KADI SARVA VISHWAVIDYALAYA

B.Sc. Curriculum as per NEP

for Semester 1

W.E.F. Academic Year : 2023-24

KADI SARVA VISHWAVIDYALAYA

B.Sc. PROGRAMME –Structure (Basic / Hons.) (NEP)

DURATION OF THE COURSE: 4 YEARS (8 SEMESTER)

B.Sc. Semester I 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 two of same subject)	MBM201-1C	Fundamentals of Microbiology	60	0	4*2 = 8	50	50	100
		MBM202-1C	Fundamentals of Microbiology Laboratory	0	120				
		CHM203-1C	Fundamentals of Chemistry-I	60	0				
		CHM204-1C	Chemistry Practicals-I	0	120				
		PHM205-1C	Basic Physics-I	60	0				
		PHM206-1C	Physics Practical-I	0	120				
		MTM207-1C	Elementary Calculus and Matrices	60	0				
		MTM208-1C	Application of Calculus and Matrices	0	120				
02	Minor (Select any One)	MBE201-1C	Basics of Microbiology	30	60	4	50	50	100
		CHE202-1C	Basics of Chemistry-I	30	60				
		PHE203-1C	Fundamentals of Physics-I	30	60				
		BTE204-1C	Basics Of Botany	30	60				
		MTE205-1C	Descriptive Statistics	30	60				
03	MDC (Select any One)	MDC211-1C	Introduction to Microbial World	30	60	4	50	50	100
		MDC212-1C	Fundamentals of Botany	30	60				
		MDC213-1C	Introduction to Chemistry-I	30	60				
		MDC214-1C	Fundamentals of Computational Physics-I	30	60				
		MDC215-1C	Introduction to 'C'	30	60				
04	AEC	AEC203-1C	Foundation course in English Language	30	0	2	25	25	50
05	IKS	IKS202-1C	Indian Astronomy-I	30	0	2	25	25	50

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Sr. no	Component	Course code	Course title	Duration In Hrs.		Credits	Maximum Marks		TOTAL
06	SEC (Select any One)	SEC211-1C	Basic Microbiological skills	30	0	2	25	25	50
		SEC212-1C	Chemistry Instrumentation and laboratory skills-I	30	0				
		SEC213-1C	Physics of Optical Instruments & Home Appliances	30	0				
		SEC214-1C	Vedic Mathematics	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 I Major Course

MBM201- 1C Fundamentals of Microbiology

COURSE OUTCOMES:

- CO1: Understand the core concept and scope of microbiology, classification of microorganisms and their distribution in nature.
- CO2: Describe general characteristics of major groups of microorganisms.
- CO3: Recall the history of microbiology and modern chemotherapy.
- CO4: Illustrate the different microscopy methods and staining techniques.
- CO5: Demonstrate the specimen preparation for light microscopy.
- CO6: Illustrate the morphology of the bacterial cell.

TEACHING AND EVALUATION SCHEME:

Course code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	Examination Scheme			Total Marks
			Theory	Hrs.	Max Marks		
					CCE	SEE	
MBM201-1C	Fundamentals of Microbiology	4	4	2.5	50	50	100

Unit 1: The Microbial World **Teaching Hours: 15 (Weightage 25%)**

- Introduction: Microbes in our lives
- Classification of Microorganisms:
  - Binomial system of nomenclature
  - Difference between prokaryotic and eukaryotic microorganisms
  - Whittaker's five kingdom concept of classification
  - Carl Woese's three kingdom classification system
  - Introduction to Bergey's Manual of Determinative and Systematic Bacteriology
- Major Groups of Microorganism (Introduction and General Characteristics)
  - Prokaryotic microbes: Eubacteria and Archaebacteria
  - Eukaryotic microbes: Fungi (Yeasts & Moulds), Protozoa, Algae
  - Acellular microbes: Viruses
- Distribution of Microorganisms in Nature
- An overview of Scope of Microbiology

Unit 2: The History of Microbiology **Teaching Hours: 15 (Weightage 25%)**

- The Discovery of Microorganisms
  - Microbiology and the origin of life
  - Contribution of A. V. Leeuwenhoek in the Discovery of Microscope
  - Spontaneous generation vs. Biogenesis
- The Golden Age of Microbiology
  - Germ theory of fermentation
  - Germ theory of disease
  - Pure culture technique and Koch's Postulates
  - Contribution of Joseph Lister in Antisepsis
  - Contribution of Edward Jenner & Louis Pasteur
- The Birth of Modern Chemotherapy: Contribution of Paul Ehrlich, Alexander Fleming and Selman A. Waksman

Unit-3 Microscopy **Teaching Hours: 15 (Weightage 25%)**

- Light Microscopy
  - Principle of bright-field microscopy: resolving power, numerical aperture, limit of resolution and magnification.
  - Component parts of the compound light microscope
  - Principle and applications of dark-field, fluorescence, and phase-contrast microscopy.
- Preparation of Specimens for Light Microscopy
  - The wet-mount and hanging-drop techniques
  - Microbiological stains: acidic, basic, and neutral dyes
  - Smear preparation, fixation, use of Mordants, Intensifiers, Decolorizers
  - Simple staining of the smear: positive [and negative staining), Differential Staining and Structural Staining
- Electron Microscopy: Principle and applications of Transmission & Scanning Electron Microscopy

Unit-4 Morphology of Bacteria **Teaching Hours: 15 (Weightage 25%)**

- Size, shape and arrangement of bacterial cells.
- Structures external to cell wall- Flagella, pili, capsule, sheath and prosthecae.
- Structures internal to cell wall- Cell membrane, nuclear material, cell wall (Protoplast and Spheroplast), spores, cytoplasmic inclusions, magnetosomes and plasmids.

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

***SEE:** Semester End Evaluation

Reference Books:

1. Microbiology - Pelczar, Chan and Kreig, 5th edition, McGraw-Hill Book Company, USA.
2. General Microbiology- Stainer RY. Ingharam JL. Wheelis ML. Painter PR, 5th edition, McMillan, Scotland.
3. Biology of Microorganisms - Brock and Madigan, 14th edition, Pearson International Edition, UK.
4. Prescott's Microbiology - Wiley JM, Sherwood LM and Woolverton CJ, 9th Edition, McGraw-Hill International, USA

5. Microbiology: An Introduction - Tortora GJ, Funke BR and Casc CL,9th edition, Pearson Education, UK.
6. Principles of Microbiology - Atlas RM, 2nd edition, Brown Publishers, USA.

Suggested Reference Books:

1. Elementary Microbiology - H. A. Modi, Ekta Prakashan, India.
2. Textbook of Microbiology - Dubey and Maheshwari, S. Chand Publishing, India.
3. Microbiology - S.S. Purohit, Agrobios, India.

	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Understand the core concept and scope of microbiology, classification of microorganisms and their distribution in nature.	PO1, PO2, PSO1	U, R	C	9
CO2	Describe general characteristics of major groups of microorganisms.	PO1, PO2, PSO1	U, R	C	6
CO3	Recall the history of microbiology and modern chemotherapy.	PO1, PO2, PSO1	U, R	C	15
CO4	Illustrate the different microscopy methods and staining techniques.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, An	C, P	10
CO5	Demonstrate the specimen preparation for light microscopy.	PO1, PO2, PO3, PSO1, PSO2	U, R, Ap	C, P	5
CO6	Illustrate the morphology of the bacterial cell.	PO1, PO2, PSO1, PSO2	U, R, Ap	C, P	15
	Total hours 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	2			1					3	3
CO5	3	3	2								3	3
CO6	3	3									3	3

3: High, 2: Medium, 1: Low

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Microbiology Semester I Major Course

MBM202- 1C Fundamentals of Microbiology Laboratory

COURSE OUTCOMES:

- CO1: Understand and apply basic knowledge of instruments in the microbiology laboratory.
- CO2: Develop skills in handling of basic tools, preparation of standard solutions, preparation and cleaning of glassware and sterilization.
- CO3: Formulate different media for the growth of microorganisms.
- CO4: Analyze microbial and algal morphology using microscopic techniques.
- CO5: Examine bacterial morphology by different staining techniques.
- CO6: Demonstrate and develop skills in study of microbial motility, size and cell counting.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	Examination Scheme			Total Marks
			Practical	Hrs.	Max Marks		
					CCE	SEE	
MBM202-1C	Fundamentals of Microbiology Laboratory	4	8	5	50	50	100

Unit-1: Basics of Instrumentations and Preparation for Microbiology laboratory

Teaching hours 60 (Weightage: 50%)

1. To study the principle and applications of important instruments used in microbiology laboratory
   - Biological Safety Cabinets
   - Autoclave,
   - Incubator
   - BOD Incubator
   - Hot Air Oven
   - Light Microscope
   - pH Meter
   - Colony counter
   - Rotary Shaker
   - Centrifuge
2. Applications of basic microbiological tools (Pipettes, Micropipette, Bunsen burner, Inoculation loop, Spreader)
3. Preparation of Standard Solutions (Moral Solution, Molal Solution, Normal Solution)
4. Preparation and Cleaning of Glass-wares in Microbiology Laboratory
5. Sterilization in Microbiology Laboratory- Sterilization of medium using Autoclave, Sterilization of glassware using Hot Air Oven

6. Preparation of different media: synthetic media BG-11, Complex media-nutrient agar, McConkey agar, EMB agar

Unit-2 Study of Microorganism **Teaching Hours 60 (Weightage: 50%)**

1. Study of different shapes of bacteria using permanent slides
2. Study of *Rhizopus, Penicillium, Aspergillus* using temporary mounts
3. Study of *Spirogyra , Nostoc* and *Anabena* using temporary Mounts
4. Motility by hanging drop method and stab agar method.
5. Use of counting chamber for yeast Cell Counting
6. Measurement of microbial size by Micrometry.
7. Staining techniques- Monochrome staining, Negative staining
8. Differential Staining – Gram Staining
9. Cell wall Staining,
10. Capsule Staining,
11. Spore Staining,
12. Granules Staining,
13. Spirochete staining
14. Flagella Staining

***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, 9thEdition, Aditya Publisher, India.
2. General Microbiology - Stanier. Ingraham, 4th & 5th Edition, Macmillan Education Ltd, United Kingdom.

Suggested Reference Books:

1. Microbiology: an introduction - Tortora G. J. Funke B. R. & Case C. L, Pearson Benjamin Cummings, United States.
2. Fundamental Principles of Bacteriology - A.J.Salle, McGraw-Hill Book Company Inc., United States.

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	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Understand and apply basic knowledge of instruments in the microbiology laboratory.	PO1, PO2, PSO1, PSO2	U, R, Ap	C, P	20
CO2	Develop skills in handling of basic tools, preparation of standard solutions, preparation and cleaning of glassware and sterilization.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, R, Ap, An	C, P	20
CO3	Formulate different media for the growth of microorganisms.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	U, R, Cr	C, P	20
CO4	Analyze microbial and algal morphology using microscopic techniques.	PO1, PO2, PO6, PSO1, PSO2	U, An, Ap	C, P	7
CO5	Examine bacterial morphology by different staining techniques.	PO1, PO2, PO6, PSO1, PSO2	U, Ap, An, E	C, P	45
CO6	Demonstrate and develop skills in study of microbial motility, size and cell counting.	PO1, PO2, PO4, PSO1, PSO2	U, R, Ap, Cr	C, P	8
	Total hours 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	3
CO2	3	3	2			3					3	3
CO3	3	3	2	1		3					3	3
CO4	3	3				3					3	3
CO5	3	3				3					3	3
CO6	3	3		1							3	3

3: High, 2: Medium, 1: Low

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Chemistry Semester I Major Course

CHM203-1C –FUNDAMENTALS OF CHEMISTRY - I

Course Outcomes:

- CO1: Explain the concepts of bonding theories (VBT, VSEPR, MOT), hybridization, molecular shapes, and periodic properties of s- and p-block elements along with their compounds.
- CO2: Explain intramolecular interactions, electronic effects and the types of reaction intermediates.
- CO3: Describe the mechanisms of substitution, addition, and elimination reactions, and explain the basic concept of aromaticity in organic chemistry.
- CO4: Understand basic concept of quantum mechanics including Heisenberg uncertainty principle, and atomic orbital shapes based on Schrödinger's equation.
- CO5: Classify analytical techniques and evaluate analytical data by applying statistical tools.
- CO6: Define fundamental thermodynamic concepts and laws, and apply them to calculate work, heat, entropy, and free energy changes in physical and chemical processes.

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	Max Marks		
						CCE	SEE	
CHM203-1C	Fundamentals of Chemistry-I	4	0	4	2.5	50	50	100

Contents

Unit1: Chemical Bonding **Teaching Hours: 15 (Weightage 25%)**

- Valence bond theory, its application and limitation of VBT • Directional characteristics of covalent bond • Types of hybridization and shape of simple inorganic molecules ($BeCl_2$,BCl_3,CH_4,PCl_5,SF_6)•V.S.E.P.R.theory for NH_3,H_2O, BF_4• M.O. Theory-Energy level diagram for homo nucleus diatomic molecules ($N_2$and O_2) and hetero diatomic molecule (CO, HF, HCl and NO), Bond strength, Bond energy, Fajan's rule, polarization power, Dipole moment, Electronegativity.

- sandp-blockelements-Periodicity, properties, diagonalrelationship, salientfeatures of hydrides, oxides, hydroxides, carbonates, sulphates

Unit2: Structure Properties and Reaction Mechanism **Teaching Hours: 15 (Weightage 25%)**

- Intramolecular forces (Hydrogen bonding, dipole-dipole interaction, Van der Waals forces) • Electromeric effect • Inductive effect • Resonance effect (draw resonating structures of Nitro benzene, Chlorobenzene, Phenoxide ion, Anilinium ion, Acetate ion)•Hyperconjugation(o,p-directinggroupandtheireffect,StabilityofCarbonium ion, Carbanionsand Free radicals)
- Types of reaction intermediates, Fission of Co-Valantbond (With at least one example of each intermediates) • Types of reagents. • Types of organic reaction with mechanism. • Substitution reactions (Nucleophilic & Electrophilic) • Addition reactions (Nucleophilic & Electrophilic) • Elimination reactions (E1&E2), Basicsof Aromaticity

Unit3: Physical and Analytical Chemistry **Teaching Hours: 15 (Weightage 25%)**

- Atomic structure- Dual nature of electron, De Broglie equation, Davissonand Germer experiment, Heisenberg uncertainty principle, Schrodinger wave equation (only definition, no derivation), significance of ψ and ψ^2, probability distribution curve, shapes of s, p and orbitals, Zëeman and Stark effects
- Introduction to Analytical Chemistry • Classification of Classical and Electro Analytical Techniques. • Literature of Analytical Chemistry (Names of Author and Publishers for Any Ten Books, Journals and Reviews) • Criterion for Selection of analytical Techniques.• Analytical Data Treatment Error, Types of errors, Accuracy and Precision. Statistical Terms: Mode, Average, Median, Deviation, Average Deviation, Relative Average Deviation, Standard Deviation & Coefficient of variance. Q-Test for the rejection of result and related numerical, Grubb's Test

Unit4: Thermodynamics **Teaching Hours: 15 (Weightage 25%)**

- Thermodynamics (only introduction) • System and surrounding- work & heat, state function, thermodynamic process, internal energy, enthalpy, free energy, maximum work function. • First law of thermodynamics • Heat capacity, specific and molar heat capacity, heat capacity at constant volume and pressure and their relationship • Work done in adiabatic and isothermal reversible expansion of an ideal gas. • Second law of thermodynamics • Carnot cycle and its efficiency • Concept of entropy; entropy change for an ideal gas under different conditions, entropy change for mixture of ideal gases • Gibbs-Helmholtz equation, Want Hoff Isochore and Isotherm, Numerical.

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

***SEE:** Semester End Evaluation

Reference books:

1. 'Concise Inorganic Chemistry'J. D. Lee,5thEdn.

2. Text book of Organic Chemistry, Arun Bahal, S. Chand.

3. Principal of Physical Chemistry by Puri,Sharma, Pathania.

4. Analytical Chemistry, GarryD. Christain.

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CO	Course Outcome	POs/ PSOs	Cognitive level	Knowledge Category	Class Session
CO1	Explain the concepts of bonding theories (VBT, VSEPR, MOT), hybridisation, molecular shapes, and periodic properties of s- and p-block elements along with their compounds.	PO1, PO2, PSO1	U	C	15
CO2	Explain various intra molecular interactions, electronic effects, reaction intermediates, and the types and mechanisms of organic reactions.	PO1, PSO1	U	C	9
CO3	Describe the mechanisms of substitution, addition, and elimination reactions, and explain the basic concept of aromaticity in organic chemistry.	PO1, PO2, PO3, PSO1	U	C	6
CO4	Understand basic concept of quantum mechanics including Heisenberg uncertainty principle, and atomic orbital shapes based on Schrödinger's equation.	PO1, PO2, PO3, PSO1	U	C	7
CO5	Classify analytical techniques and evaluate analytical data by applying statistical tools.	PO1, PO2, PO6, PSO1, PSO2	Ap	C,P	8
CO6	Define fundamental thermo-dynamic concepts and laws, and apply them to calculate work, heat, entropy, and free energy changes in physical and chemical processes.	PO1, PO3, PO6, 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	33	3									3	
CO2	3										3	
CO3	3	3	3								3	
CO4	3	3	3								3	
CO5	3	3				2					3	2
CO6	3		3			2					3	2

3: High, 2: Medium, 1: Low

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Chemistry Semester I Major Course
CHM204-1C-CHEMISTRY PRACTICALS - I

Course Outcomes:

- **CO1:** Recall and identify various laboratory glassware, their uses, and procedures for calibration of burette, pipette, and measuring flask.
- **CO2:** Explain the principles and chemical reactions involved in volumetric titrations, melting point and boiling point determinations, and semi-micro analysis of inorganic salts.
- **CO3:** Perform volumetric titrations to determine the concentration and percentage composition of different mixtures such as NaOH & Na_2CO_3, $NaHCO_3$& Na_2CO_3, and others, with precision and accuracy.
- **CO4:** Analyze titration data to calculate normality, molarity, gram/liter concentrations, and water of crystallization in salts; interpret melting and boiling point data of organic compounds.
  CO5: Identify cations and anions present in inorganic salt mixtures through semi-micro qualitative analysis.
- **CO6:**Perform experiments involving volumetric and qualitative analysis of mixtures, calibrations, and physical property determinations to solve complex analytical problems.

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			
					Max Marks		
		Practical hrs - Per Week		Hrs.	CCE	SEE	Total Marks
CHM204-1C	Chemistry Practicals-I	8	4	5	50	50	100

CONTENT:

Unit1: Chemistry Practicals **Teaching Hours: 60 (Weightage 50%)**

1. **Introductory Knowledge of Laboratory Glassware**
2. **Volumetric titration (MINIMUM8)**

- To determine the strength of NaOH and Na2CO3present in the solution mixture of NaOH & Na2CO3and to find out their percentage composition.
- To determine the strength of NaHCO3and Na2CO3present in the solution mixture of NaHCO3 & Na2CO3and to find out their percentage composition.
- To determine the Normality, gram/liter and molarities ofH2C2O4, 2H2Oand H2SO4 presenting the solution mixture of H2C2O4,2H2O&H2SO4 by using XNNaOHand Y N KMnO4solutions.
- To determine the Normality, gram/liter and molarity of H2C2O4, 2H2O and K2C2O4present in the solution mixture of H2C2O4, 2H2O & K2C2O4by using NaOH and KMnO4solutions.
- TodeterminetheamountofCa^{+2} andMg^{+2}ionbyEDTAsolutionfromthemixture solution of CaCl2and MgCl2.
- Toestimate the strengthof given Mohr's salt by titrating it against KMnO4
- ToestimatethestrengthofCuSO4solutioniodometricallybytitratingitagainst Na2S2O3 solution.
- EstimationofFe2+bytitratingitwithK2Cr2O7using Diphenylamine as an internal indicator.
- Estimationofnumberofwaterofcrystallizationin Mohr'ssaltbytitratingwith KMnO4

3. **Melting point and Boiling point** (Any two organic compounds)
4. **Calibration of burette,Pipette and measuring flask**

Unit2: Inorganic Salts **Teaching Hours: 60 (Weightage 50%)**

Semi micro-Analysis: -**(Minimum TEN)**

- Cation analysis; separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B.

Anion analysis like Cl^-, Br^-, I^-, NO_3^-, NO_2^-, SO_4^{2-}, SO_3^{2-}, S^{2-}, CO_3^{2-}, CrO_4^{2-}(Water Soluble and insoluble).

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

*SEE: Semester End Evaluation

Reference books:

- Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by GH Jeffery and others) 5th Ed. The English Language Book Society of Longman
- Willard,HobertH.et.al:InstrumentalMethodsofAnalysis,7thEd.Wardsworth Publishing Company, Belmont, California, USA, 1988.
- Christian, Gary D; Analytical Chemistry,6th Ed.NewYork-JohnWilly,2004.
- Harris, Daniel C,Quantitative Chemical Analysis, 3rd Edition,W.H.Freemanand Company, New York, 2001.

Suggested Books:

- Khopkar, S. M. Basic Concepts of Analytical Chemistry New Age, International Publisher, 2009.
- Koogs, Westand Holler, Fundamentals of Analytical Chemistry, 6thEdition, Sauders College Publishing, New York. 1991.

CO	Course Outcomes	POs/PSOs	Cognitive level	Knowledge Category	Class Session
CO1	Recall and identify various laboratory glassware, their uses, and procedures for calibration of burette, pipette, and measuring flask.	PO1, PSO1, PSO2	R, U	C	10
CO2	Explain the principles and chemical reactions involved in volumetric titrations, melting point and boiling point determinations, and semi-micro analysis of inorganic salts.	PO1, PO2, PSO2	R, U	C, P	20
CO3	Perform volumetric titrations to determine the concentration and percentage composition of different mixtures such as NaOH & Na_2CO_3, $NaHCO_3$& Na_2CO_3, and others, with precision and accuracy.	PO1, PO2, PSO2	U, Ap	P	30
CO4	Analyze titration data to calculate normality, molarity, gram/liter concentrations, and water of crystallization in salts; interpret melting and boiling point data of organic compounds.	PO1, PO2, PO3, PSO1, PSO2	An, E	P	20
CO5	Identify cations and anions present in inorganic salt mixtures through semi-micro qualitative analysis	PO1, PO2, PO3, PSO1, PSO2	An, E	P	20
CO6	Perform experiments involving volumetric and qualitative analysis of mixtures, calibrations, and physical property determinations to solve complex analytical problems.	PO1, PO6, PSO2	An, E	P	20
	Total hour of Instruction				120

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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
CO4	3	3	2								3	3
CO5	3	3	2								3	3
CO6	3					1						3

3: High, 2: Medium, 1: Low

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Physics Semester I - Major Course

PHM205-1C Basic Physics-I

COURSE OUTCOMES:

- CO1: Explain the principles of LASER operation, including spontaneous and stimulated emission, population inversion, and laser components.
- CO2: Apply the concepts of acoustics to evaluate the design requirements of auditoriums and analyze reverberation using Sabine's formula.
- CO3: Demonstrate the generation and detection techniques of ultrasonic waves and interpret their applications in industrial and underwater systems like SONAR.
- CO4: Analyze the performance parameters of rectifier circuits (Half-wave, Full-wave, Bridge) and various filters based on output characteristics and efficiency.
- CO5: Compare the electrical and physical properties of conductors, semiconductors, insulators, and superconductors, including high-Tc superconductors.
- CO6: Evaluate the technological applications of superconductors such as Maglev trains and SQUIDs, assessing their feasibility and benefits in real-world contexts.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					CCE	SEE	
PHM205-1C	Basic Physics-I (Major)	4	4	2.5	50	50	100

Unit 1: Fundamentals of LASER — **Teaching Hours: 15 (Weightage 25%)**

Introduction and characteristics of Laser, attenuation of Light in Optical Medium, Thermal equilibrium, Interaction of light with matter- Absorption, Spontaneous Emission, Stimulated Emission, Light Amplification- two Conditions for Stimulated Emission, Population inversion, Metastable states, Components of Laser: Active medium, Pumping-Three level and four level, Optical Resonant Cavity, Types of Lasers- Ruby Laser, Nd-YAG Laser, He-Ne Laser, PN junction Laser, Applications, related Problems

Unit 2: Acoustic & Ultrasonic — **Teaching Hours: 15 (Weightage 25%)**

Classification of Sound, Characteristics of Musical Sound, Acoustics of buildings, loudness and intensity of sound, reverberation time and Sabine's Formula, measurement of absorption coefficient, Sound Absorbing Materials, Principles to be observed in the Acoustical Design of an Auditorium, related Problems

Introduction, Classification of Ultrasonic Waves, Properties of Ultrasonic Waves, Generation of Ultrasonic Waves: Piezoelectric oscillator & Magnetostriction oscillator, determination of wavelength-velocity of ultrasound in liquid, Applications of Ultrasonic, SONAR & determination of depth of Sea, related Problems

Unit-3 Rectifier and Filter Circuits — **Teaching Hours: 15 (Weightage 25%)**

The Half Wave Rectifier - Output Voltage, Output Current, RMS values, Efficiency, Ripple factor, Regulation, The Full Wave Rectifier - Output Voltage, Output Current, RMS values, Efficiency, Ripple factor, Regulation, The Bridge Rectifier. The Inductor filter, The Capacitor filter, The Choke input filter, C-L-C Filter, related Problems

Unit-4 Superconductivity

Teaching Hours: 15 (Weightage 25%)

Introduction: Metals, Insulators, Semiconductors& Superconductivity, Superconductivity, General Properties of Superconducting Materials, Types of superconductors (Type-I and Type-II),High Tc superconductors, Applications of Superconductors: Maglev, SQUID, and other applications, related Problems

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

*SEE: Semester End Evaluation

Reference Books

1) A textbook of Optics – N Subrahmanyam, Brij Lal& M.N. Avadhanulu, S.Chand, New Delhi
2) Basics of LASER Physics – by Karl F. Renk, Springer Publication
3) Engineering Physics – V. Rajendran, Tata McGraw-Hill Publishing Company Ltd, New Delhi
4) Engineering Physics, G. Vijayakumari, Vikas Publication House Pvt. Ltd., New Delhi.
5) Modern Engineering Physics; A.S. Vasudeva, S. Chand, New Delhi
6) Basic Electronics by B. L. Theraja, S.Chand, New Delhi
7) Principals of Electronics – by V K Mehta & Rohit Mehta, S. Chand, New Delhi

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Explain the principles of LASER operation, including spontaneous and stimulated emission, population inversion, and laser components.	PO1, PO2, PO7, PSO1	U	C	11
CO2	Apply the concepts of acoustics to evaluate the design requirements of auditoriums and analyze reverberation using Sabine's formula.	PO1, PO2, PO3, PO5, PO6, PO9, PSO1, PSO2	Ap	P	9
CO3	Demonstrate the generation and detection techniques of ultrasonic waves and interpret their applications in industrial and underwater systems like SONAR.	PO1, PO2, PO3, PO6, PO7, PO9, PO10, PSO1, PSO2	Ap	P	12
CO4	Analyze the performance parameters of rectifier circuits (Half-wave, Full-wave, Bridge) and various filters based on output characteristics and efficiency.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	An	P	8
CO5	Compare the electrical and physical properties of conductors, semiconductors, insulators, and superconductors, including high-Tc superconductors.	PO1, PO2, PO4, PO6, PSO1, PSO2	An	C	11
CO6	Evaluate the technological applications of superconductors such as Maglev trains and SQUIDs, assessing their feasibility and benefits in real-world contexts.	PO1, PO2, PO3, PO5, PO7, PO10, PSO1, PSO2	E	C/P	9
				Total hour of Instruction	**60**

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	
CO2	3	3	3		2	3			2		3	3
CO3	3	3	3			3	3		2	2	3	3
CO4	3	3	3	2		3	3				3	3
CO5	3	3		2		3					3	3
CO6	3	3	3		2		3			2	3	3

3:High,2:Medium,1:Low

KADI SARVA VISHWAVIDYALAYA

Physics Semester I - Major Course

PHM206-1C Physics Practical - I

COURSE OUTCOMES:

- CO1: Operate precision instruments like vernier caliper, screw gauge, and travelling microscope to measure linear dimensions with accuracy and record observational data.
- CO2: Calibrate and use optical instruments such as spectrometer and diffraction grating to determine wavelengths and angular deviations accurately.
- CO3: Analyze the rectification performance of PN junction diodes in different filter configurations by measuring output and calculating voltage regulation.
- CO4: Determine resistance using colour coding and measure various electrical quantities using digital Multimeter with consideration of error analysis.
- CO5: Construct and interpret graphs for experimental data (e.g., straight line, resonance curve), including slope and intercept evaluation, to understand physical relationships.
- CO6: Calculate absolute and relative errors and evaluate the reliability of experimental results through statistical and comparative methods.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Practical Per Week		Hrs.	Max Marks		
					CCE	SEE	
PHM206-1C	Physics Practical - I	8	4	5	50	50	100

Unit-I (Weightage :50%)

1) Measurements of length / diameter for different geometrical shapes using Vernier caliper.
2) Measurements of length /diameter / thickness using screw gauge.
3) Measurement of distance between two lines /slits using travelling microscope.
4) Calibration of Spectrometer for Parallel rays using Schuster's Method.
5) Measurement of angle of minimum deviation for a given Prism using Spectrometer.
6) Estimation of the value of resistance using color code
7) Graph Plotting: Experimental, Straight Line with intercept, Resonance Curve etc.

Unit-II (Weightage :50%)

1) Measurement of various electrical quantities using Digital Multimeter
2) Absolute and relative errors calculation
3) Study of Transformer.
4) P-N Junction diode as Half Wave Rectifier (i) Without filter (ii) With Series inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of regulation.
5) P-N Junction diode as Full Wave Rectifier (i) Without filter (ii) With Series inductor Filter (iii)With Shunt Capacitor Filter. Calculation of percentage of regulation.
6) To determine the wavelength of a given laser source using diffraction grating.
7) To determine wavelength of bright lines of mercury light using diffraction grating.

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*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	Operate precision instruments like vernier caliper, screw gauge, and travelling microscope to measure linear dimensions with accuracy and record observational data.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	Ap	P	20
CO2	Calibrate and use optical instruments such as spectrometer and diffraction grating to determine wavelengths and angular deviations accurately.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	Ap	P	20
CO3	Analyze the rectification performance of PN junction diodes in different filter configurations by measuring output and calculating voltage regulation.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	An	P	20
CO4	Determine resistance using colour coding and measure various electrical quantities using digital Multimeter with consideration of error analysis.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	Ap	P	20
CO5	Construct and interpret graphs for experimental data (e.g., straight line, resonance curve), including slope and intercept evaluation, to understand physical relationships.	PO1, PO2, PO3, PO4, PO5, PO6, PSO1, PSO2	An	C/P	20
CO6	Calculate absolute and relative errors and evaluate the reliability of experimental results through statistical and comparative methods.	PO1, PO2, PO3, PO5, PO6, PO7, PSO1, PSO2	E	P	20
				Total hour of Instruction	**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	3				3	3
CO2	3	3	3			3	3				3	3
CO3	3	3	3	2		3	3				3	3
CO4	3	3	3			3	3				3	3
CO5	3	3	3	2	2	3					3	3
CO6	3	3	3		2	3	3				3	3

3:High,2:Medium,1:Low

KADI SARVA VISHWAVIDYALAYA

Mathematics Semester I Major Course

MTM207-1C Elementary Calculus and Matrices

Course Outcomes:

- **CO1:** Define types of matrices and perform basic operations including symmetric, skew-symmetric, Hermitian, and Skew-Hermitian matrices.
- **CO2:** Determine the rank and inverse of matrices using row-reduced echelon form and test for linear dependence and independence of rows and columns.
- **CO3:** Solve homogeneous and non-homogeneous systems of linear equations and calculate eigenvalues and eigenvectors.
- **CO4:** Analyze the properties of eigen values, including algebraic and geometric multiplicities, and apply the Cayley-Hamilton theorem to verify matrix equations.
- **CO5:** Apply successive differentiation, Leibnitz's theorem, and Taylor and Maclaurin series to expand algebraic and trigonometric functions.
- **CO6:** Compute partial derivatives, Jacobians, and apply Euler's theorem to multi-variable functions; determine maxima, minima, and points of inflection with accurate steps in theoretical and practical scenarios.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks CCE	Max Marks SEE	
MTM207-1C	Elementary Calculus and Matrices	4	4	2.5	50	50	100

Unit 1 Matrices — **Teaching Hours:15**

Introduction of matrices, Different types of matrices, Operations on matrices, Symmetric and skew-symmetric matrices, Hermitian and Skew-Hermitian matrices, Linear dependence and independence of row and column matrices, Row rank, Column rank and rank of matrix, Row reduced Echelon form of a matrix and matrix Inversion using it.

Unit 2 Eigen values and Eigen vectors — **Teaching Hours:15**

System of homogeneous linear equations, System of non-homogeneous linear equations, Eigen values and Eigenvectors, Nature of Eigen values of special types of matrices, Algebraic and Geometric multiplicity of Eigen values, Cayley Hamilton theorem.

Unit 3 Successive Differentiation **Teaching Hours: 15**
Revision of Differentiation, Successive derivatives, Some standard results for nth derivatives, Leibnitz's theorem and its examples, Cauchy's Mean Value Theorem, Taylor's Theorem, McLaurin's series and its examples, Expansion of power series of $\sin x$, $\cos x$, e^x.
Unit4 Partial Differentiation **Teaching Hours: 15**
Limit, Continuity, Types of discontinuity, Partial derivatives, Partial derivatives of higher order, Homogenous function, Euler's theorem on homogenous function, Jacobian, Point of Inflection, Maxima and Minima.

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

***SEE:** Semester End Evaluation

Reference Books:

1. Differential Calculus, Shanti Narayan, S. Chand Publishing.
2. Linear Algebra and Vector Calculus, Ravish R. Singh, Mukul Bhatt, Mc Graw Hill Education (India) Private Limited.
3. Calculus, Dr. R. C. Shah, Books India Publication.
4. Mathematical Analysis, S. C. Malik and Savita Arrora, New Age International (P) Limited.
5. A Textbook of Matrices, Shanti Narayan, S. Chand.

KADI SARVA VISHWAVIDYALAYA

CO	Course Outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Define types of matrices and perform basic operations including symmetric, skew-symmetric, Hermitian, and Skew-Hermitian matrices.	PO1, PO2, PO3, PSO1,PSO2	R, U, E	C, P	6
CO2	Determine the rank and inverse of matrices using row-reduced echelon form and test for linear dependence and independence of rows and columns.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, E	C, P	9
CO3	Solve homogeneous and non-homogeneous systems of linear equations and calculate eigenvalues and eigenvectors.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, E	C, P	9
CO4	Analyze the properties of eigenvalues, including algebraic and geometric multiplicities, and apply the Cayley-Hamilton theorem to verify matrix equations.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	An, Ap, E	C, P	6
CO5	Apply successive differentiation, Leibnitz's theorem, and Taylor and Maclaurin series to expand algebraic and trigonometric functions.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, E	C, P	15
CO6	Compute partial derivatives, Jacobians, and apply Euler's theorem to multivariable functions; determine maxima, minima, and points of inflection with accurate steps in theoretical and practical scenarios.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	Ap, E, C	C, P	15
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	0	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	2	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	2	0	3	0	0	0	0	3	3

3:High, 2:Medium, 1:Low

KADI SARVA VISHWAVIDYALAYA

Mathematics Semester I Major Course

MTM208-1C Application of Calculus and Matrices

Course Outcomes:

- **CO1:** Explore the properties of Hermitian, Skew-Hermitian matrices, and assess linear dependence and independence of matrix rows and columns with correct classification and verification.
- **CO2:** Compute the rank of matrices using standard methods and row-reduced echelon form, and determine matrix inverse where applicable.
- **CO3:** Solve systems of homogeneous and non-homogeneous linear equations and analyze solutions with clear interpretation.
- **CO4:**Find eigen values and eigenvectors of matrices, analyze their nature, and verify Cayley-Hamilton theorem to compute matrix inverse.
- **CO5:** Find n^{th} derivatives of functions using successive differentiation and apply Leibnitz's theorem to both standard and parametric forms.
- **CO6:** Evaluate partial derivatives of various orders, determine maxima, minima, and points of inflection, and perform coordinate transformations.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Practical Per Week		Hrs.	Max Marks CCE	Max Marks SEE	
MTM208-1C	Application of Calculus and Matrices	8	4	5	50	50	100

Unit-1: Application of Matrices **Teaching Hours:60**

1. Explore properties of a Hermitian and Skew-Hermitian Matrices and provide examples illustrating the concepts.
2. Explore the Linear dependence and independence of row and column of matrices and provide examples illustrating the concepts.
3. Find rank of a Matrix by means of examples.
4. By means of Row Reduction Echelon Form find the rank and inverse of matrices and other related examples.
5. Find solution of system of homogeneous linear equations.
6. Find solution of system of Non-Homogeneous linear equations.
7. To find Eigen values and Eigen vectors of a given matrix and nature of Eigen values.
8. Verify Caley Hamilton theorem and find inverse of matrices through this.

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

1. Finding the n^{th} derivative of various functions. Solve examples to illustrate the application of successive differentiation in finding higher-order derivatives.
2. Apply Leibnitz's theorem for successive differentiation.
3. Apply Leibnitz's theorem for successive differentiation for parametric equations.
4. Examples based on partial derivatives at given point.
5. Examples based on partial derivatives for higher order.
6. To find maxima and minima of given function.
7. To find point of inflection of given function.
8. Cartesian, Polar, Spherical and Cylindrical coordinate system and their transformation

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

*SEE: Semester End Evaluation

Reference Books:

1. Differential Calculus, Shanti Narayan, S.Chand Publishing.
2. Linear Algebra and Vector Calculus, Ravish R. Singh, Mukul Bhatt, Mc Graw Hill Education (India) Private Limited.
3. Calculus, Dr. R. C. Shah, Books India Publication.
4. Mathematical Analysis, S C Malik and Savita Arrora, New Age International (P) Limited.
5. A Textbook of Matrices, Shanti Narayan,S Chand.

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CO	Course Outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Explore the properties of Hermitian, Skew-Hermitian matrices, and assess linear dependence and independence of matrix rows and columns with correct classification and verification.	PO1, PO2, PO3, PO6, PSO1, PSO2	R, U, Ap, E	C, P	20
CO2	Compute the rank of matrices using standard methods and row-reduced echelon form, and determine matrix inverse where applicable.	PO1, PO2, PO3, PO6, PSO1	U, Ap, E	C, P	20
CO3	Solve systems of homogeneous and non-homogeneous linear equations and analyze solutions with clear interpretation.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, An, E	C, P	20
CO4	Find eigenvalues and eigenvectors of matrices, analyze their nature, and verify Cayley-Hamilton theorem to compute matrix inverse.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	Ap, An, E	C, P	20
CO5	Find n^{th} derivatives of functions using successive differentiation and apply Leibnitz's theorem to both standard and parametric forms.	PO1, PO2, PO3, PO6, PSO1	R, U, Ap	C, P	20
CO6	Evaluate partial derivatives of various orders, determine maxima, minima, and points of inflection, and perform coordinate transformations.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, E	C, P	20
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	3	0	0	0	0	3	3
CO2	3	3	3	0	0	3	0	0	0	0	3	0
CO3	3	3	3	0	0	3	0	0	0	0	3	3
CO4	3	3	3	1	0	3	0	0	0	0	3	3
CO5	3	3	3	0	0	3	0	0	0	0	3	0
CO6	3	3	3	0	0	3	0	0	0	0	3	3

3:High, 2:Medium, 1:Low

KADI SARVA VISHWAVIDYALAYA

Microbiology Semester 1 Minor Course

MBE201-1C - Basics of Microbiology

COURSE OUTCOMES:

- CO1: Understand the core concept and scope of microbiology, distribution of microorganisms in nature.
- CO2: Describe general characteristics of major groups of microorganisms.
- CO3: Illustrate the morphology of the bacterial cell.
- CO4: Understand and apply basic knowledge of instruments in the microbiology laboratory.
- CO5: Develop skills in preparation of standard solutions, preparation and cleaning of glassware and sterilization.
- CO6: Analyze bacterial shapes through permanent slides and Examine bacterial morphology by different staining techniques.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	
			Theory	Practical
MBE201-1C	Basics of Microbiology	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: The Microbial World **Teaching Hours: 15 (Weightage 25%)**

- Introduction: Microbes in our lives
- Major Groups of Microorganism (Introduction and General Characteristics)
  - Prokaryotic microbes: Eubacteria and Archaebacteria
  - Eukaryotic microbes: Fungi (Yeasts & Moulds), Protozoa, Algae
  - Acellular microbes: Viruses
- Distribution of Microorganisms in Nature
- An overview of Scope of Microbiology

Unit-2 : Morphology of Bacteria **Teaching Hours: 15(Weightage 25%)**

- **Morphology of Bacteria**
  - Size, shape and arrangement of bacterial cells.
  - Structures external to cell wall -Flagella, pili, capsule, sheath and prosthecae.
  - Structures internal to cell wall-Cell membrane, nuclearmaterial, cell wall (Protoplast and Spheroplast), spores, cytoplasmic inclusions, magnetosomes and plasmids.
- **Microscopy:** Bright field, Dark field, Phase contrast, Fluorescent and Electron microscopy.

Practical's: **Teaching Hours: 60(Weightage 50%)**

1. To study the principle and applications of important instruments used in microbiology laboratory
   - Biological Safety Cabinets
   - Autoclave,
   - Incubator
   - BOD Incubator
   - Hot Air Oven
   - Light Microscope
   - pH Meter
   - Colony counter
   - Rotary Shaker
   - Centrifuge
2. Preparation of Standard Solutions (Molar Solution, Molal Solution, Normal Solution)
3. Preparation and Cleaning of Glass-wares in Microbiology Laboratory
4. Sterilization in Microbiology Laboratory
5. Study of different shapes of bacteria using permanent slides
6. Staining techniques-Monochrome staining, Negative staining
7. Differential Staining– Gram Staining

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***SEE:** Semester End Evaluation

Reference Books

1. Microbiology- Pelczar MJ, Chan ECS and Krieg NR.,5th edition. McGraw Hill Book Company, USA.
2. Experimental Microbiology- Patel R.J. and Patel R.K., Volume I and II, 9thEdition, Aditya Publisher, India.

Suggested Reference Books

1. General Microbiology- Stanier RY, Ingraham JL, Wheelis ML, and Painter PR., 5th edition. McMillan.
2. Brock Biology of Microorganisms- Michael Madigan, John Martinko, David Stahl, David P Clark. 14th edition. Pearson International Edition, UK.

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	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Understand the core concept and scope of microbiology, distribution of microorganisms in nature.	PO1, PO2, PSO1	U, R	C	6
CO2	Describe general characteristics of major groups of microorganisms.	PO1, PO2, PSO1	U, R	C	9
CO3	Illustrate the morphology of the bacterial cell.	PO1, PO2, PSO1, PSO2	U, R, Ap	C,P	15
CO4	Understand and apply basic knowledge of instruments in the microbiology laboratory.	PO1, PO2, PSO1, PSO2	U, R, Ap	C, P	20
CO5	Develop skills in preparation of standard solutions, preparation and cleaning of glassware and sterilization.	PO1, PO2, PO3, PO4 PO6, PSO1, PSO2	U, R, Ap, Cr	C, P	15
CO6	Analyze bacterial shapes through permanent slides and Examine bacterial morphology by different staining techniques.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, An, E	C, P	25
	Total hours 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	3	3									3	
CO2	3	3									3	
CO3	3	3									3	3
CO4	3	3									3	3
CO5	3	3	3	1		3					3	3
CO6	3	3	3			3					3	3

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Chemistry Semester I Minor Course

CHE202-1C –BASICS OF CHEMISTRY - I

Course Outcomes:

- CO1: Explain the concepts of bonding theories (VBT, VSEPR, MOT), hybridization, molecular shapes, and periodic properties of s- and p-block elements along with their compounds.
- CO2: Explain intramolecular interactions, electronic effects and the types of reaction intermediates.
- CO3: Describe the mechanisms of substitution, addition, and elimination reactions, and explain the basic concept of aromaticity in organic chemistry.
- CO4: Identify and describe the use, handling, and maintenance of common laboratory glassware and equipment used in chemical analysis.
- CO5: Perform volumetric titrations of single and mixed solutions to determine the concentration and composition of chemical species.
- CO6: Determine the melting and boiling points of organic compounds and calibration of laboratory glassware.

Course Code	Course Title	Teaching Scheme		Credits
		Theory hrs Per Week	Practical hrs Per Week	
CHE202-1C	Basics of Chemistry-I	2	4	4

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

Contents:

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

- Valence bond theory, its application and limitation of VBT • Directional characteristics of covalent bond • Types of hybridization and shape of simple inorganic molecules (BeCl2, BCl3, CH4, PCl5, SF6)• V.S.E.P.R. theory for NH3, H2O, BF4• M.O. Theory-Energy level diagram for homonucleus diatomic molecules (N2 and O2)and hetero diatomic molecule (CO, HF, HCl and NO), Bond strength, Bond energy, Fajan's rule, polarization power, Dipole moment, Electronegativity.
- s and p-block elements- Periodicity.properties, diagonal relationship, salient features of hydrides, oxides, hydroxides, carbonates, sulphates

Unit 2: Structure Properties and Reaction Mechanism **Teaching Hours: 15 (Weightage 25%)**

- Intramolecularforces(Hydrogenbonding,dipole-dipoleinteraction,VanderWaals forces) • Electromeric effect • Inductive effect • Resonance effect (draw resonating structures of Nitro benzene, Chlorobenzene, Phenoxide ion. Aniliniumion, Acetate ion) • Hyperconjugation (o,p-directing group and their effect, Stability of Carboniumion, Carbanions and Free radicals)
- Types of reaction intermediates, Fission of Co-Valant bond (With at least one example of each intermediates)• Types of reagents. • Types of organic reaction with mechanism. • Substitution reactions (Nucleophilic & Electrophilic) • Addition reactions (Nucleophilic & Electrophilic) • Elimination reactions (E1 & E2). Basics of Aromaticity

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Unit 3 : Chemistry Practical's **Teaching Hours: 60 (Weightage 50%)**

1. Introductory Knowledge of Laboratory Glassware
2. Volumetric titration **(MINIMUM8)**

- To determine the strength of NaOH and Na_2CO_3present in the solution mixture of NaOH & $Na_2CO_3$and to find out their percentage composition.
- To determine the strength of $NaHCO_3$and Na_2CO_3present in the solution mixture of $NaHCO_3$ & $Na_2CO_3$and to find out their percentage composition.
- To determine the Normality, gram/liter and molarities of$H_2C_2O_4$, $2H_2O$ and H_2SO_4 present in the solution mixture of $H_2C_2O_4$,$2H_2O$&H_2SO_4 by using XNNaOH and Y N $KMnO_4$ solutions.
- To determine the Normality, gram/liter and molarity of $H_2C_2O_4$, $2H_2O$ and $K_2C_2O_4$present in the solution mixture of $H_2C_2O_4$, $2H_2O$ & $K_2C_2O_4$by using NaOH and $KMnO_4$ solutions.
- TodeterminetheamountofCa^{+2} andMg^{+2}ionbyEDTAsolutionfromthemixture solution of $CaCl_2$and $MgCl_2$.
- To estimate the strength of given Mohr's salt by titrating it against KMnO4
- To estimate the strength of CuSO4 solution iodometrically by titrating it against Na2S2O3 solution.
- Estimation ofF e2+ by titrating it with K2Cr2O7 using Diphenylamine as an internal indicator.
- Estimation of number of waters of crystallization in Mohr's salt by titrating with $KMnO_4$

3. Melting point and Boiling point(Any two organic compounds)
4. Calibration of burette, Pipette and measuring flask

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

***SEE:** Semester End Evaluation

Reference books:

- 'ConciseInorganicChemistry'J.D.Lee,5thedn.
- Textbook of Organic Chemistry, Arun Bahal, S. Chand.
- Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by GH Jeffery and others) 5th Ed. The English Language Book Society of Longman
- Willard, Hobert H.et. al: Instrumental Methods of Analysis, 7thEd. Wardsworth Publishing Company, Belmont, California, USA, 1988.
- Christian,Gary D;Analytical Chemistry,6th Ed.NewYork-JohnWilly,2004.

Suggested Books:

- Harris,Daniel C,Quantitative Chemical Analysis, 3rdEdition,W.H.Freemanand Company, New York, 2001.
- Khopkar,S.M. Basic Concepts of Analytical Chemistry New Age, International Publisher, 2009.
- Koogs,Westand Holler, Fundamentals of Analytical Chemistry, 6thEdition, Saudeıs College Publishing, New York. 1991.

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CO	Course Outcome	POs/ PSOs	Cognitive level	Knowledge Category	Class Session
CO1	Explain the concepts of bonding theories (VBT, VSEPR, MOT), hybridization, molecular shapes, and periodic properties of s- and p-block elements along with their compounds.	PO1, PO2, PSO1	U, R	C	15
CO2	Explain various intramolecular interactions, electronic effects, reaction intermediates, and the types and mechanisms of organic reactions.	PO1, PO2, PSO1	U, Ap	C	9
CO3	Describe the mechanisms of substitution, addition, and elimination reactions, and explain the basic concept of aromaticity in organic chemistry.	PO1, PO2, PSO1	U, Ap	C	6
CO4	Identify and describe the use, handling, and maintenance of common laboratory glassware and equipment used in chemical analysis.	PO2, PO3, PSO2	U, R	C, P	10
CO5	Perform volumetric titrations of single and mixed solutions to determine the concentration and composition of chemical species.	PO2, PO3, PSO2	An, Ap	P	30
CO6	Determine the melting and boiling points of organic compounds and the calibration of laboratory glassware.	PO1, PSO2	An, Ap	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	3	3									2	
CO2	3	3									2	
CO3	3	3									2	
CO4		3	3									3
CO5		3	3									3
CO6	3											3

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Physics Semester I - Minor Course

PHE203-1C Fundamentals of Physics - I

COURSE OUTCOMES:

- CO1: Explain the principles of LASER operation, including spontaneous and stimulated emission, population inversion, and laser components.
- CO2: Apply the concepts of acoustics to evaluate the design requirements of auditoriums and analyze reverberation using Sabine's formula.
- CO3: Demonstrate the generation and detection techniques of ultrasonic waves and interpret their applications in industrial and underwater systems like SONAR.
- CO4: Operate precision instruments like vernier caliper, screw gauge, and travelling microscope to measure linear dimensions with accuracy and record observational data.
- CO5: Calibrate and use optical instruments such as spectrometer and diffraction grating to determine wavelengths and angular deviations accurately.
- CO6: Determine resistance using color coding and measure various electrical quantities using digital Multimeter with consideration of error analysis.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits
		Theory Per Week	Practical Per week	
PHE203-1C	Fundamentals of Physics - I	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: Fundamentals of LASER — **Teaching Hours: 15 (Weightage 25%)**

Introduction and characteristics of Laser, attenuation of Light in Optical Medium, Thermal equilibrium, Interaction of light with matter- Absorption, Spontaneous Emission, Stimulated Emission, Light Amplification- two Conditions for Stimulated Emission, Population inversion, Metastable states, Components of Laser: Active medium, Pumping-Three level and four level, Optical Resonant Cavity, Types of Lasers- Ruby Laser, Nd-YAG Laser, He-Ne Laser, PN junction Laser, Applications, related Problems

Unit 2: Acoustic & Ultrasonic — **Teaching Hours: 15 (Weightage 25%)**

Classification of Sound, Characteristics of Musical Sound, Acoustics of buildings, loudness and intensity of sound, reverberation time and Sabine's Formula, measurement of absorption coefficient, Sound Absorbing Materials, Principles to be observed in the Acoustical Design of an Auditorium, related Problems

Introduction, Classification of Ultrasonic Waves, Properties of Ultrasonic Waves, Generation of Ultrasonic Waves: Piezoelectric oscillator & Magnetostriction oscillator, determination of wave length-velocity of ultrasound in liquid, Applications of Ultrasonic, SONAR & determination of depth of Sea, related Problems

KADI SARVA VISHWAVIDYALAYA

Practical

Teaching Hours: 30

1. Measurements of length / diameter for different geometrical shapes using Vernier caliper.
2. Measurements of length /diameter / thickness using screw gauge.
3. Measurement of distance between two lines /slits using travelling microscope.
4. Calibration of Spectrometer for Parallel rays using Schuster's Method.
5. Measurement of angle of minimum deviation for a given Prism using Spectrometer.
6. Estimation of the value of resistance using color code
7. Graph Plotting: Experimental, Straight Line with intercept, Resonance Curve etc.

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

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Explain the principles of LASER operation, including spontaneous and stimulated emission, population inversion, and laser components.	PO1, PO2, PO7, PSO1	U	C	12
CO2	Apply the concepts of acoustics to evaluate the design requirements of auditoriums and analyze reverberation using Sabine's formula.	PO1, PO2, PO3, PO5, PO6, PO9, PSO1, PSO2	Ap	C/P	8
CO3	Demonstrate the generation and detection techniques of ultrasonic waves and interpret their applications in industrial and underwater systems like SONAR.	PO1, PO2, PO3, PO6, PO7, PO9, PO10, PSO1, PSO2	Ap	C/P	10
CO4	Operate precision instruments like vernier callipers, screw gauge, and travelling microscope to measure linear dimensions with accuracy and record observational data.	PO1, PO2, PO3, PO6, PO7, PSO1	Ap	P	20
CO5	Calibrate and use optical instruments such as spectrometer and diffraction grating to determine wavelengths and angular deviations accurately.	PO1, PO2, PO3, PO6, PO7, PSO1	Ap	P	20
CO6	Determine resistance using color coding and measure various electrical quantities using digital Multimeter with consideration of error analysis.	PO1, PO2, PO3, PO6, PO7, PSO1	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	
CO2	3	3	3		1	3			1		3	1
CO3	3	3	3			3	3		1	1	3	1
CO4	3	3	3			3	3				3	
CO5	3	3	3			3	3				3	
CO6	3	3	3			3	3				3	

3:High,2:Medium,1:Low

KADISARVAVISHWAVIDYALAYA

Semester I - Minor Course

BTE204-1C BASIC OF BOTANY

COURSEOUTCOMES:

- **CO1**: Compare akaryotic, prokaryotic, eukaryotic cell structures and correlate chromosome morphology with centromere position.
- **CO2**: Categorize plant tissues and associate their structural adaptations with functions
- **CO3**: Evaluate the economic significance of algae and fungi
- **CO4**: Reconstruct the life cycles of *Spirogyra* and *Mucor* via their systematic classification and reproductive strategies.
- **CO5**: Understand microscopic structures of eukaryotic cells, plasmodesmata, and nucleus/chromosomes
- **CO6**: Analyze and compare plant tissue systems and cryptogam life cycles (*Spirogyra, Mucor*)

Subject Code	Subject Title	Teaching Scheme		Credits
		Theory Hrs. Per Week	Practical Hrs. Per Week	
BTE204-1C	Basics of Botany	2	4	4

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

Contents

TeachingHours:15

Unit-1:CellBiologyandAnatomy

- The Cell theory, Types of cells on the basis of Nucleus (Akaryota, Prokaryota & Eukaryota).
- Comparison of ultra-structure of typical Prokaryotic & Eukaryotic cell as well as Plant cell and Animal cell.
- Structure & function of Plasmodesmata.
- Kinds of plant tissues:
  - Meristematictissues:Definition,Generalcharacteristicsandtypeswithfunctions(Apicalmeristems, Intercalary meristems, Lateral meristems)
  - Simpletissues:Definition,Generalcharacteristicsandtypeswithfunctions(Parenchyma,Collenchyma and Sclerenchyma fibres).
  - Complex tissues:Definition,Generalcharacteristicsandtypeswithfunctions(Xylem, Phloem).
  - Epidermaltissues:Definition,Generalcharacteristicsandtypes(Epidermis,Stomata, Trichomes,Motor cells, Cystolith, Sphaeroraphides, Velamentissues, Periderm and Lenticel)

KADISARVAVISHWAVIDYALAYA

Unit-2BiologyofCryptogams(Algae&Fungi) **TeachingHours:15**

- General characters of Algae, Economic importance of Algae (as food, fodder and fertilizer)
- Life history of *Spirogyra* with reference to Systematic position with reasons (according to Smith), Habit, Habitat, Vegetative structure and Reproduction.
- General characters of Fungi, Economic importance of Fungi (as food and medicine).
- Life history of *Mucor* with reference to Systematic position with reasons (according to Ainsworth), Habit, Habitat, Vegetative structure and Reproduction.

Practical's: **TeachingHours:60**

1. To study the various shape of eukaryotic cells through permanent / temporary slides: *Amoeba*, *Paramecium*, Human RBC, Nerve cell, *Spirogyra* and Onion leaf scale.
2. To study the Structure of Plasmodesmata through permanent / temporary slide from Date Palm seed.
3. To study the ultra-structure of Nucleus and Chromosomes through micrographs /charts.
4. To study the Life history of *Spirogyra* through:
   Mountings - Thallus and Reproductive structure
   Permanent Slides of - Thallus and Reproductive structure
5. To study the Life history of *Mucor* through:
   Specimen - Bread / Roti with *Mucor*
   Mountings - Mycelium and Asexual and sexual Reproductive structures
   Permanent Slides of – Mycelium, Asexual and sexual Reproductive structures
6. To study the various types of Simple (parenchyma, collenchyma and sclerenchyma) and Complex tissues (thickenings in vessels / tracheids and sieve tube) from Sunflower and *Cucurbita* stems (T.S. and L.S.) through fresh and permanent preparations.
7. To study the Epidermal tissue system through permanent / temporary slides:
   - Uniseriate epidermis (Sunflower leaf) and Multiseriate epidermis (Banyan / *Nerium* leaf).
   - Stomata structure (Dicot- *Hibiscus* and Monocot-Maize).
   - Trichomes [Unicellular-stellate (*Abutilon*); Multicellular-unbranched (*Tridax*) & branched (*Withania*); Glandular (*Datura*)].
   - Motor cells in Maize leaf.
   - Cystolith in Banyan leaf.
   - Sphaeroraphides in *Nerium* leaf.
   - Velamen tissue in aerial root of Orchid.
   - Permanent slides of Periderm and Lenticel structure- *Tinospora*

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

***SEE:** Semester End Evaluation

Reference Books:

Cell Biology Author- C. B. Powar
Plant Anatomy Author- B. P. Pandey
Botany for degree students Algae Author- B. R. Vashishta
Botany for degree students Fungi Author- B. R. Vashishta

SUGGESTED BOOKS:

College Botany Vol-1 Authors- Das, Dutta and Ganguli
College Botany Vol-1 Authors- Ganguli and Kar

	Course Outcome	POs/PSOs	Cognitive Level	Knowledge Category	Class Session
CO1	Compare akaryotic, prokaryotic, eukaryotic cell structures and correlate chromosome morphology with centromere position.	PO1, PO2, PO3, PO4, PO6, PO8; PSO1, PSO2	U, An	F, C	5
CO2	Categorize plant tissues and associate their structural adaptations with functions	PO1, PO2, PO3, PO4, PO6, PO9; PSO1, PSO2	U, An	F, C	10
CO3	Evaluate the economic significance of algae and fungi	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10; PSO1, PSO2	U, Ev	C, P	5
CO4	Reconstruct the life cycles of *Spirogyra* and *Mucor* via their systematic classification and reproductive strategies.	PO1, PO2, PO3, PO4, PO6, PO7, PO9; PSO1, PSO2	A, C	F, P	10
CO5	Understand microscopic structures of eukaryotic cells, plasmodesmata, and nucleus/chromosomes	PO1, PO2, PO3, PO4, PO6, PO7, PO9; PSO1, PSO2	R, U	F, C	12
CO6	Analyze and compare plant tissue systems and cryptogam life cycles (*Spirogyra*, *Mucor*)	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10; PSO1, PSO2	A, E	F, C, P	48
Total Hours of Instructions					**90**

Mapping of COs with POs and PSOs

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

3: High, 2: Medium, 1: Low

KADISARVAVISHWAVIDYALAYA

Mathematics Semester 1 Minor Course

MTE205-1C Descriptive Statistics

Course Outcomes:

- **CO1:** Define key measures of central tendency such as mean, median, and mode, and compare their properties with correct interpretation.
- **CO2:** Compute arithmetic mean in discrete, continuous, and weighted data series.
- **CO3:** Determine median and mode for both discrete and continuous series and interpret their meaning.
- **CO4:** Explain the concepts of geometric and harmonic means, and compute them accurately in individual, combined, and weighted cases.
- **CO5:** Calculate partition values such as quartiles, octiles, deciles, and percentiles, and relate them to measures of central tendency with correct interpretation.
- **CO6:** Compare the suitability and limitations of all measures of central tendency in different data contexts and select appropriate methods with justification.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits
		Theory Per Week	Practical Per week	
MTE205-1C	Descriptive Statistics	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 : Measures of Central Tendency - I **Teaching Hours:15**

Concept of central tendency, Various measures of central tendency (mean, median and mode) and their interrelationship, Comparison and their merits and demerits.

Unit 2 : Measures of Central Tendency - II **Teaching Hours:15**

Geometric mean and its computation, Harmonic mean and its computation, Partition values–quartiles, octiles, deciles and percentiles, Relation between partition values, Their merits and demerits.

Practicals **Teaching Hours: 60**

1. Computation of arithmetic mean in discrete series.
2. Computation of arithmetic mean in continuous series.
3. Computation of weighted arithmetic mean.
4. Computation of median in case of discrete series.
5. Computation of median in case of continuous series.
6. Computation of mode in case of discrete series.
7. Computation of mode in case of continuous series.
8. Computation of geometric mean, combined geometric mean and weighted geometric mean.
9. Computation of Harmonic mean.
10. Computation of partition values– quartiles, octiles, deciles and percentiles.

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

***SEE:** Semester End Evaluation

Reference Books:

1. Statistical analysis: Graphs and diagrams, Spectrum books (P) Ltd, New Delhi.
2. Introduction to the Practice of Statistics, Moore, S. David; Mc Cabe, P. George W.H. Freeman and Company, NewYork.
3. Basic Statistics, Agarwal, B. L., New Age International (P) Ltd.
4. Introduction to the theory of Statistics, Mood, A. M., Grey bill, F. A., Boes, D. C., McGraw Hill.
5. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand and Sons, New Delhi.

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Define key measures of central tendency such as mean, median, and mode, and compare their properties with correct interpretation.	PO1, PO2, PO3, PO6, PSO1	R, U, An	C, P	13
CO2	Compute arithmetic mean in discrete, continuous, and weighted data series.	PO1, PO2, PO3, PSO1,PSO2	U, Ap, E	C, P	14
CO3	Determine median and mode for both discrete and continuous series and interpret their meaning.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, An, E	C, P	14
CO4	Explain the concepts of geometric and harmonic means, and compute them accurately in individual, combined, and weighted cases.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, E	C, P	14
CO5	Calculate partition values such as quartiles, octiles, deciles, and percentiles, and relate them to measures of central tendency with correct interpretation.	PO1, PO2, PO3, PO6, PSO1,PSO2	U, Ap, An, E	C, P	17
CO6	Compare the suitability and limitations of all measures of central tendency in different data contexts and select appropriate methods with justification.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	U, An, E	C, P	18
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	3	0	0	3	0	0	0	0	3	0
CO2	3	3	3	0	0	0	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

Microbiology Semester 1 Multidisciplinary Course

MDC211-1C -Introduction to Microbial World

COURSE OUTCOMES:

- CO1: Describe the core concept, applied areas and scope of microbiology, distribution of microorganisms in nature.
- CO2: Describe general characteristics of major groups of microorganisms and classification system.
- CO3: Illustrate the morphology of the bacterial cell and microscopic techniques.
- CO4: Understand and apply basic knowledge of instruments in the microbiology laboratory.
- CO5: Develop skills in preparation of standard solutions, preparation and cleaning of glassware and sterilization.
- CO6: Analyze bacterial shapes through permanent slides and examine bacterial morphology by different staining techniques.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	
			Theory	Practical
MDC211-1C	Introduction to Microbial World	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: The Microbial World **Teaching Hours: 15 (Weightage 25%)**

- Introduction: Microbes in our lives
  - Introduction to major groups of microorganisms: Bacteria, Fungi, Algae, Protozoa, Viruses
  - Applied areas of Microbiology.
- Distribution of Microorganisms in Nature
- An overview of Scope of Microbiology
- Classification
  - Bacterial nomenclature.
  - Whittaker's classification system of prokaryotes.
  - Introduction to Bergey's manual of determinative and systematic classification.

Unit-2 : Morphology of Bacteria **Teaching Hours: 15(Weightage 25%)**

- **Morphology of Bacteria**
  - Size, shape and arrangement of bacterial cells.
  - Structures external to cell wall- Flagella, pili, capsule, sheath and prosthecae
  - Structures internal to cell wall- Cell membrane, nuclear material, cell wall (Protoplast and Spheroplast), spores, cytoplasmic inclusions, magnetosomes and plasmids.
- **Microscopy:** Bright field, Dark field, Phase contrast, Fluorescent and Electron microscopy.

Practical's: **Teaching Hours: 60(Weightage 50%)**

- To study the principle and applications of important instruments used in microbiology laboratory
  - Biological Safety Cabinets
  - Autoclave,
  - Incubator
  - BOD Incubator
  - Hot Air Oven
  - Light Microscope
  - pH Meter
  - Colony counter
  - Rotary Shaker
  - Centrifuge
- Preparation of Standard Solutions (Molar Solution, Molal Solution, Normal Solution)
- Preparation and Cleaning of Glass-wares in Microbiology Laboratory
- Sterilization in Microbiology Laboratory
- Study of different shapes of bacteria using permanent slides
- Staining techniques-Monochrome staining, Negative staining
- Differential Staining– Gram Staining

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

***SEE:** Semester End Evaluation

Reference Books

1. Microbiology- Pelczar MJ, Chan ECS and Krieg NR., 5th edition. McGraw Hill Book Company. USA
2. Experimental Microbiology- Patel R.J. and Patel R.K., Volume I and II, 9thEdition, Aditya Publisher, India.

Suggested Reference Books

1. General Microbiology- Stanier RY, Ingraham JL, Wheelis ML, and Painter PR., 5th edition. McMillan.
2. Brock Biology of Microorganisms- Michael Madigan, John Martinko, David Stahl, David P Clark. 14th edition. Pearson International Edition, UK.

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	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Describe the core concept, applied areas and scope of microbiology, distribution of microorganisms in nature.	PO1, PO2, PSO1	U, R	C	6
CO2	Describe general characteristics of major groups of microorganisms and classification system.	PO1, PO2, PSO1	U, R	C	9
CO3	Illustrate the morphology of the bacterial cell and microscopic techniques.	PO1, PO2, PSO1, PSO2	U, R, Ap	C,P	15
CO4	Understand and apply basic knowledge of instruments in the microbiology laboratory.	PO1, PO2, PSO1, PSO2	U, R, Ap	C, P	20
CO5	Develop skills in preparation of standard solutions, preparation and cleaning of glassware and sterilization.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	U, R, Ap, Cr	C, P	15
CO6	Analyze bacterial shapes through permanent slides and Examine bacterial morphology by different staining techniques.	PO1, PO2, PO3 PO6, PSO1, PSO2	U, Ap, An, E	C, P	25
	Total hours 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	3	3									3	
CO2	3	3									3	
CO3	3	3									3	3
CO4	3	3									3	3
CO5	3	3	3	1		3					3	3
CO6	3	3	3			3					3	3

3: High, 2: Medium, 1: Low

KADISARVAVISHWAVIDYALAYA

Multidisciplinary Course- Semester 1

MDC212-1C FUNDAMENTALS OF BOTANY

Course Outcomes:

- **CO1:** Compare eukaryotic cell structures and correlate chromosome morphology with centromere position.
- **CO2:** Categorize plant tissues and associate their structural adaptations with functions
- **CO3:** Evaluate the economic significance of algae and fungi
- **CO4:** Reconstruct the life cycles of *Spirogyra* and *Mucor* via their systematic classification and reproductive strategies.
- **CO5:** Understand microscopic structures of eukaryotic cells, plasmodesmata, and nucleus/chromosomes
- **CO6:** Analyze and compare plant tissue systems and cryptogam life cycles (*Spirogyra, Mucor*)

Subject Code	SubjectTitle	Teaching Scheme		Credits
		Theory Hrs. Per Week	Practical Hrs. Per Week	
MDC212-1C	FUNDAMENTALS OF BOTANY	2	4	4

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

Contents

Unit-1:CellBiologyandAnatomy **TeachingHours:15**

- TheCelltheory,Size, ShapeandstructureofEukaryoticcells (Plantcelland Animalcell).
- Structure&functionofPlasmodesmata.
- Ultra-structureofNucleusandchromosome,Chromosomeshapedependsupontheposition of centromere.
- Kindsofplant tissues:
  - Meristematictissues:Definition,Generalcharacteristicsandtypeswithfunctions(Apicalmeristems, Intercalary meristems, Lateral meristems)
  - Simpletissues:Definition,Generalcharacteristicsandtypeswithfunctions(Parenchyma,Collenchyma and Sclerenchyma fibres).
  - Complex tissues:Definition,Generalcharacteristicsandtypeswithfunctions(Xylem, Phloem).
  - Epidermaltissues:Definition,Generalcharacteristicsandtypes(Epidermis,Stomata, Trichomes,Motor cells, Cystolith, Sphaeroraphides, Velamentissues, Periderm and Lenticel)

Unit-2BiologyofCryptogams(Algae&Fungi) **TeachingHours:15**

- GeneralcharactersofAlgae, EconomicimportanceofAlgae(asfood,fodderand fertilizer)
- Lifehistoryof*Spirogyra*withreferencetoSystematicpositionwithreasons(accordingto Smith), Habit, Habitat, Vegetative structure and Reproduction.
- GeneralcharactersofFungi, EconomicimportanceofFungi(asfoodandmedicine).
- Lifehistoryof*Mucor*withreferencetoSystematicpositionwithreasons(accordingto Ainsworth),Habit, Habitat, Vegetative structure and Reproduction.

Practical: **Teaching Hours: 60**

8. To study the various shape of eukaryotic cells through permanent / temporary slides: *Amoeba*, *Paramecium*, Human RBC, Nerve cell, *Spirogyra* and Onion leaf scale.
9. To study the Structure of Plasmodesmata through permanent / temporary slide from Date Palm seed.
10. To study the ultra-structure of Nucleus and Chromosomes through micrographs /charts.
11. To study the Life history of *Spirogyra* through:
    Mountings - Thallus and Reproductive structure
    Permanent Slides of - Thallus and Reproductive structure
12. To study the Life history of *Mucor* through:
    Specimen - Bread / Roti with *Mucor*
    Mountings - Mycelium and Asexual and sexual Reproductive structures
    Permanent Slides of – Mycelium, Asexual and sexual Reproductive structures
13. To study the various types of Simple (parenchyma, collenchyma and sclerenchyma) and Complex tissues (thickenings in vessels / tracheids and sieve tube) from Sunflower and *Cucurbita* stems (T.S. and L.S.) through fresh and permanent preparations.
14. To study the Epidermal tissue system through permanent / temporary slides:
    - Uniseriate epidermis (Sunflower leaf) and Multiseriate epidermis (Banyan / *Nerium* leaf).
    - Stomata structure (Dicot- *Hibiscus* and Monocot-Maize).
    - Trichomes [Unicellular-stellate (*Abutilon*); Multicellular-unbranched (*Tridax*) & branched (*Withania*); Glandular (*Datura*)].
    - Motor cells in Maize leaf.
    - Cystolith in Banyan leaf.
    - Sphaeroraphides in *Nerium* leaf.
    - Velamen tissue in aerial root of Orchid.
    - Permanent slides of Periderm and Lenticel structure- *Tinospora*

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

***SEE:** Semester End Evaluation

Reference Books:

Cell Biology Author- C. B. Powar
Plant Anatomy Author- B. P. Pandey
Botany for degree students Algae Author- B. R. Vashishta
Botany for degree students Fungi Author- B. R. Vashishta

SUGGESTED BOOKS:

College Botany Vol-1 Authors- Das, Dutta and Ganguli
College Botany Vol-1 Authors- Ganguli and Kar

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	Course Outcome	POs/PSOs	Cognitive Level	Knowledge Category	Class Session
CO1	Compare akaryotic, prokaryotic, eukaryotic cell structures and correlate chromosome morphology with centromere position.	PO1, PO2, PO3, PO4, PO6, PO8; PSO1, PSO2	U, An	F, C	5
CO2	Categorize plant tissues and associate their structural adaptations with functions	PO1, PO2, PO3, PO4, PO6, PO9; PSO1, PSO2	U, An	F, C	10
CO3	Evaluate the economic significance of algae and fungi	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10; PSO1, PSO2	U, Ev	C, P	5
CO4	Reconstruct the life cycles of *Spirogyra* and *Mucor* via their systematic classification and reproductive strategies.	PO1, PO2, PO3, PO4, PO6, PO7, PO9; PSO1, PSO2	A, C	F, P	10
CO5	Understand microscopic structures of eukaryotic cells, plasmodesmata, and nucleus/chromosomes	PO1, PO2, PO3, PO4, PO6, PO7, PO9; PSO1, PSO2	R, U	F, C	12
CO6	Analyze and compare plant tissue systems and cryptogam life cycles (*Spirogyra*, *Mucor*)	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10; PSO1, PSO2	A, E	F, C, P	48
Total Hours of Instructions					**90**

Mapping of COs with POs and PSOs

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

3: High, 2: Medium, 1: Low

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Chemistry Semester I Multidisciplinary Course

MDC213-1C -INTRODUCTION TO CHEMISTRY - I

Course Outcomes:

- CO1: Understand and apply the mole concept and concentration terms to prepare and analyze various types of chemical solutions, including buffers and saturated solutions.
- CO2: Understand periodic trends, acid-base theories, molecular forces, organic nomenclature, and basics of thermodynamics, kinetics, and stoichiometry.
- CO3: Explain basic solution properties and separation techniques.
- CO4: Prepare standard solutions using molar, molal, percentage, and ppm concentrations.
- CO5: Determine physical properties such as surface tension, viscosity, melting point, and boiling point of given samples.
- CO6: Perform recrystallisation and simple titrations to analyse solution concentration, acidity, and basicity.

Course Code	Course Title	Teaching Scheme		Credits
		Theory hrs Per Week	Practical hrs Per Week	
MDC213-1C	Introduction to Chemistry-I	2	4	4

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

CONTENT:

Unit1: Solution and Concentration **Teaching Hours: 15(Weightage25%)**

Mole concept, Mole fraction, Concentration terms - percentage, ppm, ppb, g/L, molarity, normality, molality, calculation of masses and volumes for preparation of solutions and their practical approach, Solutions, components of a solution, types of solution, solubility, Buffer solutions, saturated solutions, Concentrate and dilute solutions

Unit2. Chemical Properties and Principles **Teaching Hours: 15(Weightage25%)**

Periodic table and periodicity, Acid base theories, Interaction forces, IUPAC nomenclature of Organic main functional groups, Definition of thermodynamics, kinetics and equilibrium. Stoichiometry. Density, Viscosity, Surface tension, Ostwald dilution law, Ionic Strength, Conductivity, pH, common ion effect, solubility product, residue, precipitation, Crystallization.

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Unit3: Chemistry Practicals (Each2 times) **Teaching Hours: 60(Weightage50%)**

- Preparation of Molar, Molal,% w/w,%w/v, ppm solution
- Find out the surface tension and viscosity of given sample
- To recrystallize the given organic compound using water / alcohol as a solvent
- Find out the melting / Boiling point of given sample
- Find out the concentration of given unknown solution using simple titration.
- Find out the acidity and basicity of given sample solution

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

***SEE:** Semester End Evaluation

Reference books:

1. 'ConciseInorganicChemistry'J.D.Lee,5thedn.
2. Textbook of Organic Chemistry, Arun Bahal, S. Chand.
3. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by GH Jeffery and others) 5th Ed. The English Language Book Society of Longman

CO	Course Outcome	POs/ PSOs	Cognitive level	Knowledge Category	Class Session
CO1	Understand and apply the mole concept and concentration terms to prepare and analyze various types of chemical solutions, including buffers and saturated solutions.	PO1, PO2,PSO1	U, Ap	P	15
CO2	Understand periodic trends, acid-base theories, molecular forces, organic nomenclature, and basics of thermodynamics, kinetics, and stoichiometry.	PO1, PO2, PSO1	U, R	C	9
CO3	Explain basic solution properties and separation techniques.	PO1, PO2, PSO1	U, R	C	6
CO4	Prepare standard solutions using molar, molal, percentage, and ppm concentrations.	PO1, PO4, PSO2	U, Ap	P	10
CO5	Determine physical properties such as surface tension, viscosity, melting point, and boiling point of given samples.	PO2, PO6, PSO2	U, An	P	20
CO6	Perform recrystallisation and simple titrations to analyse solution concentration, acidity, and basicity.	PO2, PO4, PSO2	U, Ap	P	30
	Total hours of Instruction				90

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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									2	
CO2	3	3									2	
CO3	3	3									2	
CO4	3			3								3
CO5		3				1						3
CO6		3		3								3

3: High, 2: Medium, 1: Low

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Physics Semester I - Multidisciplinary Course

MDC214-1C Fundamentals of Computational Physics -I

COURSE OUTCOMES:

- CO1: Explain the role of computational physics and describe the fundamental architecture of computer hardware including memory hierarchy, latency, and bandwidth.
- CO2: Compare various computational tools (Excel, Fortran, C/C++, MATLAB, Python, open-source platforms) based on applicability, advantages, and limitations.
- CO3: Apply matrix operations such as multiplication, inversion, and determinant evaluation to solve problems in physical and computational contexts.
- CO4: Demonstrate the use of Excel for plotting experimental data and constructing straight-line graphs with intercepts to analyze physical relationships.
- CO5: Use Excel to perform mathematical operations on matrices, including addition, subtraction, multiplication, transpose, and computation of determinant and inverse.
- CO6: Analyze physical data and calculate results using Excel-based formulas to validate fundamental laws in physics.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits
		Theory Per Week	Practical Per week	
MBC214-1C	Fundamentals of Computational Physics -I	2	4	4

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

Unit 1: Introduction to Computational Physics — **Teaching Hours: 15**

What is computational physics? Why do we need it? Computer hardware: basic computer architecture, hierarchical memory, cache, latency and bandwidth.
Overview of Excel, available compilers (Fortran, C, C++), machine languages (MATLAB & Python), Open Sources (Python, GNU Octave, Sci. Lab, Geogebra etc.) and their Comparison, Merits and Demerits

Unit-2 :Matrices & Determinant — **Teaching Hours: 15**

Matrices, Types of matrices, Algebra of matrices, Multiplication of matrices,
Transpose of matrices, Determinant, Adjoint of matrices, The Inverse of matrices, Rank of matrices, Trace of matrices.

List of Practical — **Teaching Hours: 60**

1)Basic Plotting in Excel.
2)Plotting Experimental data in Excel.
3) Calculation of Physics formula using Excel.
4) Plotting of Straight Line with intercept in Excel.

5) Addition & Subtraction of matrices using Excel.
6) Multiplication of matrices in Excel.
7) Transpose of matrices in Excel.
8) Determinant in Excel.
9) Adjoint of matrices in Excel.
10) The Inverse of matrices in Excel.

Note:

- New Experiments can be introduced AND / OR replaced as per need by the permission of the Head / Principal of the institute.
- 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

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Explain the role of computational physics and describe the fundamental architecture of computer hardware including memory hierarchy, latency, and bandwidth.	PO1, PO2, PO6, PO7, PSO1, PSO2	U	C	10
CO2	Compare various computational tools (Excel, Fortran, C/C++, MATLAB, Python, open-source platforms) based on applicability, advantages, and limitations.	PO1, PO2, PO4, PO5, PO6, PO7, PSO1, PSO2	An	C	11
CO3	Apply matrix operations such as multiplication, inversion, and determinant evaluation to solve problems in physical and computational contexts.	PO1, PO2, PO3, PO7, PSO1, PSO2	Ap	C, P	9
CO4	Demonstrate the use of Excel for plotting experimental data and constructing straight-line graphs with intercepts to analyze physical relationships.	PO1, PO5, PO6, PO7, PSO1	Ap	P	20
CO5	Use Excel to perform mathematical operations on matrices, including addition, subtraction, multiplication, transpose, and computation of determinant and inverse.	PO1, PO2, PO7, PSO1	Ap	P	20
CO6	Analyze physical data and calculate results using Excel-based formulas to validate fundamental laws in physics.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	An	P	20
				Total hour of Instruction	**90**

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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	3
CO2	3	3		1	2	3	3				3	3
CO3	3	3	2				3				3	3
CO4	3				2	3	3				3	
CO5	3	3					3				3	
CO6	3	3	2			3	3				3	3

3:High,2:Medium,1:Low

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Mathematics Semester 1 Multidisciplinary Course

MDC215-1C Introduction to' C'

Course Outcomes:

- **CO1:** Identify C language keywords, data types, operators, and expressions, and explain their roles in syntax and semantics.
- **CO2:** Write and execute C programs using conditional and looping constructs, including nested loops and control flow statements, to solve basic logical problems.
- **CO3:** Declare, initialize, and manipulate one-dimensional and multi-dimensional arrays in C programs and perform searching and sorting tasks.
- **CO4:** Manipulate character arrays and apply string handling functions to solve problems in text processing, demonstrating proper use of built-in functions.
- **CO5:** Develop modular C programs using user-defined functions and structures, demonstrating appropriate function calls, parameter passing, and structure usage.
- **CO6:** Apply pointer concepts including declaration, initialization, and dereferencing to create efficient programs, with proper memory access and pointer logic.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits
		Theory Per Week	Practical Per week	
MDC215-1C	Introduction to 'C'	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

Unit1 Basics of C Language **Teaching Hours: 15**

C character set, Identifiers and keywords, Data types, Enumeration type, Constants, Variables, Declarations, Qualifiers – long, short and unsigned declarations, Expressions, Symbolic constants, Input/output functions,Compound statements, Arithmetic operators, Unary operators, Relational and logical operators, Assignment operators, Increment and decrement operators, Precedence and order of evaluation, Conditional operators, Bit operators, Type casting, Using library functions in math

Control flow: if statement, if- else statement, Nested if-else statement, Switch statements, Looping–for loop While loop, do-while statements, Nested loop structure, Break, Continue and go to statements.

Unit 2 Arrays, Strings and Pointers **Teaching Hours:15**

Array and Strings: Single dimensional arrays, Multidimensional arrays, Initializing array using static declaration, Searching and sorting of Arrays, Array of Characters, Character arrays and strings, String handling Functions.

Pointers: Introduction to pointers, Benefits of using pointers, Concept of pointer, Declaring pointer variable, Initialization of pointer variable.

Practicals **Teaching Hours:60**

1. Programs using Basic Constructs.
2. Programs using Control Structure.
3. Programs using Arrays.
4. String Manipulation Programs.
5. User Defined Function Programs.
6. Programs using Structure.
7. Programs using Pointer.

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

***SEE:** Semester End Evaluation

Reference Books:

1. Programming in ANSI C 4E,E. Bala Guru swamy, TMH.
2. Programming in C, By ron S Gottfried, Shaum's Outline series, TMH.
3. Computer Fundamentals by P K Sinha & Priti Sinha Fourth Edition.
4. B. Kernighan and D. Ritchie, "The ANSIC Programming Language", PH

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CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Identify C language keywords, data types, operators, and expressions, and explain their roles in syntax and semantics.	PO1, PO2, PO3, PO7, PSO1	R, U	C	15
CO2	Write and execute C programs using conditional and looping constructs, including nested loops and control flow statements, to solve basic logical problems.	PO1, PO2, PO3, PO4, PO7, PSO1	U, Ap, E	C, P	17
CO3	Declare, initialize, and manipulate one-dimensional and multi-dimensional arrays in C programs and perform searching and sorting tasks.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	U, Ap, E	C, P	17
CO4	Manipulate character arrays and apply string handling functions to solve problems in text processing, demonstrating proper use of built-in functions.	PO1, PO2, PO3, PO7, PSO1, PSO2	U, Ap	C, P	15
CO5	Develop modular C programs using user-defined functions and structures, demonstrating appropriate function calls, parameter passing, and structure usage.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	U, Ap, C	C, P	15
CO6	Apply pointer concepts including declaration, initialization, and dereferencing to create efficient programs, with proper memory access and pointer logic.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	U, Ap, C	C, P	11
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	3	0	0	0	3	0	0	0	3	0
CO2	3	3	3	3	0	0	3	0	0	0	3	0
CO3	3	3	3	0	0	3	3	0	0	0	3	3
CO4	3	3	3	0	0	0	3	0	0	0	3	3
CO5	3	3	3	3	0	3	3	0	0	0	3	3
CO6	3	3	3	3	0	3	3	0	0	0	3	3

3:High,2:Medium,1:Low

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Ability Enhancement Course – Semester 1

AEC203-1C –Foundation course in English Language

Course Outcomes:

CO 1: Demonstrate effective spoken communication in social and professional settings, applying appropriate vocabulary and grammatical structures.

CO 2: Apply fundamental rules and structures to construct grammatically correct sentences.

CO 3: Discuss the principles of effective note-taking and note-making, and generate professional circulars and memos using appropriate structure and style.

CO 4: Construct effective book reviews by following the review writing process, and develop presentations based on these reviews.

Teaching and Evaluation Scheme:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					CCE	SEE	
AEC-203-1C	Foundation course in English Language	2	2	2	25	25	50

Unit 1: Speaking / Enhancing Speaking Skills Teaching Hours:12(Weightage35%)

- Introducing oneself, talking about friends and family members-suggested conversations, contracted forms, describing oneself using adjectives (2 hr)
- Talking to and about friends and family members in various social situations-suggested conversations, using simple present and present continuous, using suggested vocabulary to talk about family, talking about future, using since and for, tag questions. (2 hr)
- Talking about daily activities Suggested vocabulary and conversations, adverbs of frequency (2 hr)
- Talking about Job interviews -suggested conversations, expressing opinions (2 hr)
- Small talks- suggested conversations, using present perfect(2 hr)
- Talking about Holidays and travel-suggested conversations and special usages (2 hr)

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Unit 2: Grammar Teaching Hours: 10 (Weightage 30 %)

- **Parts of speech**(2 hr)
  - Noun
  - Pronoun
  - Verb
  - Adverb
  - Adjective
  - Preposition
  - Connectives
- **Tenses** (3 hr)
  - Simple present or present progressive
  - Present perfect or simple past
  - Simple past or past perfect
  - Simple future or future progressive
  - Future perfect
  - Present perfect continuous
  - Past perfect continuous
  - Future perfect continuous
- **Modals**(2 hr)
  - Use of 'Be', 'Do', 'Have'
  - Can – Could
  - Shall – Should
  - Will – Would
  - May – Might
  - Must – Ought to
  - Dare – Need
- **Subject – Verb Agreement**(1 hr)
- **Active-Passive Voice**(2 hr)
  - Basic Rules
  - Omissions of the objects
  - Passive voice: Transitive verb, Two Objects, Preposition, Imperative sentences

Unit 3:Writing skills Teaching Hours: 06(Weightage25%)

- Note taking and note making -Importance, features of a good note, making effective class-notes, five methods of preparing notes, useful tips. (3 hr)
- Circulars and memo writing -informative and official circulars, inter office memo-structure and style. (3 hr)

Unit 4: Art of Book Reviews **Teaching Hours: 02 (Weightage 10%)**

- Writing to Presentation Book reviews: process of writing(1 hr)
- Writing reviews and making presentations tips(1 hr)

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

***SEE:** Semester End Evaluation

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Reference books:

Kumar, Sanjay, and Pushpa Lata. *Communication Skills*. Oxford University Press, 2018.

Mahan and, Anand. *English for Academic and Professional Skills*. Tata McGraw Hill Publishing Company Limited, 2013.

Pillai, Sabina. *Spoken English for My World*. Oxford University Press, 2016.

	Course Outcome	Pos/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO 1	Demonstrate effective spoken communication in social and professional settings, applying appropriate vocabulary and grammatical structures.	PO1, PO2, PO4, PO5	U, Ap	C, P	12
CO 2	Apply fundamental rules and structures to construct grammatically correct sentences.	PO1, PO2, PO5	U, Ap	C, P	10
CO 3	Discuss the principles of effective note-taking and note-making, and generate professional circulars and memos using appropriate structure and style.	PO1, PO2, PO3, PO4, PO5, PO6	U, Ap	C, P	06
CO 4	Construct effective book reviews by following the review writing process, and develop presentations based on these reviews.	PO1, PO2, PO3, PO4, PO5, PO6	C, U, Ap	C, P	02
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	3													
CO2	3	3			3													
CO3	3	3	2	3	3	2												
CO4	3	3	2	3	3	2												

3:High,2:Medium,1:Low

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CO		POs												PSOs	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	1	2
CO1	12	Y	Y		Y	Y									
CO2	10	Y	Y			Y									
CO3	06	Y	Y	Y	Y	Y	Y								
CO4	02	Y	Y	Y	Y	Y	Y								
	30	30	30	08	20	30	08								
		3	**3**	**2**	**3**	**3**	**2**								

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

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Indian Knowledge System – Semester 1

IKS202-1C Indian Astronomy-I

(BBA / BCA / B.Sc All Semester 1)

COURSEOUTCOMES:

- CO1: Describe the contributions of ancient Indian astronomers and identify key concepts from Vedic and Siddhanta traditions in the development of astronomy.
- CO2: Explain the apparent motion of celestial bodies and determine astronomical directions and positions using concepts like celestial horizon, meridian, and equinoxes.
- CO3: Compare different celestial coordinate systems and analyze the impact of precession on celestial measurements and traditional systems like Rāsi and Nakṣatra.

TEACHINGANDEVALUATIONSCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					CCE	SEE	
IKS202-1C	Indian Astronomy-I	2	2	2	25	25	50

Unit 1: Historical Introduction & Celestial Sphere **Teaching Hours: 15 (Weightage 25%)**

Introduction, Ancient Indian Astronomy, The Vedic Period and Vedāngajyotiṣa, Siddhanta, Aryabhaṭa I (476 AD), Astronomers after Aryabhata, Contents of the Siddhantas, Continuity in Astronomical Tradition, Diurnal Motion of Celestial Bodies, Motion of Celestial Bodies Relative to Stars, Celestial Horizon, Meridian, Pole Star and Directions, Zodiac and Constellations, Equator and Poles (Viṣuvadvṛtta and Dhruva), Latitude of a Place and Altitude of Pole Star, Ecliptic and the Equinoxes

Unit 2: Co-ordinate Systems &Rāsi and Nakṣatra Systems **Teaching Hours: 15 (Weightage 25%)**

Introduction, Celestial Longitude and Latitude (Ecliptic System), Right Ascension and Declination (Equatorial System), Azimuth and Altitude (Horizontal System), Hour Angle and Declination (Meridian System), Phenomenon of Precession of Equinoxes, Ancient Indian References to the Precession, Effects of Precession on Celestial Longitude, Tropical (Sayana) and Sidereal (Nirayana) Longitudes, Zodiac and Rāsis, Nakṣatra System

*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 Univeristy 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 the contributions of ancient Indian astronomers and identify key concepts from Vedic and Siddhanta traditions in the development of astronomy.	PO1, PO2, PO4, PO5, PO8, PSO1	U	C	11
CO2	Explain the apparent motion of celestial bodies and determine astronomical directions and positions using concepts like celestial horizon, meridian, and equinoxes.	PO1, PO2, PO3, PO5, PO6, PSO1, PSO2	U	C	9
CO3	Compare different celestial coordinate systems and analyze the impact of precession on celestial measurements and traditional systems like Rāsi and Nakṣatra.	PO1, PO2, PO3, PO6, PSO1, PSO2	An	C	10
				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	3			2			3	
CO2	3	3	3		3	3					3	3
CO3	3	3	3			3					3	3

3:High,2:Medium,1:Low

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Microbiology Semester I Skill Enhancement Course

SEC 211-1C- Basic Microbiological Skills

COURSE OUTCOMES

- CO1: Build a strong understanding of culture media and its types and the methods for isolation, cultivation, and maintenance of microbial cultures, including anaerobic bacteria.
- CO2: Demonstrate proficiency in handling microbiological tools and techniques including serial dilution, streaking, pouring, and spreading to obtain pure cultures.
- CO3: Illustrate the culturing process and identification of microorganisms through morphological and biochemical Characterization.

Course code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	Examination Scheme			Total Marks
			Theory	Hrs.	Max Marks		
					CCE	SEE	
SEC 211-1C	Basic Microbiological Skills	2	2	2	25	25	50

Unit-1: Media and Pure Culture Techniques **Teaching Hours 15 (Weightage: 50%)**

- Culture media: basic composition, Solid and liquid media, Synthetic and complex media, Enriched and enrichment media, Selective and differential media.
- Isolation and culture of microbes, inoculation and incubation and maintenance of cultures and related instruments.
- Pure culture techniques (Pour plate, Spreading, Streaking and serial dilution)
- Maintenance and preservation of pure culture
- Cultivation of anaerobic bacteria.

Unit-2: Basic Characterization of microorganisms **Teaching Hours 15 (Weightage: 50%)**

- Collection of samples, processing of samples, serial dilution, technique, inoculation of samples, incubation and observations of microbial colonies.
- Morphological characterization of microorganisms
- Colony characteristics
- Microscopic characters
- Biochemical/physiological tests or properties and identification

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

***SEE:** Semester End Evaluation

Reference Books:

1. Elementary of microbiology- H. A Modi, Ekta Prakashan. India.
2. Experimental Microbiology- Patel R.J. and Patel R.K., Volume I and II, 9thEdition, Aditya Publisher, India.

Suggested Reference Books:

1. Microbiology - Pelczar, Chan and Kreig, 5th edition, McGraw Hill Book Company, United States
2. Microbiology: A Laboratory Manual- James G. Cappuccino and Chad Wels, 11th Edition, Global edition, Pearson Education, USA.
3. Microbiology: an introduction- Tortora G. J. Funke B. R. & Case C. L. (2004). (Eighth edition). Pearson Benjamin Cummings.

	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Build a strong understanding of culture media and its types and the methods for isolation, cultivation, and maintenance of microbial cultures, including anaerobic bacteria.	PO1, PO2, PO4, PO6, PSO1,PSO2	U, R, Ap, Cr	C,P	10
CO2	Demonstrate proficiency in handling microbiological tools and techniques including serial dilution, streaking, pouring, and spreading to obtain pure cultures.	PO1, PO2, PO3, PO4, PO6, PS01, PS02	U, R, Ap, Cr	C,P	10
CO3	Illustrate the culturing process and identification of microorganisms through morphological and biochemical Characterization.	PO1, PO2, PO3, PO4, PO6, PSO1, PS02	U, R, Ap, An, Cr	C, P	10
	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		3					3	
CO2	3	3	3	3							3	3
CO3	3	3	3	3		3					3	3

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Chemistry Semester I Skill Enhancement Course

SEC212-1C CHEMISTRY INSTRUMENTATION AND LABORATORY SKILLS-I

Course Outcomes:

- **CO1:** Identify various laboratory glassware, equipment, and heating devices used in chemical experiments.
- **CO2:** Demonstrate safe handling procedures for chemicals and laboratory apparatus following standard safety protocols.
- **CO3:** Classify and explain various types of reagents, solvents, and analytical standards with suitable examples for their roles in chemical analysis.

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	Max Marks		
						CCE Theory	SEE Theory	
SEC212-1C	Chemistry Instrumentation and Laboratory Skills-I	2	0	2	2	25	25	50

CONTENT:

Details
Unit 1.Laboratory apparatus & their uses **Teaching Hours: 15 (Weightage :50%)** Beaker, test tube, boiling tube, conical flask / Erlenmeyer flask, filtration flask, round bottom flask, flat bottom flask, funnel, separating funnel, watch glass, measuring cylinder, petridish, desiccator, measuring cylinder, glass rod, glass tube. Volumetric flask, burette, pipette, analytical balance, electronic balance. Heating apparatus: Bunsen burner, water bath, sand bath, hot air oven, heating mantle. Buchner funnel, burner, test tube stands, tong, burette stand, clamp, china dish, wire gauze, cork, vacuum pumps, crucibles, clay pipe triangle, pestle and mortar, spatulas, thermometer, pH meter, Kipp's apparatus, Safe Handling of Chemicals and Glass wares
Unit2: Solvent and Reagents **Teaching Hours: 15 (Weightage :50%)** Reagents: Classification of reagents according to their action; (i) acids (ii) bases (iii) salts (iv) complexing agents (v) oxidizing and reducing agents (vi) precipitating agents (vii) chelatingagents. Each type to be explained with at least one suitable example. Primary and secondary standards: Definition, characteristics, uses examples for different types of reactions. Solvent: Solute, Solvent & Solution, classification of solvents (i) Protic and aprotic (ii) Acidic, basic amphiprotic and neutral (iii) Aqueous and non-aqueous (iv) Polar and nonpolar. Each type is to be explained with at least one example.

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

*SEE: Semester End Evaluation

Reference books:

- Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by GH Jeffery and others) 5th Ed. The English Language Book Society of Longman
- Willard,Hobert H.et.al: Instrumental Methods of Analysis,7thEd.Wardsworth Publishing Company, Belmont, California, USA, 1988.
- Christian, GaryD; Analytical Chemistry, 6thEd. New York- John Willy,2004.

Suggested Books:

- Harris, Daniel C, Quantitative Chemical Analysis, 3rdEdition, W.H. Freemanand Company, New York, 2001.
- Khopkar,S.M. Basic Concepts of Analytical Chemistry New Age, International Publisher, 2009.
- Koogs,Westand Holler, Fundamentals of Analytical Chemistry, 6thEdition, Sauders College Publishing, New York. 1991.

CO	Course Outcome	POs/ PSOs	Cognitive level	Knowledge Category	Class Session
CO1	Identify various laboratory glassware, equipment, and heating devices used in chemical experiments.	PO1, PSO1	U, Ap	C, F	8
CO2	Demonstrate safe handling procedures for chemicals and laboratory apparatus following standard safety protocols.	PO1, PSO1, PSO2	U, Ap	C, P	7
CO3	Classify and explain various types of reagents, solvents, and analytical standards with suitable examples for their roles in chemical analysis.	PO1, PO2, PSO1, PSO2	R, U	C	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											
CO2	3										3	
CO3	3	3									3	3
											3	3

3: High, 2: Medium, 1: Low

KADI SARVA VISHWAVIDYALAYA

Physics Semester I - Skill Enhancement Course

SEC213-1C Physics of Optical Instruments & Home Appliances

COURSE OUTCOMES:

- CO1: Explain the working principles and image formation mechanisms of optical instruments such as the eye, camera, magnifiers, microscopes, and telescopes.
- CO2: Apply the laws of reflection and refraction to analyze image formation by mirrors and lenses used in optical instruments.
- CO3: Describe the physical principles and energy conversion processes involved in common household electrical appliances like stoves, heaters, and mixers.

TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory Per Week	Practical Per week		Hrs.	Max Marks		
						CCE	SEE	
SEC213-1C	Physics of Optical Instruments & Home Appliances	2	0	2	2	25	25	50

Unit-1: Physics of Optical Instruments - I(Weightage :50%)

Introduction, Image formed by plane mirror, spherical mirror, and refraction, The Eye, The Camera, The simple magnifier, Microscopes & Telescopes

Unit-2:Physics of Home Appliances - I(Weightage :50%)

Electrical cooking appliances – (i) Electric stove and (ii) Electric Toaster (iii) Electric Iron box, (iv) water heater and coffee makers, (v)Mixer

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

*SEE: Semester End Evaluation

Reference Books

1) University Physics (volume – 3) by Samuel J ling, Jeff Sanny, William mobes.
2) Electrical machine & Appliances by Ms. A. Sumathi, Mr. R. Krishnakumar, Mr. P. Balasubramanian, Mr. K.S. Sampath Nagarajan

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CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Explain the working principles and image formation mechanisms of optical instruments such as the eye, camera, magnifiers, microscopes, and telescopes.	PO1, PO2, PO5, PSO1	U	C/P	10
CO2	Apply the laws of reflection and refraction to analyze image formation by mirrors and lenses used in optical instruments.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap	P	11
CO3	Describe the physical principles and energy conversion processes involved in common household electrical appliances like stoves, heaters, and mixers.	PO1, PO3, PO4, PO7, PO9, PSO1, PSO2	U	C/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						3	
CO2	3	3	3			2					3	3
CO3	3		3	2			2		2		3	3

3:High,2:Medium,1:Low

KADISARVAVISHWAVIDYALAYA

Mathematics Semester 1 Skill Enhancement Course

SEC214-1C Vedic Mathematics

Course Outcomes:

- **CO1:**Recall key developments in the history of Indian mathematics and apply basic multiplication techniques such as complements and base multiplication.
- **CO2:**Perform algebraic operations, divisions, and mental math techniques using traditional Indian methods.
- **CO3:**Calculate squares, cubes, square roots, and cube roots of exact numbers using Indian mathematical methods.

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
						Max Marks		
		Theory Per Week	Practical Per week		Hrs.	CCE	SEE	
SEC214-1C	Vedic Mathematics	2	0	2	2	25	25	50

Unit1 **Teaching Hours: 15**
History of Indian mathematics, Complement, Multiplication by specific numbers, Base Multiplication, Working base multiplication, Multiplication.
Unit2 **Teaching Hours: 15**
Algebra, Division, Squares, Cubes, Square root of exact squares, Cube roots of exact cube.

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

*SEE: Semester End Evaluation

Reference Books:

1. Vedic Mathematics for allages, Vandana Singhal, Shri Jinendra Press.
2. Vedic Mathematics, Jagadguru Swami Sri Bharati Krsna Tirthaji Maharaja, Motilal Banarsidass.
3. Vedic Mathematics for schools book1, J.T. Glover, Motilal Banarsidass.

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CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Recall key developments in the history of Indian mathematics and apply basic multiplication techniques such as complements and base multiplication.	PO1, PO2, PO3, PO4, PSO1, PSO2	R, U, Ap	C, P	15
CO2	Perform algebraic operations, divisions, and mental math techniques using traditional Indian methods.	PO1, PO2, PO3, PO4, PSO1, PSO2	U, Ap, E	C, P	8
CO3	Calculate squares, cubes, square roots, and cube roots of exact numbers using Indian mathematical methods.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, E	C, P	7
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	3	0	0	0	0	0	0	3	3
CO2	3	3	3	3	0	0	0	0	0	0	3	3
CO3	3	3	3	0	0	2	0	0	0	0	3	3

3:High, 2:Medium, 1:Low