\ 0 & 3 \end{bmatrix}$ find D^{10}.

12. Let $P_2 \rightarrow P_4$ be the transformation defined by $T(p(t)) = (t+5)p(t)$ for $p(t) \in P_2$. Show that T is a linear Transformation.

13. Find the distance between $X = [10 \quad -3]$ and $Y = [-1 \quad -5]$.

14. Let $\bar{u}, \bar{v} \in R^n$ then $\|\bar{u} + \bar{v}\|^2 + \|\bar{u} - \bar{v}\|^2 = 2\|\bar{u}\|^2 + 2\|\bar{v}\|^2$.

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LINEAR ALGEBRA
PRACTICAL

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

Course Code: U24/MAT/DSE/501/P **Hours per week: 2**

Course Type: DSE I **Max. Marks: 50**

No. of credits: 1

Course Outcomes:

- Find basis and dimension for a given vector space.
- Calculate the rank, Eigen values and eigenvectors of a given matrix/linear transformation.

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PRACTICAL SESSIONS

1. Vector spaces and subspaces
2. Linear Transformations.
3. Linearly independent sets and Bases
4. Rank and Change of bases.
5. Eigen values and Eigen vectors.
6. Diagonalisation.
7. Eigen Vectors and Linear transformations.
8. Complex Eigen values.
9. Inner Products and Orthogonality.
10. Gram-Schmidt Process.

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MODEL QUESTION PAPER
PRACTICAL

Course Code: U24/MAT/DSE/501/P **Max. Marks : 30**

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

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

1. Let H be the set of all vectors of the form (a-3b, b-a, a, b) where a, b are arbitrary scalars. Show that H is a subspace of R^4.
2. Let $v_1=\begin{pmatrix}0\\2\\-1\end{pmatrix}$, $v_2=\begin{pmatrix}2\\2\\0\end{pmatrix}$ and $v_3=\begin{pmatrix}6\\16\\-5\end{pmatrix}$, and H=span $\{v_1, v_2, v_3\}$. Then show that $v_3=5\,v_1+3\,v_2$ and also show that $_{span}\{v_1, v_2, v_3\}$ =span $\{v_1, v_2\}$. Hence find a basis for the subspace H.
3. Let $A=\begin{pmatrix}1&6\\5&2\end{pmatrix}$, $v_1=\begin{pmatrix}6\\-5\end{pmatrix}$, $v_2=\begin{pmatrix}3\\-2\end{pmatrix}$. Are v_1 and v_2 Eigen vectors of A.
4. Find the characteristic equation of $A=\begin{pmatrix}6&-2&0\\-2&9&0\\5&8&3\end{pmatrix}$.
5. Diagonalize the following matrix $A=\begin{pmatrix}2&4&3\\-4&-6&-3\\3&3&1\end{pmatrix}$.
6. Find the Eigen values and Eigen vectors of $A=\begin{pmatrix}0.5&-0.6\\0.75&1.1\end{pmatrix}$.
7. Determine whether the pair of vectors are orthogonal or not

   (i) $u=\begin{pmatrix}8\\-5\end{pmatrix}$, $v=\begin{pmatrix}-2\\-3\end{pmatrix}$

   (ii) $u=\begin{pmatrix}12\\3\\-5\end{pmatrix}$, $v=\begin{pmatrix}2\\-3\\5\end{pmatrix}$
8. Find the orthogonal basis for $u=\begin{pmatrix}3\\6\\0\end{pmatrix}$, $v=\begin{pmatrix}0\\0\\2\end{pmatrix}$.

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SEMESTER – V

MATHEMATICAL METHODS

1. Course Description

Programme : B. Sc
Course Code : U24/MAT/GE/501
Course Type : GE
No. of credits : 4

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

2. Course Objectives

- To equip the students with variety of techniques to methodically solve certain ordinary differential equations.
- To provide knowledge about the possible applications of differential equations in diverse areas as biology, economics, engineering and physical sciences.

3. Course Outcomes

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

CO1: Discuss the concepts of existence and uniqueness of solutions to PDEs. **(UNDERSTAND)**
CO2: Develop critical thinking skills by analyzing complex problems involving homogeneous and non-homogeneous linear PDEs, identifying relevant concepts and techniques for their solution. **(DEVELOP)**
CO3: Evaluate Fourier transform of a function and its derivative **(EVALUATE)**
CO4: Apply Fourier transforms to boundary value problems. **(APPLY)**

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4. Course Content

MODULE I: **(15 HRS)**

PARTIAL DIFFERENTIAL EQUATIONS

Introduction, Formation and Solution of Partial Differential Equations, Equations easily integrable, Linear equations of the first order, Nonlinear equations of the first order, Charpit's method.

Sections: - 9.1- 9.6, Pg No. 428-441

MODULE II: **(15 HRS)**

HOMOGENEOUS AND NON-HOMOGENEOUS LINEAR PARTIAL DIFFERENTIAL EQUATIONS

Homogeneous Linear equations with constant coefficients, Non-homogeneous Linear partial differential equations, Equations reducible to Linear partial differential equations, Separation of Variables.

Sections: 9.7, 9.8.1, 9.10, Pg. No.442-458, 465 - 467

MODULE III: **(17 HRS)**

FOURIER TRANSFORMS

Introduction, Classes of functions, Fourier Series and Fourier Integral Formula, Fourier Transforms, Fourier sine and cosine Transforms, Linearity property of Fourier Transforms, Change of Scale property, The Modulation theorem, Evaluation of integrals by means of inversion theorems, Fourier Transform of some particular functions, Convolution or Faltung of two integrable functions, Convolution or Falting or Faltung Theorem for FT, Parseval's relations for Fourier Transforms, Fourier Transform of the derivative of a function, Fourier Transform of some more useful functions, Fourier Transforms of Rational Functions, Other important examples concerning derivative of Fourier Transform.

Sections: 1.1 – 1.16, Pg. No. 1- 46

MODULE IV: **(13 HRS)**

APPLICATION OF FOURIER TRANSFORMS

The solution of Integral Equations of Convolution Type, Fourier Transform of Functions of several variables, Application of Fourier Transform to Boundary Value Problems.

Sections: 1.17 - 1.19, Pg. No. 47 - 78

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5. References

1. Zafar Ahsan, **Differential Equations & their Applications** (Third Edition), Prentice Hall of India, Pvt. Ltd. New Delhi.
2. Baidyanath Patra, **An Introduction to Integral Transforms** (2018), CRC Press.
3. A.R.Vasishtha, R.K.Gupta, Integral Transforms, Krishna Prakashan Media (P) Ltd., Meerut.
4. Rai Singhania, **Ordinary & Partial Differential Equations,** S. Chand & Co., New Delhi.
5. K. Shankar Rao, **Introduction to Partial Differential Equations**, PHI, Third Edition.

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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	Solve complex real-world problems by modelling them as differential equations.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 1 : Partial Differential Equations	Solve PDE problems to reinforce your understanding and improve problem-solving skills.
Skill Development	Module 2: Homogeneous and Non-homogeneous Linear partial differential equations	Practice solving homogeneous and non-homogeneous linear PDEs with different types of forcing terms, such as constant, polynomial, exponential, or sinusoidal functions.
Skill Development	Module 3 : Fourier transforms	Practice applying Fourier transforms to analyze and Explore applications of Fourier transforms
Skill Development	Module 4 :Application of Fourier Transforms	Improve the knowledge of Fourier transformations and it's uses in many fields.

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 Test)	
CO4	CIA-II(Assignment)	

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b) Model Question Paper- End Semester Exam

MATHEMATICAL METHODS
MODEL QUESTION PAPER
THEORY

Course code: U24/MAT/GE/501 **Max. Marks: 60**
No. of credits: 4 **Time: 2 Hrs**

SECTION-A

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

1. (a) Solve $y\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial x}{\partial y} = 4xy$

   (b) Solve $(mx - ny)p + (nx - ly)q = ly - mx$

(OR)

2. Solve $(p^2 + q^2)y = qz$

3. Solve $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x} + 3x^2 y$

(OR)

4. Solve $x^2 D^2 z - y^2 D'^2 = xy$

5. If the Fourier transform of $F(\xi) = F_c\{e^{-x^2/2}; x \to \xi\}$ then deduce $F(\xi) = e^{-\xi^2/2}$

(OR)

6. Find the Fourier transform of F(x) defined by $F(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$

7. The temperature u (x ,t) of a semi –infinite rod is determined by the partial differential equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, x > 0, t > 0$ subject to the initial condition $u(x, 0) = 1, 0 < x < 1$

   $= 0, x > 1$

   And the boundary condition u (0,t)=0. Find the temperature at any time t at any distance x from x = 0.

(OR)

8. Solve the PDE $\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}$ subject to the conditions u(0, t) = 0, u (x, 0) = e^{-x} , x > 0 and u (x, t) is bounded when x > 0 , t > 0

SECTION – B

II. Answer any FOUR **4 x5 = 20 M**

9. Solve $\sqrt{p} + \sqrt{q} = 1$.

10. Solve $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 y}{\partial x^3} = e^{x+2y}$.

11. Solve $(D^2 + 2DD' + D'^2 - 2D - 2D')z = \sin(x + 2y)$.

12. State and Prove Modulation theorem.

13. Find Fourier Sine and Fourier cosine transforms of the function $f(x) = \begin{cases} sinx\,, 0 < x < a \\ 0\ \ , x > a \end{cases}$

14. Solve for F(x) the integral equation $\int_0^\infty F(x) \sin x\xi\, dx = F(\xi) = \begin{cases} 1, & 0 \le \xi < 1 \\ 2, & 1 \le \xi < 2 \\ 0, & \xi \ge 2 \end{cases}$

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SEMESTER V

OPERATIONS RESEARCH

1. Course Description

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

Course Code: U24/STA/GE/501 **Hours per week: 4**

Course Type: GE **Max Marks: 100**

No. of Credits : 4

2. Course Objectives

At the end of this course students are expected to be able to understand a wide variety of applications and problems that can be addressed using Operations Research techniques.

3. Course Outcomes

CO1: **Understand** optimization techniques using OR tools

CO2: **Interpret** minimum cost of transporting item from Source and Destination.

CO3: **Interpret** Total Elapsed time for processing of jobs.

CO4: **Understand** about network construction and to find critical path and total project duration.

4. Course Content

MODULE-I: Linear Programming **(15 HOURS)**

Meaning and scope of OR. Definition of general LPP, Formulation of LPP, Solution of LPP by graphical method. Simplex algorithm. Concept of artificial variables. Big –M (Penalty) method and two-phase simplex methods. Concept of degeneracy and resolving it.

MODULE-II: Transportation Problem: **(15 HOURS)**

Transportation problem as a special case of LPP, Initial solution by North West corner rule, Least cost method and Vogel's approximation method (VAM), MODI's method to find the optimal solution, special cases of transportation problem.

MODULE-III: Assignment problem and Sequencing **(15 HOURS)**

Assignment problem: as a special case of LPP, Hungarian method to find optimum assignment. Special cases of assignment problem.

Sequencing: Problem of Sequencing. Optimal sequence of 'n' jobs on two and three machines without passing under appropriate conditions

MODULE-IV: Networking and project planning **(15 HOURS)**

Network Analysis: Introduction - Critical Path Method and Project Evaluation Review Technique – Rules of network construction - Time calculations in networks - probability of completing the project within given time.

5. Reference Books:

1. KantiSwarup, Gupta, P.K. and Manmohan (2007): Operations Research, 13th Edition, Sultan Chand and Sons

2. J.K.Sharma(2012) : Operations Research:Thoery and applications,5th edition,Macin

3. S.D.Sharma : Operations Research; Theory,Methods and applications,15th Edition ,Reprint, Kedarnath

4. Taha, H. A. (2007): Operations Research: An Introduction, 8th Edition, Prentice Hall of India.

5. S.C. Gupta and V.K. Kapoor (2008): Fundamentals of Applied Statistics, 4th Ed. Sultan Chand and Sons .

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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	Operations Research plays a significant role globally by providing valuable insights and decision making tools to optimize various business processes and operations.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Linear programming problem	Using TORA

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6. Pedagogy

S.No	Student centric method adopted	Type/Description of activity
1	MCQ test	Experiential learning
2	Assignment	Experiential learning

7. Course Assessment Plan

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

COs	Continuous Internal Assessments -CIA (40%)	End Semester Examination - (60%)
CO1	CIA-1	End Semester examination
CO2	CIA-1	
CO3	CIA-2 written test/Assignment	
CO4	CIA-2 MCQ test	

b) Question Paper Pattern

OPERATIONS RESEARCH
THEORY

Course Code: U24/STA/GE/501
Credits : 4

Max. Marks: 60
Time: 2 Hrs.

SECTION –A (Essay Questions)

I. Answer the following **4x8=32Marks**

1. Give the general form of L.P.P. Write the Simplex algorithm to solve it?

OR

2. Solve the following L.P.P. graphically

$$\text{Min } Z = 20x_1 + 10x_2$$
$$\text{S.T.C.} \quad x_1 + x_2 \leq 40$$
$$3x_1 + x_2 \geq 30$$
$$4x_1 + 3x_2 \geq 60$$
$$x_1 , x_2 \geq 0$$

3. Obtain the IBFS for the following T.P using
   i) North west corner rule. ii) Matrix minima method

	O1	O2	O3	O4	Req
D1	3	2	4	1	20
D2	2	4	5	3	15
D3	3	5	2	6	25
D4	4	3	1	4	40
Avail	30	20	25	25	

OR

4. Explain the stepwise procedure for finding optimum solution for Transportation problem using MODI method?
5. Give the Hungarian algorithm to solve an assignment problem?

OR

6. Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order ABC

Job	1	2	3	4	5	6	7
Machine A	3	8	7	4	9	8	7
Machine B	4	3	2	5	1	4	3
Machine C	6	7	5	11	5	6	12

7. A Project consists of the following tasks. Relationships among the activities are given below. Draw the network; determine the different types of float and the critical path.

Activity	A	B	C	D	E	F	G	H	I
Predecessor Activity	-	-	A	B	C,D	C,D	E	F	G,H
Time(days)	5	4	6	2	1	7	8	4	3

OR

8. A project consists of seven activities whose time estimates are listed in the table below.

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Optimistic	1	1	2	1	2	2	3
Most likely	1	4	2	1	5	5	6
Pessimistic	7	7	8	1	14	8	15

Draw the network and find the critical path.

SECTION-B

II. Answer any SIX. **6x3=18 Marks**

9. List the scope and origin of O.R

10. Explain the concept of resolving degeneracy in simplex method.

11. Show that TP is a special case of LPP.
12. Explain the procedure of VAM.
13. Explain the processing of n jobs through 2 machines.
14. Explain travelling salesman problem and formulate it as an A.P.
15. Explain the rules for constructing the Network Diagram?

16. Write the differences between CPM and PERT.

c) Question Paper Blue print

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	10	CO-2	2	10	2	5
3	10	CO-3	2	10	2	5
4	10	CO-4	2	10	2	5

SEMESTER - V

STATICTICAL METHODS AND ACADEMIC WRITING (SEC-3)

1.Course Description

Programme:	BSC	Max. Hours:	30
Course Code:	U24/ECO/SEC/501	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: write effective research paper, research proposal and thesis.

CO2: Formulate and test hypothesis ,identify research tools and their use in research.

4. Course Content

MODULE I: Research writing

1. Introduction to Research
2. Research problem and Research Design
3. Sampling design
4. Measurement of scaling techniques

MODULE II: Testing of hypothesis and Statistical analysis

1. Hypothesis testing - Steps involved in Hypothesis testing
2. Parametric tests
3. Non-parametric tests
4. Correlation coefficient and regression.

5. References

1.Research methodology : a guide for researchers in management and social sciences by Taylor, Bill, Sinha, Gautam, Ghoshal, Taposh, Phi learning Delhi
2. Creating research and scientific documents using microsoft word by Mamishev, Alexander V., Sargent, Murray, phi learning Delhi
3. Research methodology in behavioural sciences (Vyavaharik Vighyano Meinanusandhan Vidhiya) by Mangal, S.K. & Mangal, S., phi learning Delhi
4. Research Methodology in education by Sandeep Chauhan, Pearson India
5. Research Methodology: methods and techniques by Kothari, CR New Age International.

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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

SECTION A - INTERNAL CHOICE			5 Q X 6 M = 30 M	
Question Number	**Question**	**Question**	**CO**	**BTL(Blooms Taxonomy Level)**
1	**Module 1**	What the research Problems .	CO 1	BL 2
2	**Module 1**	What are the different sampling techniques.	CO 1	BL 2
3	**Module 1**	What are the Measurements of Scaling Techniques	CO 1	BL 2
4	**Module 2**	What the steps involved in Hypothesis testing	CO 1	BL 2
5	**Module 2**	Write Difference between Parametric and non Parametric Test.	CO 2	BL 2
6	**Module 2**	Difference between Exploratory Research and Descriptive Research	CO 2	BL 2
7	**Module 2**	Types of Descriptive statistics .	CO 2	BL 2

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6.Syllabus Focus

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

Local /Regional/National /Global Development Need	Relevance
Global	The students learn to use different research tools for data analysis and present an effective research paper.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module II	Data Analysis

7. Pedagogy

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

SEMESTER V
STATISTICAL ANALYSIS USING R

1. Course Description

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

Course Code: U24/STA/SEC/503 | **Hours per week: 2**

Course Type: SEC -3 | **Max Marks: 50**

No. of Credits : 2

2. Course Objectives

- This course will review and expand upon core topics in probability and statistics through the study and practice of data analysis and graphical interpretation using `R'.

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, probability distributions to datasets using R.

CO2: **UNDERSTAND** and **APPLY** various hypothesis testing procedures using R.

4. Course Content:

MODULE – I: Data Visualization and Descriptive Statistics using R (15 HOURS)

Introduction ,commands and functions. Graphics using R.

Bar Diagrams-Simple bar diagram,Subdivided bar diagram,multiple bar diagram,Piediagram,Stem and leaf diagram Boxplot for one and more than one variables, histogram for raw data , histogram for equal and unequal class intervals, frequency polygon, ogivecurves, empirical distribution function ,Saving the diagram and graph in MS-Word file.

Computation of Measures of central tendency, dispersion, skewness and kurtosis.

MODULE-II: Probability distributions & Testing of hypothesis (12 HOURS)

Probability distributions :Simulation from distributions, computations of probabilities, cumulative probabilities, quantiles and drawing random sample using d,p,q,r functions for following distributions.-Binomial,Poisson, ,Normal.

Hypothesis testing: Test for Means, Chi-square test for independence of attributes ,ANOVA - One way and two way classification.

Non parametric tests : Wilcoxon's signed rank test, Mann Whitney test.

5. References

1. Gardener, M (2012) Beginning R: The Statistical Programming Language, Wiley Publications.
2. Braun W J, Murdoch D J (2007): A First Course in Statistical Programming with R. Cambridge University Press. New York
3. Crawley, M. J. (2006). Statistics - An introduction using R. John Wiley, London 32
4. Purohit, S.G.; Gore, S.D. and Deshmukh, S.R. (2015). Statistics using R, second edition. Narosa Publishing House, New Delhi.
5. Shahababa , B. (2011). Biostatistics with R, Springer, New York.

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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	Statistical Analysis using R equips the students with the knowledge and skills necessary to conduct statistical analysis using the R 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, fitting of distributions and Hypothesis testing.	Using R software

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	Written Exam

b)Question Paper Pattern

STATISTICAL ANALYSIS USING R

Course Code: U24/STA/SEC/501 **Max. Marks: 30**
Credits : 2 **Time: 1 Hr.**

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

1. The following data is a contingency table containing 5 house tasks and their distribution in the couple:

Housetask	Wife	Alternating	Husband	Jointly
Laundry	156	14	2	4
Main_meal	124	20	5	4
Dinner	77	11	7	13
Breakfeast	82	36	15	7
Tidying	53	11	1	57

(i)Write a program to create a data frame for the above data

(ii) Add new rows with (Dishes,32,24,4,53),(shopping,33,23,9,55) and print the data frame

(iii)Draw a simple bar plot with the variables house task and wife using new data frame.

2.a) Access the dataset ***faithful*** from the base package R. Using suitable R-command make sure that there is a variable named ***eruptions*** in this dataset. Find the summary of this variable. Prepare Box- plot and Stem and leaf plot of the variable. Draw the histogram with appropriate labels.

b) Access the dataset ***women*** from the base package R. Find the regression lines between the variables height and weight

3.a)Suppose that the number of screws produced by a sophisticated machine per day has a poisson distribution with mean 2.What is the probability that out of total production of the day ,there is (i) no defective screw (ii) exactly two defective screws (iii)at least

one defective screw (iv)at most two defective screws.

b) Following data represent the number of germinating seeds(x) among 10 seeds on damp filter paper for 80 sets of seeds. Fit a binomial distribution. Compute the expected frequencies.

x	0	1	2	3	4	5	6	7	8	9	10
f	6	20	28	12	8	6	0	0	0	0	0

4.a)A cell phone store sold 150 phones of brand A and returned 14 as defectives .It sold 125 phones of brand B and returned 15 as defectives .Is there statistical evidence that brand A has a smaller chance of being returned than brand B.

b)Following table shows gain in weight of two lots of female rats under two diets. Test the hypothesis that the average gain in weight for high protein diet is more than for low protein.

S.no	1	2	3	4	5	6	7	8	9	10	11
High protein	134	146	104	119	124	161	107	83	113	129	97
Low protein	70	118	101	85	107	132	94				

5. The quality control director for a clothing manufacturer wants to study the effect of machines on the breaking strength (in pounds)of wool serge material. A batch of the material is cut into square –yard pieces and these are randomly assigned ,12 each to the three machines chosen specially for the experiment.Test whether there is any significant difference between three machines.

I	II	III
115	111	109
115	108	110
119	114	107
117	105	110
114	102	113
114	106	114
109	100	103

110	103	102
106	101	105
112	105	108
115	107	111
111	107	110

6) USA Today reported on preferred types of office communication by different age groups. Suppose the results were based on a survey of 500respondents in each age group. The results are cross classified in the following table.

Age group	Type of communication required			
	Group meetings	Face to face meetings with individuals	E-mails	other
GenerationY	180	260	50	10
Generation X	210	190	65	35
Boomer	205	195	65	35
Mature	200	195	50	55

Is there any evidence of a relationship between age group and type of communication preferred?

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

SEMESTER - V

Telangana Economy (Generic Elective)

1. Course Description

Programme: BA
Course Code: U24/ECO/GE/501
Course Type: GE
No. of credits: 4

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

2. Course Objectives

- To upgrade the student's knowledge related to the in-depth conceptual analysis of the Telangana Economy
- To equip the students with contemporary trends of varied economic aspects related to the Telangana Economy

3. Course Outcomes

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

CO1: To understand the working of the Economy

CO2: Improves capacities towards Economic problem solving and solution finding related to State Economy

CO3: To Analyse the performance of the Agricultural sector

CO4: To Evaluate the working to the industrial and Service sector

4. Course Content

MODULE-I: Telangana Economy

1.EconomicFeaturesofTelangana,

2.DemographicFeaturesofTelangana-

3.OccupationalDistributionofpopulationin Telangana-

4.SectoralDistributionofpopulation.

MODULE-II: Gross State Domestic Product, Poverty and Unemployment

1.Growth and Trends in Gross State Domestic Product and Per capita income in Telangana-

2.SectoralContributiontoGrossStateDomesticProduct

3.PovertyandunemploymentinTelangana:

4.Trends, Causes & Concentration of Economic Power.

MODULE-III: Agriculture Sector

1. Growth of Agriculture in Telangana Economy

2. Trends in Agricultural Production and Productivity.

3. Agrarian Structure and Land Reforms, Irrigation sources Trends-Mission Kakatiya,

4.AgriculturalCredit and Rural Indebtedness.

MODULE-IV: Industrial Sector and Service Sector

1.Structure of Telangana Industry-Its Growth and Pattern,

2.Industrial Policy of Telangana- Special Economic Zones.

3.Importance of Service Sector in Telangana-

4.Growth and Pattern of Development of Service Sector in Telangana

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5. References

1. Rao S Kishan and Rahul A Shastry (2009): Andhra Pradesh Economy – Dynamics of TransformationwithafocusonRegionalDisparities,NationalAcademyofDevelopment,
2. HanumanthaRaoandS.MahenderDev(2003);AndhraPradeshDevelopment – EconomicReformandChallengesAhead,CentreforEconomicandSocialStudies,Hyderabad.
3. KankalathaMukund(1990);"AndhraPradeshEconomyinTransition;CentreforEconomicandSocialStudies,HyderabadandBookLinksCorporation,Hyderabad.
4. MahendraDev,S.C.RaviandM.Venkatanarayana(2009);HumanDevelopmentinAndhra Pradesh: Experiences, Issues and Challenges; Centre for Economic and SocialStudies(CESS), Hyderabad.

6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Regional	The students will be able to understand, evaluate and Analyse the performance of the state

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.	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

TELANGANA ECONOMY

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 Economic features of Telangana	CO 1	BL 2
2	**Module 1**	Write about the sartorial Distribution of Telangana	CO 1	BL 2
3	**Module 2**	Analyze the trends in GDP and PCI of Telangana	CO 2	BL 4
4	**Module 2**	Examine the various trend of unemployment in Telangana and write about its programs	CO 2	BL 4
5	**Module 3**	Explain the Agricultural Land reforms in Telangana	CO 3	BL 2
6	**Module 3**	Analyze the trends agricultural production and Productivity	CO 3	BL 2
7	**Module 4**	Evaluate the growth and pattern of development of the service sector in Telangana	CO 4	BL 2
8	**Module 4**	Explain the Industrial Policy of Telangana	CO 4	BL 2
SECTION B - ANSWER ANY 4 OUT OF 6 (To compulsorily have **ONE** question from **each** module)			**4 Q X 5 M = 20 M**	
9	**Module 1**	Write about the demographic features of Telangana	**CO 1**	BL 1
10	**Module 2**	Write a short note on Poverty in Telangana	**CO 2**	BL 1
11	**Module 2**	Explain the concentration of Economic power in Telangana	**CO 2**	BL 1
12	**Module 3**	Write about agricultural Credit	**CO 3**	BL 1
13	**Module 3**	Explain Mission Kakatiya	CO 3	BL 1
14	**Module 4**	Write a short note on i pass	**CO 4**	BL 1

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SEMESTER - V

TIME SERIES ANALYSIS

- **Course Description**

Programme: B.Sc

Max. Hours: 45

Course Code: U24/STA/DSC/502

Hours per week: 3hrs.

Course Type: DSE 1B

Max. Marks: 100

No. of credits: 4

- **Course Objectives:**

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

1) Present time series in an informative way, both graphically and with summary Statistics.
2) Model time series to analyze the underlying structure(s) in both the time and frequency domains.

3. **Course Outcomes :**

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

CO1: **Interpret** the trend pattern exhibited by the given data by using various methods
CO2: **Identify** various time series models and regression models for time series
CO3: **Understand** the Box-Jenkins approach to model and forecast time series data empirically.
CO4:**Understand** and **estimate** the cyclic components using special processes.

4. Course Content:

MODULE-I: Introduction to trend **(10 HOURS)**

Introduction to times series data, application of time series from various fields, Components of a time series, Decomposition of time series. Trend: Estimation of trend by free hand curve method, method of semi averages, fitting a various mathematical curve, and growth curves.

MODULE- II: Trend and seasonal component **(12 HOURS)**

Method of moving averages. Detrending. Effect of elimination of trend on other components of the time series. Seasonal Component: Estimation of seasonal component by Method of simple averages, Ratio to Trend, Ratio to moving average and Link relatives.

MODULE- III: Forecasting **(10 HOURS)**

Variate component method: Stationary Time series: Weak stationary, autocorrelationfunction and correlogram of moving average . Forecasting: Exponential smoothing methods, Short term forecasting methods: Brown's discounted regression, Box-Jenkins Method.

MODULE- IV: Cyclic Component **(13 HOURS)**

Deseasonalization . Cyclic Component: Harmonic Analysis. Some Special Processes: Moving-average (MA) process and Autoregressive (AR) process of orders one and two, Estimation of the parameters of AR (1) and AR (2) – Yule-Walker equations.

5. References:

1. Kendall M.G. (1976): Time Series, Charles Griffin.

2. Chatfield C. (1980): The Analysis of Time Series –An Introduction, Chapman & Hall.

3. Mukhopadhyay P. (2011): Applied Statistics, 2nd ed. Revised reprint, Books and Allied

6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	Time series analysis can be applied in economic development, financial markets, health care , environment sustainability , climate change mitigation. Development using time series analysis involves applying appropriate techniques and models to analyze the historical data.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Time series analysis	There are many skill opportunities in the field of Time series analysis including data processing, statistical modelling, machine learning, forecasting, data science, analytics , research and consultancy roles.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	MCQ test	Experiential learning
2.	Assignment	Experiential 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/Assignment	
CO4	CIA-2 MCQ test	

b)Question Paper Pattern

TIME SERIES ANALYSIS
THEORY

Course Code: U24/STA/DSE/502
Credits : 4

Max. Marks: 60
Time: 2 Hrs.

SECTION –A (Essay Questions)

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

1. Define Time series. Explain the components of time series with examples.

(OR)

2. (i) Explain the method of semi averages

   (ii) Explain the fitting of gompertz curve.

3. (i)Explain the method of ratio to trend to measure seasonal variation.

   (ii) Explain the method of moving averages.

(OR)

4. Find the Seasonal Indices by Link relative Method to the following data.

Years	QI	QII	QIII	QIV
2001	15	20	18	17
2002	17	26	25	22
2003	20	29	27	24
2004	27	57	34	31
2005	40	37	43	41

5. Define stationary Time series. Discuss briefly about identification of stationarity by Autocorrelation graph.

(OR)

6. Write in detail about exponential smoothing methods.
7. Explain the autoregressive process of order 1 and also estimate the parameters of AR(1) process.

(OR)

8. Explain the moving average process of order 2 and estimate the parameters of MA(2) Process.

SECTION-B

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

9. Explain the estimation of trend by fitting mathematical curves.
10. Mention the applications of time series analysis.
11. Explain Box Jenkin's methodology.
12. Explain the properties of autocorrelation function.
13. Write in detail about Yule-Walker equation.
14. Explain about Harmonic Analysis.

SEMESTER V

TIME SERIES ANALYSIS PRACTICAL

1. Course Description

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

Course Code :U24/STA/DSE/502/P **Max . Marks: 50**

Course Type: DSE

No of Credits : 1

2. Course Outcomes:

1. Able to **interpret** various growth curves, trend and to measure seasonal indices.
2. **Apply** forecasting by different methods and to calculate variance of a random component.

3. Course Content :

LIST OF PRACTICALS

1. Fitting and plotting of modified exponential curve
2. Fitting and plotting of Gompertz curve
3. Fitting and plotting of logistic curve
4. Fitting of trend by Moving Average Method
5. Measurement of Seasonal indices Ratio-to-Trend method
6. Measurement of Seasonal indices Ratio-to-Moving Average method

7. Measurement of seasonal indices Link Relative method

8. Calculation of variance of random component by variate difference method

9. Forecasting by exponential smoothing

10. Forecasting by short term forecasting methods

4. ABSTRACT Question Paper pattern

TIME SERIES ANALYSIS

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.

SEMESTER – V

WEB TECHNOLOGIES PRACTICAL

1. Course Description

Programme : BSC | Max. Hours : 30

Course Code : U24/ECM/DSE/501 /P | Hours per week : 2

Course Type : DSE | Max. Marks : 50

No. of credits : 1

Course Objective:

To introduce the fundamental concepts of web programming

Course Outcomes:

CO1: To understand the basic elements of a web page

CO2: To develop interactive web pages

Suggested Exercises:

1. Design a web page for displaying all Text Formatting tags.
2. Create a web page to demonstrate nested list.
3. Create a web page which demonstrate different types of HyperLinks
4. Design a web page for creating your Time Table.
5. Design a web page using all form controls.
6. Create a webpage to display college webpage.
7. Design webpages with frames
8. Write HTML Code to create an external style sheet to set the list properties.
9. Write HTML Code to demonstrate inline stylesheet to set the font properties.
10. Write HTML Code to create an embedded style sheet to set text properties.
11. Write HTML code to use borders, margins, padding properties using CSS.
12. Write a JavaScript program to calculate area of rectangle using function.
13. Write a JavaScript program to wish good morning, good afternoon, good evening depending on the current time.
14. Write a JavaScript program using switch case
15. Write a JavaScript program to print multiplication table of given number using loop.
16. Write a JavaScript programs using any 5 events.
17. Write a JavaScript program using JavaScript built in objects.
18. Write a JavaScript program to create registration form and validate all fields using form validation.

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