SEMESTER - IV

DATA ANALYSIS AND VISUALIZATION

1. Course Description:

Programme: B.Sc./B.Com./BMS

Course Code: U24/CSC/SEC/401

Course Type: SKILL ENHANCEMENT COURSE

No. of credits: 2

Max. Hours: 30

Hours per week: 2

Max. Marks: 50

2. Course Objectives:

- To learn the skills for working with formulas, functions, named ranges, referencing cells, and auditing for effective data analysis and manipulation.
- To learn the skills required for case analysis of different scenarios using the tools for analysis and visualisation.

3.Course Outcomes:

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

CO1: ***Apply*** formulas, functions, and named ranges for effective data manipulation to Demonstrate Excel Data Analysis Proficiency. (Cognitive level – 3)

CO2: ***Demonstrate*** ability to employ analytical tools and visualization techniques to extract insights and present findings effectively. (Cognitive level – 3)

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

4. Course Content

MODULE I: DATA REPRESENTATION (15 Hrs)

Review of Excel-Worksheet Basics, Protecting Workbook, Importing and Exporting data, Sharing in Excel; Formula sand functions – understanding formulas; operators in formula; named ranges; calculations; functions in formulas; relative and absolute addressing; referencing cells outside the worksheet and workbook; functions- logical, summarizing, text, lookup, reference, data and time, math functions; error handling, formula auditing.

MODULE II: DATA VISUALIZATION (15 Hrs)

Charts–waterfall, histogram, pareto, box and whisker, Tree map, sunburst, sparkline,3D map charts and their uses; Advanced charts -Milestone chart, SmartArt graphics, Organization chart. Pivot tables–verify data source, format data, recommended pivot tables, adding slicers, timelines, calculated fields and group fields in pivot.

5. References

1. Manisha Nigam, "Data Analysis with Excel", BPP publications, 2018

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

6. Syllabus Focus:

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

Local/Regional/National/Global Development Needs	Relevance
Global Development	Data Analysis is a systematic method to look for trends, groupings, or other relationships between different types of data. Data visualization is to make it easier to identify patterns, trends and outliers in large data sets.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD and EMP	Modules 1 and 2	Proficiency in Excel for worksheet management, data importing/ exporting, sharing, formula understanding, error handling and auditing for effective data analysis and manipulation. Proficiency in creating and utilizing various types of charts and understanding their purposes for data visualization.

7. 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/Written Assignment / Problem solving/Case studies	End Semester Exam – 30 Marks

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University
Hyderabad-500 007.

b) Question Paper Pattern

EXTERNAL- MODEL QUESTION PAPER

PRACTICAL

Course code: U24/CSC/SEC/401
Credits:2

Max. Marks: 30
Max Time: 1 Hr

I. Answer the following.

1. Refer the excel worksheet shared and perform the below tasks: **(15M)**
   a. Apply conditional Formatting for Total column and find how many students Mark1 is greater than 42.
   b. Calculate total and Percentage.
   c. Use VLOOKUP function to find the name of the student with Roll No 12823.
   d. Use IF CONDITION for Pass/fail. If Percentage greater than 72 "Pass" else "Fail".
   e. Add a new column as Full name and fill the data using CONCATENATE function.

2. Draw a sparkline chart for the following chart **(15M)**

Month	Jan	feb	Mar	Apr	may	jun
Revenue 2020	7850	8900	-8700	740	-7463	7841
Revenue 2021	7900	5008	4700	-4500	4850	7958
Revenue 2022	8000	6700	-4000	7200	5300	8900

Prepared by	Checked & Verified by	Approved by
Ms.Afeefa Noorain Teaching Faculty	Ms. D. Sowjenya HOD	Dr. Uma Joseph Principal

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

SEMESTER - IV

DATABASE MANAGEMENT SYSTEM

1. Course Description

Programme:	**B.Sc.**	**Max. Hours: 60**
Course Code:	**U24/CSC/DSC/401**	**Hours per week: 4**
Course Type:	**DISCIPLINE SPECIFIC CORE**	**Max. Marks: 100**
No. of credits:	**4**	

2. Course Objectives

- To understand the importance of database management system and its application.
- To learn the process of Normalizations and implement
- To learn the security measures to considered in a database management system.

3. Course Outcomes

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

CO1: ***Describe*** the relational database management system and ***illustrate*** the relational model with ER-Diagrams. (Cognitive level – 2)

CO2: ***Demonstrate*** the process of Normalization in databases. (Cognitive level – 3)

CO3*: Outline* the database security measures and transaction management techniques. (Cognitive level - 1)

CO4: ***Define*** and ***Categorize*** advanced database concepts. (Cognitive level – 4)

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

4. Course Content

MODULE I: INTRODUCTION TO DATABASE **(15 Hrs)**

Introduction to Databases: Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment, Advantages and Disadvantages of DBMSs, The Three-Level ANSI-SPARC Architecture, Database Languages, Data Models, Functions of a DBMS, Components of a DBMS. Relational Model- Introduction, Terminology, Integrity Constraints, Views; Entity Relationship Modelling- Entity–Relationship Modelling: Entity Types, Relationship Types, Attributes, Keys, Strong and Weak Entity Types, Attributes on Relationships, Structural Constraints, Enhanced Entity–Relationship Modelling-Specialization/Generalization

MODULE II: NORMALIZATION **(15 Hrs)**

Functional–Dependencies- Anomalies, Partial Functional Dependency, Transitive Functional Dependency, Multi Valued Dependency, Join Dependency; Normalization- The Purpose of Normalization, Data Redundancy, Update and delete Anomalies, The Process of Normalization, First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF); Advanced Normalization – Boyce- Codd normal form (BCNF), Fourth Normal form (4NF)

MODULE III: SECURITY & TRANSACTION MANAGEMENT **(15 Hrs)**

Database security – threats, counter measures - authorization, access controls, views, backup and recovery, integrity, encryption, RAID; Transaction Support – Properties of transactions, database architecture, Concurrency Control- the need for concurrency control, Serial Schedule and Serializability, Conflict Serializability, Locking methods- Shared Lock, Exclusive Lock, 2 Phase Locking, and Deadlocks.

MODULE IV: INTRODUCTION TO ADVANCED DATABASE CONCEPTS (15 Hrs)

Distributed DBMS Concepts and Design-Introduction ,Advantages and Disadvantages, Distributed Relational Database Design ; Data Warehousing Concepts -Introduction to Data Warehousing ; OLAP - Representation of Multi-Dimensional Data ; Data Mining-Introduction, Data Mining Techniques-.Predictive Modeling

5. References

1. Connolly, Thomas; Begg, Carolyn,"Database Systems A Practical Approach to Design, Implementation and Management 4/E", Pearson, 2008
2. Elmasri, Navathe, "Fundamentals of Database Systems 5/E", Pearson
3. Peter Rob, Carlos Coronel, "Database System Concepts" ,Cengage learning, India Edition.

6.Syllabus Focus

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

Local/Regional/National /Global Development Needs	Relevance
Global Development	RDBMS is used to efficiently organize and retrieve data for a wide range of applications. It forms the basis for all OLTP and OLAP applications.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules 1 and 2	Designing ER Diagrams and generating Normalized tables.
EMP	Modules 1,2 and 3	Understanding the role responsibilities of database administration.

7. Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Design the queries for data retrieval

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

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 – Assignment/Presentation/Case Study	
CO4	CIA 3 – Lab Test	

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

b) Model Question Paper- End Semester Exam

DATABASE MANAGEMENT SYSTEM

Course Code: U24/CSC/DSC/401 **Max. Marks: 60**

No. of credits: 4 **Time: 2Hrs.**

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

1. a) Explain the limitation of the file-based approach.
   b) Explain the roles in the database environment.

   OR
2. a) Explain weak and strong entity types with an example.
   b) Explain the degree of Relationship with an example.

3. What is Normalization? Explain 1NF and 2NF with an example.

   OR
4. Consider the following unnormalized data. Illustrate the process of normalizing the attributes to produce a set of well-designed 3NF Relations

Project Code	Project Title	Project Manager	Project Budget	Employee No.	Employee Name	Department No.	Department Name	Hourly Rate
PC010	Pensions System	M Phillips	24500	S10001	A Smith	L004	IT	22.00
PC010	Pensions System	M Phillips	24500	S10030	L Jones	L023	Pensions	18.50
PC010	Pensions System	M Phillips	24500	S21010	P Lewis	L004	IT	21.00
PC045	Salaries System	H Martin	17400	S10010	B Jones	L004	IT	21.75
PC045	Salaries System	H Martin	17400	S10001	A Smith	L004	IT	18.00
PC045	Salaries System	H Martin	17400	S31002	T Gilbert	L028	Database	25.50
PC045	Salaries System	H Martin	17400	S13210	W Richards	L008	Salary	17.00

5. Explain any five counter measures for providing database security.

   OR
6. What is a deadlock and how can it be avoided? Discuss any one strategy to deal with deadlocks.
7. Explain distributed Database systems.

   OR
8. Explain OLAP and its benefits.

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

9. Explain Integrity Constraints with an example.
10. Explain three level architecture with a diagram.
11. Explain the purpose of normalization.
12. Explain Data Replication. X Explain briefly Data Warehousing
13. What is Transaction? Explain the ACID properties for transactions.
14. Explain RAID Levels.

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

DATABASE MANAGEMENT SYSTEM
PRACTICAL

1. Course Description

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

Course Code: U24/CSC/DSC/401/P **Hours per week: 2**

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

No. of credits: 1

2. Course Objective:

To introduce the fundamental concepts of programming through C language.

3. Course Outcomes:

CO1: To design simple queries for data retrieval and apply different functions of SQL
CO2: To apply DML Commands and design Joins and Subqueries

PRACTICAL SESSIONS

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

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

DATABASE MANAGEMENT SYSTEM
PRACTICAL MODEL PAPER

Course Code: U24/CSH/DSC/401/P
Credits:1

Time: 2Hrs
Max Marks:50

Answer ALL:

1. Create a new database with e_last5digitsofyour roll no.
2. Create the following tables (with the data specified below) to store information about Channel and their Video.
    a. Channel
    b. Videos

Identify and create the Primary Keys and the Foreign Key

CHANNEL (CID, C_NAME, NO_OF_VIDEOS, SUBSCRIBERS)

VIDEOS (VID, V_TITLE, DURATION, PUBLISH_DATE, VIEWS, CID)

VID	V_TITLE	DURATION	PUBLISH_DATE	VIEWS	CID
1	TRAILER1	2.34	2000-03-22	105	101
2	EGG HACK	2.50	2018-04-04	64	103
3	MATCH2	55.00	2009-06-24	1	105
4	KBC EP 20	49.50	2017-04-04	40	102
5	MASH UP	3.34	2019-11-10	200	101
6	LEARN ABC	4.45	2019-01-30	10	104
7	MATCH 1	44.50	2019-12-30	4	105
8	KBC LAST EP	50.00	2018-04-04	50	102
9	KITCHEN TIPS	1.59	2019-05-30	100	103
10	REMIX	3.34	2018-04-04	110	101

CID	C_NAME	NO_OF_VIDEOS	SUBSCRIBERS
101	T-SERIES	14423	129
102	SET INDIA	10000	110
103	5-MINUTE CRAFTS	500	90
104	NURSERY RHYMES	100	80
105	WWE	40000	50

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

Queries:

3. Display all the channels having alphabet S.
4. Display all the videos with more than 50 views.
5. Display all the videos published after 2015.
6. Display the average views of all videos of channel 101.
7. Add a new column LABEL in VIDEOS table (allowed values are LIVE, TV, MUS
8. Update the LABEL as (for VID 1,5,6,10 as MUSIC, for VID 4,8 as TV,

   for VID 2,3,7,9 as Live)
9. Display the total number of VIDEOS of each channel.
10. Display the total views for LIVE and TV LABEL videos.
11. Display the total number of videos of the same duration.
12. Display v_id, v_title, cid,c_name for all videos.

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

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

SEMESTER – IV

DATA COMMUNICATION AND NETWORKS

1. Course Description

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

Course Code: U24/CSH/DSC/401

Course Type: DISCIPLINE SPECIFIC CORE

No. of Credits: 4

Max. Hours: 60

Hours per week: 4

Max. Marks:100

2.Course Objectives

Introducing fundamentals of networking concepts with the help of layered architecture which includes OSI and TCP/IP models.

3. Course Outcomes

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

CO1: ***Illustrate*** and ***explain*** basic computer concepts of client/server (Cognitive level –2)

CO2: ***Apply*** programming principles of networking (Cognitive level – 3)

CO3*:* To ***understand*** data transmission across the network. (Cognitive level - 5)

CO4: ***Design*** client/server programs using TCP/UDP (Cognitive level – 6)

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

4.Course Content

MODULE I: INTRODUCTION **(15 Hrs)**

Introduction - Data Communication System and Its Components, Data Flow, Networks, types of Connection and Topologies, LAN, MAN, WAN, Internetwork, Internet; Network Models - OSI Models, Layers in OSI Models, TCP/IP protocol Suite, Address.

MODULE II: NETWORK ACCESS LAYER **(15 Hrs)**

Digital Transmission -Transmission Modes, Bandwidth Utilization: Multiplexing; Switching Circuit Switched Network, Datagram Network; Error Detection and Correction - Types of errors, Detection versus correction, CRC encoder and decoder, checksum; Data Link Control Framing, flow and error control; Multiple Access - CSMA/CA, CSMA/CD.

MODULE III : NETWORK LAYER **(15 Hrs)**

Network Layer-IPv4 Addressing, Address space, Classful Addressing, Classless Addressing, Address block mask, Network Address. Network Layer: Internet Protocol-Internetworking, Network Layer: Delivery, Forward Techniques, Next-Hop Method verses route method, Network Specific method versus Host- specific Method.

MODULE IV: TRANSPORT AND APPLICATION LAYER **(15 Hrs)**

Transport Layer - Process to process delivery; UDP - Well known ports of UDP, Operation and uses, TCP services and features. Three-way Handshake for connection establishment and termination; Application Layer - Domain Name Space, Remote Logging; Electronic Mail and File Transfer - Email, FTP.WWW and HTTP- HTTP

5. References:

1. Data communications and networking, Forouzan, B. A., & Fegan, S. C. NewYork, McGraw-Hill Higher Education, 2007.
2. Data and Computer Communications, by Stallings,William.,Upper SaddleRiver, NJ: Pearson/Prentice Hall, 2007

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

6.Syllabus Focus

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

Local/Regional/National /Global Development Needs	Relevance
Global Development	C is an adaptable, effective, and performance-driven language and is widely employed in everything from system software to game development.

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
SD	Modules1 and 2	Designing algorithms, flowcharts and writing C programs for given algorithm
EMP	Modules3 and 4	Testing programming skills in C, including using its libraries and troubleshooting code

7.Pedagogy

S. No	Student Centric Methods Adopted	Type / Description of Activity
1.	Participative	Seminars
2.	Experimental	Quiz
3.	Problem solving	Lab Exercises

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

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 – Assignment	
CO4	CIA 3 – Lab Test	

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

DATA COMMUNICATION AND NETWORKS

Course Code: U24/CSH/DSC/401 **Max. Marks: 60**

No. of Credits: 4 **Time: 2hrs**

SECTION A

I. Answer All: **4 x 10 = 40 M**

1. Explain TCP/IP Model in detail.
   OR
2. Explain the components of the network and its topologies.
3. Explain circuit-switched Network.
   OR
4. Explain CRC processing.
5. Explain Classful Addressing with an example.
   OR
6. Explain different forwarding techniques used in the network layer.
7. Explain the operation of TCP.
   OR
8. Explain FTP in detail.

SECTION B

II. Answer any FOUR:

9. Write short notes on LAN and WAN.
10. Briefly explain Multiplexing.
11. Explain CSMA /CD operations
12. Explain different types of errors found in the data link layer.
13. Explain the significance of Network Mask.
14. Explain UDP processing.

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

DATA COMMUNICATION AND NETWORKS

1.Course Description

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

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

No. of credits: 1

Max. Hours: 30

Hours per week: 2

Max. Marks: 50

2.Course Objectives

Introducing fundamentals of networking concepts with the help of layered architecture which includes OSI and TCP/IP models.

3.Course Outcomes:

CO1: To implement client /server programs.

CO2: To develop code for connection oriented and connectionless client-server Communication.

PRACTICAL SESSIONS

1. Simple Server Socket
2. Simple Client
3. Time Server Program
4. TCP Echo Server Program
5. TCP Echo Client Program
6. TCP Concurrent Program
   i) TCP Echo Client 1 Program
   ii) TCP Echo Client 2 Program
7. UDP Server Program
8. UDP Client Program
9. To Implement CRC
10. To Implement Checksum

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University,
Hyderabad-500 007.

DATA COMMUNICATION AND NETWORKS

Course code: U24/CSH/DSC/401/P
No. of Credits:1

Max. Time: 2 hrs
Max. Marks: 50

Answer any ONE from the following

1. Write a java program to implement TCP Echo Server, TCP Echo Client
2. Write a java program to implement UDP Server, UDP Client

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

9. CO-PO Mapping

CO	PO	Cognitive Level	Classroom sessions(hrs)
1	1	2	15
2	2	3	15
3	5	5	15
4	4	6	15

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

PROFESSOR
Department of Computer Science & Engineering
University College of Engineering (A)
Osmania University
Hyderabad-500 007.

SEMESTER - IV

REAL ANALYSIS

1. Course Description

Programme : B.Sc

Course Code : U24/MAT/DSC/401
Course Type : DSC IV
No. of credits : 4

Max. Hours : 60

Hours per week : 4
Max. Marks : 100

2. Course Objectives

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

3. Course Outcomes

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

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

CO 2: Apply the concepts to find maximum and minimum values of functions and to expand functions as power series. **(APPLY)**

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

CO 4: Evaluate the integral values of basic functions using fundamental theorem of calculus. **(EVALUATE)**

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

4. Course Content

MODULE I: **(16 HRS)**

SEQUENCES AND SERIES

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

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

MODULE II: **(16 HRS)**

CONTINUITY

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

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

MODULE III: **(15 HRS)**

DIFFERENTIATION

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

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

MODULE IV: **(13 HRS)**

INTEGRATION

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

Sections: 32 to 34
Pg No's 243 – 268

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

5. References

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

6. Syllabus Focus

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

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

b)Components on Skill Development/Entrepreneurship Development/Employability

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

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

7. Pedagogy

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

8. Course Assessment Plan

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

CO	Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CO1	CIA-1 - Written Exam	Written Exam
CO2	CIA-I(Written Exam)	
CO3	CIA-II (Skill Tests)	
CO4	CIA-II (Assignments)	

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

b) Model Question Paper- End Semester Exam

MODEL QUESTION PAPER

THEORY

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

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

SECTION-A

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

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

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

OR

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

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

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

OR

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

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

   (b) Using the definition of derivative calculate the derivative of the following functions .

   (i) $f(x) = x^3$ at x = 2, (ii) $f(x) = x^2 cosx$ at x= 0

OR

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

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

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

OR

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

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

SECTION –B

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

9. Prove using limit theorems $\lim \frac{3n+7}{6n-5} = \frac{1}{2}$.
10. Using integral test show that the series $\sum \frac{1}{n^p}$ converges if p > 1.
11. If f(x) = 1 for irrational numbers of x and f(x) = 0 for irrational numbers of x, then show that f is discontinuous at every S in R.
12. Show that the equation $xlogx = 2 - x$ is satisfied by atleast one value of x lying between 1 and 2.
13. Find $\lim_{x \to \frac{\pi}{4}} tanx^{tan2x}$
14. Every monotonic function f on [a, b] is integrable.

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

REAL ANALYSIS
PRACTICAL

Programme : B.SC.

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

Course Type : DSC IV

No. of credits : 1

Max. Hours : 30

Hours per week : 2

Max. Marks : 50

Course Outcomes:

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

PRACTICAL SESSIONS

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

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

MODEL QUESTION PAPER
PRACTICAL

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

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

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

1. Determine whether it converges and if it converges, give its limit.
   (i) $a_n=\frac{n}{n+1}$ (ii) $b_n=\frac{n^2+3}{n^2-3}$

OR

2. Using cauchys general principle of convergence show that the sequence $S_n = 1+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{n}$ cannot converge.
3. Show that the series $\sum_{n=1}^{\infty}\frac{n^s}{b^n}$ is convergent if b> 1 and divergent if 0<b≤1.

OR

4. Show that the series $\sum\frac{1}{n^p}$ converges, if p>1 and diverges if p≤1 Using Integral Test.
5. Prove that each of the following functions are continuous using $\in -\delta$ property.
   (i) $f(x) = x^2$, $x_0 = 2$
   (ii) $f(x) = \sqrt{x}$, , $x_0 = 0$

OR

6. Show that if $\lim_{x\to a^+} f_1(x)=\lim_{x\to a^+} f_3(x)=L$ and if $f_1(x) \le f_2(x) \le f_3(x)$ for all x in some interval (a,b) then $\lim_{x\to a^+} f_2(x)=L$.
7. Let $f(x) = x\sin 1/x$ for $x\neq 0$ and $f(0)=0$. If f differentiable at x=0? Justify your answer.

OR

8. (i) Verify Rolle's theorem for the function $f(x)=2+(x-1)^{2/3}$, $x\in[0,2]$
   (ii) Show that $x<\tan x \forall x\in(0,\pi/2)$.
9. (i) Find $\lim_{x\to\frac{\pi}{4}}\tan x^{\tan 2x}$
   (ii) Find the taylor series for $\cos x$

OR

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

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

SEMESTER IV
STATISTICAL ANALYSIS USING SPSS

1. Course Description

Programme: B.Sc

Course Code: U24/STA/SEC/401

Course Type: SEC -2

No. of Credits : 2

Max Hours: 30

Hours per week: 2

Max Marks: 50

2. Course Objectives

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

3. Course Outcomes

On completion of the course the student will be able to

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

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

4. Course Content:

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

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

MODULE – II: Hypothesis testing **(15 HOURS)**
Correlation(Karl Pearson's coefficient of correlation, Rank Correlation) , Fitting of a straight line, parabola and exponential curve. Simple regression analysis(X on Y , Y on X).

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

Small sample tests

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

5. References:

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

6.Syllabus Focus

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

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

b)Components on Skill Development/Entrepreneurship Development/Employability

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

8. Course Assessment Plan

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

Continuous Internal Assessments CIA - 40%	End Semester Examination-60%
CIA- 20 Marks Assignment/Problem solving	Written Exam

b)Question Paper Pattern

STATISTICAL ANALYSIS USING SPSS

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

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

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

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

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

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

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

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

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

Draw a multiple bar diagram using EXCEL and SPSS.

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

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

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

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

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

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

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

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

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

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

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

c) Question Paper Blueprint

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

SEMESTER - IV

TESTING OF HYPOTHESIS

- **Course Description**

Programme: B.Sc | Max. Hours: 60

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

Course Type: DSC 4B | Max. Marks: 100

No. of credits: 4

- **Course Objectives:**

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

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

Course Outcomes :

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

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

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

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

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

4. Course Content:

MODULE- I : Concepts Of Hypothesis **(15 HOURS)**

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

MODULE- II : Large sample tests **(15 HOURS)**

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

MODULE- III: Small sample Tests **(15 HOURS)**

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

MODULE-IV : Non parametric tests **(15 HOURS)**

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

5. References

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

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

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

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

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

6.Syllabus Focus

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

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

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University,
HYDERABAD-07

b)Components on Skill Development/Entrepreneurship Development/Employability

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

7. Pedagogy

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

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	

Professor, Dept. of Statistics
UNIVERSITY COLLEGE OF SCIENCE
Osmania University,
HYDERABAD-07, T.S.

b) Model Question Paper- End Semester Exam

TESTING OF HYPOTHESIS

THEORY

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

SECTION –A (Essay Questions)

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

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

OR

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

OR

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

5. i)Explain t-test procedure for testing the significance of correlation coefficient. (ii) A bivariate random sample of 27 pairs of observations from a normal population gave a correlation coefficient of 0.6.Is this significant of correlation in the population

OR

6. For the 2x2 table prove that χ^2 test of independence give $\chi^2 = N\,(ad-bc)^2 / (a+c)(b+d)(a+b)(c+d)$, $N=a+b+c+d$.
7. Define a 'run' and the length of a run. Explain the Wald Wolfowitz run test for testing the equality of two distribution functions.

OR

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

SECTION-B

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

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

c)Question Paper Blueprint

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

SEMESTER IV

TESTING OF HYPOTHESIS PRACTICAL

1. Course Description

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

Course Code :U24/STA/DSC/401/P **Max . Marks: 50**

Course Type: DSC 4B

No of Credits : 1

2. Course Outcomes:

1. Ability to write the suitable hypothesis and **apply** appropriate testing procedure.
2. Understand the important applications of chi square test and able to **execute** different non parametric tests.

3. Course Content :

List of Practicals

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

a) Question Paper Pattern

TESTING OF HYPOTHESIS
PRACTICAL

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SEMESTER - IV

VECTOR CALCULUS

1. Course Description

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

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

2. Course Objectives

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

3. Course Outcomes

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

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

(DISCUSS)

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

(APPLY)

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

4. Course Content

MODULE I (15 Hrs)

Gradient, Divergence and Curl

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

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

MODULE II (15 Hrs)

Line and Surface Integrals

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

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

5. References

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

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

6. Syllabus Focus

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

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

b) Components on Skill Development/Entrepreneurship Development/Employability

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

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad - 500 007.

7. Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

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

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.

b) Model Question Paper- End Semester Exam

VECTOR CALCULUS (SEC)

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

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

SECTION –A

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

1. (a) Find the unit normal n to the surface $x^2 + y^2 - z = 0$ at the point (1,1,2).
   (b) Show that the vector field F = (2x + y, x, 2z) is conservative .
2. (a)Find the divergence of the vector field$v = (xyz, z^2, x - y)$.
   (b) Find the Laplacian '∇^2 for the scalar field$C = x^2 + xy + yz^2$.
3. Find the angle between the surfaces of the sphere$x^2 + y^2 + z^2 = 2$ and the cylinder $x^2 + y^2 = 1$ at a point where they intersect.
4. (a) Show that the curl are linear operator, i.e.$\nabla X (c\bar{u} + d\bar{v}) = c\nabla X \bar{u} + d\nabla X \bar{v}$
   (b)For what values of the constants a and b such that the vector field
   $u = (ycosx + axz, bsinx + z, x^2 + y)$ is irrotational.
5. Evaluate the line integral $\int_C F \cdot d\bar{r}$where $F = (5z^2, 2x, x + 2y)$and the curve C is given by $x = t, y = t^2, z = t^2, 0 \leq t \leq 1$.
6. Evaluate the line integral$\int_C x + y^2\, dr$ where C is the parabola $y = x^2$ in the plane z = 0 connecting the points (0,0,0) and (1,1,0).
7. Find the surface integral of $U = (xy, x, x + y)$over the surface S defined by z = 0 with $0 \leq x \leq 1, 0 \leq y \leq 2$, with the normal pointing upwards.

Dr. N. Kishan
Professor of Mathematics
Department of Mathematics
Osmania University
Hyderabad-500 007.