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).

<div align="center">OR</div>

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.

<div align="center">OR</div>

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).

<div align="center">OR</div>

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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MODEL QUESTION PAPER

PRACTICAL

Course Code: U24/MAT/DSE/502/P

No. Of Credits: 1

Max. Marks : 30

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

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- **Course Description**
  Programme: B.Sc

  Course Code: U24/STA/DSC/501

  Course Type: DSE 1B

  No. of credits: 4

  Max. Hours: 45

  Hours per week: 3hrs.

  Max. Marks: 100

- **Course Objectives:**

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

- to 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

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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

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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

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

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.

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12. Prove that the probability of drawing any sampling unit at any draw is equal to its probability 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

SEMESTER V
APPLIED STATISTICS – I PRACTICAL

1. **Course Description**

   Programme : B.Sc

   Course Code :U24/STA/DSE/501/P

   Course Type: DSE IB

   No of Credits : 1

   No of Hrs allotted: 2Hrs./Week

   Max . Marks: 50

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.

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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

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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

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

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8. Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

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

b 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 $n \geq 1$, we have $\sum_{d/n} \varphi(d) = n$.

6. Derive the relation that connects φ and μ.

7. Prove that for $n \geq 1$, $\varphi(n) = n \prod_{d/n} (1 - \frac{1}{p})$.

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SEMESTER - V

FUNDAMENTALS OF AI AND ML

1. Course Description

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

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

Course Type: GENERIC ELECTIVE   **Max. Marks: 100**

No. of credits: 4

2. Course Objectives

- To understand AI fundamentals, including data types and processing tools.
- To learn Machine Learning principles and algorithms for various tasks.
- To gain practical skills in Deep Learning, NLP, and implementing AI solutions.

3. Course Outcomes

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

CO1: *Demonstrate* a comprehensive understanding of AI fundamentals. (Cognitive level – 3)

CO2: *Classify* the Machine Learning processes and algorithms, including supervised, unsupervised, reinforcement, and semi-supervised learning techniques. (Cognitive level – 4)

CO3: *Develop* a comprehensive understanding of Deep Learning principles, applications, and drawbacks, including distinctions from Machine Learning and insights into neural networks and hardware requirements. (Cognitive level - 6)

CO4: *Apply* natural language processing (NLP) techniques and effectively implement AI systems. (Cognitive level – 3)

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4. Course Content

MODULE I: AI FOUNDATIONS   (15 Hrs)

Introduction- Turing Test, Neural Networks and Deep Learning, Structure of AI; Data-Basics, Types of data: Databases and other Tools, Data Process, More Data terms and Concepts.

MODULE II: MACHINE LEARNING   (15 Hrs)

Introduction: Standard Deviation, Normal Distribution, Bayes' Theorem, Correlation, Feature Extraction, Uses of Machine Learning, Machine Learning Process, Supervised Learning, Un-Supervised Learning, Reinforcement Learning, Semi-Supervised Learning, Common Types of Machine Learning Algorithms- Navies Biased Classifier, K-Nearest Neighbour, Linear Regression, Decision Tree, Ensemble Modeling, K-Means Cluster.

MODULE III: DEEP LEARNING   (15 Hrs)

Introduction to Deep Learning, Difference between Deep learning and Machine Learning, The Brain and Deep Learning, Artificial Neural Networks, Back Propagation, Various Neural Networks, Deep Learning Applications, Deep Learning Hardware, Draw Backs with Deep Learning.

MODULE IV: NLP   (15 Hrs)

NLP- The Challenges of NLP, Understanding How AI Translates Language, Voice Recognition, NLP in the real world-Use Cases, Voice Commerce, Virtual Assistance, Chart Bort, Implementation of AI-Approaches to implementing AI, The Steps of AI Implementation, Forming a Team, The Right Tools and Platforms, AI Frame-works, Deploy and Monitor the AI System

5. References

1. Artificial Intelligence in the 21st Century - 2E by Stephen Lucci, Danny Kopec., Mercury Learning and Information, 2016
2. Artificial Intelligence: Building Intelligent Systems by Parag Kulkarni, Prachi Joshi, PHI Learning Yashwant Kanetkar, Let Us C 13E, BPS Publications.
3. Artificial Intelligence: A New Synthesis by Nils J Nilsson, Morgan Kaufmann Publishers Inc.
4. Introduction to Machine Learning with Python, 1st Edition by Andreas C. Müller & Sarah Guido, O'Reilly Media.2016.
5. Machine Learning for Absolute Beginners, by Oliver Theobald, 2020.

6. Syllabus Focus

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

Local/Regional/National /Global Development Needs	Relevance
Global Development	AI and ML revolutionize industries by enabling data-driven decision-making, automation, and personalized experiences, ultimately shaping the future of technology and society.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 2 and 4	ML and NLP empower individuals to analyze language patterns, extract insights from text data, and develop intelligent systems for natural language understanding and generation.
EMP	Modules 1,2,3 and 4	Enables individuals to meet the growing demand for data-driven decision-making, automation, and innovation across various industries.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars/ Presentations
2.	Experimental	Data Analysis exercises
3.	Problem solving	Case studies

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8. Course Assessment Plan

a) Weightage of Marks in Continuous Internal Assessments and Written Exam

CO	Continuous Internal Assessments CIA -40%	End Semester Examination- 60%
CO1	CIA 1 – Written Test	Written Exam
CO2	CIA 2 – Written Test	
CO3	CIA 2 –Written Assignment /Presentation/Case Study	
CO4	CIA 3 – Written Assignment /Presentation/Case Study	

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b) Model Question Paper- End Semester Exam

FUNDAMENTALS OF AI AND ML

Course Code: U24/CSC/GE/501   **Max Marks: 60**

Credits:4   **Time: 2hrs**

Section- A

I. Answer any Four: **4 x 10 = 40 M**

1. Explain the relevance of AI and discuss about different types of data.

OR

2. Explain CRISP-DM Process.
3. Define Supervised Learning Algorithm. Explain in detail about k-nearest neighbours and

   Naive Bayes' classification.

OR

4. Describe in detail about Decision Trees.

5. Explain various Neural networks in detail.

OR

6. Explain the advantages and disadvantages of Deep Learning.

7. What is NLP? Explain how AI translates a language.

OR

8. Explain the steps of AI implementation in detail.

Section- B

II. Answer any Four: **4 x 5 = 20 M**

9. Explain structure of AI.
10. Give an overview of Neural Networks.
11. Differentiate between classification and Regression.
12. Explain Reinforcement learning with example.
13. Explain the difference between Deep learning and Machine Learning.
14. Explain briefly voice commerce and Virtual Assistance.

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<center>

SEMESTER V
INTRODUCTION TO DATA SCIENCE

</center>

1.Course Description

Programme: B.Sc.

Course Code: U24/CSC/DSE/502

Course Type: DISCIPLINE SPECIFIC ELECTIVE

No. of credits: 4

Max. Hours: 60

Hours per week: 4

Max. Marks: 100

2.Course Objectives

- To educate the students in data science and its related introductory.
- To introduce the students to the concept of Big Data.

3. Course Outcomes

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

CO1: *Explain* the concepts of data science and its relation with big data and data science process (Cognitive level – 2)

CO2: *Describe* the concepts related to machine learning, big data handling steps, handling data in a single computer. (Cognitive level – 2)

CO3: *Demonstrate* data operations with NOSQL and graph representation of database content. (Cognitive level - 3)

CO4: *Analyse* different mining and text analytics and data visualization techniques. (Cognitive level – 5)

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4. Course Content

MODULE I: DATA SCIENCE IN A BIG DATA WORLD AND THE DATA SCIENCE PROCESS   (15 Hrs)

Data science in a big data world: benefits and uses of data science and big data, facts of data, the data science process, the big data ecosystem and data science, The data science process: overview of the data science process, defining research goals and creating a project charter, retrieving data, cleaning-integrating and transforming data. Exploratory data analysis builds the models, presenting finding and building applications on top of them.

MODULE II: MACHINE LEARNING, HANDLING LARGE DATA ON A SINGLE COMPUTER AND FIRST STEPS IN BIG DATA.   (15 Hrs)

Machine learning: machine learning, the modelling process, types of machine learning, semi-supervised learning, Handling large data on a single computer: problems in handling large volume of data, technique for handling large volume of data, general programming tips for dealing with large data sets. First steps in big data: distributed data storage and processing with framework.

MODULE III: NOSQL MOVEMENT AND THE RISE OF GRAPH DATABASES.   (15 Hrs)

Join the NOSQL Movement: Introduction to NOSQL, The rise of graph databases: introducing connected data and graph databases, introducing neo4j a graph database. connected data example - a recipe recommendation engine.

MODULE IV: TEXT MINING AND TEXT ANALYTICS, CASE STUDY AND DATA VISUALIZATION TO THE END USER.   (15 Hrs)

Text mining and text analytics: text mining in the real world, text mining techniques. Case study: classifying reddit posts, Data visualization to the end user: data visualization options, classifier, the java script MapReduce library, creating an interactive dashboard with dc.js, dashboard development tools.

5. References

Introducing Data Science (Big data, Machine Learning and More, using python Tools), Davy Cielen Arno D. B. Meysman Mohamed Ali, 2020

6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global Development	Data science has become the fuel for countless industries. It powers everything from innovation and the customer experience to the future of health care. Data science has the potential to improve the way we live and work, and it can empower others to make better decisions, solve problems, discover new advancements, and address some of the world's most pressing issues.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	Problem-solving for large volume data Techniques for efficient data handling, cleaning and integration.
EMP	Modules 3 and 4	Working with connected data structures. Applying text mining techniques in real-world scenarios.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Troubleshoot (debug) code

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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 Test	Written Exam
CO2	CIA 2 – Written Test	
CO3	CIA 3 – Assignment	
CO4	CIA 3 – Lab Test	

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b)   Model Question Paper- End Semester Exam

INTRODUCTION TO DATA SCIENCE

Course Code: U24/CSC/DSE/502   **Max. Marks: 100**
No. of credits: 4   **Time: 2Hrs**

Section A

I: Answer any Four: **4 x 10 = 40 M**

1.   What is big data? Write about big data ecosystem for data science.
                                        OR
2.   Write about cleansing, integrating and transforming data for Data Science.

3.   Write about Supervised and Semi-supervised learning techniques.

                                        OR
4.   Write in detail for choosing a right algorithm to handle large data.

5.   What is NoSQL? Explain the BASE principles of NoSQL databases.
                                        OR
6.   Write about Neo4j software structure for graph database process

7.   Write about different text mining techniques in detail.
                                        OR
8.   Explain different data visualization options related to Java script.

Section B

II. Answer any Four: **4 x 5 = 20 M**

9.   Explain structured and unstructured data.

10.   What is machine learning? Write the applications of ML.

11.   What is CAP theorem? Explain the concepts of availability and consistency.

12.   What is Map Reducing? Write about Map Reduce Table.

13.   What is Large Data? What are the problems to be faced while handling large data?

14.   Write about the setting of Data Science objective or goal.

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INTRODUCTION TO DATA SCIENCE
PRACTICAL

1. Course Description

Programme: B.Sc.

Course Code: U24/CSC/DSE/502/P

Course Type: DISCIPLINE SPECIFIC ELECTIVE

No. of credits: 1

Max. Hours: 30

Hours per week: 2

Max. Marks: 50

2. Course Objective

The objective of the course is to explore and analyse mega data from various sources in order to take advantage of them and reach conclusions to optimize business processes or for decision support

3. Course Outcomes:

CO1: Apply NoSQL development tools on different types of NoSQL Databases.

CO2: To explore machine learning techniques.

PRACTICAL SESSIONS

Neo4j
1. Query to create Nodes
2. Query to create Relationships between nodes.
3. Query to return nodes and relationships
4. Query to return nodes and relationships depending on condition
5. Query to store Employee Data in XML Document

Base X
6. Query to display employee details who belong to IT department
7. Query to count and display the number of employees who work in marketing department.
8. Query to display emp_name, ethnicity, age, and annual salary of employees whose age more than 40 years
9. Query to display employee data in descending order of their age
10. Query to display employee data depending on their city (use group by).

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INTRODUCTION TO DATA SCIENCE
PRACTICAL MODEL PAPER

Course Code: U24/CSC/DSE/502/P   **Time: 2Hrs**
Credits:1   **Max Marks:50M**

Answer any one:

1.

The 10 Richest People in the World 2023				
Rank	Name	Age	Wealth ($bil)	Wealth per year
1	Bernard Arnault & family	74	211	2.85
2	Elon Musk	51	212	4.16
3	Jeff Bezos	59	213	3.61
4	Larry Ellison	78	214	2.74
5	Warren Buffett	92	215	2.34
6	Bill Gates	67	216	3.22
7	Michael Bloomberg	81	217	2.68
8	Carlos Slim & family	83	218	2.63
9	Mukesh Ambani	65	219	3.37
10	Steve Ballmer	67	220	3.28

Create the above structure using BaseX

- Insert minimum of 10 records.
- Display the details of people in ascending order of their age.
- Display the details of people whose wealth per year is >3.00.
- Count the number of people whose age is >80.

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2.
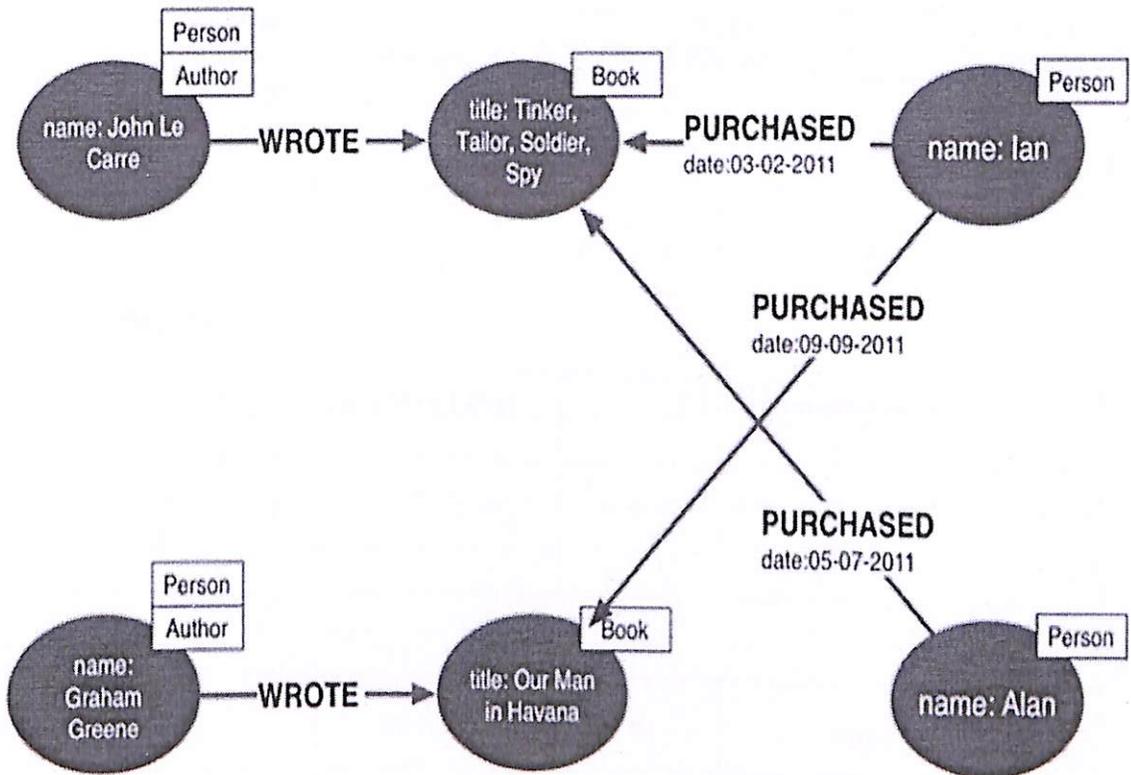
. Create the above graph and perform the following queries.

· Display all names of the persons in the graph.

· Display the details of the person who purchased books.

· Display name of the author who wrote book titled spy

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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
I	15	1	2	10	2	10
II	15	2	2	10	2	10
III	15	3	2	10	1	5
IV	15	4	2	10	1	5

9. CO-PO Mapping

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

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

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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 $1, 2 \ldots \ldots, r$ 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. $\qquad$ **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 $P_2 \to P_4$ 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 $X = \begin{bmatrix} 10 & -3 \end{bmatrix}$ and $Y = \begin{bmatrix} -1 & -5 \end{bmatrix}$.

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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CBCS 2024 LINEAR ALGEBRA

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. $5 \times 6 = 30$ 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	Max. Hours : 60
Course Code : U24/MAT/GE/501	Hours per week : 4
Course Type : GE	Max. Marks : 100
No. of credits : 4	

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.

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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 Test)	
CO4	CIA-II(Assignment)	

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CBCS 2024　　　　　　　　　　　　　　　**MATHEMATICAL METHODS**

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 $y\dfrac{\partial^2 z}{\partial x \partial y} + \dfrac{\partial x}{\partial y} = 4xy$

   (b) Solve $(mx - ny)p + (nx - ly)q = ly\text{-}mx$

   (OR)

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

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

   (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

   $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}, x > 0, t > 0$　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)

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

12. State and Prove Modulation theorem.

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

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

Course Code: U24/STA/GE/501

Course Type: GE

No. of Credits : 4

Max Hours: 60

Hours per week: 4

Max Marks: 100

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	
CO2	CIA-1	
CO3	CIA-2 written test/Assignment	End Semester examination
CO4	CIA-2 MCQ test	

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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

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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.

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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

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SEMESTER-V
PHP with MYSQL

1. Course Description:

Programme: B.Sc.

Course Code: U24/CSC/SEC/501

Course Type: SKILL ENHANCEMENT COURSE

No. of credits: 2

Max. Hours: 30

Hours per week: 2

Max.Marks:50

2. Course Objectives:

To provide the knowledge necessary to design and develop dynamic, database-driven web pages using PHP.

3. Course Outcomes:

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

- **CO1:** A*nalyze* the basic structure of a PHP web application and its deployment on the s server. (Cognitive Level 4)

- **CO2**: *Develop* a database driven dynamic website using PHP and MySQL.
  (Cognitive Level 6)

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4. Course Content:

Module I: Handling HTML Forms (15 Hrs)

Submitting form values, using $_Get and $_Post Methods, Accessing form inputs with Get/Post functions, Combining HTML and PHP codes together on single page, Redirecting the user.

Module II: DATABASE CONNECTIVITY USING PHP (15 Hrs)

Database connectivity - Using the MYSQLI extension, setting up the connection, handling errors, querying the database, committing and rolling back a transaction.

5. References:

1. "Beginning PHP 5.3", by Matt Doyle, Wiley Publishing, Inc., 1/E, 2010.
2. "Web Technologies Black Book", by Kogent Learning Solutions Inc. DreamTech Press, 1/E, 2009.
3. "Beginning PHP and MySQL from Novice to Professional" by W. Jason Gilmore., Apress, 4/E, 2010.
4. "PHP and MySQL Web Development" by Luke Welling, Laura Thomson, Pearson, 4/E, 2016.

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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 Development	The **PHP Hypertext Preprocessor (PHP)** is a programming language that allows web developers to create dynamic content that interacts with databases. PHP is basically used for developing web-based software applications

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Module 1	Creating HTML Forms
EMP	Module 2	Mini Project

7. Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

Formative Assessment - FA (50%)	Summative Assessment - SA (50%)
CIA-20 marks Mini project/Assignment/ Problem solving/Case studies	End Semester Exam – 30 Marks

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b) Question Paper Pattern

PRACTICAL MODEL QUESTION PAPER

Course Code: U24/CSC/SEC/501
Credits: 2

Max Time: 1 Hr
Max. Marks: 30

Answer any 2 of the following:

1. Write a PHP Script for creating Fibonacci Series with recursive function.
2. Write a PHP Script to demonstrate Single Inheritance.
3. Write a PHP Script using built-in String functions.

Prepared by	Checked & verified by	Approved by
diyya M.S. Divya Rachala Facelty.	*(signature)* **Ms. Sowjenya** **HOD**	*(signature)* **Dr. Uma Joseph** **Principal**

(signature)

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SEMESTER-V

SOFTWARE TESTING

1. Course Description

Programme: B.Sc. S.E(H).

Course Code:U24/CSH/DSC/501

Course Type: DISCIPLINE SPECIFIC CORE

No. of credits:4

Max. Hours: 60

Hours per week: 4

Max. Marks: 100

2. Course Objective:

- Students learn to verify the complete software package functions according to the expectations.
- Defined by the requirements/specifications.
- The overall objective to not to find every software bug that exists, but to uncover situations that could negatively impact the customer, usability and/or maintainability.

3. Course Outcomes:

CO1: *Understand & Outline* Various test processes and continuous quality improvement. Types of errors and fault models.

(Cognitive Level: 1 and 2)

CO2: *Plan &Prepare* able to test software in structured, organized ways.

(Cognitive Level: 6)

CO3: *Apply &Illustrate* Students will learn about high level software testing concepts & testing methods (Cognitive Level: 3)

CO4: *Examine &analyze:* Dataflow and Control flow-base test adequacy criteria.

(Cognitive Level: 4)

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4. Course Content

MODULE I: INTRODUCTION TO SOFTWARE ENGINEERING AND QUALITY ASSURANCE   (15 Hrs.)

Software Quality Assurance: Software Engineering, Criteria for the success of a Software Project, Process –oriented software of a software project, Phases in Software Development Life Cycle, Review of Software development life cycle model, Software Quality Assurance, and Quality Management Systems, Software Testing Process.
Introduction: The Purpose of Testing, a Model for Testing.

MODULE II: TESTING TECHNIQUES   (15 Hrs.)

Flow Graphs and Path Testing: Path Testing Basics, Predicates, Path Predicates, and Achievable Paths. Path sensitizing. Implementation and application of path testing, testability tips. Transaction Flow Testing: Transaction Flows, and Transaction Flow Testing Techniques, Implementation comments. Data-Flow Testing- Data-Flow Testing Basics, and Data-Flow Testing Strategies.

MODULE III: DOMAIN TESTING   (15 Hrs.)

Domain Testing: Domain and paths, Domain Testing, and Domains and Interface Testing, Domains and testability. Syntax Testing: Why, What, and How, A Grammar for format, Test Case Generation, and Testability Tips.

MODULE IV: LOGIC BASED TESTING   (15 Hrs.)

Review of Logic Based Testing: Decision Tables. Path Expressions,
States, State Graphs, and Transition Testing- State Graphs, Good state Graph and Bad State Testing.

5. References:

1. Boris Beizer, Software Testing Techniques, Dreamtech Press, 2e, 2011

2. Dr. K.V.K.K. Prasad, Software Testing Tool, Dreamtech Press, 2012 Edition

3. Patton," Software Testing", Pearson Education Limited, 2nd Edition
4. Limaye, "Software Testing", Tata Mcgraw Hill
5. Ammann and Offutt *"Introduction to Software Testing* "(edition 1), Cambridge University Press, 2008

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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 Development	Global development for software testing offers several benefits, including cost savings, access to specialized skills, and increased testing efficiency through round-the-clock testing cycles. However, it also presents challenges such as cultural differences, communication barriers, and security concerns that need to be effectively managed for successful outcomes.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	strong foundation in software testing and enhance your career prospects in this field. Continuous practice, hands-on experience, and a willingness to learn are key to becoming a proficient software tester.
EMP	Modules 3 and 4	combination of technical expertise, soft skills, industry knowledge, and a proactive approach to learning and professional development can greatly enhance your employability in the field of software testing.

7. Pedagogy

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

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8. Course Assessment Plan

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

COs	Continuous Internal Assessments – CIA (40%)	End Semester Examination (60%)
CO1	CIA-1 Written test	
CO2	CIA-1 Written test	End Semester exam
CO3	CIA-2 Presentation	
CO4	CIA-2 Quiz	

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b) Model Question paper- End Semester Exam

SOFTWARE TESTING

Course Code:U24/CSH/DSC/501   **Max Marks:60**
No. of Credits: 4   **Time: 2 Hrs.**

SECTION - A

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

1. Discuss about requirements, features and functionality bugs.

Or

2. Why is it impossible for a tester to find all the bugs in a system? Why might it not be necessary for a program to be completely free of defects before it is delivered to its customers?

3. Explain path testing with an example.

Or

4. Discuss in detail data - flow testing strategies.

5. Discuss in detail the domains and interface testing.

Or

6. What is meant by transaction flow testing? Discuss its significance

7. What are the principles of state testing? Discuss advantages and disadvantages

Or

8. Explain the decision tables.

SECTION B

Answer any FOUR   **4x 5 = 20**

9. What is meant by integration testing? Goals of Integration Testing?

10. Explain various loops with an example?

11. What is path testing? How are paths selected?

12. Distinguish Control Flow and Transaction flow.

13. Write short notes on criteria for success of a software projects

14. State and explain various path selection rules.

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SOFTWARE TESTING
PRACTICAL

1. Course Description

Programme: B.Sc. SE(H)

Max. Hours: 30

Course Code:U24/CSH/DSC/501/P

Hours per week: 2

Course Type: DISCIPLINE SPECIFIC CORE

Max. Marks: 50

No. of credits: 1

2. Course Objectives

- Students learn to verify the complete software package functions according to the expectations.
- The overall objective is not to find every software bug that exists, but to uncover situations that could negatively impact the customer, usability and/or maintainability.

3. Course Outcomes

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

CO1: Various test processes and continuous quality improvement. Types of errors and fault models. Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.

CO2: Apply practical knowledge of a variety of ways to test software and an understanding of some of the tradeoffs between testing techniques.

PRACTICAL SESSIONS

Note: Use Selenium or the latest testing tool which is available.

1. Introduction to testing tools

2. Manual testing

3. Automation testing

Introduction

Web drivers

Selenium Web Driver/Selenium 2.0

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Installing Selenium IDE

4. Locators and Object Identification

Tools to identify elements/objects

Write your own Selenium IDE script without record and playback

5.Selenium WEB-DRIVER

- Why WebDriver?
- Downloading web driver Jars configuring in eclipse
- Architecture of selenium web driver
- Drivers for Firefox, IE, Chrome, I phone, Android etc
- What is the difference between Selenium RC and WD?

Sample programs in web driver

- Web Driver with TEST NG Frame Work
- Executing Automation Test Cases in multiple browsers Sequentially
- Working with Chrome and IE browsers
- What is Firefox Profile and Implementation of Firefox Profile

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SOFTWARE TESTING
MODEL PAPER
PRACTICAL

Course Code: U24/CSH/DSC/501/P   **Max Marks: 50**
No. of Credits: 1   **Time: 2 hrs**
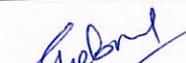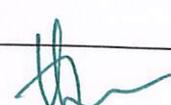
Answer the following

1. Prepare sample data for the test cases design for the scenario given, use the latest tools used in the practical session to test the cases.

b) Question Paper Blueprint

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

9. CO-PO Mapping

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

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

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SEMESTER V
STATISTICAL ANALYSIS USING R

</div>

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.

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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

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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	Written Exam

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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 500 respondents 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

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SEMESTER - V

TIME SERIES ANALYSIS

- **Course Description**
  Programme: B.Sc

  Course Code: U24/STA/DSC/502

  Course Type: DSE 1B

  No. of credits: 4

Max. Hours: 45

Hours per week: 3hrs.

Max. Marks: 100

- **Course Objectives:**

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

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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

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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	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.

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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	

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b)Question Paper Pattern

TIME SERIES ANALYSIS
THEORY

Course Code: U24/STA/DSE/502   Max. Marks: 60
Credits : 4   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

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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

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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

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TIME SERIES ANALYSIS

PRACTICAL

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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.

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SEMESTER - V

WEB TECHNOLOGIES USING JAVA

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1. Course Description

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

Course Code: U24/CSC/DSE/501   **Hours Per week:4**

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

No. of credits: 4

2. Course Objectives

- To introduce the concepts of Java Database Connectivity Programming, servlets and JSP.
- To develop proficiency in creating dynamic web pages.

3. Course Outcomes

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

CO1: *Explain* the concept of XML(Cognitive level – 2)

CO2: *Design* dynamic Web pages using Servlets(Cognitive level – 4)

CO3: *Analyse* the problems in servlets and overcome those in JSP by creating interactive
dynamic Web pages using Java Server Pages(Cognitive levels - 4)

CO4: *Develop* web application using JSP (Cognitive levels – 6)

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4. Course Content

MODULE I: INTRODUCTION TO XML & JSON   (15 Hrs)

XML: Introduction to XML, Defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model,
JSON: Introduction to JSON, syntax, data types, objects, schema, JSON vs XML, JSON with Java.

MODULE II: ACCESSING DATABASES WITH JDBC   (15 Hrs)

Introduction, JDBC architecture, JDBC classes and interfaces, loading JDBC driver, establishing the connection, creating a statement object, executing a query or update, using Prepared statements, using scrollable and updatable ResultSet, creating Callable statements, using database transactions.

MODULE III: INTRODUCTION TO SERVLET TECHNOLOGY   (15 Hrs)

Overview of Servlets, Server setup and configuration, Servlet basics, handling the client request– form data, generating the server – http status codes, response headers, session tracking using cookies, URL rewriting, hidden form fields, session tracking API.

MODULE IV: JAVA SERVER PAGES TECHNOLOGY   (15 Hrs)

Overview of JSP technology, types of JSP tags, invoking Java code with scripting elements, page directive, including files. Introduction to MVS Arcitecture,Understanding the need for MVC, implementing MVC with RequestDispatcher, forwarding requests from JSP pages and including pages.

5. References:

1. Hall, M., Brown, L., & Chaikin, Y. (2008). Core Servlets and JavaServer pages. Core technologies (2nd ed.). Prentice Hall. Basham, B., & Bates, B. (2008). Head first servlets & JSP. O'Reilly.
2. Sharanam Shah, Vaishali Shah, Java EE 7 for Beginners
3. Java EE, JavaScript, jQuery, and Android Training, Tutorials, Consulting, Books, & Resources. Retrieved from http://www.coreservlets.com.
4. JSON Book: Easy Learning of JavaScript Standard Object Notation,Steven Keller,PublisherCreateSpace Independent Publishing Platform, 2016
5. Tutorial:Json Tutorial | Learn Json Tutorial With Our Step by Step Guide (mygreatlearning.com)

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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 Development	To introduce the concepts of Java Database Connectivity Programming, servlets and JSP.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	To establish the connection between Java Application and Database to perform CRUD operations
EMP	Modules 3 and 4	Creating Interactive dynamic web pages using JSP

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Troubleshoot (debug) code

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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 Test	Written Exam
CO2	CIA 2 – Written Test	
CO3	CIA 2 – Skill Test	
CO4	CIA 3 – Lab Test	

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b)   Model Question Paper- End Semester Exam

WEB TECHNOLOGIES USING JAVA

COURSE CODE: U24/CSC/DSE/501   **MAX.MARKS: 60**

Credits:4   **Time: 2 Hrs**

SECTION – A

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

1. a) Explain in detail about XML-DOM?
    b) Explain about JSON Objects? Distinguish between XML vs JSON.

    OR

2. a) What are the elements in XML? Give an example.
    b) Explain in detail how JSON type are mapped in Java

3. Explain JDBC Architecture? Explain different types of JDBC Drivers and how to establish JDBC connection?

    OR

4. Explain in detail about the Statement and Prepared Statement interfaces with suitable diagrams and examples.

5. Explain the life cycle of a Servlet?

    OR

6. Explain session tracking using cookies?

7. Explain different types of JSP tags and JSP scripting elements?

    OR

8. Explain MVC architecture in detail?

SECTION - B

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

9. Explain the Rules of syntax in XML.
10. Write a program to update a record using prepared statements.
11. Explain URL rewriting.
12. Explain http status codes.
13. Explain the process of including a file in JSP.
14. How to load JDBC Driver.

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WEB TECHNOLOGIES USING JAVA

PRACTICAL

1. Course Description

Programme: B.Sc.	Max. Hours: 30
Course Code: U24/CSC/DSE/501/P	Max. Marks: 50
Course Type: DISCIPLINE SPECIFIC ELECTIVE	Hours per week:2
No. of credits: 1	

2.Course Objective:

1. To introduce the concepts of Java Database Connectivity Programming, servlets and JSP.
2. To develop proficiency in creating dynamic web pages.

3.Course Outcomes:

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

CO1: *Establish* connections between Java Application to perform CRUD operations.

CO2: *Creating* dynamic Web pages using Servlets.

Practical Exercises:

1. Creating Sample data using XML.
2. Creating Sample data using JSON.
3. Integrating JSON objects in Java
4. Write a Java application to load a JDBC driver and connect to database.
5. Write a Java application to load a JDBC driver and implement CRUD operations using Statement interface and Result Set interface.
6. Write a Java application implement CRUD operations using Prepared Statement interface and Result Set interface.
7. Develop the servlet to display a welcome message.
8. Develop the servlet to perform arithmetic operations.
9. Develop a servlet to demonstrate login and registration of users to a sample site without database connectivity.
10. Develop a servlet for validating a login page.
11. Develop a dynamic web application to perform CRUD operations on a database using servlets.
12. Develop a servlet to demonstrate login and registration of users to a sample site connecting to database.

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13. Develop a dynamic web application to demonstrate request dispatcher.
14. Develop a dynamic web application to demonstrate session tracking cookies. Create a JSP page that prints temperature conversion (from Celsius to Fahrenheit) chart.
15. Create a JSP page to print current date and time
16. Create a JSP page to find factorial of a given number.
17. Develop a JSP Application to accept Registration Details from the user and store database table.
18. Develop a web application demonstrating JavaBeans.

WEB TECHNOLOGIES USING JAVA
PRACTICAL
MODEL PAPER

Course Code: U24/CSC/DSE/501/P
No of Credits: 1

Max. Marks: 50
Time: 2hrs

Answer any TWO:

1. Develop a web application program to demonstrate Session Tracking using Servlets.

2. Implement a web application to display the Course information, given the course-id using Servlets and JDBC. (Create appropriate database with a table and insert 3 rows)

3. Develop a web application to perform arithmetic operations (+, -, *, /) using JSP.

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
I	15	1	2	10	1	5
II	15	2	2	10	1	5
III	15	3	2	10	2	5
IV	15	4	2	10	2	5

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