Internal Quality Assurance Cell

Government Arts and Science College
Ratlam (M.P.) 457001

Need Based Methods According to Topics of Different Subjects

Department of Economics

Department of Economics

Govt. Arts and Science College Ratlam

Problem Solving Methodologies

Sl.No.	Course	Problem Solving Methods Adopted in Understanding Economics
1	Micro and Macro Economics	Economic Modeling and Analysis
2	MEC and Investment	Cost-Benefit Analysis
3	Imperfect Competition	Game Theory
4	Macro Economics	Regression Analysis
5	Indian Economy	Comparative Analysis
6	Indian Economic Policy	Policy Analysis
7	Statistics and Quantitative Technique	Quantitative and Qualitative Research

विभागाध्यक्ष
अर्थशास्त्र विभाग
शासकीय कला एवं विज्ञान
महाविद्यालय रतलाम (म.प्र.)

Signature Not Verified
YASHWANT KUMAR MISHRA
28.05.2024 13:20

Department of Statistics

विभाग का नाम

प्राक्रूप

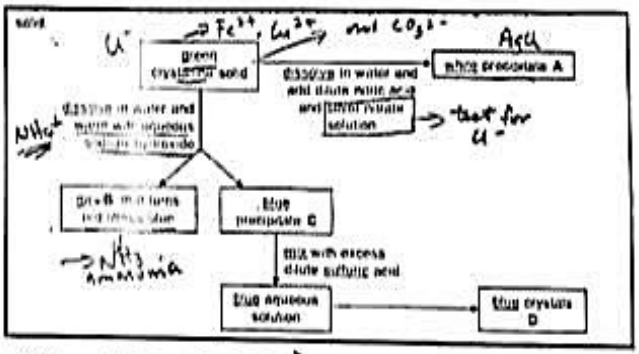
क्र.	कक्षा	पाठ्यक्रम से सम्बंधित अधिक विषय विवरण	प्रशासन की विधि का विवरण
UG			
①	B.Sc. I Year	Regression	Computation
		Elementary Probability	— " —
②	B.Sc. II Year	Time Series	Graphs
③	B.Sc. III Year	Index Number	Computation
PG			
①	M.Sc. I Sem	Probability distribution	Curve fitting
②	M.Sc. II Sem	Name	-
③	M.Sc. III Sem	Name	-
④	M.Sc. IV Sem	Regression	Analysis of
		Methodology	data

Signature Not Verified
YASHWANT KUMAR MISHRA
28.05.2024 13:20

GOVT. ARTS AND SCIENCE COLLEGE RATLAM

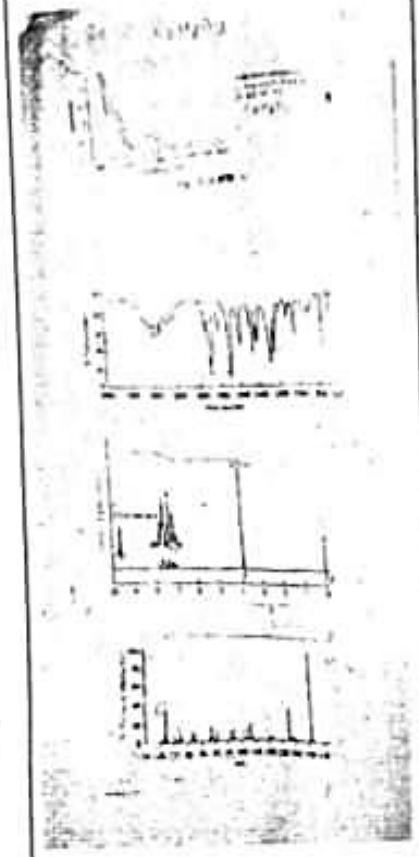
DEPARTMENT OF CHEMISTRY

पाठ्यक्रम से सम्बंधित जटिल समसयाओ का विवरण जो विद्यार्थियों को आसानी से समझ नहीं आती है, उनका विवरण एवं समाधान :

क्रमांक	कक्षा	पाठ्यक्रम से संबंधित विषय वर्णन	पाठ्यक्रम की विधि का वर्णन
1.	UG	Qualitative analysis Identification of the substances and name of substances A, B, C, D.	Solving qualitative analysis of given green inorganic solid with flow chart and reactions which shows the results of some experiments and test. With the help of below flow chart and reactions, we explain the name of given substances.  $Cu(OH)_2 + H_2SO_4 \rightarrow CuSO_4 + H_2O$ Base Acid Salt Results a. SILVER CHLORIDE AgCl b. AMMONIA NH_3 c. COPPER (II) HYDROXIDE $Cu(OH)_2$ d. CUPPER (II) SULPHATE $CuSO_4$
2.	UG	Solid state chemistry	Explanation of SC, BCC, FCC and ECC by 3D model

Signature Not Verified
YASHWANT KUMAR MISHRA
28.05.2024 13:20

3.	PG	Identification of organic compounds by their spectral data	DATA INTERPRETATION
4.	PG	Group theory	Explanation of plane of symmetry and axis of rotation by 3D model
5.	PG	Stereochemistry	Explanation of optical , geometrical and conformational isomerism by model



(1) Interpretation of UV spectra:

(i) 295 cm^{-1} λ_{max} due to C=C (π-π^*) transition indicates presence of benzene ring highly conjugate.

(ii) 240 nm λ_{max} due to n-π^* transition. Indicates presence of C=O group.

Conclusion: On the basis of UV- spectra it contains C=C group, C=O group.

(2) Interpretation of IR spectra:

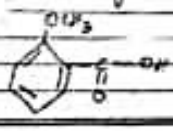
Fragmentation	Intensity	Vibrational Mode
(i) 3500 – 3000 cm^{-1}	broad (B) Medium (M) band	Due to aromatic C=C stretching
(ii) 3100 – 3000 cm^{-1}	Weak (W) band	due to –OH stretching
(iii) 1700 – 1220 cm^{-1}	Strong (S) band	Due to C–O stretching
(iv) 800 – 666 cm^{-1}	strong band.	Due to He deformation

Teacher's Signature _____

(3) Interpretation of NMR spectra:

δ value	Multiplicity	Reference
(i) 3.85	singlet (3H)	$-OCH_3$ group
(ii) 7.85	multiplet (4H)	Ortho Benzene Ring
(iii) 2.7 – 10.5	Singlet (1H)	due to Carboxylic group

Results: On the basis of given spectra and data structure of compound is $C_8H_8O_3$



Signature Not Verified
YASHWANT KUMAR MISHRA
28.05.2024 13:20

Department of Mathematics

Govt. Arts and Science College, Ratlam

Problem solving methods

Mathematics department ensures that students not only understand mathematical theories but also develop the skills and confidence to tackle new and complex problems throughout their academic and professional journeys.

Teaching problem-solving methods is a crucial aspect of mathematics education, as it equips students with the skills and strategies needed to approach and solve a wide range of mathematical challenges. Here are two examples that demonstrate how mathematics department typically teaches problem-solving methods to UG and PG students:

Class M. Sc. II Semester (Mathematics)

Topic: Separation axioms

Separation axioms are fundamental concepts in topology that describe the level of "separation" between points and sets in a topological space. Developing problem-solving skills related to separation axioms involves understanding their definitions, properties, and applications. Problems specific to separation axioms in topology can be solved by keeping following points in mind.

1. Understanding the Definitions: Students have a clear understanding of the various separation axioms, such as T_0, T_1, T_2 (Hausdorff), T_3, and T_4. Know their definitions and the implications of each axiom on the behaviour of open and closed sets.

2. Identifying Properties: When presented with a topological space, identify which separation axioms hold and which ones do not. This involves recognizing the characteristics that satisfy each axiom.

3.Using Counter examples: Develop the ability to construct counter examples to show that a particular topological space does not satisfy a certain separation axiom. This skill involves understanding the nuances of each axiom.

4. Proving Implications: Practice proving implications between separation axioms. For example, showing that a T_4 space is also T_3, or that a Hausdorff space is T_1. This requires understanding the definitions and logical connections between the axioms.

5.Applying to Topological Spaces: Given a specific topological space, analyze whether it satisfies certain separation axioms This involves working with open sets, closed sets, and points to demonstrate the separation properties.

6. Relating to Continuity and Convergence: Understand how separation axioms relate to the concepts of continuity and convergence of sequences in topological spaces. This knowledge can help you solve problems that involve mapping between spaces and convergence of points.

7. Comparing Different Axioms: Given a space that satisfies multiple separation axioms, compare and contrast the strengths and implications of each axiom. For example, how does T_2 compare to T^3 in terms of separation?

8. Problem Variation: Practice solving problems where you're asked to find the weakest separation axiom that holds for a given space or construct spaces that satisfy specific combinations of separation axioms.

9. Relating to Compactness: Understand how separation axioms relate to the concept of compactness in topology. Practice solving problems that involve the interplay between separation properties and compactness.

Developing problem-solving skills in separation axioms involves a combination of understanding the theory, working through examples, and applying logical reasoning to analyze and solve problems related to these axioms in different topological spaces.

Problem solving methods

Class B. Sc. I Year (Major -Mathematics)

Topic: Curve tracing (Cartesian form)

Curve tracing in Cartesian form involves analyzing and understanding the behaviour of a given equation to sketch its corresponding curve. We instruct our students to concentrate on the following points while solving a problem related to curve tracing.

1. Analyze Domain and Range: Determine the domain and range of the given equation. This will provide insights into the possible x and y values and any restrictions on the curve.

2. Symmetry: Check for symmetry in the equation. An even function implies symmetry about the y-axis, while an odd function implies symmetry about the origin. Symmetry simplifies the tracing process.

3. Intercepts: Find the x and y intercepts by setting $y = 0$ and $x = 0$, respectively. These points can provide starting points for curve and help identify its general shape.

4. Asymptotes: Identify vertical, horizontal, and slant asymptotes, if any. Asymptotes can help to understand the curve's behaviour as it approaches certain values.

5. Critical Points: Find critical points where the derivative is zero or undefined. These points could correspond to maxima, minima, or points of inflection on the curve.

6. Derivative Analysis: Analyze the sign of the derivative to determine where the curve is increasing, decreasing, or concave up/down. This helps to understand the overall shape of the curve.

7. Inflection Points: Find inflection points by analyzing where the curve changes concavity. These points can affect the concavity of the curve.

8. Extrema: Determine the local and global extrema by locating points where the derivative changes sign. Use the second derivative test to confirm whether these points are maxima or minima.

9. Curve Behaviour at Asymptotes: Analyze how the curve behaves near asymptotes. It might approach them or cross them, depending on the equation's behaviour.

10. Sketch the Curve: Use the gathered information to start sketching the curve. Begin with key points like intercepts, asymptotes, critical points, and inflection points. Then, connect these points smoothly, considering the concavity and slope at different regions.

11. Check for Accuracy: Ensure that the sketched curve matches the characteristics you've identified. Verify that the curve behaves correctly around asymptotes, intercepts, and extrema.

12. Label and Annotate: Label key points on the curve and provide annotations to indicate important features like inflection points, extrema, and asymptotes.

Curve tracing is a combination of mathematical analysis and artistic representation. Practice is required for identifying essential characteristics and sketching curves accurately.

Dr. Bhavana Deshpande
Professor and Head
Department of Mathematics

प्रोफेसर एवं विभागाध्यक्ष
गणित विभाग
[illegible] विज्ञान महाविद्यालय

शासकीय कला एवं विज्ञान महाविद्यालय रतलाम

भौतिक शास्त्र विभाग

पाठ्यक्रम से संबंधित जटिल चुनोतियों का विवरण सत्र- 2022-23

क्र.	कक्षा	पाठ्यक्रम से संबंधित जटिल विषय विवरण	समाधान की विधि का विवरण
UG	बी. एस. सी. प्रथम	सदिश क्षेत्र का डाईवेर्जेंस	आयताकार बंद ग्रह के रूप में चॉक का डब्बा ले कर समझाया
	बी. एस. सी. द्वितीय	व्यतिकरण व् यंग द्वि स्लिट प्रयोग	प्रोजेक्टर व् इन्टरनेट की सहायता से सिमुलेशन का प्रयोग कर समझाया
	बी. एस. सी. तृतीय	क्रिस्टल संरचना व् सरल घनीय जालक	कई चॉक के डिब्बे पास पास रख कर क्रिस्टल संरचना व् सरल घनीय जालक को समझाया
PG	एम. एस. सी. प्रीवियस	प्लाज्मा व् सोलर सिस्टम, फील्ड इफेक्ट ट्रांजिस्टर	प्रोजेक्टर व् इन्टरनेट की सहायता से सिमुलेशन का प्रयोग कर समझाया
	एम. एस. सी. फाइनल	सुपर कंडक्टिविटी, सैप 1 आर्किटेक्चर	प्रोजेक्टर व् इन्टरनेट की सहायता से सिमुलेशन का प्रयोग कर समझाया

विभागाध्यक्ष
भौतिक विभाग
शास. कला एवं विज्ञान महाविद्यालय
रतलाम (म.प्र.) - ४५७००१

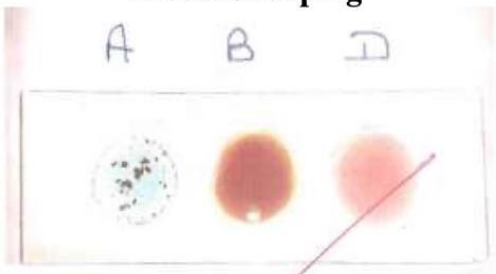
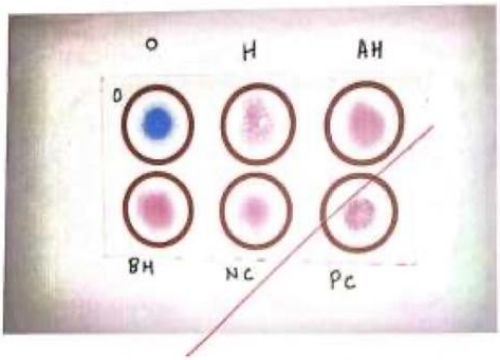
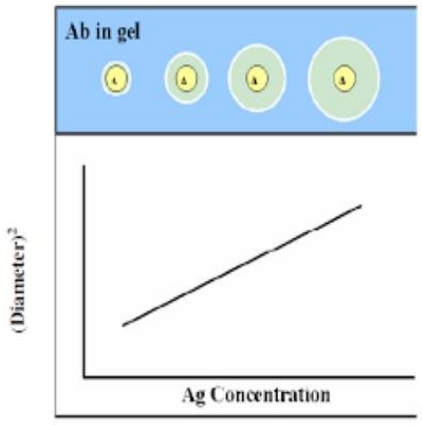
Signature Not Verified
YASHWANT KUMAR MISHRA
28.05.2024 15:20

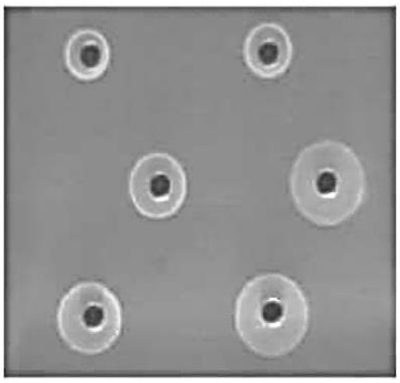
Department of Botany

S.No.	Class	Difficult Topics in curriculum	Problem solving method
1.	**B. Sc. I year**	1. Plant Tissue Culture: Definition, Types and importance. 2.DNA Recombinant Technique: Introduction tools and importance 3. Role of recombination in present era. 4. Bioinformatics: Definition, Concept and tools. 5.Introduction of Bioinformatics software: Basic idea of Blasta and Fasta importance of Bioinformatics 6.Microscope Structure and function of light microscope (magnification and resolving power) 7. Various types of microscope: Bright field, Phase Contrast, SEM and TEM.	With the help of Animation video/ Power point Presentation
2.	**B. Sc. II year**	1. Perfume products of Gulab, Jasmine and Pickles. 2.Edible oil Industry (Groundnut, Soybean) 3.Sugar and Jaggery Industries. 4. Project proposal Preparation for establishment of an industry. 5. Grants and Funding Provider organizations of India.	With the help of Animation video/ Power point Presentation
3.	**M.Sc. I semester**	1. Viruses: Isolation and Purification 2. General account of Mastigomycotina 3. Evolution of stele, Heterospory and origin of seed habits. Evolution and differentiation of species- Allopatric and Sypatric speciation.	With the help of Animation video / Power point Presentation
4.	**M.Sc. IIsemester**	1.Double Fertilization 2. Carpel evolution 3.Remote sensing concept and tools 4.Satellite remote sensing 5.Plasma membrane ion carrier channels and pumps	With the help of Animation video / Power point Presentation
5.	**M.Sc. III semester**	1.Calcium-Calmodium cascade 2. Photosynthetic pigment and light harvesting complex. 3.C- value paradox, cot curve 4. FISH – flow cytometry	With the help of Animation video / Power point Presentation
6	**M.Sc. IV semester**	1.Cryopreservation and germplasm storage 2.DNA fingerprinting 3.Fungi in Production of organic acids: Citric acid, Gluconic acid, Gallic acid, Fumaric acid	With the help of Animation video / Power point Presentation

Signature Not Verified
YASHWANT KUMAR MISHRA
28.05.2024 13:20

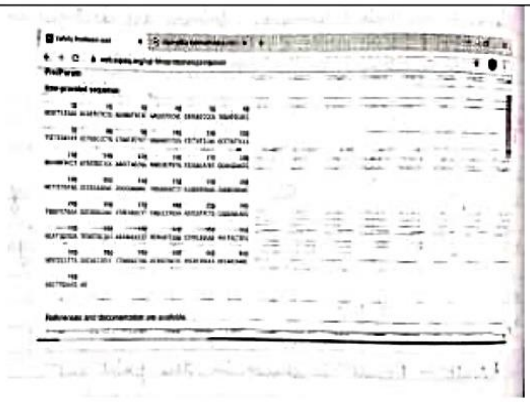
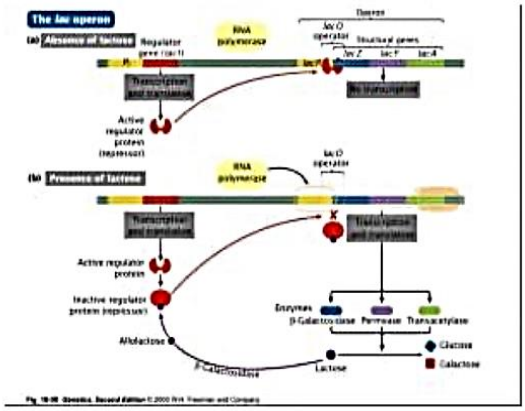
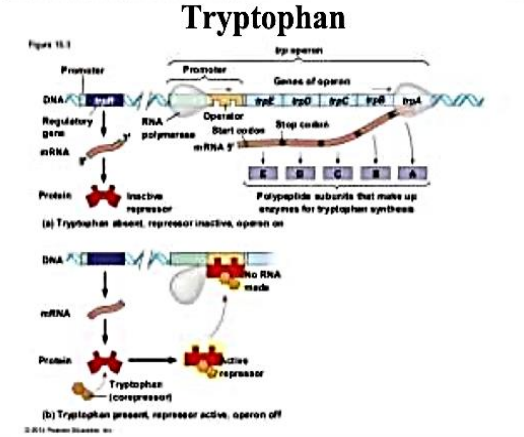
PROBLEM SOLVING APPROACH
DEPARTMENT OF BIOTECHNOLOGY
SESSION 2022-23

S.No.	TOPIC	PROBLEM SOLVING APPROACH	Supporting document
1.	Immunology: Antigen and Antibody reactions like Precipitation and agglutination.	This topic is explained through practicals using teaching kits like Blood grouping, Radial immunodiffusion, ELISA, Widal test etc.	Blood Grouping  Widal test  Radial Immunodiffusion 

			
2.	**Enzymology: Isolation and Sreening of enymei.e. Amylase & Protease producing micro-organisms**	**This topic is explained through flowcharts and hands on experiments**	      
3.	**Bioinformatics**	**Data retrieval and explanation of Databases is done through search engines like NCBI,**	**NCBI**

Signature Not Verified
YASHWANT KUMAR MISHRA
28.05.2024 13:20

		and softwares like Primer3, BLAST, RASMOL, PROTPARAM, CLUSTAL W, etc	  **Results of the Software used** **1. CLUSTAL W**  **2. Primer 3**  **3. PROTPARAM**

			
4.	**Gene Regulation**	**Explained by simple diagram and flow chart**	**Lac Operon**  **Tryptophan** 
5.	**Molecular Biology: Qualitative and quantitative Estimation of DNA and**	**Explanation is done using Spectrophotometer by preparing standard graphs**	

	RNA