SEMESTER -IV

SEC-II - BASIC INSTRUMENTATION SKILLS

1. Course Description

Programme: B.Sc.
Course Code: U24/PHY/SEC/401 /P
Type of course: SEC
No. of credits: 2

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

2. Course Objectives

- To equip the students with fundamental knowledge and skills on basic instruments.

3. Course Outcomes

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

CO1: Use multimeter proficiently in measuring various parameters (L3).

CO 2: Describe the specifications of a Cathode ray Oscilloscope effectively (L2)

4. Course Content

MODULE I **(15 Hrs)**

Basic of Measurement

Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects.

Multimeter: Principles of measurement of dc voltage and dc current ,ac voltage ,ac current and resistance. Specifications of a multimeter and their significance.

Digital Multimeter : Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/frequency counter, time -base stability, accuracy and resolution.

MODULE II **(15 Hrs)**

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, electron gun, electrostatic focusing and acceleration (Explanation only-no mathematical treatment), brief discussion on screen phosphor, visual persistence& chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance.

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special

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features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.

Demonstration and Experiments:

1. Measurement of resistance using different types of multimeters(analog vs Digital) to understand sensitivity and resolution.
2. Verification of Ohms law using a multimeter to measure votage, current and resistance in a simple circuit.
3. Comparisons of measurement using analog vs Digital multimeters to understand advantages and limitations.
4. Demonstration of the construction of CRT and its components(electron gun, deflection plates) to understand how an image formed on the screen.
5. Measurement of voltage(DC & AC) , frequency, and time period using a CRO .
6. Comparison of analog CRO vs Digital oscilloscope in terms of speed, accuracy , and ease of use.

5. Reference Text Books

a. B.L. Theraja A textbook in Electrical Technology, S Chand and Co.
b. M G Say Performance and design of AC machines ELBS Edn
c. Venugopal Digital circuits and systems,2011, Tata McGraw Hill.
d. Subrata Digital Electronics, Tata McGraw Hill.

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	The proficiency in instrumentation skills is essential for engineers, scientists and researchers working in various fields. Understanding measurement principles,

b) Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module1: Basic of measurement. Module 2: Cathode Ray Oscilloscope	1. Error analysis Experiments 2.Signal analysis and trouble shooting activity

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7. Course Assessment Plan

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

Formative Assessment - FA (40%)	Summative Assessment - SA (60%)
CIA- 20 Marks Assignment/Problem solving/Case studies/Mini Project	End Semester examination

b. Question Paper Pattern

MODEL QUESTION PAPER

PRACTICAL

Course Code: U24/PHY/SEC/401/P Max Time: 1 Hr

Credits: 2 Max. Marks: 30

Answer any ONE of the following. **5 X6=30**

1. Explain the difference between precision and accuracy in the context of measurement instruments.
2. Draw a block diagram and explain the working of a digital multimeter.
3. Explain the working principle of a CRO and its various components.
4. Discuss common errors in measurements and loading effects. How can these errors be minimized in practical applications?
5. Explain the principles of measurements for DC voltage, DC Current, AC voltage, instrument specifications in ensuring accurate measurements.
6. Discuss the front panel controls of a CRO and their functions in signal Visualization and analysis.
7. Analyse the specifications of a CRO and explain their significance in selecting an appropriate oscilloscope for specific measurement tasks.

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

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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)

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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

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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 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

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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
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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)

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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

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

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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.

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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.

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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

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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

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SEMESTER –IV

ELECTROMAGNETIC THEORY

1. Course Description

Programme : B.Sc.
Course Code : U24/PHY/DSC/401
Type of course: DSC- 4
No. of credits : 4

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

2. Course Objectives:

1. Inculcate knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations.
2. Enhance knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.

3. Course Outcomes:

It helps the graduates to-

CO 1: Interpret basic mathematical concepts related to electromagnetic vector fields. (L2)

CO2: Illustrate the knowledge of Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation. (L3)

CO3: Infer & assess principles of magneto statics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density. (L4,5)

CO4: Analyse the concepts related to Faraday's law, induced emf and Maxwell's equations. (L4)

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4. Course Content –

Module I: MAGNETOSTATICS **(15 Hrs)**

Magnetic shell. Potential at a point due to magnetic shell. Field due to a magnetic shell. Applications of field due to magnetic shell. Magnetic potential at a point on the axis of circular shell. Intensity of magnetic field. Equivalence of circular coil and magnetic shell. Equivalence between a magnetic shell and a current circuit. Magnetic induction, intensity of magnetization, magnetic permeability and susceptibility. Magnetic intensity (or Magnetizing Force). Relation between B, H and I. Relation between relative permeability and susceptibility. B-H curve and Hysteresis.

Module II: ELECTROMAGNETIC INDUCTION **(15 Hrs)**

Electromagnetic induction. Faraday's Laws of electromagnetic induction. Lenz's law. Expression for induced E.M.F. Electromotive force (Motional). Time varying magnetic field. Betatron. Moving coil ballistic galvanometer. Electromagnetic damping and critical damping. Damping and its correction. Difference between ballistic galvanometer and dead galvanometer. Conditions for a moving coil galvanometer to be ballistic. Self induction, Self inductance of long solenoid. Self inductance of a toroid. Energy density in magnetic field. Coefficient of mutual induction. Mutual inductance of two given coils. Coefficient of coupling (coupling of two coils with flux linkage). Transformer. Power (Energy) losses in a transformer.

Module III: VARYING AND ALTERNATING CURRENTS **(15 Hrs)**

Growth and decay of current in an inductance-resistance circuit (L-R circuit). Growth and decay of charge in a capacitance-resistance circuit (C-R circuit). Decay of condenser through inductance. Alternating current. A.C. through pure resistance only. A.C. through pure inductance only. A.C. through pure capacitance only. A.C. circuit inductance, capacitance and resistance. Series resonant circuit. Quality factor (Q) of a resonant circuit. Parallel resonant circuit. Series resonance versus parallel resonance.

Module IV:MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES **(15 Hrs)**

A Review of basic laws of electricity and magnetism. Displacement current. Conduction current and displacement current, correction to Ampere's law. Maxwell's equations in different forms. Maxwell's wave equation or equation of electromagnetic waves. Uniform Plane waves.

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Transverse wave nature of electromagnetic waves. Poynting theorem. Electromagnetic waves in conducting media (waves in metals) –Skin depth. Production and detection of electromagnetic waves (Hertz experiment).

5. Reference Books:

a) Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968).
b) Electricity and magnetism by J.H.Fewkes & John Yarwood. Vol.I (Oxford Univ. Press, 1991).Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
c) Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin Cummings,1998)
d) Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)
e) Electricity and magnetism. By D C Tayal (Himalaya Publishing House,1988)
f) Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata McGraw Hill, 2006).

6. Syllabus Focus

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

Local /Regional/National /Global Development Needs	Relevance
Global	Nurtures a skilled workforce capable of driving innovation and technological progress and ensuring global competitiveness.
National	Spurs the development of novel materials to tackle pressing global challenges like clean energy generation and efficient communication networks.

b.Components on Skill Development/Entrepreneurship Development/Employability

SD/ED/EMP	Syllabus Content	Description of Activity
Skill Development	Module 3	Hands on practicals with various circuits

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6. 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

7. 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	

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Modern Question Paper- End Semester Exam

ELECTROMAGNETIC THEORY

Course Code: U20/ PHY/DSC/401 **Time: 2 Hrs**
Max Marks: 60

SECTION –A

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

1. Define Magnetic flux density $\bar{B}$, Magnetizing Force $\bar{H}$ and Intensity of Magnetization I and Derive a relation between them.

OR

2. What is a Magnetic shell? Show the equivalence between a circular coil and a magnetic shell.

3. Explain the theory, construction and working of Betatron.

OR

4.Define self-induction and Derive an equation for self-inductance of a solenoid.

5.Explain the growth and decay of current in an inductance resistance

circuit. Define time constant.

OR

6.Examine condition for the resonance series LCR circuit. Define quality factor.

7.Outline the basic laws of electricity and magnetism in integral form and develop Maxwell's equation in differential form from these laws.

OR

8.What is poynting vector? Derive an expression of poynting vector from Maxwell's equation.

SECTION – B

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

9. How can you assess the value of relative permeability if the magnetic susceptibility of the medium is 948 $x10^{-11}$.
10. Evaluate induced emf if the flux in the coil changes by 0.5Wb in 1ms and self-inductance of a coil is 10 mH.
11. Determine the r.m.s value of current if AC voltage of 180 volts with frequency 50 Hz is connected in series with a resistance 100 ohms and coil of inductance 0.2H.
12. What is alternating current? Obtain an expression for the r.m.s value of current.
13. Explain what is meant by displacement current?
14. Build an expression for magnetic potential at a point in the axis of a circular magnetic shell.

ELECTROMAGNETIC THEORY
PRACTICAL

1. Course Description:

Programme : B.Sc.
Course Code : U24/PHY/DSC/401/P
Type of course : DSC-4
No. of credits : 1

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

2. Course Objectives:

Introduce the basic practical knowledge of Electromagnetism.

3. Course Outcome:

This course will help the students to-

CO1: Demonstrate experiments and compare results with theoretical predictions. (L3,L5)

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

PRACTICAL SESSIONS

1. To compare capacities using Desauty's Bridge.
2. To determine self-inductance of a coil by Rayleigh's method.
3. To Construct a RC circuit with DC power supply and to find the time constant while charging.
4. To construct a RC circuit with DC power supply and to find the time constant while discharging.
5. To study a parallel LCR circuit and determine its (a) Anti-Resonant Frequency, (b) Quality Factor.
6. To study the series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.
7. To determine the power factor for the inductive circuit.
8. To construct a High pass and low pass filter using CR circuits with AC source.
9. To construct a High pass and low pass filter using LR circuits with AC source.
10. To determine self-inductance of a coil by Anderson's bridge using AC.

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/DSC/401/P
Credits: 1

Max Time: 2 Hrs
Max. Marks: 50

Answer any ONE of the Following

1. Construct a RC circuit with DC power supply and to find the time constant while charging.
2. Construct a RC circuit with DC power supply and to find the time constant while discharging.
3. Study a parallel LCR circuit and determine its
   (a) Anti-Resonant Frequency, (b) Quality Factor
4. Study the series LCR circuit and determine its
   (a) Resonant Frequency, (b) Quality Factor
5. Determine the power factor for the inductive circuit.
6. Construct a High pass and low pass filter using CR circuits with AC source.
7. Construct a High pass and low pass filter using LR circuits with AC source.
8. Determine self-inductance of a coil by Anderson's bridge using AC.

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

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SEMESTER - IV

REAL ANALYSIS

1. Course Description

Programme : B.Sc

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

Max. Hours : 60

Hours per week : 4
Max. Marks : 100

2. Course Objectives

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

3. Course Outcomes

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

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

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

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

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

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4. Course Content

MODULE I: **(16 HRS)**

SEQUENCES AND SERIES

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

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

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5. References

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

6. Syllabus Focus

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

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

b)Components on Skill Development/Entrepreneurship Development/Employability

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

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7. Pedagogy

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

8. Course Assessment Plan

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

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

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b) Model Question Paper- End Semester Exam

MODEL QUESTION PAPER

THEORY

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

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

SECTION-A

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

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

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

OR

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

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

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

OR

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

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

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

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

OR

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

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

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

OR

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

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

SECTION –B

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

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

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REAL ANALYSIS
PRACTICAL

Programme : B.SC.

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

Course Type : DSC IV

No. of credits : 1

Max. Hours : 30

Hours per week : 2

Max. Marks : 50

Course Outcomes:

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

PRACTICAL SESSIONS

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

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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.

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SEMESTER - IV

VECTOR CALCULUS

1. Course Description

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

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

2. Course Objectives

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

3. Course Outcomes

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

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

(DISCUSS)

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

(APPLY)

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4. Course Content

MODULE I (15 Hrs)

Gradient, Divergence and Curl

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

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

MODULE II (15 Hrs)

Line and Surface Integrals

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

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

5. References

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

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6. Syllabus Focus

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

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

b) Components on Skill Development/Entrepreneurship Development/Employability

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

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7. Course Assessment Plan

a) Weightage of Marks in Formative and Summative Assessments

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

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b) Model Question Paper- End Semester Exam

VECTOR CALCULUS (SEC)

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

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

SECTION –A

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

1. (a) Find the unit normal n to the surface $x^2 + y^2 - z = 0$ at the point (1,1,2).
   (b) Show that the vector field F = (2x + y, x, 2z) is conservative .
2. (a)Find the divergence of the vector field$v = (xyz, z^2, x - y)$.
   (b) Find the Laplacian '∇^2 for the scalar field$C = x^2 + xy + yz^2$.
3. Find the angle between the surfaces of the sphere$x^2 + y^2 + z^2 = 2$ and the cylinder $x^2 + y^2 = 1$ at a point where they intersect.
4. (a) Show that the curl are linear operator, i.e.$\nabla X (c\bar{u} + d\bar{v}) = c\nabla X \bar{u} + d\nabla X \bar{v}$
   (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.

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