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SEMESTER - V

ANALYTICAL SOLID GEOMETRY

1. Course Description

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

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

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

No. of credits : 4

2. COURSE OBJECTIVES:

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

3.COURSE OUTCOMES:

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

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

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

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

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

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4. Course Content

MODULE I **(15 Hours)**

THE PLANE

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

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

MODULE II **(15 Hours)**

THE LINE

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

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

MODULE III **(17 Hours)**

THE SPHERE

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

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

MODULE IV **(13 Hours)**

CONES, CYLINDERS

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

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

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

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

5. References

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

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6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	A major application of solid geometry is in 3D computer graphics.

b)Components on Skill Development/Entrepreneurship Development/Employability

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

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7. Pedagogy

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

8. Course Assessment Plan

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

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

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b) Model Question Paper- End Semester Exam

ANALYTICAL SOLID GEOMETRY

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

SECTION-A

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

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

   OR

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

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

   OR

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

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

   OR

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

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

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

(OR)

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

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

SECTION-B

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

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

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ANALYTICAL SOLID GEOMETRY

PRACTICAL

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

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

Course Outcomes:

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

PRACTICAL SESSIONS

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

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ANALYTICAL SOLID GEOMETRY

MODEL QUESTION PAPER

PRACTICAL

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

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

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

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

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SEMESTER –V

COMPUTATIONAL PHYSICS

1. Course Description:

Programme : B.Sc. **Max. Hours: 60**
Course Code : U24/PHY/DSE/502 **Hours per week:4**
Type of course: DSE-1 **Max. Marks: 100**
No. of credits : 4

2. Course Objectives:

1. The students will be able to explore the dimensions of computer simulations
2. Students will be ready for programming languages as Python, MATLAB, or C/C++.

3. Course Outcome:

This course will help students in –

CO1: List and Define data integrity, reproducibility, and responsible use of computational resources. (L 1 & 2)

CO2: Summarise and complex physical problems through numerical simulations and analysis. (L 2 & 3)

CO3: Infer the benefits of computational tools necessary to tackle complex physical problem. (L4)

CO4: Assess various numerical techniques and algorithms used in computational physics for solving differential equations, optimization problems, and other mathematical models. (L5)

4. Course Content

Module I: PROGRAMMING IN C **(15 Hrs)**

Flow charts, Algorithms, Integer and floating-point arithmetic, Precision, Variable types, Arithmetic statements, Input and output statements, Control statements, Executable and non-executable statements, Arrays, Repetitive and logical structures, Subroutines and functions, Operation with files, Operating systems, Creation of executable programs.

Module II: NUMERICAL METHODS OF ANALYSIS **(15 Hrs)**

Solution of algebraic and transcendental equations: Iterative, bisection and Newton-Raphson methods, Solution of simultaneous linear equations: Matrix inversion method

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Interpolation: Newton and Lagrange formulas, Numerical differentiation, Numerical Integration, Trapezoidal, Simpson and Gaussian quadrature methods, Least-square curve fitting, Straight line and polynomial fits.

Module III:NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS: (15 Hrs)

Euler and Runge-Kutta methods. Simulation,Generation of uniformly distributed random integers, Statistical tests of randomness, Monte- Carlo evaluation of integrals and error analysis, Non-uniform probability distributions, Importance of sampling, Rejection method

Module IV: ALGORITHMS **(15 Hrs)**

Metropolis algorithm, Molecular diffusion and Brownian motion as random walk problems and their Monte Carlo simulation. Finite element and finite difference methods, boundary value and initial value problems, density functional methods.

5. Reference Books:

a) Computational Methods in Physics and Engineering: Wong.
b) Computer Oriented Numerical Methods: Rajaraman.
c) Computer Programming in FORTRAN 77: Rajaraman.
d) Applied Numerical Analysis: Gerald.
e) A Guide to Monte Carlo Simulations in Statistical Physics: Land

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
National	Invaluable tool for tackling some pressing challenges faced by nation today as it can model complex systems.
Global	Development of defense technologies and cybersecurity measures. contributing to global security and stability.

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b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Entire Course	Modelling and Simulations

7.Pedagogy

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

8.Course Assessment Plan

d) Weightage of Marks in Formative and Summative Assessments

COs	Formative Assessment - FA (50%)	Summative Assessment - SA (50%)
CO1	CIA-1 (Written Exam)	End Semester exam
CO2	CIA-1 (Written Exam)	
CO3	CIA-2 Presentation/Case Studies/Video Making.	
CO4	CIA-2 Quiz/Assignment	

b)Question Paper Pattern

MODEL QUESTION PAPER

Course Code: U24/PHY/DSE/502 **Max Marks: 60**
Credits: 4 **Time: 2 Hrs**

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

1 Discuss Input and output and Control statements
OR
2. Explain subroutines and functions.

3. Discuss Newton Raphson's method with examples.
OR
4. Demonstrate Gaussian quadrature method with examples.

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5. Categorise Monte-Carlo evaluation of integrals.

OR

6. Analyze Runge-Kutta methods.

7.Assess density functional methods.

OR

8.Discuss Molecular diffusion and Brownian motion

II. Write Short notes on any 4 questions **(4x5=20 M)**

9. floating point arithmetic
10. Matrix inversion method
11. Trapezoidal rule
12. Numerical Integration,
13. Least-square curve fitting
14. Error analysis

c) **Question Paper Blueprint**

Modules	**Hours Allotted in the Syllabus**	**CO Addressed**	**Section A** (No. of Questions)	**Total Marks**	**Section B** (No. of Questions)	**Total Marks**
1	15	CO-1	2	4x10=40	6 (By taking atleast one question from each Module)	4x5=20
2	15	CO-2	2			
3	15	CO-3	2			
4	15	CO-4	2			

9.CO-PO Mapping:

CO	PO	Cognitive Level	Class room sessions(hrs)
1	1	Remembering & understanding	15
2	2	Understanding & Applying	15
3	1	Analysing	15
4	2	Evaluating	15

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PRACTICAL

1. Course Description:

Programme : B.Sc. **Max. Hours: 30**
Course Code : U24/PHY/DSE/502/P **Hours per week:2**
Type of course : DSE- 1 **Max. Marks: 50**
No. of credits : 1

2. Course objective:

Prepare students how to validate and verify computational models by comparing numerical results.

Course Outcome:

This course will help the students to-

CO1: Enhance knowledge on computing techniques and high-performance computing architectures.

CO2: Analyse various computational projects and exploring open-ended problems.

PRACTICAL SESSIONS

1. Jacobi Method of Matrix Diagonalization.
2. Solution of transcendental or polynomial equations by the Newton Raphson method.
3. Linear curve fitting and calculation of linear correlation coefficient.
4. Matrix summation, subtraction and multiplication.
5. Matrix inversion and solution of simultaneous equation.
6. Lagrange interpolation based on given input data.
7. Numerical integration using the Simpson's method.
8. To evaluate sum of finite series and the area under a curve.
9. To find the product of two matrices.
10. To find a set of prime numbers and Fibonacci series.
11. To write program to open a file and generate data for plotting using Gnuplot.
12. Plotting trajectory of a projectile projected horizontally.

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MODEL QUESTION PAPER
PRACTICAL

Course Code: U24/PHY/DSE/502/P
Credits: 1

Max Time: 2 Hrs
Max. Marks: 50

Answer any ONE of the following:

1. Evaluate sum of finite series and the area under a curve.
2. Find the product of two matrices.
3. Find a set of prime numbers and Fibonacci series.
4. Write program to open a file and generate data for plotting using Gnuplot.
5. Plot trajectory of a projectile projected horizontally.
6. Plot trajectory of a projectile projected making an angle with the horizontal direction
7. Find numerical solution of equation of motion of simple harmonic oscillator and plot the outputs for visualization.
8. Simulate the motion of a particle in a central force field and plot the output for visualization.

Prepared by Course Teacher [Name & Signature]	Checked &Verified by HOD [Name & Signature]	Approved by the Principal
Dr. Usha Praveena	R. S. Karthikeya	

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SEMESTER – V

SEC-III- ELECTRICAL CIRCUITS AND NETWORK SKILLS

1. Course Description

Programme: B.Sc.
Course Code: U24/PHY /SEC/501/P
Type of course: SEC
No. of credits: 2

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

2. Course Objectives:

- Enable the students to design and trouble shoot the electrical circuits, networks and appliances through hands-on mode.
- Study of various devices

3. Course Outcome:

This SEC paper will help students to enhance their overall skills

CO1: Acquire knowledge of basic Electricity Principles. (L2)

CO2: Interpret basic techniques to measure Power in ac circuits. (L3)

CO3: Analyse the working of electric circuit elements. (L4)

CO4: Knowledge of electric generators and Solid-state devices. (L5)

4. Course Content:

Module I: **(15 Hrs)**

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.
Understanding Electrical Circuits: Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor.

Module II: **(15 Hrs)**

Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers.

Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor.

Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources.

Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection.

5. Reference Books:

a. A text book in Electrical Technology - B L Theraja - S Chand & Co.
b. A text book of Electrical Technology - A K Theraja
c. Performance and design of AC machines - M G Say ELBS Edn.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Local	By applying these principles effectively, communities can ensure reliable, efficient, and sustainable electrical systems.

7.Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
ED	Entire Course	Enable individuals to start their own businesses, offering services as electrical system design, consulting, or specialized equipment manufacturing.
EMP	Module-II	Enhances employability across a wide range of industries, offering diverse career paths.

8.Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

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

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b) Question Paper Pattern

PRACTICAL

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

Answer any ONE of the Following

1. Construct resistances in series and find resultant.
2. Draw phasor diagram, voltage and current waveform of AC circuit.
3. Explain the procedure to convert a practical Voltage source into an equivalent Current source with suitable example.
4. Determine the action of diode.
5. Determine the power factor for the inductive circuit.
6. Construct a full wave rectifier.
7. Construct a single-phase DC motor.
8. Determine grounding and reversal of circuits.

Prepared by Course Teacher [Name & Signature]	Checked &Verified by HoD / Programme Coordinator [Name & Signature]	Approved by the Principal
Dr Usha Praveena	R.S. Kanth Kaur	

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SEMESTER - V

ELEMENTARY NUMBER THEORY

1. Course Description

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

2. Course Objectives

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

3. Course Outcome

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

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

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

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4. Course Content

MODULE I: **(15 HRS)**

THE FUNDAMENTAL THEOREM OF ARITHMETIC

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

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

MODULE II **(15 HRS)**

ARITHMETICAL FUNCTIONS

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

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

5. Reference Books

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

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6. Syllabus Focus

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

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

7. Components on Skill Development/Entrepreneurship Development/Employability

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

8. Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

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

b Model Question Paper- End Semester Exam

ELEMENTARY NUMBER THEORY

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

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

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

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SEMESTER - V

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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SEMESTER V
INTRODUCTION TO DATA SCIENCE

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 A1i, 2020

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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	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

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. **Max. Hours: 30**

Course Code: U24/CSC/DSE/502/P **Hours per week: 2**

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

No. of credits: 1

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
Credits:1

Time: 2Hrs
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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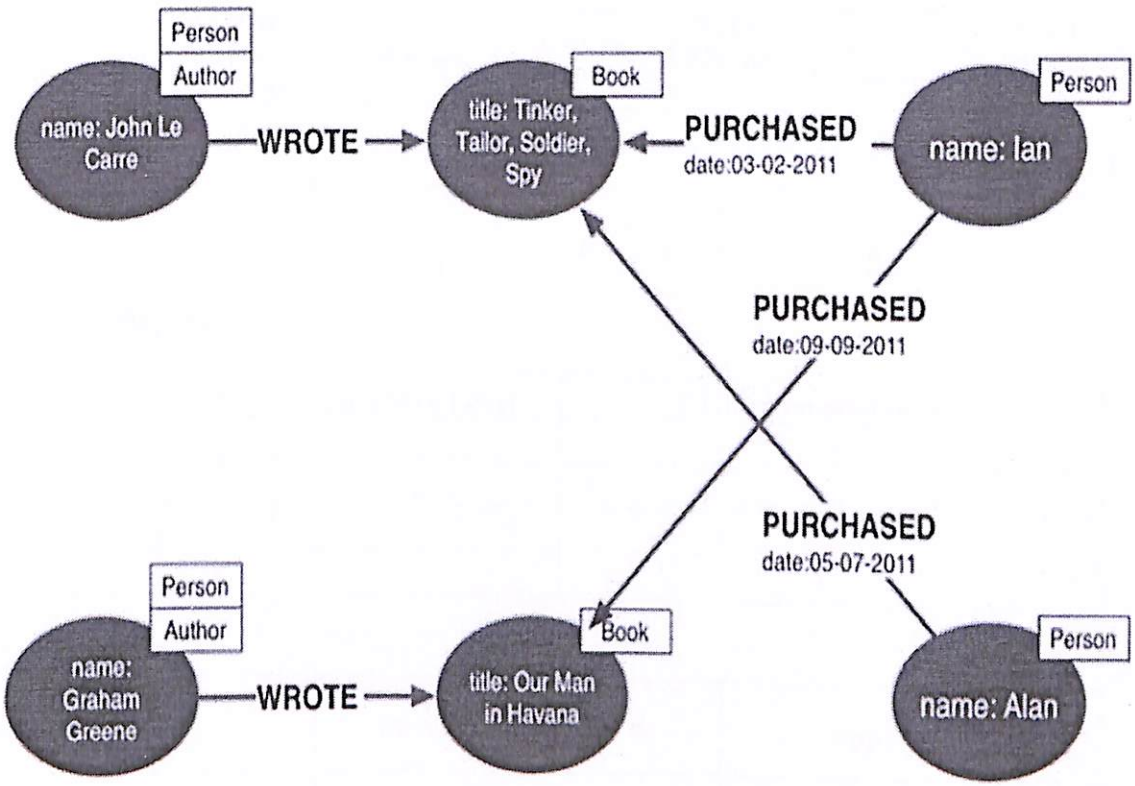
2.



. 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……,,r of an n x n matrix A then prove that the set $\{ v_1, v_2, \ldots\ldots v_r\}$ is linearly independent.
5. Prove that an n x n matrix A is diagonalizable if and only if A has n linearly independent eigenvectors.

OR

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

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

OR

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

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SECTION –B (Short Answer Questions)

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

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

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

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

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

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

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

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LINEAR ALGEBRA
PRACTICAL

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

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

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

No. of credits: 1

Course Outcomes:

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

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PRACTICAL SESSIONS

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

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MODEL QUESTION PAPER
PRACTICAL

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

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

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

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

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

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

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SEMESTER – V

MATHEMATICAL METHODS

1. Course Description

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

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

2. Course Objectives

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

3. Course Outcomes

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

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

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4. Course Content

MODULE I: **(15 HRS)**

PARTIAL DIFFERENTIAL EQUATIONS

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

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

MODULE II: **(15 HRS)**

HOMOGENEOUS AND NON-HOMOGENEOUS LINEAR PARTIAL DIFFERENTIAL EQUATIONS

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

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

MODULE III: **(17 HRS)**

FOURIER TRANSFORMS

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

Sections: 1.1 – 1.16, Pg. No. 1- 46

MODULE IV: **(13 HRS)**

APPLICATION OF FOURIER TRANSFORMS

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

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

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5. References

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

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6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	Solve complex real-world problems by modelling them as differential equations.

b) Components on Skill Development/Entrepreneurship Development/Employability

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

7. Pedagogy

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

8. Course Assessment Plan

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

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

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b) Model Question Paper- End Semester Exam

MATHEMATICAL METHODS
MODEL QUESTION PAPER
THEORY

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

SECTION-A

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

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

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

(OR)

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

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

(OR)

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

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

(OR)

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

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

   $= 0, x > 1$

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

(OR)

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

SECTION – B

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

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

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

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

12. State and Prove Modulation theorem.

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

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

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SEMESTER –V

MODERN PHYSICS

1. Course Description

Programme : B.Sc. **Max. Hours: 60**
Course Code : U24/PHY/DSE/501 **Hours per week:4**
Type of course: DSE- 1 **Max. Marks: 100**
No. of credits : 4

2. Course Objectives:

1. Inculcate knowledge of Quantum Physics and Nuclear Physics.
2. Enhance the theoretical knowledge of crystal systems and their related properties.

3. Course Outcomes:

It helps the graduates to-

CO 1: Interpret the failure of classical physics and need for quantum physics. (L2)

CO2: Illustrate the knowledge of central concepts of nuclear physics and models. (L3)

CO3: Infer & assess the knowledge of various structural properties of elemental solids. (L4,5)

CO4: Validate the spectroscopic techniques to execute experiments with electric and magnetic fields. (L5)

4. Course Content –

Module I: QUANTUM MECHANICS **(15 Hrs)**

Inadequacy of classical Physics: Spectral radiation - Planck's law (only discussion). Photoelectric effect - Einstien's photoelectric equation. Compton's effect - experimental verification.

Matter waves & Uncertainty principle: de Broglie's hypothesis - wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de Brogile waves of electron in Bohr orbits. Heisenberg's uncertainty principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Complementary principle of Bohr.

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Schrodinger Wave Equation

Schrodinger time independent and time dependent wave equations. Wave function properties - Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values. Particle in one dimensional box.

Module II: SPECTROSCOPY **(15 Hrs)**

Atomic Spectra: Introduction - Drawbacks of Bohr's atomic model - Sommerfeld's elliptical orbits -relativistic correction (no derivation). Stern & Gerlach experiment, Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules - spectra of alkali atoms, doublet fine structure, Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

Molecular Spectroscopy: Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule. Determination of inter nuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman effect, classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

Module III: NUCLEAR PHYSICS **(15 Hrs)**

Nuclear Structure: Basic properties of nucleus - size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p, n-n, and n-p scattering (concepts), nuclear forces. Nuclear models- liquid drop model, shell model.

Alpha and Beta Decays: Range of alpha particles, Geiger - Nuttal law. Gammow's theory of alpha decay. Geiger - Nuttal law from Gammow's theory. Beta spectrum - neutrino hypothesis,

Particle Detectors: GM counter, Proportional counter, Scintillation counter.

Module IV: SOLID STATE PHYSICS & CRYSTALOGRAPHY **(15 Hrs)**

Crystal Structure : Crystalline nature of matter. Cystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, FCC, CsCl, NaCl, diamond and Zinc Blende)

X ray Diffraction: Diffraction of X -rays by crystals, Bragg's law, Experimental techniques - Laue's method and Powder method.

Superconductivity : Basic experimental facts - zero resistance, effect of magnetic field, Meissner effect, persistent current, Isotope effect. Thermodynamic properties, specific heat, entropy. Type I and Type II super conductors. Elements of BCS theory - Cooper pairs, Applications.

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5. Reference Books:

a) Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
b) Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A.Dubson,2009, PHI Learning
c) Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
d) R. Murugeshan and Kiruthiga Siva prasath, Modern physics, S.chand &Co.
e) Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill.
f) Kittel. C,An Introduction to Solid State Physics (5th edition)

6.Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	By leveraging modern physics innovations and fostering global cooperation, communities can strive for a sustainable world.
National	Its applications not only drive technological innovation but also contribute to enhanced national security.
Local	Through the use of physics-based technologies and collaborative efforts communities can pave the way toward a resilient future.

b)Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 4	Hands on practicals on Materials
Employability	Module 3	Instrumentation

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7.Pedagogy

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

8.Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

COs	Formative Assessment - FA (40%)	Summative Assessment - SA (60%)
CO1	CIA-1 (Theory Exam)	End Semester exam
CO2		
CO3	CIA-2 Presentation/ Model making/Quiz/ Assignment	
CO4	CIA-2 Objective test	

b) Question paper Pattern

Course Code: U20/ PHY/DSE/501

Time: 2 Hrs
Max Marks: 60

SECTION –A

I. Answer All questions: **4 x10=40M**

1. Describe Davisson and Germer experiment on electron diffraction. Discuss the results of the experiment.

OR

2 Apply Schrodinger equation to obtain the expression for energy of a particle in one dimensional box. Outline physical significance of wave function.

3. What is Raman Effect and describe the experimental setup to observe it.

OR

4. Describe the concept of vector atom model. Explain L-S and J J coupling scheme.

5. Explain nuclear models in detail.

OR

6. Explain Gamow's theory of alpha decay.

7. List seven crystal systems with necessary diagrams and examples.

OR

8. Define superconductivity and classify Super conductors on the basis of critical fields.

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SECTION – B

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

9. Report the consequences of Heisenberg Uncertainty principle.
10. What are Operators?
11. Extend electron spin to illustrate spatial quantization.
14. Explain Geiger Nuttal law.
15. What are Miller Indices?
16. Interpret Meissner effect?

c) Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	CO Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO-1	2	4x10=40	6 (By taking atleast one question from each Module)	4x5=20
2	15	CO-2	2			
3	15	CO-3	2			
4	15	CO-4	2			

9. CO-PO Mapping:

CO	PO	Cognitive Level	Class room sessions (hrs)
1	1	Understand	15
2	2	Applying	15
3	1	Analyzing, Evaluating	15
4	2	Creating	15

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PRACTICAL

SEMESTER-V

1. Course Description:

Programme : B.Sc.
Course Code : U24/PHYS/DSE/501/P
Type of course : DSE-1
No. of credits : 1

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

2. Course Objectives:

Introduce the basic practical knowledge of Modern Physics

3. Course Outcome:

This course will help the students to-

CO1: Carry out experiments and compare results with theoretical predictions. (L5)

CO2: Prepare the technical report on the experiments carried (L6)

PRACTICAL SESSIONS

1. To determine value of Boltzmann constant using V-I characteristic of PN diode.
2. To determine the laws of photoelectric emission and draw relevant graphs.
3. To determine the ionization potential of mercury.
4. To determine the value of e/m for electron by long solenoid method.
5. To determine Planck's constant using Photo cell.
6. To find the value of photo electric work function of a material of the cathode using a photo- electric cell.
7. To determine Energy gap of intrinsic semi-conductor
8. To measure the Magnetic susceptibility of Solids.
9. To determine the Coupling Coefficient of a piezoelectric crystal.
10. To measure the Dielectric Constant of a dielectric Materials.
11. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.
12. To determine the Hall coefficient of a semiconductor sample.

Note: Minimum of eight experiments should be performed.

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Reference Text Books

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers

MODEL QUESTION PAPER
PRACTICAL

Course Code: U24/PHY/DSE/501/P
Credits: 1

Max Time: 2 Hrs
Max. Marks: 50

Answer any ONE of the following.

1. Determine value of Boltzmann constant using V-I characteristic of PN diode.
2. Determine the laws of photoelectric emission and draw relevant graphs.
3. Determine the ionization potential of mercury.
4. Determine the value of e/m for electron by long solenoid method.
5. Determine the Coupling Coefficient of a piezoelectric crystal.
6. Measure the Dielectric Constant of a dielectric Materials.
7. Draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.
8. Determine the Hall coefficient of a semiconductor sample.

Prepared by Course Teacher [Name & Signature]	Checked &Verified by HOD [Name & Signature]	Approved by the Principal
Dr. Usha Praveena	R.S. Karthikeyan	

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SEMESTER-V
PHP with MYSQL

1. Course Description:

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

Course Code: U24/CSC/SEC/501 **Hours per week: 2**

Course Type: SKILL ENHANCEMENT COURSE **Max.Marks:50**

No. of credits: 2

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
M.S. Divya Rachala Faculty.	Ms. Sowjenya HOD	Dr. Uma Joseph Principal

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SEMESTER –V
RENEWABLE ENERGY RESOURCES

1. Course Description

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

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

2. Course Objectives:

- To equip the students with a comprehensive understanding of various renewable energy sources, and their technologies.
- To acquire knowledge on the applications of renewable energy sources and potential contributions to address global energy challenges.

3. Course Outcomes:

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

CO1: Compare renewable and non-renewable energy sources.(L4)

CO2: Interpret Discuss the efficiency, scalability, and environmental impacts of various renewable energy technologies.(L2).

CO3: Analyse the challenges and opportunities associated with renewable energy grid integration((L4)

CO4: Develop strategies and recommendations for advancing renewable energy adoption and achieving climate mitigation.(L6)

4. Course Content:

MODULE I **(15 Hrs)**

Principles of Solar Radiation and collection (Qualitative only):

Non-renewable energy resources -Principles of power generation and transmission. A model of conventional thermal power plant. Advantages and disadvantages of conventional power plants. Role and potential of new and renewable sources, the solar energy option , environmental impact of solar power, physics of the sun , the solar constant, solar radiation on tilted surface, instruments for measuring solar radiation and sunshine, solar radiation data.

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MODULE II **(15 Hrs)**

Solar Energy Storage and Applications:

Solar energy collectors-Flat plate and concentrating collectors, classification of concentration collectors and orientation , advanced collectors. Different sensible , latent heat and stratified storage, solar ponds. Solar Applications-Solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

MODULE-III **(15 Hrs)**

Wind and Biomass Energy:

Resources and potentials, horizontal and vertical axis windmills, performance characteristics .Principles of Bio-Conversion, Energy from waste, types of biogas digesters, gas yield, combustion characteristics of biogas, utilization for cooking, LPG and CNG.

MODULE-IV

Geothermal and Ocean Energy: **(15 Hrs)**

Resources, Types of Wells, methods of harnessing the energy, potential in India. OTEC, principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants, land and their economics.

5. Reference Text books:

1. Non-Conventional Energy Sources-G.D.Rai, Khanna Publishers
2. Renewable Energy Resources-Twidell & Wier, CRC Press(Taylor & Francis)
3. Renewable energy resources-Tiwari and Ghosal, Narosa.
4. Renewable Energy Technologies-Ramesh & Kumar, Narosa
5. Non- Conventional Energy Systems-K Mittal, Wheeler
6. Renewable energy sources and emerging technologies by D.P. Kothari, K.C. Singhal.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
GLOBAL	Renewable energy development supports sustainable development goals by providing access to clean and affordable energy services contributing to economic development and competitiveness.

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b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 1 Module 4	Learn the various instruments and their functions in measuring solar radiation and sunshine, as well as principles of power generation. Coach students to propose solutions for overcoming challenges in geothermal well-drilling or ocean energy conversion.
Employability	Module 3	To analyse wind and biomass resources in a selected area and then propose feasibility studies for wind farm or biomass energy plant development.
Entrepreneurship Development	Module 2	Develop business plans for solar energy applications, including market analysis, financial projections, and marketing strategies.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Experiential Learning	Experiments/Quiz
2.	Participative Learning	Presentation/Seminar
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)	Written Exam
CO2	CIA-I(Written Exam)	
CO3	CIA-II (Skill Tests)	
CO4	CIA-II (Assignments)	

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b. Question paper pattern

RENEWABLE ENERGY RESOURCES

Course Code: U24/PHY/GE/501 **Max Time: 2 Hr**

Max. Marks: 60

SECTION -A

I. Answer All

1. Compare the environmental impact of solar power compared to conventional power plants.

or

2. Examine the significance of instruments used for measuring solar radiation and sunshine.

3. Explain flat plates and concentration solar energy collectors.

or

4. Describe the working principle of photovoltaic energy conversion.

5. Compare horizontal and vertical axis windmills, highlighting their performance characteristics.

or

6. Examine the combustion characteristics of biogas and its utilization for cooking , LPG and CNG.
7. Explain the different types of geothermal wells and methods of harnessing geothermal energy.

or

8. Discuss the principles of ocean Thermal energy conversion (OTEC). Describe the setting of OTEC plants and the thermodynamic cycles involved.

SECTION –B

II. Answer any FOUR : 4X5=20 M

9. Explain the concept of the solar constant and its significance in solar energy applications.

10. Define sensible and latent heat storage in solar energy systems. Give examples of each. E

11. Explain the concept of energy from waste in biomass energy production.

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12. Discuss the economics of mini-hydel power plants and their suitability for different geographical locations.

13. Discuss the advantages and disadvantages of conventional power plants compared to solar energy options.

14. Compare the potential of geothermal energy with other renewable energy sources in India.

c. Question Paper Blueprint

Modules	Hours Allotted in the Syllabus	CO Addressed	Section A (No. of Questions)	Total Marks	Section B (No. of Questions)	Total Marks
1	15	CO-1	2	4x10=40	6 [By taking at least 2 questions from each module].	4x5=20
2	15	CO-2	2			
3	15	CO-3	2			
4	15	CO-4	2			

9. CO-PO Mapping

CO	PO	Cognitive Level	Class room sessions(hrs)
1	1,2	Analysis	15
2	1,6,7	Comprehension	15
3	1,6	Analysis	15
4	2,7	Synthesis	15

Prepared by Course Teacher [Name & Signature]	Checked &Verified by HoD / Programme Coordinator [Name & Signature]	Approved by the Principal
Devy.K.	K.S Kantikar	

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SEMESTER - V

WEB TECHNOLOGIES USING JAVA

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.

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 **Max. Marks: 50**
No of Credits: 1 **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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