KADI SARVA VISHWAVIDYALAYA

B.Sc. Curriculum as per NEP

for Semester 3

W.E.F. June 2024

KADI SARVA VISHWAVIDYALAYA

B.Sc. Programme – Structure

(Scheme for teaching and evaluation for B.Sc Programme (Basic/Honours)

Aligning to NEP–2020 as per Govt. of Gujarat Dated 11/07/2023

B.Sc. Semester III Structure

Sr. no	Component	Course code	Course title	Duration In Hrs.		Credits	Maximum Marks		TOTAL
				Theory	Practical		CCE (Formative)	SEE (Summative)	
01	Major Courses (Select any three of same subject)	MBM221-2C	Introduction to Biochemistry	60	0	4*3 = 12	50	50	100
		MBM222-2C	Fundamentals of Immunology	60	0				
		MBM223-2C	Microbiology Practical- III	0	120				
		CHM224-2C	Inorganic & Analytical Chemistry-I	60	0				
		CHM225-2C	Organic & Physical Chemistry-I	60	0				
		CHM226-2C	Chemistry Practical's-III	0	120				
		PHM227-2C	Basic Physics - III	60	0				
		PHM228-2C	Basic Physics - IV	60	0				
		PHM229-2C	Physics Practical-III	0	120				
		MTM230-2C	Linear Algebra	60	0				
		MTM231-2C	Advanced Calculus	60	0				
		MTM232-2C	Application of Linear Algebra and Calculus	0	120				
02	Multi Disciplinary (Select any One)	MDC221-2C	Basic Statistical Techniques	30	60	4	50	50	100
		MDC222-2C	Introduction to Chemistry-III	30	60				
		MDC223-2C	Optical Fibers and Optoelectronic Devices	30	60				
		MDC224-2C	Database Management System	30	60				
03	AEC	AEC 211-2C	Business Communication	30	0	2	25	25	50
04	IKS	IKS207-2C	Indian Astronomy-II	30	0	2	25	25	50

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Sr. no	Component	Course code	Course title	Duration In Hrs.		Credits	Maximum Marks		TOTAL
05	SEC (Select any One)	SEC261-2C	Basics of Pathology and Hematology	30	0	2	25	25	50
		SEC262-2C	Industrial Chemistry-I	30	0				
		SEC263-2C	Physics in Biology and Medicine -I	30	0				
		SEC264-2C	Quantitative Aptitude-I	30	0				
	Total					22	275	275	550

Note:

1. The marks distribution is mainly divided into two components named Continuous and Comprehensi Evaluation (CCE) = 50 % and Semester End Evaluation (SEE) = 50 %.
2. Passing Percentage for each subject is 36%.

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Microbiology Semester III Major Course

MBM 221-2C- Introduction to Biochemistry

COURSE OUTCOMES:

- CO1: Understand the fundamental biochemical concepts of structure and properties of water, concepts of pH and buffer systems, and their biological significance.
- CO2: Apply the principles of bioenergetics to understand the role of high-energy compounds like ATP, NADH, and NADPH in metabolism.
- CO3: Describe the classification, structure, and metabolic significance of carbohydrates and lipids in microbial and cellular systems.
- CO4: Describe the classification, structural features, and biochemical roles of amino acids, vitamins, and hormones, especially steroid hormones.
- CO5: Describe the classification and functions of proteins and compare the various levels of protein structure and the concept of denaturation and folding.
- CO6: Illustrate the structure and functions of DNA and RNA and discuss the biological roles of nucleic acids, nucleotides, and nitrogenous bases.

TEACHING AND EVALUATION SCHEME:

Course code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	Examination Scheme			Total Marks
			Theory	Hrs.	Max Marks		
					CCE	SEE	
MBM 221-2C	Introduction to Biochemistry	4	4	2.5	50	50	100

Unit 1: pH, Buffer and Bioenergetic — **Teaching Hours: 15 (Weightage 25%)**

- Structure and properties of water
- pH : Hydrogen ion concentration, Handerson – Hasselbalch equation.
- Buffer- definition, Types & Properties of buffer, Buffers of biological importance such as carbonate-bicarbonate, phosphate and acetate buffer.
- Principles of bioenergetics.
- High energy phosphate compounds (ATP, NADH, and NADPH).

Unit 2: Carbohydrates and lipids — **Teaching Hours: 15 (Weightage 25%)**

Carbohydrates

- Definition, Nature, properties and significance
- Classification of Carbohydrates
  - Structure and functions of Monosaccharides (trioses, pentoses and hexoses),
  - Structure and functions of Disaccharides (maltose, lactose and sucrose) and
  - Structure and functions of Polysaccharides (starch and cellulose).

Lipids

- Definition, classification of lipids
- Distribution and functions of lipids in microorganisms.
- Structure and functions of Fatty acids: Saturated and unsaturated

Unit 3: Vitamins, Amino acids and Hormones **Teaching Hours: 15 (Weightage 25%)**

- **Vitamins**: Classification and its biological importance.
- **Amino acids**
  - Structural Features of Amino Acids and properties.
  - Classification, Structure, Zwitterions nature.
- **Hormones:** Steroid hormones, Structure and function.

Unit 4: Proteins and Nucleic acids **Teaching Hours: 15 (Weightage 25%)**

- **Proteins**
  - Classification, Structure and function.
  - Levels of Protein Structure: Primary, secondary, tertiary and quaternary structure.
  - Protein Denaturation and Folding.
- **Nucleic acids**
  - Classification, structures and importance.
  - Structure of nitrogenous bases; Structure and function of nucleotides.
  - Structures of DNA and RNA
  - Types of DNA and RNA

***CCE**: Continuous and Comprehensive Evaluation: It consists of Assignments/Seminars/Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

Reference Books:

1. Biochemistry- U. Satyanarayana, U. Chakrapani, 4th Edition, Elsevier, A division of Reed Elsevier India Pvt. Ltd, India.
2. Principles of Biochemistry-A.L. Lehninger, W.H. Freeman, USA.

Suggested Reference Books:

1. Fundamentals of Biochemistry - J.L. Jain, S Chand, India.
2. Biochemistry- Voet & Voet, Wiley, USA.
3. Textbook of Biochemistry- S.P. Singh, CBS Publishers & Distributors, India.
4. Biochemistry - Lubert Stryer, W.H. Freeman / Palgrave Macmillan, USA.
5. Introduction to Protein Structure- Branden & Tooze, Garland Science, USA.
6. Principles of Biochemistry- Zubey, Parson & Vance, Wm. C. Brown, USA.

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	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Understand the fundamental biochemical concepts of structure and properties of water, concepts of pH and buffer systems, and their biological significance.	PO1, PO2, PSO1	U, R	C	7
CO2	Apply the principles of bioenergetics to understand the role of high-energy compounds like ATP, NADH, and NADPH in metabolism.	PO1, PO2, PSO1	U, R, Ap	C	8
CO3	Describe the classification, structure, and metabolic significance of carbohydrates and lipids in microbial and cellular systems.	PO1, PO2, PSO1	U, R,	C	15
CO4	Describe the classification, structural features, and biochemical roles of amino acids, vitamins, and hormones, especially steroid hormones.	PO1, PO2, PSO1	U, R	C	15
CO5	Describe the classification and functions of proteins and compare the various levels of protein structure and the concept of denaturation and folding.	PO1, PO2, PSO1	U, R, E	C,	7
CO6	Illustrate the structure and types of DNA and RNA and discuss the biological roles of nucleic acids, nucleotides, and nitrogenous bases.	PO1, PO2, PSO1	U, R, An	C	8
	Total hour of Instruction				60

Mapping of COs with POs & PSOs

CO	PO										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3									3	
CO2	3	3									3	
CO3	3	3									3	
CO4	3	3									3	
CO5	3	3									3	
CO6	3	3									3	

3: High, 2: Medium, 1: Low

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Microbiology Semester III Major Course

MBM222-2C –Fundamentals of Immunology

COURSE OUTCOMES:

- CO1: Describe the components and types of immunity including innate, acquired, and herd immunity.
- CO2: Identify the normal human microbiota and the key cells and organs involved in the immune system.
- CO3: Explain the types and characteristics of immune responses including humoral, cell-mediated, primary, and secondary responses.
- CO4: Describe antigens with their types and properties, epitopes, MHC molecules, structures, types, and immunological properties of antibodies.
- CO5: Demonstrate understanding of antigen-antibody reactions and immunoassays such as ELISA, RIA, and complement pathways.
- CO6: Analyze immune system disorders and immunization strategies.

TEACHING AND EVALUATION SCHEME:

Course code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	Examination Scheme			Total Marks
			Theory	Hrs.	Max Marks		
					CCE	SEE	
MBM222-2C	Fundamentals of Immunology	4	4	2.5	50	50	100

Unit 1: Immune System and Immune Response **Teaching Hours: 15 (Weightage25%)**

- Immunity and its types (4hr):
  - Innate immunity: Types of defensive barriers: anatomic, physiologic, phagocytic, and inflammatory (native), Innate immunity: species, racial and individual,
  - Acquired immunity: active and passive, Natural and Artificial
  - Herd immunity
- Overview of Normal Flora of Human Body: Skin, Respiratory, Digestive Tract, Genitourinary Tract, Eyes, Mouth etc
- Cells and organs of the immune system:
  - Types of lymphocyte: B-cells and T-cells, Antigens presenting cells: neutrophils, macrophages and dendritic cells (3hr)
  - Primary (central) and secondary (peripheral) lymphoid organs (3hr)
- Immune response (IR) (5 hr):
  - Characteristics of Immune response,

- Humoral and cell mediated immune response,
- Primary and secondary immune response

Unit 2: Antigens and Antibodies **Teaching Hours: 15 (Weightage25%)**

- Antigens: Nature and types of Antigen, Concept of Antigenicity and Immunogenicity, Characteristics of Antigen, Adjuvants and Hapten (5 hr).
- Epitopes, B- Cells and T-cells Epitopes (3hr).
- MHC molecules (2 hr)
- Immunoglobulin: Basic structure, Classes of immunoglobulin, Biological properties of immunoglobulin, Antibody-Mediated Effector Functions (5 hr).

Unit-3: Antigen-Antibody Reactions **Teaching Hours: 15 (Weightage 25%)**

- General features of antigen-antibody reactions, Mechanism of antigen-antibody reactions: zone phenomenon and lattice formation (3hr)
- Agglutination reactions (2 hr)
- Precipitation reactions (1 hr)
- Immunofluorescence (1 hr)
- ELISA and RIA (3hr)
- Complement System: Components of complement, Pathways of Complement System-Classical, Alternate and Lectin, Biological activities of complement (5hr).

Unit-4: Immune Disorders and Immunization **Teaching Hours: 15 (Weightage 25%)**

- Hypersensitivity: Immediate and delayed type (4hr).
- Immunodeficiency disease: AIDS (2hr).
- Autoimmunity: Mechanism and Classification of Autoimmune diseases (3hr).
- Immunology of Transplantation: Classification of Transplants (3hr).
- Immunization: Principles of vaccination, Types of Vaccines (3hr).

***CCE**: Continuous and Comprehensive Evaluation: It consists of Assignments/ Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

Reference Books:

1. Kuby Immunology- Janis Kuby, W.H. Freeman and Company, USA.
2. Microbiology- Prescott, L.M, Harley, J.P. and Klein, D.A, McGraw-Hill Science, USA.
3. Textbook of Microbiology- Ananthanarayan & Paniker, Universities Press Pvt. Ltd., India.
4. Fundamental Immunology- William E. Paul, Lippincott Williams & Wilkins, USA
5. Fundamentals of Immunology- Coleman, Lombard, and Sicard, W.H. Freeman and Company, USA
6. Immunology: A Textbook- C.V. Rao, Alpha Science International Ltd., India

Suggested Reference Books:

1. Immunology- David M. Weir and Leslie E. Stewart, Churchill Livingstone, UK
2. Lecture Notes: Immunology- I.R. Todd, Wiley-Blackwell, UK
3. Essential Immunology- Ivan M. Roitt, Wiley-Blackwell, UK
4. Immunology: Understanding the Immune System- Klaus D. Elgert, Wiley-Liss, USA

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	Course Outcome	POs/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Describe the components and types of immunity including innate, acquired, and herd immunity.	PO1, PO2, PSO1	U, R	C	6
CO2	Identify the normal human microbiota and the key cells and organs involved in the immune system.	PO1, PO2, PSO1	U, R	C	6
CO3	Explain the types and characteristics of immune responses including humoral, cell-mediated, primary, and secondary responses.	PO1, PO2, PSO1	U, R	C	6
CO4	Describe antigens with their types and properties, epitopes, MHC molecules, structures, types, and immunological properties of antibodies.	PO1, PO2, PSO1	U, R, An	C	12
CO5	Demonstrate understanding of antigen-antibody reactions and immunoassays such as ELISA, RIA, and complement pathways.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	U, R, Ap	C, P	15
CO6	Analyze immune system disorders and immunization strategies.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, R, An	C, P	15
	Total hour of Instruction				**60**

Mapping of COs with POs & PSOs

CO	PO										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3									3	
CO2	3	3									3	
CO3	3	3									3	
CO4	3	3									3	
CO5	3	3	3			3	2				3	3
CO6	3	3	3			3					3	3

3: High, 2: Medium, 1: Low

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Microbiology Semester III Major Course

MBM223-2C – Microbiology Practical III

COURSE OUTCOMES:

- CO1: Develop the ability to prepare standard solutions of different concentration.
- CO2: Implement widely used biochemical protocols and methods for qualitative analyses of carbohydrates and proteins.
- CO3: Analyze carbohydrates and proteins quantitatively through spectrophotometry.
- CO4: Determine the acid value or free fatty acid content of oils essential for quality control and nutritional assessment in food and pharmaceutical industries.
- CO5: Develop proficiency in determining blood groups, estimating hemoglobin levels, and complete blood counts.
- CO6: Demonstrate and apply the flocculation reaction (VDRL), agglutination reaction (Widal test), and immuno-diffusion techniques (ODD and RID) for disease detection.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	Examination Scheme			Total Marks
			Practical	Hrs.	Max Marks		
					CCE	SEE	
MBM223-2C	Microbiology Practical III	4	8	5	50	50	100

Practicals — **Teaching Hours: 60 (Weightage 50%)**

1. Preparation of standard solutions.
2. Qualitative analysis of carbohydrates.
3. Qualitative analysis of Protein.
4. Quantitative estimation of protein by Folin Lowry's Mehod.
5. Quantitative estimation of carbohydrates by DNSA Method.
6. Quantitative estimation of Protein by Biuret Method.
7. Quantitative estimation of reducing sugar by Cole's Method.
8. Quantitative estimation of Sugar by Anthrone method.
9. Determination of Free Fatty Acid or Acid value of an oil.

Practicals — **Teaching Hours: 60 (Weightage 50%)**

1. Blood Grouping
2. Estimation of haemoglobin by Sahli's method
3. Total count of W.B.C
4. Total count of R.B.C
5. Differential W.B.C. count

6. Flocculation reaction- VDRL
7. Agglutination reaction- Widal test
8. Immuno-diffusion techniques- ODD and RID

***CCE**: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

Reference Books:

1. Experimental Microbiology- Patel R.J. and Patel R.K., Volume I and II, 9th Edition, Aditya Publisher, India.
2. An Introduction to Practical Biochemistry- David Plummer, 3rd Edition, McGraw Hill Education, USA (Indian Edition).

Suggested Reference Books:

1. Microbiology: A Laboratory Manual- James G. Cappuccino and Chad Wels, 11th Edition, Global edition, Pearson Education, USA.
2. Practical Microbiology - Dubey R. C. and Maheshwari D. K., S. Chand and Company Limited, New Delhi, India.
3. Dacie and Lewis Practical Haematology- Barbara J. Bain, M.D. Bates, Imelda, Michael A. Laffan, Twelfth Edition, Elsevier Science Health Science, UK.

	Course Outcomes	POs/ PSOs	CL Cognitive level	Knowledge Category	Lab Session
CO1	Develop the ability to prepare standard solutions of different concentration.	PO1, PO2, PO3, PO4, PSO1, PSO2	U, R, Ap, Cr	C, P	12
CO2	Implement widely used biochemical protocols and methods for qualitative analyses of carbohydrates and proteins.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, R, Ap, An	C, P	18
CO3	Analyze carbohydrates and proteins quantitatively through spectrophotometry.	PO1, PO2, PO3, PO6, PSO2	U, R, An	P	30
CO4	Determine the acid value or free fatty acid content of oils essential for quality control and nutritional assessment in food and pharmaceutical industries.	PO2, PO6, PSO2	Ap	P	06
CO5	Develop proficiency in determining blood groups, estimating hemoglobin levels, and complete blood counts.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	U, Ap, An, E, Cr	C, P	30
CO6	Demonstrate and apply the flocculation reaction (VDRL), agglutination reaction (Widal test), and immuno-diffusion techniques (ODD and RID) for disease detection.	PO1, PO2, PO3, PO6, PSO2	U, Ap, E	P	24
	Total hour of Instruction				**120**

Mapping of COs with POs & PSOs

CO	PO										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3	3	2							3	3
CO2	3	3	3			3					3	3
CO3	3	3	3			3						3
CO4		3				3						3
CO5	3	3	3	2		3					3	3
CO6	3	3	3			3						3

3: High, 2: Medium, 1: Low

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Chemistry Semester III Major Course

CHM224-2C INORGANIC&ANALYTICALCHEMISTRY-I

Course Outcomes:

- CO1: **Describe** the classification and general properties of non-aqueous solvents, especially ionising solvents.
- CO2: **Explain** the physical properties and chemical behaviour of liquid ammonia and liquid sulfur dioxide as solvents.**Analyse** the advantages and disadvantages of the same.
- CO3: Understand the chemical inertness, occurrence, and practical applications of noble gases; explain the synthesis, structure, and bonding of xenon compounds using Valence Bond Theory (VBT), Molecular Orbital Theory (MOT), and VSEPR theory.
- CO4: Apply the principles of quantitative analysis to identify and evaluate different types of errors in chemical measurements; analyse the feasibility of acid-base using appropriate indicators and methods for different acid-base combinations.
- CO5: Explain the principles and applications of potentiometric titrations and solvent extraction techniques, including endpoint determination methods.
- CO6: Explain the distribution law and evaluate the determination of the distribution ratio in various solvent extraction processes

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	Max Marks CCE	Max Marks SEE	
CHM224-2C	Inorganic & Analytical Chemistry-I	4	0	4	2.5	50	50	100

CONTENT:

UNIT	Details
1	**Non-Aqueous Solvents** **TeachingHours:15** **(Weightage25%)** • Introduction, Classification of Solvents, General Properties of Ionising Solvents. • **Liquid Ammonia (NH_3):** Physical Properties, Auto-ionisation, Acid-Basereactions, Ammonia as a proton-acceptor, Precipitation reactions, Complex formation reaction, Ammonolysis reactions, Reactions of Metal-Ammonia solution, Reduction-Oxidation (Redox) reactions; Advantages and disadvantages of using liquid Ammonia as a solvent. • **Liquid SO_2:** Physical Properties, solubility of Inorganic materials and Organic Compounds, Electrolytic conductance behaviour of solutions, Acid-Base reactions, Solvolysis, Precipitation reactions, Complex formation reactions, Reduction-Oxidation (Redox) reactions
2	**Teaching Hours:15** **(Weightage25%)** • **Noble Gases- Occurrence** and uses, rationalisation of inertness of noble gases, clathrates; preparation and properties of XeF2, XeF4 and XeF6; Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF2). Molecular shapes of noble gas compounds XeO3, XeO4, XeOF2, XeO2F2, XeOF4, [XeO6]4- (VSEPRtheory).

3	**TeachingHours:15 (Weightage25%)** • **Errors in Quantitative Analysis** - Accuracy and precision, determinate, indeterminate and accidental errors, precision of a single measurement, precision of mean, rejection of a result, errors in a derived result, methods of checking the accuracy of analysis,significant figures, computation values. • **Acid-BaseTitrations** Strong Acid Vs Strong Base, Strong Acid Vs Weak Base, Weak Acid Vs Strong Base, Weak Acid Vs Weak Base, Strong Acid + Weak Acid Vs Strong Base Titration curves, Feasibility, Indicators, Mohr, Volhard and Fajans' Methods, Factors affecting solubility
4	**TeachingHours:15 (Weightage25%)** • **Potentiometric titration-**The scope of potentiometric titrations, Precipitation and neutralization titrations, Graphical method including Gran's plot for selecting end point, Differential titration, Dead stop titration, Ion selective Electrode, various types of Ion Selective Electrodes • **Solvent extraction-**Distribution law, Determination of distribution ratio Batch extraction, continuous extraction, discontinuous extraction, counter current extraction

***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

REFERENCESBOOKS

- Analytical Chemistry G.D.Christain
- Fundamentals of Analytical Chemistry D.A.Skoog,D.M.West&F.J.Holler
- Principles of Analytical Chemistry J.H.Kennedy
- Analytical Chemistry– Principles & TechniquesL.G.Hargis
- Instrumental Methods of analysis: (CBS) H.H.Willard,L.L.Mirrit,J.A.Dean
- Chemical Instrumentation : A Systematic approach - H.A.Strobel
- Principles of Instrumental Analysis : Douglas A. Skoog.,F. James Holler,StanleyR. Crouch, Cengage Learning; 6th Edition.
- Quantitative Chemical Analysis : Daniel C.Harris,W H Freeman,NewYork
- Concise Inorganic Chemistry J.D.Lee,4thedition

SUGGESTED BOOKS:

- Principles of inorganic chemistry,Puri,Sharma&Kalia
- Inorganic Chemistry by James Huheey,Keiter & Keiter
- Text book of Inorganic Chemistry by Durrantand Durrant.
- Advance Inorganic Chemistry Vol-II Satya Prakash (S.Chand)
- Advanced inorganic chemistry by CottonandWilkinson
- Valency and Molecular structure by Cartmelland Fowles.
- Inorganic Chemistry: Principles of Structure and Reactivity by James E.Huheey, Ellen A.Keiter, RichardL. Keiter, OkhilK. Medhi
- Advanced Inorganic Chemistry by G.D.Tuli, Madan, Basu and Satyaprakash

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CO	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Describe the classification and general properties of non-aqueous solvents, especially ionising solvents.	PO1,PSO1	U	C	7
CO2	Explain the physical properties and chemical behaviour of liquid ammonia and liquid sulfur dioxide as solvents. analysethe advantages and disadvantages of the same	PO1,PO2,PO3 ,PSO1	U, An	C	8
CO3	Understand the chemical inertness, occurrence, and practical applications of noble gases; explain the synthesis, structure, and bonding of xenon compounds using Valence Bond Theory (VBT), Molecular Orbital Theory (MOT), and VSEPR theory.	PO1,PO2,PO3 ,PSO1, PSO2	U, Ap, An	C	15
CO4	Apply the principles of quantitative analysis to identify and evaluate different types of errors in chemical measurements; analyse the feasibility of acid-base using appropriate indicators and methods for different acid-base combinations.	PO1,PO6, PSO1, PSO2	Ap, An, E	C, P	15
CO5	Explain the principles and applications of potentiometric titrations and solvent extraction techniques, including endpoint determination methods	PO2,PO3, PO6,PSO1 , PSO2	U, Ap	C, P	8
CO6	Explain the distribution law and evaluate the determination of the distribution ratio in various solvent extraction processes	PO1, PO2, PO3,PSO1	U, An, Ap	C, P	7
	Total hours of Instruction				**60**

Mapping of COs with POs and PSOs

CO	PO										PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3										3	
CO2	3	3	3								3	
CO3	3	3	3								3	3
CO4	3										3	3
CO5		3	3			1					3	3
CO6	3	3	3								3	

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Chemistry Semester III Major Course

CHM225-2C ORGANIC & PHYSICAL CHEMISTRY - I

Course Outcomes:

•CO1: Understand basic concepts, method of formation, properties and reactions of alkanes and cycloalkanes.

•CO2: Analyse alkene formation and regioselectivity, apply key reaction mechanisms, evaluate substitutions, and understand industrial uses.

•CO3: Explain and classifythe structure, formation, and polymerisation of dienes and alkynes and analyze key addition reactions with mechanisms of electrophilic and nucleophilic additions and reductions, including Diels–Alder.

•CO4: Deduce Nernst heat theorem, Clapeyron–Clausius equation and its applications and evaluate colligative properties by applying thermodynamic principles.

•CO5: Explain basic concepts of adsorption related to surface chemistry.

•CO6: Explain fundamental nuclear concepts including nuclear particles, isotopes, and nuclear reactions, nuclear binding energy, packing fraction, decay kinetics and laws of integration.

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			
						Max Marks		
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	CCE	SEE	Total Marks
CHM225-2C	Organic & Physical Chemistry-I	4	0	4	2.5	50	50	100

CONTENT:

UNIT	Details
1	**TeachingHours:15(Weightage25%)** • **Alkanes and Cycloalkanes–Alkanes:** General methods of formation, physical & chemical properties. Mechanism of free radical substitution in alkanes with reference to halogenation, orientation, reactivity and selectivity. **Cycloalkanes:** Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitation, ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings, the case of cyclopropane ring: banana bond.
2	**TeachingHours:15(Weightage25%)** • **Alkenes, Dienes and Alkynes** - Brief introduction of alkenes, their formation with reference to mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes- mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction, epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO4,polymerization of alkenes, substitutionatthe allylic and vinylic positions of alkenes, industrial applications of ethylene and propene.

	• Nomenclature and classification of dienes : isolated, conjugated and cumulateddienes, structure of allenes and butadiene, methods of formation, polymerisation, chemical reactions -1, 2 and 1, 4-additions, Diels-Alderreaction. Acidity of alkynes, mechanism of electrophilic and nucleophilic addition reactions, hydroboration, metal-ammonia reductions, oxidation and polymerisation.
3	**TeachingHours:15 (Weightage25%)** • **Chemical Thermodynamics** - Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data.Clapeyron-Clausius equation, Integrated form of Clapeyron-Clausius equation, Application of Clapeyron-Clausius equation from various phases in equilibrium, Elevation in Boiling point (Kb), Depression of freezing point (Kf), Relative lowering in vapour pressure, Osmotic pressure
4	**TeachingHours:15 (Weightage25%)** • **Surface Chemistry** – Introduction, Physical and Chemical adsorption, Adsorption isotherms, Multi-molecular Theory OR **B.E.T** Adsorption Isotherm (No derivation), Gibbs Adsorption Equation (No derivation), Surface active agent OR Surfactants, Micellization, Critical Micellar Concentration (CMC) • **Nuclear Chemistry-** Concept of Nuclear particle, Definition of Isotopes, Isotones, Isobars, Isomers, fission and fusion reactions, Packing fraction, Nuclear binding energy, Nuclear coulomb barrier, Rate of radioactive disintegration, half-life period and Average life period, Rutherford & Sodi'slaw (Group transfer law),Use of radioisotopes as tracers, Numerical.

***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

REFERENCESBOOKS

- Organic chemistry by Morrison & Boyd Vth Edition
- Advance Organic Chemistry by Jerry March.
- Advance Organic Chemistry by Arun Bahaland B.S. Bahal.
- Organic Chemistry Vol. I & II by S.M.Mukherji, S.P.Sing R.P.Kapoor.
- Text book of Organic Chemistry by Arun Bahal, B.S. Bahal, S.Chand.
- Organic Chemistry by I.L.Finar Vol I &.II Vth Edition
- Organic Chemistry by pine, Hendriction, Cramand Hammond 4th ed By P.S.Kalsi.
- Advance Physical Chemistry by Gurdeep Raj
- Physical Chemistry (Questionand Answers) by R.N. Madan G.D.Tully, S.Chand.

SUGGESTED BOOKS:

- Principles of Physical Chemistry by Puri, Sharma, Pathania.
- Essentials of Physical Chemistry by B.S.Bahal, Arun Bahal G.D.Tully.
- Chemical Thermodynamics by R.P. Rastogyand R.R.Misra.
- Physical Chemistry by P.W.Atkins.5th ed.,Oxford,1994,7thed.,2002
- Physical Chemistry by R.A. Albertyand R.J.Silbey,JohnWiley,1995.
- Physical Chemistry by G.H.Barrow,5th ed.,MacGrawHill,1998,6thed.
- Physical Chemistry byW.J.Moore,4th ed.,OrientLongmans,1969.
- Concise in organic Chemistry by J.D.Lee 4th edition.

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CO	Course Outcomes	POs/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Understand basic concepts, methods of formation, properties and reactions of alkanes and cycloalkanes.	PO1, PSO1	U	C	8
CO2	Analyse alkene formation and regioselectivity, apply key reaction mechanisms, evaluate substitutions, and understand industrial uses.	PO1,PO2, PSO1	An, E	C, P	7
CO3	Explain and classify the structure, formation, and polymerisation of dienes and alkynes and analyze key addition reactions with mechanisms of electrophilic and nucleophilic additions and reductions, including Diels–Alder.	PO1, PO2, PSO1	U, An	C, P	15
CO4	Deduce the Nernst heat theorem, Clapeyron–Clausius equation and its applications and evaluate colligative properties by applying thermodynamic principles.	PO1, PO2,PO3, PSO1, PSO2	An, E	C, P	8
CO5	Explain basic concepts of adsorption related to surface chemistry	PO1,PSO1	U	C	7
CO6	Explain fundamental nuclear concepts including nuclear particles, isotopes, and nuclear reactions, nuclear binding energy, packing fraction, decay kinetics and laws of integration.	PO1,PO2, PO3,PSO1, PSO2	U, Ap	C, P	15
	Total hours of Instruction				**60**

Mapping of COs with POs and PSOs

CO	PO										PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3										3	
CO2	3	3									3	
CO3	3	3									3	
CO4	3	3	3								3	
CO5	3										3	2
CO6	3	3	3								3	
											3	2

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Chemistry Semester III Major Course

CHM226-2C CHEMISTRY PRACTICALS - III

Course Outcomes:

- CO1: Identify the presence of acidic and basic radicals in a mixture of inorganic salts by performing systematic qualitative analysis, excluding PO_4^{3-}, BO_3^{3-}, AsO_4^{3-}, SO_3^{2-}, and O^{2-}.
- CO2: Estimate the concentration of organic compounds such as aniline, phenol, glucose, sucrose, and formaldehyde using appropriate chemical methods, including bromination and oxidation.
- CO3: Determine the amount of Zn, Ni, and Cu in respective salts using EDTA Complexometric titration methods with accuracy.
- CO4: Evaluate the concentration of substances such as Cu(II), $K_2Cr_2O_7$, arsenite, antimony, and available chlorine by applying iodometric and iodimetric titration techniques.
- CO5: Demonstrate the use of Conductometric titrations to determine the strength of strong acid–strong base, weak acid–strong base, and strong acid–weak base systems.
- CO6: Analyse experimental data obtained from various volumetric and instrumental titration methods to interpret results and assess the reliability and precision of chemical estimations.

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	Max Marks CCE	Max Marks SEE	
CHM226-2C	Chemistry Practicals-III	0	8	4	5	50	50	100

CONTENT

A. Inorganic Mixtures (Minimum Seven) Teaching Hours:60 (Weightage 50%)

- Inorganic qualitative analysis of a mixture containing 4 radicals(except PO_4^{-3}, BO_3^{-3}, AsO_4^{-3}, SO_3^{-3}, O^{-2})

Water Soluble and Insoluble Inorganic salts of following cations and anions:

Cations:Na^+, K^+, NH_4^+, Mg^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Fe^{2+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Co^{3+}, Pb^{2+},Cu^{2+}.

Anions:S^{2-},SO_4^{2-},CO_3^{2-}.$CrO^{2-}{}_4$,Cl^-,Br^-,I^-,NO^-,NO_2^-,CrO_3^{-2}. 27

- **Organic Estimation (Minimum five)**
- To determine the amount of Aniline by Brominating Method.
- To determine the amount of Phenol by Brominating Method.
- To determine the amount of Glucose by oxidation Method.
- Estimation glucose by titration with Fehling's solution.
- Estimation of sucrose by titration with Fehling's solution.
- Estimation glucose and sucrose in a given mixture.
- Estimation of formal dehyde (formalin).

B. Volumetric Titration (**Minimum Ten**) **Teaching Hours:60** **(Weightage50%)**

- To determine the amount of Zn in Zinc sulphate by EDTAtitration method.
- To determine the amount of Ni in Nickel chloride by EDT Atitration method.
- To determine the amount of Cu in cupric chloride by EDT Atitration method.
- Estimation of Cu (II)and $K_2Cr_2O_7$ using sodium thiosulphate solution (Iodimetrically).
- Estimation of (i) arseniteand (ii) antimony in tartar-emetic iodimetrically
- Estimation of Cu (II) using standard sodium thiosulphate solution (Iodimetrically).
- Estimation of available chlorine in bleaching powder iodometrically.
- To determine the strength of given strong acid and strong base (HCl vs NaOH) by conductometric titrations.
- To determine the strength of given Weak acid vs. strong base (CH_3COOH vs NaOH) by conductometric titrations.
- To determine the strength of given Strong acid vs. weak base (HCl vs NH_4OH) by conductometric titrations

***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

REFERENCESBOOKS

- Vogel, Arthur Israel.Vogel's text book of practical chemistry
- Vogel,s qualitative inorganic analysis, 7th edition,text book of practical chemistry.
- Advanced Practical Chemistry by Jagdamba Singh,R.K.P.Singh, JayaSingh, LDSYadav, I. R. Siddiqui, Jaya Shrivastava
- Advanced Inorganic Analysis by Agrawal Keemtilal, PragatiAdditions
- Practical Physical Chemistry by B.Vishwanathanand P.S.Ragvan

SUGGESTED BOOKS:

- Advanced Physical Chemistry Experiments by Gurtu-Gurtu Pragati Additions
- Text book of Organic Chemistry by Parashar and Ahluvalia
- Comprehensive Practical Organic Chemistry by K Ahluwalia and Renu Aggarwal

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CO	Course Outcomes	POs/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Identify the presence of acidic and basic radicals in a mixture of inorganic salts by performing systematic qualitative analysis, excluding PO_4^{3-}, BO_3^{3-}, AsO_4^{3-}, SO_3^{2-}, and O^{2-}.	PO1, PSO1, PSO2	Ap	P	20
CO2	Estimate the concentration of organic compounds such as aniline, phenol, glucose, sucrose, and formaldehyde using appropriate chemical methods, including bromination and oxidation.	PO1, PO2,PSO2	Ap	P	20
CO3	Determine the amount of Zn, Ni, and Cu in respective salts using EDTA Complexometric titration methods with accuracy.	PO1, PO2,PSO1, PSO2	Ap	P	20
CO4	Evaluate the concentration of substances such as Cu(II), $K_2Cr_2O_7$, arsenite, antimony, and available chlorine by applying iodometric and iodimetric titration techniques.	PO1, PO2,PO6, PSO2	Ap, E	P	20
CO5	Demonstrate the use of Conductometric titrations to determine the strength of strong acid–strong base, weak acid–strong base, and strong acid–weak base systems.	PO1,PSO1, PSO2	Ap	P	20
CO6	Analyse experimental data obtained from various volumetric and instrumental titration methods to interpret results and assess the reliability and precision of chemical estimations.	PO1, PO2,PO6, PSO2	Ap, An	P	20
	Total hours of Instruction				**120**

Mapping of COs with POs and PSOs

CO	PO										PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3										3	3
CO2	3	3										3
CO3	3	3									3	3
CO4	3	3				2						3
CO5	3										3	3
CO6	3	3				2						3

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Physics Semester III - Major Course

PHM227-2C Basic Physics-III

COURSEOUTCOMES:

- **CO1:**Distinguish between interference and diffraction phenomena with examples.
- **CO2:**Apply calculus-based methods to derive diffraction formulas and analyse grating.
- **CO3:** Explain and classify crystalline solids, crystal lattice, and unit cell types.
- **CO4:**Use Miller indices and calculate inter-planar spacing in crystal structures
- **CO5:**Solve first and second-order differential equations with applications in physics.
- **CO6:**Analyse Maxwell's equations and apply to electromagnetic wave propagation

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory PerWeek		Hrs.	Max Marks		
					CCE	SEE	
PHM227-2C	Basic Physics-III	4	4	2.5	50	50	100

Unit 1: Diffraction **Teaching Hours: 15 (Weightage 25%)**

Distinction between Interference and diffraction, Fresnel and Fraunhoffer types of diffraction, Fraunhoffer diffraction at a single slit, Fraunhoffer diffraction at a single slit (Calculus method), Fraunhoffer diffraction at a double slit, Fraunhoffer diffraction at double slit (Calculus method), Distinct between single slit and double slit diffraction pattern, Fraunhoffer diffraction at N slit, Plane diffraction grating, Theory of plane transmission grating, Dispersive power of Grating, Illustrative examples

Unit 2: Crystal Structure **Teaching Hours: 15 (Weightage 25%)**

Crystalline and Amorphous Solids, Crystal Lattice and Crystal Structure, Translational Symmetry, Space, Unit Cell and Primitive Cell, Symmetry Elements in Crystals, The Seven crystal Systems, Coordination Number, some importance crystal structure, Simple Cubic Structure, Body Centered Cubic Structure, Face Centered Cubic Structure, Wigner-Seitz Cells, Miller Indices, the inter planner spacing of a set of crystal planes, Illustrative examples.

Unit-3 Ordinary Differential equation and Applications **Teaching Hours: 15 (Weightage 25%)**

Introduction, Separable Equations, Linear First-Order Equations, Other Methods for First-Order Equations, Second-Order Linear Equations with Constant Coefficients and Zero Right Hand Side, Second-Order Linear Equations with Constant Coefficients and Right-Hand Side Not Zero, Illustrative Examples.

Unit-4 ElectromagnetismTeaching Hours: 15 (Weightage 25%)

Waves in One Dimension, Three-Dimensional Wave Equation, Transverse Waves on a Stretched String, Stroboscope or Strobe, Illustrated Problems.
Maxwell's Equations, Propagation of Plane Electromagnetic Waves in Matter, Energy Flow and Poynting Vector, Radiation Pressure, Polarization of Electromagnetic Wave, Illustrated Problems.

*CCE: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

*SEE: Semester End Evaluation

Reference Books

1) Mathematical Methods in Physical Sciences by M. L. Boas, John Wiley & Sons
2) Mathematical Physics byP. K. Chattopadhyay, New Age International Publishers
3) A textbook of Optics by N Subrahmanyam, Brij Lal& M.N. Avadhanulu, S.Chand
4) Optics by Ajoy Ghatak, McGraw-Hill Education
5) Elements of Solid-State Physics by J. P. Srivastava, PHI Learning
6) Introduction to Solid State Physics by C. Kittle, John Wiley & Sons
7) Waves and Oscillations, R. N. Chaudhuri, New Age International Publishers
8) Introduction to Electrodynamics, David J. Griffiths, Pearson Education

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Distinguish between interference and diffraction phenomena with examples.	PO1, PO2, PO3 PSO1	U, An	C	10
CO2	Apply calculus-based methods to derive diffraction formulas and analyse grating.	PO1, PO3, PO6 PSO1	Ap, E	C	5
CO3	Explain and classify crystalline solids, crystal lattice, and unit cell types.	PO1, PO2 PSO1	U, An	C	7
CO4	Use Miller indices and calculate inter-planar spacing in crystal structures.	PO1, PO3 PSO1, PSO2	Ap	C	8
CO5	Solve first and second-order differential equations with applications in physics.	PO1, PO2, PO6 PSO1	Ap, C	C	15
CO6	Analyse Maxwell's equations and apply to electromagnetic wave propagation.	PO1, PO3, PO6 PSO2	Ap, E	C	15
				Total hours of instructions	60

Mapping of Cos with Pos & PSOs

COs	POs										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3	3								3	
CO2	3		3			3					3	
CO3	3	3									3	
CO4	3		3						1		3	2
CO5	3	3				3					3	
CO6	3		3			3					3	2

3:High,2:Medium,1:Low

KADI SARVA VISHWAVIDYALAYA

Physics Semester III - Major Course

PHM228-2C Basic Physics-IV

COURSEOUTCOMES (COs):

- **CO1:**Explain electrostatic concepts using gradient, divergence, and curl operations.
- **CO2:**Solve Laplace's and Poisson's equations for electrostatic systems.
- **CO3:**Analyse BJT and JFET working principles and output/input characteristics.
- **CO4:**Compare characteristics and applications of JFET, BJT, and UJT.
- **CO5:**Describe and evaluate consequences of Lorentz transformations in relativity.
- **CO6:**Use thermodynamic functions and Maxwell's relations to solve thermal problems.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					CCE	SEE	
PHM228-2C	Basic Physics-IV	4	4	2.5	50	50	100

Unit 1: Electrostatics **Teaching Hours: 15 (Weightage 25%)**

Introduction-Gradient, Divergence and curl, Divergence of electrostatic field, curl of electrostatic field, Introduction to potential, Poisson's equation and Laplace's equation, The potential of a localized charge distribution, The work done in moving a charge, the energy of a point charge distribution, the energy of a continuous charge distribution, Illustrative Examples. related Problems

Unit 2: Transistors **Teaching Hours: 15 (Weightage 25%)**

Basics of Transistor, Transistor current component, Leakagecurrent, Characteristics of transistor, Common base configuration static characteristics, Common emitter configuration static characteristics, importance of characteristics, Load Line, Operating point, Illustrative Examples.
Principle and working of JFET, Importance of JFET, Difference between JFET and BJT, Characteristics of JFET, Advantages of JFET, UJT, Characteristics of UJT, Advantages of UJT, Application of UJT, Illustrative Examples. related Problems

Unit-3 Special theory of Relativity **Teaching Hours: 15 (Weightage 25%)**

Newtonian Relativity, Michelson-Morley experiment, Special theory of relativity, Lorentz Transformation, Consequences of Lorentz Transformation-(a) Relativity of Simultaneity (b) the Lorentz-Fitz Gerald length Contraction (c) Time Dilation, Addition of Velocities, Mass-energy relation, Space time or Minkowski four-dimensional continuum, related Problems.

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Unit-4 Heat and Thermodynamics **Teaching Hours: 15 (Weightage 25%)**

Characteristic functions, Enthalpy, The Helmholtzand Gibb's function, Two Mathematical Theorems, Maxwell's equations, The T-ds equations, Energy equation, The Thermal Expansivity, Compressibility, Joule-Kelvin effect (Porous plug Experiment), Lique faction of Gases by Joule-Kelvineffect, Illustrative examples

***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

Reference Books

1) Introduction to Electro dynamics by D. J.Griffiths, Pearson Education
2) Principles of Electronics by V.K. Mehta & Rohit Mehta, S.Chand
3) Introduction to Classical Mechanics byR. G. Takwale & P. S. Puranik, Tata McGraw Hill
4) Heat and Thermodynamics by MarkW. Zeemansky & Richard H. Dittman, McGraw Hill

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Explain electrostatic concepts using gradient, divergence, and curl operations.	PO1, PO2 PSO1	U, An	C	7
CO2	Solve Laplace's and Poisson's equations for electrostatic systems.	PO1, PO6 PSO1	Ap, E	C	8
CO3	Analyze BJT and JFET working principles and output/input characteristics.	PO1, PO3, PO6 PSO2	U, An	P	10
CO4	Compare characteristics and applications of JFET, BJT, and UJT.	PO1, PO4 PSO2	An, C	P	5
CO5	Describe and evaluate consequences of Lorentz transformations in relativity.	PO1, PO3 PSO1	U, E	C	15
CO6	Use thermodynamic functions and Maxwell's relations to solve thermal problems.	PO1, PO4, PO6 PSO2	Ap, E	C	15
				Total hours of instructions	**60**

Mapping of Cos with Pos & PSOs

COs	POs										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	1									3	
CO2	3					3					3	
CO3	3		3			3						3
CO4	3			2								3
CO5	3		3								3	
CO6	3			2		3						3

3:High,2:Medium,1:Low

KADI SARVA VISHWAVIDYALAYA

Physics Semester III - Major Course

PHM229-2C Physics Practical - III

COURSEOUTCOMES (COs):

- **CO1:**Demonstrate understanding and implementation of basic logic gates and verify their truth tables.
- **CO2:**Measure physical parameters like radius of curvature using speedometer and determine 'g' using bar pendulum.
- **CO3:**Apply AC theory to study LCR circuits and analyse resonance phenomena in series and parallel configurations.
- **CO4:**Determine Planck's constant using LEDs and understand the experimental basis of quantum physics.
- **CO5:**Analyse characteristics of transistor configurations (CB/CE), UJT, and study spectrometer-based diffraction.
- **CO6:**Investigate magnetic moment and validate rules for inductors in series and parallel; analyse real data.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Practical Per Week		Hrs.	Max Marks		
					CCE	SEE	
PHM229-2C	Physics Practical - III	8	4	5	50	50	100

Unit-1 (Weightage :50%)

1) To study the Basic Logic gates. (Discrete/IC)
2) To determine radius of curvature of lens using Spherometer.
3) L-C-R circuit with AC Source: Study of the series resonance with frequency variation.
4) Verification of Maximum power transfer theorem
5) Study of line spectra.
6) Determination of self-inductance 'L' of Inductor using AC Voltmeter & AC Ammeter.
7) To check the Parallel and series connections rules for Inductors.
8) To determine the magnetic moment (M) using deflection magnetometer

Unit-2 (Weightage :50%)

1) L-C-R circuit with AC Source: Study of the parallel resonance with frequency variation.
2) To determine the Planck's constant using LED.
3) To determine the ratio of magnetic moments of two magnets by using vibration magnetometer.
4) To study Common Base Transistor Characteristics (PNP).
5) To study the diffraction by Single Slit using spectrometer.
6) To measure the resolving power of Telescope.
7) To study the X-ray diffraction (Powder) Pattern.
8) Bar Pendulum: Determination of 'K' and 'g'.

*CCE: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

*SEE: Semester End Evaluation

Note:

1) New Experiments can be introduced AND / OR replaced as per need by the permission of the Head / Principal of the institute.
2) Hands-on / Project /Model etc. will carried out additionally for the enhancement of related skills

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Demonstrate understanding and implementation of basic logic gates and verify their truth tables.	PO1, PO3, PO6 PSO1	U, Ap	P	20
CO2	Measure physical parameters like radius of curvature using speedometer and determine 'g' using bar pendulum.	PO1, PO2, PO6 PSO1	Ap, An	P	20
CO3	Apply AC theory to study LCR circuits and analyse resonance phenomena in series and parallel configurations.	PO1, PO3, PO6 PSO2	Ap, An	C, P	20
CO4	Determine Planck's constant using LEDs and understand the experimental basis of quantum physics.	PO1, PO4, PO6 PSO2	Ap, E	C, P	20
CO5	Analyse characteristics of transistor configurations (CB/CE), UJT, and study spectrometer-based diffraction.	PO1, PO3, PO6 PSO2	U, Ap, An	P	20
CO6	Investigate magnetic moment and validate rules for inductors in series and parallel; analyse real data.	PO1, PO2, PO6 PSO1, PSO2	An, E	C, P	20
				Total hours of instructions	**120**

Mapping of Cos with Pos & PSOs

COs	POs										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3		3			3					3	
CO2	3	2				3					3	
CO3	3		3			3						3
CO4	3			1		3						3
CO5	3		3			3						3
CO6	3	2				3					3	3

3:High,2:Medium,1:Low

KADI SARVA VISHWAVIDYALAYA

Mathematics Semester III – Major Course

MTM230-2C Linear Algebra

Course Outcomes:

- **CO1:**Explain the elementary properties, subspaces, basis, and dimension of vector spaces under given definitions and examples.
- **CO2:**Analyze the span, linear dependence, and independence of vectors in finite-dimensional spaces given vector sets, justifying conclusions.
- **CO3:**Apply algebraic techniques to analyze and represent linear transformations through matrices, computing rank, nullity, and Invertibility.
- **CO4:**Evaluate dual spaces, dual bases, and annihilators using natural mappings.
- **CO5:**Construct orthonormal bases in inner product spaces using the Gram-Schmidt procedure with complete accuracy.
- **CO6:**Solve least square approximation problems using inner product space methods.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					CCE	SEE	
MTM230-2C	Linear Algebra	4	4	2.5	50	50	100

Unit 1 Vector Space **Teaching Hours: 15**

Introduction, Elementary properties of vector space, Subspace, Linear sum of two subspaces, Direct sum of two subspaces, Linear combination of vectors, Linear dependence and independence of vectors, Span of a set, Basis of a vector space, Finite dimensional vector space.

Unit 2 Linear Transformation **Teaching Hours: 15**

Introduction, Algebra of linear transformation, Linear operator, Range and Kernel of linear transformation, Rank and Nullity of a linear transformation, Rank-Nullity Theorem, Invertible linear transformation, Matrix representation of a linear transformation.

Unit 3 Linear Functional and Duality **Teaching Hours: 15**

Linear functional, Dual spaces, Dual Basis, Second dual space, Natural mapping, Annihilator, Annihilator of an annihilator.

Unit 4 Inner Product Space **Teaching Hours: 15**

Introduction, Properties of inner product space, Norm and Distance of vectors, Inner product space generated by matrices, Orthogonal vectors, Orthogonal complement, Orthogonal and Orthonormal basis, Cauchy-Schwartz inequality, Parallelogram law, Pythagorean theorem of an inner product space, Gram Schmidt procedure, Least square approximation.

*CCE: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

*SEE: Semester End Evaluation

Reference Books:

1. An Introduction to linear algebra, by V. Krishnamurthy, J. L. Arora, East West Press Pvt Ltd, New Delhi.
2. Linear Algebra, Ramchandra Rao, P. Bhimasankar, Tata McGraw Hill.
3. Linear Algebra, S. K. Berberion, Oxford University Press.
4. Linear Algebra, Sharma and Vashishtha, Krishna Prakashan, Meerut.
5. Linear Algebra, Gupta K. P., Pragati Prakshan, Meerut.
6. Advanced Linear Algebra, Steven Roman, 3rd edition, Springer.

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Explain the elementary properties, subspaces, basis, and dimension of vector spaces under given definitions and examples.	PO1, PO2, PO3 PSO1, PSO2	R, U	C	8
CO2	Analyze the span, linear dependence, and independence of vectors in finite-dimensional spaces given vector sets, justifying conclusions.	PO1, PO2, PO3, PO6, PSO1, PSO2	R, An, E	C, P	7
CO3	Apply algebraic techniques to analyze and represent linear transformations through matrices, computing rank, nullity, and Invertibility.	PO1, PO3, PO6, PSO1, PSO2	U,Ap, An	C, P	15
CO4	Evaluate dual spaces, dual bases, and annihilators using natural mappings.	PO1, PO2,PO3, PO6, PSO1, PSO2	Ap, E	C, P	15
CO5	Construct orthonormal bases in inner product spaces using the Gram-Schmidt procedure with complete accuracy.	PO1, PO2,PO3, PO4, PO6, PSO1, PSO2	Ap, E	C, P	8
CO6	Solve least square approximation problems using inner product space methods.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	Ap, E	C, P	7
Total hours of instruction					60

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Mapping of COs with POs & PSOs

CO	PO										PSO	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3	3	0	0	0	0	0	0	0	3	3
CO2	3	3	3	0	0	3	0	0	0	0	3	3
CO3	3	0	3	0	0	3	0	0	0	0	3	3
CO4	3	3	3	0	0	3	0	0	0	0	3	3
CO5	3	3	3	3	0	3	0	0	0	0	3	3
CO6	3	3	3	3	0	3	0	0	0	0	3	3

3:High, 2:Medium, 1:Low

KADI SARVA VISHWAVIDYALAYA

Mathematics Semester III - Major Course

MTM231-2C Advanced Calculus

Course Outcomes:

- **CO1:**Analyze curvature and radius of curvature for plane curves defined in Cartesian, polar, parametric, and implicit forms.
- **CO2:**Evaluate the concavity, convexity, and singularity of plane curves using analytical techniques, identifying curve behavior.
- **CO3:**Apply properties and transformations of Beta and Gamma functions to evaluate integrals and functional relationships.
- **CO4:**Compute gradient, divergence, curl, and Laplacian for given scalar and vector point functions.
- **CO5:**Interpret and apply Green's, Stoke's, and Gauss's theorems to evaluate vector integrals.
- **CO6:** Solve complex calculus problems by integrating techniques from curvature, special functions, and vector calculus, demonstrating logical accuracy across varied problem types.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					CCE	SEE	
MTM231-2C	Advanced Calculus	4	4	2.5	50	50	100

Unit 1 Curvature & Radius of Curvature **Teaching Hours: 15**

Relation between Cartesian coordinate and arc length, Pedal equation, Curvature of plane curve, Radius of curvature of a curve defined in explicit equation, implicit equation, polar equation and parametric equation, Radius of curvature of a curve at origin, Singular points, Point of inflexion for plane curve, Test of concavity and convexity.

Unit 2 Beta and Gamma Function **Teaching Hours: 15**

Definition of Beta and Gamma function, Properties of Beta and Gamma function, Transformations of Beta and Gamma function, Relation between Beta and Gamma function, , Different forms of Beta function, Duplication formula.

Unit 3 Vector Differential Calculus **Teaching Hours: 15**
Directional derivatives in the plane, Scalar and vector point functions and field, The vector differential operator, Divergence of a vector point function, Curl of a vector point function, Vector identities, Laplacian operator, Classification of vector fields.
Unit 4 Vector Integral Calculus **Teaching Hours: 15**
Line integrals, Fundamental theorem of line integral, Green's theorem, Surface Integral, Stoke's theorem, Volume integrals, Gauss's theorem.

*CCE: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.
*SEE: Semester End Evaluation

Reference Books:

1. Integral Calculus, Shantinarayan S. Chand, New Delhi (Course Book).
2. Advanced Calculus, D. V. Widder, Prentice Hall , New Delhi.
3. Advanced Calculus Vol : I & II, T. M. Apostol, Blaisdoll.
4. Advanced Calculus, R. C. Buck, MacMillan.
5. Differential Calculus, Shanti Narayan, S. Chand Publishing.
6. Linear Algebra and Vector Calculus, Ravish R. Singh, Mukul Bhatt, McGraw Hill Education (India) Private Limited.
7. Calculus, Dr. R.C. Shah, Books India Publication.
8. Mathematical Analysis, S. C. Malik and Savita Arora, New Age International (P) Limited.

KADI SARVA VISHWAVIDYALAYA

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Analyze curvature and radius of curvature for plane curves defined in Cartesian, polar, parametric, and implicit forms.	PO1, PO2, PO3, PO6, PSO1, PSO2	R, U, An	C, P	8
CO2	Evaluate the concavity, convexity, and singularity of plane curves using analytical techniques, identifying curve behavior.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, An, E	C, P	5
CO3	Apply properties and transformations of Beta and Gamma functions to evaluate integrals and functional relationships.	PO1, PO2, PO3, PO6, PSO1, PSO2	R, Ap, E	C, P	11
CO4	Compute gradient, divergence, curl, and Laplacian for given scalar and vector point functions.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, E	C, P	12
CO5	Interpret and apply Green's, Stokes', and Gauss's theorems to evaluate vector integrals.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, An	C, P	12
CO6	Solve complex calculus problems by integrating techniques from curvature, special functions, and vector calculus, demonstrating logical accuracy across varied problem types.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	Ap, E	C, P	12
Total hours of instruction					60

Mapping of COs with POs & PSOs

CO	PO										PSO	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3	3	0	0	3	0	0	0	0	3	3
CO2	3	3	3	0	0	3	0	0	0	0	3	3
CO3	3	3	3	0	0	3	0	0	0	0	3	3
CO4	3	3	3	0	0	3	0	0	0	0	3	3
CO5	3	3	3	0	0	3	0	0	0	0	3	3
CO6	3	3	3	1	0	3	0	0	0	0	3	3

3:High,2:Medium,1:Low

KADI SARVA VISHWAVIDYALAYA

Mathematics Semester III – Major Course

MTM232-2C Application of Linear Algebra and Calculus

Course Outcomes:

- **CO1:**Demonstrate understanding of vector spaces by verifying subspaces, span, linear independence, and basis using examples.
- **CO2:**Investigate linear transformations through range, kernel, Invertibility, and matrix representations.
- **CO3:**Apply inner product methods to analyze norm, distance, orthogonality, and perform Gram-Schmidt orthogonalization and least square approximation.
- **CO4:**Compute radius of curvature and evaluate geometric behavior (concavity, convexity) of curves from given equations.
- **CO5:**Analyze scalar and vector fields using divergence, curl, and Laplacian operators, and solve line, surface, and volume integrals.
- **CO6:**Verify the validity of Green's, Stoke's, and Gauss divergence theorems using region-based examples.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Practical Per Week		Hrs.	Max Marks		
					CCE	SEE	
MTM232-2C	Application of Linear Algebra and Calculus	8	4	5	50	50	100

Unit 1 Application of Linear Algebra **Teaching Hours: 60**

1. Examples on Vector Space, subspaces.
2. Check whether a given set is linearly dependent or independent.
3. Examples on span of a set.
4. Check whether given set is a basis of a vector space or not.
5. To Expand linearly independent set up to a basis of a vector space.
6. Check whether the given map is a linear transformation or not.
7. Examples on range and kernel of linear transformation.
8. Verifications on Rank-Nullity theorem
9. To find the inverse of a Linear transformations
10. To find the matrix for the given linear transformation.
11. To find the linear transformation from a given matrix.
12. Examples on dual basis.
13. To check given set is an inner product space or not for a given inner product.
14. Examples on norm and distance of vectors.
15. To check whether the given set of vector will form an orthogonal set for a given inner product.
16. Examples on Gram Schmidt procedure.
17. Examples on Least square approximation.

Unit 2 Application of Calculus **Teaching Hours:60**

1. Examples based on finding radius of curvature of a curve.
2. Examples based on finding radius of curvature of a curve at origin. 3. Examples to test concavity and convexity.
4. Application of Beta and Gamma functions.
5. Examples based on divergence of a vector point function.
6. Examples based on curl of a vector point function.
7. Calculation of Laplacian operator of a function.
8. Examples on line integral.
9. Problems based on surface integral.
10. Application of Green's theorem
11. Application of Stokes' theorem
12. Application of Gauss divergence theorem.

***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

Reference Books:

1. An Introduction to linear algebra, by V. Krishnamurthy, J. L. Arora, East West Press Pvt Ltd. New Delhi.
2. Linear Algebra, Ramchandra Rao, P. Bhimasankar, Tata McGraw Hill.
3. Linear Algebra, S. K. Berberion, Oxford University Press.
4. Linear Algebra, Sharma and Vashishtha, Krishna Prakashan, Meerut.
5. Linear Algebra, Gupta K. P., Pragati Prakshan, Meerut.
6. Advanced Linear Algebra, Steven Roman, 3rd edition, Springer.
7. Integral Calculus, Shantinarayan S. Chand, New Delhi (Course Book).
8. Advanced Calculus, D. V. Widder, Prentice Hall, New Delhi.
9. Advanced Calculus Vol: I & II, T. M. Apostol, Blaisdoll.
10. Advanced Calculus, R. C. Buck, MacMillan.
11. Differential Calculus, Shanti Narayan, S. Chand Publishing.
12. Calculus, Dr. R. C. Shah, Books India Publication.
13. Mathematical Analysis, S. C. Malik and Savita Arrora, New Age International (P) Limited.
14. Linear Algebra and Vector Calculus, Ravish R. Singh, Mukul Bhatt, McGraw Hill Education (India) Private Limited.

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Demonstrate understanding of vector spaces by verifying subspaces, span, linear independence, and basis using examples.	PO1, PO2, PO3, PSO1, PSO2	U, Ap, An	C, P	20
CO2	Investigate linear transformations through range, kernel, invertibility, and matrix representations.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	Ap, E	C, P	20
CO3	Apply inner product methods to analyze norm, distance, orthogonality, and perform Gram-Schmidt orthogonalization and least square approximation.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, An, E	C, P	20
CO4	Compute radius of curvature and evaluate geometric behavior (concavity, convexity) of curves from given equations.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	Ap, An, E	C, P	12
CO5	Analyze scalar and vector fields using divergence, curl, and Laplacian operators, and solve line, surface, and volume integrals.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, An, E	C, P	24
CO6	Verify the validity of Green's, Stokes', and Gauss divergence theorems using region-based examples.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	An, E	C, P	24
Total hours of instruction					120

Mapping of COs with POs & PSOs

CO	PO										PSO	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3	3	0	0	0	0	0	0	0	3	3
CO2	3	3	3	3	0	3	0	0	0	0	3	3
CO3	3	3	3	0	0	3	0	0	0	0	3	3
CO4	3	3	3	3	0	3	0	0	0	0	3	3
CO5	3	3	3	0	0	3	0	0	0	0	3	3
CO6	3	3	3	3	0	3	0	0	0	0	3	3

3:High, 2:Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Microbiology Semester III Multidisciplinary Course

MDC221-2C - Basic Statistical Techniques

COURSE OUTCOMES:

- CO1: Apply foundational concepts of biostatistics to organize, present, and summarize biological data using appropriate graphical and tabular methods.
- CO2: Describe sampling techniques to collect representative data from diverse populations and evaluate sampling errors.
- CO3: Understand the concept of descriptive and inferential statistical analyses, including central tendency, dispersion, and hypothesis testing using Student's t-test.
- CO4: Apply measure of central tendency to summarize and interpret biological data sets.
- CO5: Analyze data variability using standard deviation and variance, and evaluate the reliability of results through appropriate dispersion techniques.
- CO6: Conduct hypothesis testing using Student's t-test to draw valid inferences from sample data, including interpretation of p-values and confidence intervals.

TEACHING AND EVALUATION SCHEME:

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	
			Theory	Practical
MDC221-2C	Basic statistical techniques	4	2	4

Examination Scheme						Total Marks
Theory			Practical			
Hrs.	Max Marks		Hrs.	Max Marks		
	CCE	SEE		CCE	SEE	
2	25	25	2.5	25	25	100

Unit 1: Introduction to Biostatistics **Teaching Hours: 15 (Weightage 25%)**

- Definition and Scope of Biostatistics
- Sources and Presentation of Data:
  - Types of data and methods for collection of data
  - Classification & presentation of data: Tabulation, Diagramatic and Graphical representation, Frequency distributions of data.
- Sampling: Introduction, Definition and methods, Types of population, Sample, Sample size, sampling error

Unit 2: Tools and Techniques for data-analysis **Teaching Hours: 15 (Weightage 25%)**

- Descriptive Statistics:
  - Introduction and types of descriptive Statistics
  - Measures of central Tendency: Mean Median and Mode (Merits and Demerits).
  - Selection of the appropriate measure of central Tendency: Arithmetic mean, Geometric mean and Harmonic mean (Merits and Demerits).
  - Measures of Dispersion: Standard Deviation and Variance
- Inferential statistics
  - Introduction and types of inferential statistics
  - Introduction to Hypothesis, types of errors, confidence interval, level of significance(p value)
  - Student t-test: Introduction, Student's t-Distribution, Application of t Distribution

Practicals **Teaching Hours: 60 (Weightage 50%)**

1. Problem sum for Arithmetic mean, Geometric mean and Harmonic mean.
2. Problem sum for Median.
3. Problem sum for Mode.
4. Problem sum for Standard Deviation.
5. Problem sum for Variance.
6. Hypothesis testing using students t test.

Reference Books:

1. Biostatistics Authors S. Prasad, 3rd Edition, Rastogi Publications, India
2. Biostatistics- P.N. Arora & P.K. Malhan, Himalaya Publishing House, India
3. Introduction to Biostatistics and Research Methods- Sundar Rao, 4th Edition. Prentice-Hall of India Private Limited, New Delhi.

Suggested Reference Books:

1. An Introduction to Biostastistics- Gurumani, N., 2nd Edition. MJP Publishers, Chennai, India.
2. Fundamental of Biostatistics- Bernard Rosner, 8th Edition. USA.
3. Fundamentals of Biostatistics- P. Hanmanth Rao & K. Janardhan, 1st edition, I.K International Publishing House Pvt. Ltd, India.

KADI SARVA VISHWAVIDYALAYA

	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class/ Lab Session
CO1	Apply foundational concepts of biostatistics to organize, present, and summarize biological data using appropriate graphical and tabular methods.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	U, R, Ap, An, Cr	C, P	8
CO2	Describe sampling techniques to collect representative data from diverse populations and evaluate sampling errors.	PO1, PO2, PSO1, PSO2	U, R, Ap, An, E	C, P	7
CO3	Understand the concept of descriptive and inferential statistical analyses, including central tendency, dispersion, and hypothesis testing using Student's t-test.	PO1, PO2, PSO1, PSO2	U, R, An, Ap, Cr	C, P	15
CO4	Apply measure of central tendency to summarize and interpret biological data sets.	PO2, PO3, PO4, PO6, PSO2	R, Ap, An, E	P	30
CO5	Analyze data variability using standard deviation and variance, and evaluate the reliability of results through appropriate dispersion techniques.	PO2, PO3, PO4, PO6, PSO2	R, An, Ap, Cr	P	15
CO6	Conduct hypothesis testing using Student's t-test to draw valid inferences from sample data, including interpretation of p-values and confidence intervals.	PO2, PO3, PO4, PO6, PSO2	R, Ap, An, E	P	15
	Total hour of Instruction				90

Mapping of COs with POs & PSOs

CO	PO										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	2	3	3	3		3					2	3
CO2	2	3									2	3
CO3	2	3									2	3
CO4		3	3	3		3						3
CO5		3	3	3		3						3
CO6		3	3	3		3						3

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Chemistry Semester III Multidisciplinary Course

MDC222-2C INTRODUCTION TO CHEMISTRY-III

Course Outcomes:

- CO1: Explain electronic and steric effects and evaluate their role in determining the properties, stability, and reactivity of organic compounds.
- CO2: Understand the basic concepts of thermodynamic systems, work, heat, state functions, and the laws of thermodynamics, including Carnot's cycle.
- CO3: Apply the concepts of entropy, enthalpy, and free energy to calculate changes in thermodynamic properties of ideal gases under various conditions using numerical methods.
- CO4: Identify the solubility behaviour of inorganic salts formed by common cations and anions in water based on solubility rules.
- CO5: Classify salts of given cations and anions as water-soluble or insoluble and predict precipitation reactions based on ionic interactions.
- CO6: Interpret experimental observations related to solubility and precipitation to verify theoretical solubility rules for the given inorganic salts.

Course Code	Course Title	Teaching Scheme		Credits
		Theory hrs Per Week	Practical hrs Per Week	
MDC222-2C	Introduction to Chemistry-III	2	4	4

Examination Scheme						Total Marks
Theory			Practical			
Hrs.	Max Marks		Hrs.	Max Marks		
	CCE	SEE		CCE	SEE	
2	25	25	2.5	25	25	100

Unit 1:Basics of Organic Chemistry — **Teaching Hours:15**

- Factors affecting to the properties of organic molecule
- Electromeric effect, Inductive effect, Mesomaric effect
- Resonance effect (resonating structures of Nitrobenzene, Chlorobenzen, Phenoxide ion, Anillinium ion, Acetate ion)
- Steric effect, Electromeric and field effect,Hyperconjugation
- Aromaticity

Unit 2.Thermochemistry — **Teaching Hours:15**

- Introduction
- System and surrounding-work & heat, state function, thermodynamic process, internal energy, enthalpy, free energy, maximum work function
- Zerothlaw,firstlaw,Secondlawofthermodynamics;proofof2ndlaw(Carnot's Cycle)
- Concept of entropy; Entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases
- Related Numericals

Unit 3: Chemistry Practical **Teaching Hours:60**

Inorganic Qualitative Analysi s(Four Radicals) (Minimum Ten)

Water Soluble and Insoluble Inorganic salts of following cations and anions:

Cations: Na^+, K^+, NH_4^+, Mg^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Fe^{2+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Co^{3+}, Pb^{2+}, Cu^{2+}.

Anions: S^{2-}, SO_4^{2-}, CO_3, PO_4^{3-}, CrO_4, Cl^-, Br, I, NO_2^-, NO_3^-, O^{2-}

*CCE: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

*SEE: Semester End Evaluation

REFERENCESBOOKS

- 'PhysicalChemistry'byP.W.Atkins,7/E,2002,OxfordUniversityPress,IndianEdition.
- 'PhysicalChemistry'byW.J.Moore,MacGrawHillPublication,1996,6/E.
- 'PrincipleofPhysicalChemistry'byPuri,Sharma&Pathania,41/E,VishalPublishers.
- 'EssentialsofPhysicalChemistry'byBahl&Tuli.22/E,S.ChandpublicationNewDelhi.
- 'AdvancedPhysicalChemistry'byGurdeepRaj,19/E,GoelPublishingHouseMeerut.
- 'OrganicChemistry'by G.MarcLoudon,4/E,2010,OxfordUniversityPress,IndianEdition,
- 'Organic Chemistry' by Robert Thornot Morrison, Robert Neilson Boyd, 6/E, 1992, Prentice Hallof India Pvt Ltd, New Delhi.

SUGGESTED BOOKS:

- 'Text book of Organic Chemistry' by P.L.Soni and H. M. Chawla, 26/E, 1995, Sultan Chand & Sons Publication, New Delhi.
- 'Textbook of Organi cChemistry' by P.S. Kalsi,1999, MacMillan of India Pvt. Ltd.
- 'Organic Chemistry' by Bhupinder Mehta, Manju Mehta, Prentice Hall of India Pvt. Ltd, New Delhi.
- Vogel, ArthurIsrael. Vogel's textbook of practical chemistry
- Vogel,s qualitative inorganic analysis, 7th edition, textbook of practical chemistry.

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CO	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Explain electronic and steric effects and evaluate their role in determining the properties, stability, and reactivity of organic compounds.	PO1,PO2, PSO1	U, E	C	15
CO2	Understand the basic concepts of thermodynamic systems, work, heat, state functions, and the laws of thermodynamics, including Carnot's cycle.	PO1,PO2, PO3, PSO1	U	C	9
CO3	Apply the concepts of entropy, enthalpy, and free energy to calculate changes in thermodynamic properties of ideal gases under various conditions using numerical methods.	PO1,PO2, PO3, PSO1	U, Ap	P	6
CO4	Identify the solubility behaviour of inorganic salts formed by common cations and anions in water based on solubility rules.	PO2,PO6,PSO2	U, R	C	20
CO5	Classify salts of given cations and anions as water-soluble or insoluble and predict precipitation reactions based on ionic interactions.	PO2,PO3,PSO2	U, An	C, P	20
CO6	Interpret experimental observations related to solubility and precipitation to verify theoretical solubility rules for the given inorganic salts.	PO2,PO3,PSO2	E	C, P	20
	Total hours of Instruction				**90**

Mapping of COs with POs and PSOs

CO	PO										PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	2	3									2	
CO2	2	3	3								2	
CO3	2	3	3								2	
CO4		3				1						3
CO5		3	3									3
CO6		3	3									3

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Physics Semester III - Multidisciplinary Course

MDC223-2C Optical Fibers and Optoelectronic Devices

COURSEOUTCOMES (COs):

- CO1: Explain the structure, types, and principles of optical fibres.
- CO2: Analyse light propagation, losses, and applications in optical communication.
- CO3: Understand working and characteristics of optoelectronic devices like LEDs, Solar Cells, etc.
- CO4: Understand the working of various optoelectronic devices including LEDs, photodiodes, phototransistors, and solar cells.
- CO5: Experimentally analyze the behaviour of optical fibers, photoconductive cells, and laser diodes.
- CO6: Apply experimental techniques of optoelectronic devices for potential applications in communication and renewable energy systems.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits
		Theory PerWeek	Practical Per week	
MDC223-2C	Optical Fibers and Optoelectronic Devices	2	4	4

Examination Scheme						Total Marks
Theory			Practical			
Hrs.	Max Marks		Hrs.	Max Marks		
	CCE	SEE		CCE	SEE	
2	25	25	2.5	25	25	100

Unit 1: Optical Fibers — **Teaching Hours: 15 (Weightage 25%)**

Introduction, Optical Fibers–Principle, Structure of Optical Fibers, Acceptance Angle and Cone, Numerical Aperture and Acceptance Angle, Types of Optical Fibers, Fabrication of Optical Fibers, Loss in Optical Fibers, Fiber Optical Communication, Fiber Optical Sensor, Classification of Optical Sensors, Fiber Endoscope, Applications of Optical Fibers, Illustrated Examples.

Unit 2: Optoelectronics Devices — **Teaching Hours: 15 (Weightage 25%)**

Fundamentals of Light,

Theory, Construction, Working & Applications with Illustrated Examples of;

i) Light Emitting Diode (LED)
ii) Liquid Crystal Displays
iii) P-N Junction Photodiode
iv) Photoconductive Cell
v) Phototransistor
vi) Photo voltaic or Solar Cell
vii) Laser Diode

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Practical **Teaching Hours: 30 (Weightage 50%)**

1. To determine the Numerical Aperture and Acceptance angle of an optical fiber.
2. To study the characteristics of a different coloured LED.
3. To study the characteristics of a Photodiode.
4. To study the characteristics of a Photoconductive Cell.
5. To study the characteristics of aPhototransistor.
6. To study the characteristics of a Photo voltaic or Solar Cell and hence determine the power and Fill factor.
7. To study the characteristics of a Laser Diode.

Note:

1) New Experiments can be introduced AND / OR replaced as per need by the permission of the Head / Principal of the institute.
2) Hands-on / Project /Model etc. will carried out additionally for the enhancement of related skills.

***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

Reference Books

1) Engineering Physics by V. Rajendran, McGraw Hill Education, New Delhi
2) A Textbook of Electrical Technology by B. L. Theraja, A. K. Theraja, S. Chand, New Delhi
3) Electronic Communications by Dennis Roddy, John Coolen, Pearson Education.

CO	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Explain the structure, types, and principles of optical fibres.	PO1, PO2, PO6 PSO1, PSO2	U	C	9
CO2	Analyse light propagation, losses, and applications in optical communication.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	An	P	6
CO3	Understand working and characteristics of optoelectronic devices like LEDs, Solar Cells, etc.	PO1, PO2, PO3, PO6, PO7, PSO1	U	C	15
CO4	Understand the working of various optoelectronic devices including LEDs, photodiodes, phototransistors, and solar cells.	PO1, PO2, PO3, PO6, PSO1	U	C	20
CO5	Experimentally analyze the behavior of optical fibers, photoconductive cells, and laser diodes	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	An	P	20
CO6	Apply experimental techniques of optoelectronic devices for potential applications in communication and renewable energy systems.	PO1, PO3, PO6, PO7, PSO1, PSO2	Ap	P	20
				Total hour of Instruction	**90**

KADI SARVA VISHWAVIDYALAYA

Mapping of Cos with Pos & PSOs

COs	POs										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3				3					3	3
CO2	3	3	3			3	3				3	3
CO3	3	3	3			3	3				3	
CO4	3	3	3				3				3	
CO5	3	3	3			3	3				3	3
CO6	3		3			3	3				3	3

3:High,2:Medium,1:Low

KADI SARVA VISHWAVIDYALAYA

Mathematics Semester III – Multidisciplinary Course

MDC224-2C Database Management System

Course Outcomes:

- **CO1:**Explain fundamental concepts of DBMS and RDBMS, including relational model features, advantages, and data modeling principles using real-world examples.
- **CO2:**Design ER models and relational schemas for real-life applications, correctly identifying keys, attributes, and relationships.
- **CO3:**Apply functional dependency theory and normalization techniques up to BCNF for database schema design to minimize redundancy and ensure data integrity.
- **CO4:**Implement SQL queries to perform data definition, manipulation, and enforce constraints on databases.
- **CO5:**Construct advanced SQL queries using built-in functions, joins, set operators, and sub-queries to retrieve and analyze data from multiple tables.
- **CO6:**Execute SQL transaction control commands such as COMMIT, ROLLBACK, and SAVEPOINT to ensure data consistency, correctly handling transactions.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits
		Theory Per Week	Practical Per Week	
MDC224-2C	Database Management System	2	4	4

Examination Scheme						Total Marks
Theory			Practical			
Hrs.	Max Marks		Hrs.	Max Marks		
	CCE	SEE		CCE	SEE	
2	25	25	2.5	25	25	100

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Unit 1 **Teaching Hours:15**

Introduction to DBMS and RDBMS: What is Database Management System, Purpose of database system, Advantages and disadvantages of database system, Introduction to RDBMS, The relational model, Introduction to SQL, Working with relations of RDBMS, Advantages and disadvantages of relational database

Data Modelling: Entity types, Entity set, Attribute, Attribute types and key, Relationships, Relation types, ER diagrams, Database design using ER diagrams.

Entity Relationship Model: Entity, Attributes, Relationships, E-R modeling symbols, Connectivity and Cardinality, Aggregation, Generalization.

Relational Database Model: Tables and Characteristics, Keys: Super key, Candidate key, Primary key,Foreign key, Composite key, Relational set operators - Union,Intersection, Difference, Divide, Product.

Relational Database Design: Functional dependency definition, Trivial and non-trivial FD, Closure of FD set, Closure of attributes, Irreducible set of FD, Normalization – 1NF, 2NF, 3NF, BCNF.

Unit 2 **Teaching Hours :15**

Introduction to SQL: Basics of SQL, DDL, DML, DCL, Structure – creation, Alteration, Defining constraints, Primary key, Foreign key, Unique, Not null, Check in operator.

Functions - aggregate functions, Built-in functions –numeric, date, string functions.

Advanced SQL: Aggregate Functions and GROUP BY clause, retrieving data from multiple tables using Join, SET operators.

Sub-Queries: Single-row, Multiple-row, correlated – Sub-queries, In-line View–EXISTS, NOT EXISTS, IN, ANY, ALL operators.Transaction control commands – COMMIT, ROLLBACK, SAVEPOINT.

Practicals **Teaching Hours:60**

1. Implement SQL queries to perform various DDL Commands.
2. Implement SQL queries to perform various DML Commands.
3. Implement SQL queries using Date functions
4. Retrieve data using SELECT command and various SQL operators.
5. Implement SQL queries using Numeric functions
6. Implement SQL queries using Character Functions
7. Implement SQL queries using Conversion Functions
8. SQL queries using Comparison Operators, Logical Operators in WHERE clause
9. Sorting data using ORDER BY clause
10. Implement SQL queries using Aggregate functions and group by clause
11. Implement SQL queries using Set operators
12. SQL queries based Joins
13. Sub-Queries - Single-row, Multiple-row, correlated – Sub-queries, Inline View, EXISTS, NOT EXISTS, IN, ANY, ALL operators
14. Transaction based queries using COMMIT, ROLLBACK, SAVEPOINT

*CCE: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

*SEE: Semester End Evaluation

Reference Books:

1. Database system concepts, Abraham Silberschatz, Henry Korth, S. Sudarshan, McGraw Hill International.
2. Database systems: Design implementation and management, Rob Coronel, Thomson Learning Press.
3. Database Management Systems, Raghu Ramkrishnan, Johannes Gehrke, McGraw Hill International.
4. Database Management System, Alexis Leaon, Mathews Leon, Leon press.
5. Fundamentals of Database Systems, Remez Elmasri, Shamkant Navathe, Pearson.
6. Database Systems – a Practical approach to design, implementation & Management, Thomes M. Colnnolly, Carolyn E. Begg, Pearson.

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Explain fundamental concepts of DBMS and RDBMS, including relational model features, advantages, and data modeling principles using real-world examples.	PO1, PO2, PO4, PO7, PSO1	R, U	C, P	11
CO2	Design ER models and relational schemas for real-life applications, correctly identifying keys, attributes, and relationships.	PO1, PO3, PO4, PO6, PSO1	U, Ap, C	C, P	15
CO3	Apply functional dependency theory and normalization techniques up to BCNF for database schema design to minimize redundancy and ensure data integrity.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	R, Ap, E	C, P	15
CO4	Implement SQL queries to perform data definition, manipulation, and enforce constraints on databases.	PO1, PO2, PO3, PO4, PO7, PSO1	U, Ap	C, P	15
CO5	Construct advanced SQL queries using built-in functions, joins, set operators, and sub-queries to retrieve and analyze data from multiple tables.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	U, Ap, An	C, P	17
CO6	Execute SQL transaction control commands such as COMMIT, ROLLBACK, and SAVEPOINT to ensure data consistency, correctly handling transactions.	PO1, PO3, PO6, PO7, PSO1	U, Ap, An	C, P	17
Total hours of instruction					90

Mapping of COs with POs & PSOs

CO	PO										PSO	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3	0	3	0	0	3	0	0	0	3	0
CO2	3	0	3	3	0	3	0	0	0	0	3	0
CO3	3	3	3	0	0	3	3	0	0	0	3	2
CO4	3	3	3	3	0	0	3	0	0	0	3	0
CO5	3	3	3	0	0	3	3	0	0	0	3	2
CO6	3	0	3	0	0	3	3	0	0	0	3	0

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Ability Enhancement Course - Semester 3

AEC-211-2C- Business Communication

Course Outcomes:

CO 1: Discuss the process and mechanics of written business communication.
CO 2: Demonstrate the importance and influence of persuasive communication
CO 3: Define the use of web tools and hand-held technical devices for online business communication.

Teaching and Evaluation Scheme:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					CCE	SEE	
AEC-211-2C	Business Communication	2	2	2	25	25	50

Unit 1: Written Communication **Teaching Hours: 17 (Weightage 57%)**

- **The writing process** (2 hr)
  - How business communication is different from general communication
  - Pre writing, writing, and rewriting
- **SOPs – importance, components, usability check and sample** (1 hr)
- **Process descriptions and instructions** (1 hr)
- **Writing for Business** (1 hr)
  - Structure, layout and style (1 hr)
  - Acknowledgement letter, acceptance letter (1 hr)
  - Inquiry letter and order letter (1 hr)
  - Complaint letter and apology letter (1 hr)
  - Sales letter (2 hr)
- **Report Writing: formal and Informal reports** (1 hr)
  - Definition, features, significance, and types (2 hr)
  - Informal reports- layouts (1 hr)
  - Formal report (2 hr)
  - Structure of a formal report

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Unit 2: Persuasive Communication **Teaching Hours: 10(Weightage 33 %)**

- Importance of argumentation and persuasion in communication (1 hr)
  - Ethical, emotional and Logical argumentation (1 hr)
  - Organize your persuasion (1 hr)
- Communicating for positive influence- need and Importance in Business (1 hr)
  - Using conversational style and YOU attitude (1 hr)
  - Using positive words, being courteous, avoid blaming refrain from preaching, be sincere, don't overdo (1 hr)
- Public Speaking (3 hr)
  - The PRPSA test
  - Developing confidence, preparing the speech, and delivering the Same
  - Practical purview (1 hr)

Unit 3: Use of Web and Digital tools for business Teaching Hours: 03(Weightage 10%)

- Why the web is important for Business Communication, Characteristics of online communication, Considerations for Handheld mobile device (1 hr)
- Smartphones and communication (1 hr)
- Using collaborative writing tools and tips to use them effectively (1 hr)

***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments / Seminars/ Presentations/ Quizzes/ Surprise Tests.

***SEE:** Semester End Evaluation

Reference books, articles & Online Sources:

Books:

Gerson, Sharon J., and Steven M. Gerson. *Technical Communication: Process and Product.* Pearson, 2014.

Kumar, Sanjay, and Pushpa Lata. *Communication Skills.* Oxford University Press, 2013.

Lesikar, Raymond V. *Business Communication: Connecting in a Digital World.* McGraw Hill Education, 2015.

Padmaja, T. V. S. *Technical Communication: A Practical Approach.* 6th ed., Pearson, 2012.

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	Course Outcome	Pos/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO 1	Discuss the process and mechanics of written business communication.	PO1, PO2, PO5	U, Ap	C, P	17
CO 2	Demonstrate the importance and influence of persuasive communication	PO1, PO2, PO3, PO4, PO5, PO8,	U, Ap, C	C, P	10
CO 3	Define the use of web tools and hand-held technical devices for online business communication.	PO1, PO3, PO5, PO7, PO8	U, Ap, R	C	03
Total hour of instruction					30

Mapping of Cos with Pos & PSOs

Co	PO																PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	1	2
CO1	3	3			3													
CO2	3	3	3	2	3			3										
CO3	3		3		3			3										

3:High,2:Medium,1:Low

CO		POs												PSOs	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	1	2
CO1	17	Y	Y			Y									
CO2	10	Y	Y	Y	Y	Y			Y						
CO3	03	Y		Y		Y			Y						
CO4															
	30	30	27	13	10	30			13						
		3	**3**	**3**	**2**	**3**			**3**						

Note: less than 5 %=0; 5-25%=1; 25-40%=2; Greater than 40%=3

KADI SARVA VISHWAVIDYALAYA

Indian Knowledge System – Semester III

IKS207-2C Indian Astronomy-II

(BBA / BCA / B.Sc All Semester 3)

COURSE OUTCOMES:

- CO1: Describe and compare various calendar systems such as the Gregorian, Hindu, Islamic, and Indian calendars, including the structure and significance of Pañcāṅga.
- CO2: Analyze the epicyclic theory and compute true positions and daily motions of the Sun, Moon, and planets using traditional astronomical methods.
- CO3: Apply traditional astronomical techniques to determine cardinal directions, local latitude, sunrise/sunset times, and predict celestial events like eclipses.

TEACHINGANDEVALUATIONSCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					CCE	SEE	
IKS207-2C	Indian Astronomy-II	2	2	2	25	25	50

Unit 1: Calendars and Pancanga **Teaching Hours: 15 (Weightage 25%)**

Introduction, Gregorian Calendar, Hindu Calendar, Islamic Calendar, Indian Calendar and Pancanga.

True Positions of Sun, Moon and Star-Planets

Introduction Epicyclic theory, equation of Centre for the Sun and the Moon, True daily motions of the Sun, the Moon and star-planets.

Unit 2: Triprasna - Direction, Place and Time **Teaching Hours: 15 (Weightage 25%)**

Introduction, determination of North-South Line, Finding Latitude & co-latitude of a place, Rising and Setting Points of the Sun, Times of Sunrise and Sunset, Rising of Signs of the Zodiac, Determination of Lagna at a given Time and Place,

Eclipse

Lunar Eclipse, Solar Eclipse

***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

Reference books:

1) Indian astronomy: An introduction by S. Balachandra Rao, Universities Press (India) Ltd, Hyderabad
2) THE ARYABHATI of ARYABHATA: An Ancient Indian Work on Mathematics and Astronomy, Walter Eugene Clark, The University of Chicago Press, Illinois
3) Indian Astronomy- A source book (Based primarily on Sanskrit Texts), Compiled by B V Subbarayappa & K V Sharma, Nehru Center, Bombay.

CO	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Describe and compare various calendar systems such as the Gregorian, Hindu, Islamic, and Indian calendars, including the structure and significance of Pañcāṅga.	PO1, PO2, PO5, PO8, PSO1	U	C	11
CO2	Analyze the epicyclic theory and compute true positions and daily motions of the Sun, Moon, and planets using traditional astronomical methods.	PO1, PO2, PO3, PO6, PSO1, PSO2	An	P	10
CO3	Apply traditional astronomical techniques to determine cardinal directions, local latitude, sunrise/sunset times, and predict celestial events like eclipses.	PO1, PO2, PO3, PO6, PO9, PSO1, PSO2	Ap	P	9
				Total hour of Instruction	**30**

Mapping of Cos with Pos & PSOs

COs	POs										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3			2			2			3	
CO2	3	3	3			3					3	3
CO3	3	3	3			3			2		3	3

3:High,2:Medium,1:Low

KADI SARVA VISHWAVIDYALAYA

Microbiology Semester III - Skill Enhancement Course

SEC261-2C – Basics of Pathology and Hematology

COURSE OUTCOMES:

- CO1: Understand the fundamentals of pathology, normal cell, cellular injury, cell death mechanisms, inflammation, tissue repair and cellular adaptation processes.
- CO2: Discuss laboratory organization with safety procedures and describe Hematopoiesis, blood components, coagulation mechanisms and the effective use of anticoagulants in diagnostic applications.
- CO3: Discuss and illustrate blood grouping, donor selection, and transfusion practices with adverse reaction and management.

TEACHING AND EVALUATION SCHEME:

Course code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	Examination Scheme			Total Marks
			Theory	Hrs.	Max Marks		
					CCE	SEE	
SEC261-2C	Basics of Pathology and Hematology	2	2	2	25	25	50

Unit 1 Pathology **Teaching Hours: 15(Weightage 50%)**

- Introduction to pathology: History -Evolution of pathology.
- Cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling.
- Cell death: types- autolysis, necrosis, apoptosis and gangrene
- Cellular adaptations-atrophy, hypertrophy, hyperplasia & dysplasia, Neoplasia
- Inflammation and repair
  - Acute inflammation – Definition, vascular and cellular response, Chemical mediators and their role
  - Chronic and granulomatous inflammation
  - Repair and regeneration – Wound healing and factors influencing repair.
  - Repair in specialized tissues, bone, muscle, nerve, parenchymal organs.

Unit 2 Hematology and Blood banking **Teaching Hours: 15(Weightage 50%)**

Hematology

- Introduction to haematology and laboratory organization Lab safety and Instrumentation.
- Haematopoietic Growth Factors (HGFs). Haematopoiesis.
- Composition of blood: Red blood cells, White blood cells, Platelets
- Haemostasis: Introduction, Role of Platelets in Haemostasis, Plasma Proteins in Haemostasis, Mechanism of Blood Coagulation.
- Functions of blood
- Various anticoagulants, their uses, mode of action and their merits and demerits.

Blood banking

- Different blood groups and their Clinical significance. Blood grouping. Significance of reverse grouping and cross-matching
- Introduction and Clinical Significance of Blood Transfusion, Indications of Blood Transfusion
- Selection criteria of blood donors and adverse donor reactions and management.
- Collection of Blood for Transfusion.
- Preparation and use of blood components.
- Storage of Blood and blood components for transfusion
- Transfusion reactions and Hemolytic Diseases.

***CCE:** Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

***SEE:** Semester End Evaluation

Reference Books:

1. Text Book of Pathology – V. Krishna, Orient Longman, India.
2. Text Book of Pathology – BN Datta, Jaypee Brothers Medical Publishers, India.
3. Mini Atlas Pathology – Harsh Mohan, Jaypee Brothers Medical Publishers, India.
4. Robbins Basic Pathology – Vinay Kumar, Abul K Abbas, Jon C. Aster, Elsevier, United States
5. Essentials of Haematology- S. M. Kawathalkar, JP Medical Ltd, India.

Suggested Reference Books:

1. Atlas and Text of Haematology – Dr.Jitender Singh, Arya Publishing Company, India
2. Clinical Hematology Atlas – Bernadette F. Rodak, Jacqueline H. Carr, Elsevier, United States
3. Wintrobe's Clinical Hematology – John P. Greer, Daniel A. Arber, Wolters Kluwer, United States.

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	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Understand the fundamentals of pathology, normal cell, cellular injury, cell death mechanisms, inflammation, tissue repair and cellular adaptation processes.	PO1, PO2, PSO1	U, R	C	15
CO2	Discuss laboratory organization with safety procedures and describe Hematopoiesis, blood components, coagulation mechanisms and the effective use of anticoagulants in diagnostic applications.	PO1, PO2, PO3, PSO1, PSO2	U, R, Ap	C, P	8
CO3	Discuss and demonstrate blood grouping, donor selection, and transfusion practices with adverse reaction and management.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, R, An, Ap	C, P	7
	Total hour of Instruction				**30**

Mapping of COs with POs & PSOs

CO	PO										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3									3	
CO2	3	3	3								3	3
CO3	3	3	3			1					3	3

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Chemistry Semester III Skill Enhancement Coure

SEC262-2C INDUSTRIALCHEMISTRY-I

Course Outcomes:

- CO1: Describe the nomenclature (generic and trade names) and explain the sources, processing, and chemical transformation of organic raw materials like petroleum, natural gas, coal, cellulose, and starch.
- CO2: Illustrate the basic metallurgical and separation techniques such as distillation, solvent extraction, leaching, adsorption, and demonstrate their applications in the extraction of metals and scaling up in chemical industries.
- CO3: Analyse the structure, availability, and industrial relevance of inorganic materials such as alumina, silicates, clays, mica, carbon, and zeolites, and evaluate the need for clean technology in chemical manufacturing.

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
					Hrs.	Max Marks		
		Theory hrs Per Week	Practical hrs Per Week			CCE	SEE	
SEC262-2C	Industrial Chemistry-I	2	0	2	2	25	25	50

CONTENT

Unit: 1 - Industrial Aspects of Organic and Inorganic chemistry.

Teaching Hours: 15 (Weightage :50%)

- Nomenclature: Genericnames, Tradenames
- Raw materials for organic compounds: Petroleum, Natural gas, Fractionation of crude oil, cracking, reforming, hydro forming and Isomerisation.
- Coal: Types of coal, properties, calorific value, distillation of coal, chemicals derived from them.
- Renewable Natural resources: Cellulose, Starch: - properties, modification, important industrial chemicals derived from them. Alcohols, oxalic acid and Furfural.
- Basic Metallurgical operations: pulverization, calcinations, roasting, refining of metals.
- Physicochemical principles of Extraction of: Iron, Copper, Lead, Silver, Sodium, Aluminium and Zinc.
- Inorganic Materials of Industrial Importance: Availability, forms, structure and modifications of – alumina, silicates, clays, mica, carbon, zeolites.

Unit2:ChemicalTechnology **TeachingHours:15** **(Weightage:50%)**

- Basic principles of distillation, solvent extraction, solid-liquid leaching and liquid- liquid extraction, separation by absorption and adsorption.
- An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, emulgators.
- Scaling up operations in chemical industry. Introduction to clean technology

REFERENCESBOOKS

- B.K.Sharma, Industrial chemistry
- E.Stocchi: Industrial Chemistry,Vol-I,EllisHorwoodLtd.UK.
- R.M. Felder,R.W. Rousseau: Elementary Principles of Chemical Processes,Wiley Publishers, New Delhi.

SUGGESTED BOOKS:

- J.A.Kent:Riegel'sHandbookofIndustrialChemistry,CBSPublishers,NewDelhi.
- S.S.Dara:ATextbookofEngineeringChemistry,S.Chand&CompanyLtd.NewDelhi

CO	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Describe the nomenclature (generic and trade names) and explain the sources, processing and chemical transformation of organic raw materials like petroleum, natural gas, coal, cellulose, and starch.	PO1, PSO1	R, U	C	9
CO2	Illustrate the basic metallurgical and separation techniques such as distillation, solvent extraction, leaching, adsorption, and demonstrate their applications in the extraction of metals and scaling up in chemical industries.	PO1, PO2, PSO1, PSO2	U, Ap, An	C, P	6
CO3	Analyse the structure, availability, and industrial relevance of inorganic materials such as alumina, silicates, clays, mica, carbon, and zeolites, and evaluate the need for clean technology in chemical manufacturing.	PO1,PO2,PO9,PSO1, PSO2	Ap, E	C, P	15
	Total hours of Instruction				**30**

Mapping of COs with POs and PSOs

CO	PO										PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	3										3	
CO2	3	3									3	3
CO3	3	3							3		3	3

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Physics Semester III - Skill Enhancement Course

SEC263-2C Physics in Biology and Medicine - I

COURSEOUTCOMES (COs):

- **CO1:**Explain human body statics and equilibrium using biomechanical principles.
- **CO2:**Analyse effects of external forces and friction on the human skeleton.
- **CO3:**Apply physics concepts to human physical activities like jumping and motion.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
						MaxMarks		
		Theory PerWeek	Practical Per week		Hrs.	CCE	SEE	
SEC263-2C	Physics in Biology and Medicine-I	2	0	2	2	25	25	50

Unit-1: Static Forces and friction **Teaching Hours: 15 (Weightage 50%)**

Equilibrium and stability, equilibrium consideration for human body, Stability of the human body under the action of a next ernal force, Skeletal muscles, Levers, The Elbow, The Hip, The back, Standing Tip-toe on one foot, Dynamic aspects of Posture. Standing at a nincline, Friction at the hip joint.

Unit-2:Translationmotion **Teaching Hours: 15 (Weightage 50%)**

Vertical jump, Effect of gravity on the vertical jump, Running high jump, Range of a projectile, Standing broad jump, Running broad jump (long jump), Motion through air, Energy consumed in physical activity.

*CCE: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

*SEE: Semester End Evaluation

Reference Books

1) Physics in Biology and Medicine by PaulDavidovits, 5th edition, Academic Press.

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Explain human body statics and equilibrium using biomechanical principles.	PO1, PO2, PO6 PSO1	U, An	C	10
CO2	Analyse effects of external forces and friction on the human skeleton.	PO2, PO3 PSO2	An	C	10
CO3	Apply physics concepts to human physical activities like jumping and motion.	PO1, PO4, PO6 PSO2	Ap, E	C	10
				Total hour of Instruction	30

KADI SARVA VISHWAVIDYALAYA

Mapping of Cos with Pos & PSOs

COs	POs										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3				3					2	
CO2		3	2									3
CO3	3			2		3						3

3:High,2:Medium,1:Low

KADI SARVA VISHWAVIDYALAYA

Mathematics Semester III - Skill Enhancement Course

SEC264-2C Quantitative Aptitude-I

Course Outcomes:

- **CO1:** Solve problems involving simplification, roots, averages, numbers, and ages by applying appropriate arithmetic procedures and reasoning.
- **CO2:** Apply algebraic techniques involving surds, indices, ratios, and chain rules to solve real-life and mathematical problems, formulating correct expressions.
- **CO3:** Analyze and solve commercial and time-motion problems using percentage, profit & loss, time & work, and speed-distance relations.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
					Hrs.	Max Marks		
		Theory Per Week	Practical Per week			CCE	SEE	
SEC264-2C	Quantitative Aptitude-I	2	0	2	2	25	25	50

Unit 1 **Teaching Hours: 15**

Problem solving on simplification, Examples of square roots and cube roots, Problem solving on average, Problems on numbers, Problems on ages, Examples of surds and indices

Unit 2 **Teaching Hours: 15**

Problems on percentage, Examples of profit and loss, Problem solving on ratio and proportion, Examples on partnership, Problems on chain rule, Problem solving on time and work, Examples on pipes and cistern, Problems on time and distance

*CCE: Continuous and Comprehensive Evaluation: It consists of Assignments /Seminars/ Presentations /Quizzes/Surprise Tests.

*SEE: Semester End Evaluation

ReferenceBooks:

1. Quantitative Aptitude for Competitive Examinations, Dr. R. S. Aggarwal, S. Chand Publishing.
2. The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Dinesh Khattar, Pearson.
3. CSIR-NET General Aptitude - A New Outlook, Christy Varghese, Lilly Publishing.

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Solve problems involving simplification, roots, averages, numbers, and ages by applying appropriate arithmetic procedures and reasoning.	PO1, PO2, PO3, PSO1, PSO2	R, U, Ap	C, P	15
CO2	Apply algebraic techniques involving surds, indices, ratios, and chain rules to solve real-life and mathematical problems, formulating correct expressions.	PO1, PO2, PO3, PO4, PSO1, PSO2	U, Ap	C, P	7
CO3	Analyze and solve commercial and time-motion problems using percentage, profit & loss, time & work, and speed-distance relations.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, An, E	C, P	8
Total hours of instruction					30

Mapping of COs with POs & PSOs

CO	PO										PSO	
	1	2	3	4	5	6	7	8	9	10	1	2
CO1	3	3	3	0	0	0	0	0	0	0	3	3
CO2	3	3	3	1	0	0	0	0	0	0	3	3
CO3	3	3	3	0	0	2	0	0	0	0	3	3