



**KADI SARVA VISHWAVIDYALAYA**



**B.Sc. Curriculum as per NEP**

**for Semester 2**

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



# KADI SARVA VISHWAVIDYALAYA

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

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

## B.Sc. Semester II 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)	MBM209-1C	Microbial Physiology	60	0	4*2 = 8	50	50	100
		MBM210-1C	Microbial Growth and Control of Microorganisms	0	120				
		CHM211- 1C	Fundamentals of Chemistry-II	60	0				
		CHM212- 1C	Chemistry Practicals-II	0	120				
		PHM213- 1C	Basic Physics-II	60	0				
		PHM214- 1C	Physics Practical-II	0	120				
		MTM215-1C	Calculus and Differential Equations	60	0				
		MTM216-1C	Application of Calculus and Differential Equations	0	120				
02	Minor (Select any One)	MBE206- 1C	Fundamentals Of Microbial Physiology	30	60	4	50	50	100
		CHE207- 1C	Basics Of Chemistry-II	30	60				
		PHE208- 1C	Fundamentals of Physics-II	30	60				
		BTE209- 1C	Basics of Botany-II	30	60				
		MTE210- 1C	Probability and Probability Distributions-I	30	60				
03	MDC (Select any One)	MDC216- 1C	Microbial Growth and Its Control	30	60	4	50	50	100
		MDC217- 1C	Fundamentals of Botany-II	30	60				
		MDC218- 1C	Introduction to Chemistry- II	30	60				
		MDC219- 1C	Fundamentals of Computational Physics-II	30	60				
		MDC220- 1C	Object Oriented Programming using C++	30	60				
04	AEC	AEC204- 1C	Communication Skills	30	0	2	25	25	50
05	VAC	VAC201- 1C	Environmental Studies	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)	SEC216- 1C	Basic Mycology	30	0	2	25	25	50
		SEC217- 1C	Chemistry Instrumentation And Laboratory Skills - II	30	0				
		SEC218- 1C	Introduction to Measurements and Instrumentation I	30	0				
		SEC219- 1C	Cyber Sphere and Security: Global Concern	30	0				
		Total				22	275	275	550

**Note:**

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



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## Microbiology Semester II Major Course

### MBM 209-1C - Microbial Physiology

#### COURSE OUTCOMES:

- CO1: Discuss the nutritional requirements and types of microorganisms, and evaluate environmental conditions that influence microbial growth and survival.
- CO2: Describe the mechanisms of nutrient uptake and transport in microbial cells.
- CO3: Explain the bacterial growth cycle and derive mathematical expression of microbial growth.
- CO4: Describe the growth patterns of microorganisms in different culture systems and compare methods for measuring microbial growth.
- CO5: Explain general principles for microbial control, and compare physical methods for controlling microbial growth
- CO6: Discuss and design appropriate disinfection strategies using chemical agents based on their properties, mechanisms of action, and target microorganisms.

#### TEACHING AND EVALUATION SCHEME:

Course code	Course Title	Credit	Teaching Scheme (Hrs. Per Week )	Examination Scheme			Total Marks
				Theory	Hrs.	Max Marks	
			CCE			SEE	
MBM209-1C	Microbial Physiology	4	4	2.5	50	50	100

#### **Unit 1: Nutritional requirement and Transport**

Teaching Hours: 15 (Weightage 25%)

- Nutritional requirements of micro-organism.
- Nutritional types of bacteria (Phototrophs, Chemotrophs, Autotrophs and Heterotrophs).
- Classification of bacteria on the basis of growth supporting environmental factors such as Oxygen, Temperature, pH, osmotic pressure, Salt and Hydrostatic pressure.
- Uptake of nutrients by cell
  - Passive and facilitated diffusion,
  - Primary and secondary active transport,
  - Concept of uniport, symport and antiport,
  - Group translocation

#### **Unit 2: Microbial Growth**

Teaching Hours: 15 (Weightage 25%)

- Microbial Growth: Definition and Introduction.
- Modes of cell division in bacteria.
- Mathematical Expressions of Microbial Growth.
- Normal Growth Cycle of Bacteria, generation time and specific growth rate.
- Batch culture, Continuous culture, synchronous growth, diauxic growth.
- Methods for the Measurement of microbial growth



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- Total cell count,
- Viable cell count,
- Biomass determination and Biological assay,
- Kjeldahl's method (C and N content),
- ATP Bioluminescence Method

### Unit 3: Control of Microorganisms I

Teaching Hours: 15 (Weightage 25%)

- General principles: Control by killing, inhibition and removal.
- Definition of Terms: Bactericidal, Bacteriostatic, MIC, MLD, LD50, Chemotherapy, Antibiotic, Growth Factor Analogue.
- Concept of sterilization, disinfection, aseptic and sanitation.
- Pattern of Microbial death, Conditions influencing effectiveness of antimicrobial agent activity.
- Physical methods of control- Temperature, radiation, desiccation, osmotic pressure, filtration.

### Unit 4: Control of Microorganisms II

Teaching Hours: 15 (Weightage 25%)

- Characteristics of ideal disinfectants.
- Modes of action of disinfectants.
- Chemical methods of control- Phenol, alcohol, halogens, heavy metals, dyes, detergents, quaternary ammonium compounds, aldehydes and gaseous chemo sterilizers.
- Evaluation of antimicrobial potency of disinfectants and antiseptics- Tube dilution, Agar Diffusion, Phenol coefficient.

\*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. (1993). 5<sup>th</sup> edition. McGraw Hill Book Company, USA
2. Prescott Harley Kleins Microbiology- Willey, Joanne M; Sherwood, Linda; Woolverton, Christopher J; Prescott, Lansing M., 7<sup>th</sup> edition. McGraw-Hill Higher Education, USA.
3. Elementary Microbiology- H.A. Modi, Ekta Prakashan, India.

### Suggested Reference Books:

1. General Microbiology- Stanier RY, Ingraham JL, Wheelis ML, and Painter PR., 5<sup>th</sup> edition. McMillan.
2. General Microbiology- Powar CB, Dagainawala HF, Himalaya Publishing House, India.



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	Course Outcome	POs/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Discuss the nutritional requirements and types of microorganisms, and evaluate environmental conditions that influence microbial growth and survival.	PO1, PO2 PSO1	U, R	C	7
CO2	Describe the mechanisms of nutrient uptake and transport in microbial cells.	PO1, PO2 PSO1	U, R	C	8
CO3	Explain the bacterial growth cycle and derive mathematical expression of microbial growth.	PO1, PO2, PSO1, PSO2	U, R, Ap	C, P	6
CO4	Describe the growth patterns of microorganisms in different culture systems and compare methods for measuring microbial growth.	PO1, PO2, PO3, PSO1, PSO2	U, R, Ap, An	C, P	9
CO5	Explain general principles for microbial control, and compare physical methods for controlling microbial growth	PO1, PO2, PO3, PO6, PSO1, PSO2	U, R, Ap, An,	C, P	15
CO6	Describe and design appropriate disinfection strategies using chemical agents based on their properties, mechanisms of action, and target microorganisms.	PO1, PO2, PO3, PO4 PO6, PSO1, PSO2	Ap, An, E, Cr	C, P	15
	<b>Total hour of Instruction</b>				<b>60</b>

### 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	3
CO5	3	3	3			3					3	3
CO6	3	3	3	2		3					3	3

3: High, 2: Medium, 1: Low

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## Microbiology Semester II Major Course

### MBM210-1C - Microbial Growth and Control of Microorganisms

#### COURSE OUTCOMES:

- CO1: Demonstrate safe practices in a microbiology lab.
- CO2: Develop proficiency in enrichment, cultivation and isolation of bacteria and demonstrate use of selective, differential, and enriched media for microbial growth.
- CO3: Apply techniques for preservation of microbial cultures.
- CO4: Demonstrate growth curve of bacteria and measurement of microbial growth.
- CO5: Analyze the effect of physical and chemical environmental conditions on microbial growth.
- CO6: Evaluate use of antibiotics, chemicals and heavy metals for controlling growth of microorganisms.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	Examination Scheme			Total Marks
				Hrs.	Max Marks		
			Practical		CCE	SEE	
MBM210-1C	Microbial Growth and Control of Microorganisms	4	8	5	50	50	100

<b>Practicals</b>	<b>Teaching Hours 60 (Weightage 50%)</b>
<ol style="list-style-type: none"> <li>1. Safety precautions to work in Microbiology Laboratory.</li> <li>2. Cultivation techniques- Broth culture, Agar slope culture.</li> <li>3. Isolation of bacteria: Streak Plate, Pour Plate, Spread Plate technique</li> <li>4. Enrichment of bacteria by batch culture technique.</li> <li>5. To study growth curve of <i>E. coli</i>.</li> <li>6. Measurement of microbial growth by Plate count method.</li> <li>7. Preservation of fungal and bacterial culture – use of mineral oils, use of slant, use of soil.</li> <li>8. Use of Selective, Differential and Enriched medium.</li> </ol>	
<b>Practicals</b>	<b>Teaching Hours 60 (Weightage: 50%)</b>
<ol style="list-style-type: none"> <li>1. To study effect of U.V. light on Bacteria.</li> <li>2. To study effect of antibiotics on microbes</li> <li>3. To study effect of chemicals on microbes</li> <li>4. To study effect of temperature on bacterial growth.</li> <li>5. To study effect of pH on bacterial growth.</li> <li>6. To study effect of osmotic pressure (salt and sugar concentration) on bacterial growth.</li> <li>7. To study oligodynamic action of heavy metals on bacterial growth.</li> </ol>	

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

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\*SEE: Semester End Evaluation

## Reference Books:

1. Experimental Microbiology- Patel R.J. and Patel R.K., Volume I and II, 9<sup>th</sup> Edition, Aditya Publisher, India.
2. General Microbiology- Stanier, Ingraham et al., (1987). 4<sup>th</sup> & 5<sup>th</sup> Ed. Macmillan Education Ltd.
3. Fundamental Principles of Bacteriology- A.J. Salle, McGraw-Hill Publishing Company, USA.

## Suggested Reference Books

1. Practical Microbiology- Dubey R. C. and Maheshwari D. K., S. Chand and Company Limited, New Delhi, India
2. Microbiology: A Laboratory Manual- James G. Cappuccino and Chad Wels, 11th Edition, Global edition, Pearson Education, USA.

	Course Outcome	POs/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Demonstrate safe practices in a microbiology lab.	PO1, PO2, PO3, PSO1, PSO2	U, R, Ap, An	C, P	6
CO2	Develop proficiency in enrichment, cultivation and isolation of bacteria and demonstrate use of selective, differential, and enriched media for microbial growth.	PO1, PO2, PO3, PO4, PSO1, PSO2	U, Ap, An, Cr	C, P	24
CO3	Apply techniques for preservation of microbial cultures.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap	C, P	6
CO4	Demonstrate growth curve of bacteria and measurement of microbial growth.	PO2, PO3, PO4, PO6, PSO2	Ap, An, Cr	P	24
CO5	Analyze the effect of physical and chemical environmental conditions on microbial growth.	PO2, PO3, PO4, PO6, PSO2	Ap, An, Cr	P	36
CO6	Evaluate use of antibiotics, chemicals and heavy metals for controlling growth of microorganisms.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	An, E, Cr	C, P	24
<b>Total hour of Instruction</b>					<b>120</b>

## 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
CO4		3	3	3		3						3
CO5		3	3	3		3						3
CO6	3	3	3	3		3					3	3

3: High, 2: Medium, 1: Low



# KADI SARVA VISHWAVIDYALAYA

## Chemistry Semester II Major Course

### CHM211-1C FUNDAMENTALS OF CHEMISTRY - II

#### Course Outcomes:

- CO1: Describe the properties and oxidation states of the d-block, lanthanides, and actinides, and explain lanthanide contraction and separation methods.
- CO2: Explain the classification and orientation effects of substituent groups in electrophilic aromatic substitution reactions.
- CO3: Describe the mechanisms of nitration, sulfonation, halogenation, and Friedel-Crafts reactions, including the factors influencing reactivity and substitution patterns.
- CO4: Explain the principles of acid-base theories and the factors affecting acidity and basicity in organic compounds.
- CO5: Describe the concept, classification of Hard and Soft Acids and Bases based on hardness, softness, and electronegativity.
- CO6: Apply rate equations to analyse zero, first, second, and third-order reactions and determine kinetic parameters through numerical problem-solving.

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	Max Marks		
						CCE	SEE	
CHM211-1C	Fundamentals of Chemistry-II	4	0	4	2.5	50	50	100

#### Contents

<b>Unit1: Chemistry of elements</b>	<b>Teaching Hours:15</b>	<b>(Weightage25%)</b>
<ul style="list-style-type: none"><li>• <b>d-block elements</b> - Electronic Configuration. Oxidation state, Periodic properties, Basic properties</li><li>• <b>Lanthanides and Actinides</b> - Electronic Configuration. Oxidation state, Contraction, Separation methods</li></ul>		
<b>Unit2: Electrophilic Aromatic Substitution</b>	<b>Teaching Hours:15</b>	<b>(Weightage25%)</b>
<ul style="list-style-type: none"><li>• Introduction, Effect of substituent groups, Determination of orientation and relative reactivity, Classification of substituent groups, Orientation and synthesis, Mechanism of nitration, Sulfonation, Friedel-Craft alkylation and halogenations, Orientation in mono and disubstituted benzenes, Electrophilic aromatic substitution (Two steps), Theory of reactivity, Theory of orientation, Electron release via resonance</li></ul>		
<b>Unit3: Acid Base Concept</b>	<b>Teaching Hours:15</b>	<b>(Weightage 25%)</b>
<ul style="list-style-type: none"><li>• Proton Acids-Bases theory, Lewis Acids-Bases theory, Scale of acidity-basicity, Factors affecting acidity and basicity of organic compounds, Effect of hybridization, Steric effects, Effects by hydrogen bonding</li><li>• Hard and Soft Acid and Bases (HSAB)- Classification of Acid and Bases as hard and soft. Pearson's HSAB concept, Acid base strength vs hardness and softness, Relation of electronegativity with hardness and softness.</li></ul>		

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**Unit4: Chemical kinetics**

**Teaching Hours: 15**

**(Weightage25%)**

- Rate of reaction, Order of reaction, Molecularity, Pseudo order reaction, • Rate equation for zero, first and second order reaction. ( $a=b$ ), ( $a \neq b$ ) • Characteristics of second order reaction. • Rate equation for third order reaction ( $a=b=c$ ) • Characteristics of third order reaction. • 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, 5th edn.
2. Text book of Organic Chemistry, Arun Bahal, S. Chand.

### **SUGGESTED BOOKS:**

1. Principal of Physical Chemistry by Puri, Sharma, Pathania.
2. Analytical Chemistry, Garry D.Christain

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CO	Course Outcome	POs/ PSOs	CL Cognitive level	Knowled ge Category	Class Session
CO1	Describe the properties and oxidation states of the d-block, lanthanides and actinides, and explain lanthanide contraction and separation methods.	PO1, PO2, PSO1	U	C	15
CO2	Explain the classification and orientation effects of substituent groups in electrophilic aromatic substitution reactions.	PO1, PO2, PSO1	U	C	6
CO3	Describe the mechanisms of nitration, sulfonation, halogenation, and Friedel-Crafts reactions, including the factors influencing reactivity and substitution patterns.	PO1, PO2, PO3, PSO1	U, Ap	C	9
CO4	Explain the principles of acid-base theories and the factors affecting acidity and basicity in organic compounds.	PO1, PSO1, PSO2	U	C	8
CO5	Describe the concept, classification of Hard and Soft Acids and Bases based on hardness, softness and electronegativity.	PO1, PSO1	R, U	C	7
CO6	Apply rate equations to analyse zero, first, second, and third-order reactions and determine kinetic parameters through numerical problem-solving.	PO1, PO3, PSO1, PSO2	U, Ap, An	C, P	15
	<b>Total hours of Instruction</b>				<b>60</b>

### 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	
CO3	3	3	2								3	
CO4	3										3	2
CO5	3										3	
CO6	3		2								3	2

3: High, 2: Medium, 1: Low

*Alp Patel*



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## Chemistry Semester II Major Course CHM212-1C CHEMISTRY PRACTICALS - II

### Course Outcomes:

- CO1: Recall and identify organic compounds based on functional group analysis, and determine their melting and boiling points accurately.
- CO2: Explain the preparation of suitable derivatives for organic compounds and interpret their significance in compound identification.
- CO3: Perform chemical kinetics experiments to study reaction rates and analyse the effects of concentration and temperature on reaction mechanisms.
- CO4: Measure physical properties such as viscosity and surface tension of liquids and mixtures, and apply graphical methods to determine composition and comparative efficiencies.
- CO5: Prepare colloidal solutions and emulsions, and evaluate the effectiveness of different oils and emulsifying agents in stabilising colloidal systems.
- CO6: Design and conduct comprehensive experiments integrating organic analysis, kinetics, and surface chemistry to solve complex practical problems and present accurate conclusions.

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
				Practical hrs Per Week	Hrs.	Max Marks	
		CCE				SEE	
CHM212-1C	Chemistry Practicals-II	8	4	5	50	50	100

### UNIT-I Practical (Organic),

Any Ten

Teaching Hours:60

- Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point, Preparation of suitable derivative.
- List of compounds  
Acids: Benzoic acid, Cinnamic acid, Phthalic acid, Oxalic acid, Succinic acid.
- Phenols:  $\alpha$ -Naphthol,  $\beta$ -Naphthol.
- Bases: p-Toluidine, Diphenylamine, Aniline.
- Neutrals : Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene, Acetone, Benzaldehyde, Methyl acetate, Ethyl acetate, Ethanol, 1-Propanol, Glycerol, Chloroform, Carbon tetrachloride, Chlorobenzene, Nitrobenzene.

### UNIT-II Practical (Physical)

Teaching Hours:60

- **Chemical Kinetics Experiments**
- To study the kinetics of the reaction of decomposition of  $H_2O_2$  catalysis by iodine ion (Clock reaction)
- Effect of concentration and temperature on the rate of reaction between Sodium Thiosulphate and Hydrochloric acid.
- Reaction between Potassium Iodate, ( $KIO_3$ ) and Sodium Sulphite: ( $Na_2SO_3$ ) using starch solution as an indicator (clock reaction).

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- **Viscosity (Any Two)**
- To determine the viscosity of different mixtures of liquid A and B and determine the percentage composition of unknown mixture by graphical method
- Stalagmometry
- To determine the surface tension and compare cleaning-efficiency of two samples of a detergent or soap with stalagmometer
  
- **Surface Chemistry (Any Two)**
- To prepare colloidal solution (sol) of starch and gum.
- To prepare ferric hydroxide,  $[\text{Fe}(\text{OH})_3]$  sol. And aluminium hydroxide,  $[\text{Al}(\text{OH})_3]$  sol.
- To study the effectiveness of different common oils (castor oil, cottonseed oil, coconut oil, kerosene oil, mustard oil) in forming emulsions.
- To compare the effectiveness of a number of emulsifying agents in forming emulsions.

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

\*SEE: Semester End Evaluation

### Reference books:

[1] Vogel AI, Furniss BS. Vogel's textbook of practical organic chemistry. 5th ed. London: Longman Scientific & Technical; 1989.

### SUGGESTED BOOKS:

[2] Principle of Physical Chemistry by Puri, Sharma, Pathania.

*Sh. Patel*



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CO	Course Outcomes	POs/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Recall and identify organic compounds based on functional group analysis, and determine their melting and boiling points accurately.	PO1, PSO1, PSO2	R, U	C, P	20
CO2	Explain the preparation of suitable derivatives for organic compounds and interpret their significance in compound identification.	PO1, PO2, PSO1, PSO2	U	C	20
CO3	Perform chemical kinetics experiments to study reaction rates and analyze the effects of concentration and temperature on reaction mechanisms.	PO1, PO6, PSO2	Ap, An	P	20
CO4	Measure physical properties such as viscosity and surface tension of liquids and mixtures, and apply graphical methods to determine composition and comparative efficiencies	PO1, PO2, PSO1, PSO2	Ap, An	P	20
CO5	Prepare colloidal solutions and emulsions, and evaluate the effectiveness of different oils and emulsifying agents in stabilizing colloidal systems.	PO1, PO2, PSO1, PSO2	Ap, E	C	20
CO6	Design and conduct comprehensive experiments integrating organic analysis, kinetics, and surface chemistry to solve complex practical problems and present accurate conclusions	PO1, PO3, PSO2	C	C, P	20
<b>Total hour of Instruction</b>					<b>120</b>

## 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	3
CO3	3					1						3
CO4	3	3									3	3
CO5	3	3									3	3
CO6	3		1									3

3: High, 2: Medium, 1: Low

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## Physics Semester II - Major Course

### PHM213-1C Basic Physics-II

#### COURSE OUTCOMES:

- CO1: Explain the principles of refraction through lenses and analyze optical parameters such as principal foci, cardinal points, and equivalent focal length.
- CO2: Apply the concept of interference in thin films to determine the wavelength of light and refractive index of liquids using Newton's Rings experiments.
- CO3: Describe the fundamental concepts of elasticity, including stress, strain, elastic constants, and relate them to mechanical behaviour of solids under deformation.
- CO4: Calculate Young's modulus, Poisson's ratio, and energy stored in elastic materials using standard experimental and mathematical methods.
- CO5: Perform vector algebra and vector analysis to evaluate physical quantities such as gradient, divergence, and curl in scalar and vector fields.
- CO6: Analyze the motion of particles in resistive media and central force fields, including the derivation of orbital equations and application of Kepler's laws.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
				Theory Per Week	Hrs.	Max Marks	
		CCE				SEE	
PHM213-1C	Basic Physics-II (Major)	4	4	2.5	50	50	100

#### Unit 1: Refraction through Lenses & Interference

Teaching Hours: 15 (Weightage 25%)

Introduction Principal Foci, least possible distance between an object & it's real image in a convex lens, Derivation produced by a thin lens, Equivalent Focal Length of Two Thin Lenses Separated by a Finite Distance, Cardinal Points of an Optical system, Principal Foci and Focal Planes, Principal Points and Principal Planes, Nodal Points, Illustrative Problems.

Interference in thin films, Interference due to reflected light, Interference due to transmitted light, Interference due to wedge shaped thin film, Newton's Rings, Determination of the wavelength of sodium light using Newton's Rings, Refractive Index of a Liquid using Newton's Rings, Illustrative Problems

#### Unit 2: Basics of Elasticity

Teaching Hours: 15 (Weightage 25%)

Introduction, Load, Stress and Strain, Hooke's law, Elastic limit, Behavior of a wire or a bar under increasing stress, Elastic behavior of solids in general, Different types of elasticity, Equivalence of a shear to a tensile and a compressive strain at right angles to each other and each equal to half the shear, Work done per unit volume (or energy per unit volume) in a strain, Poisson's ratio, Relations connecting the elastic constants-deformation of a cube, Limiting values of Poisson's ratio(s), Determination of Young's modulus for a material-wire, Determination of Poisson's ratio (s), Relation between volume strain and linear strain, Ratio of Adiabatic And Isothermal Elasticities of A Gas, cantilever, Illustrative Examples.

#### Unit-3: Vector Algebra & Vector Analysis

Teaching Hours: 15 (Weightage 25%)

Vector Algebra: Introduction, Surface area as a vector, distribution law for vector products, Dyadic, Scalar Triple product, Reciprocal Vectors, Vector triple product, Rotational quantities as vectors, Rotation of coordinate axes, Pseudo-vectors & Pseudo-scalars, Illustrative Examples.

*M. J.*



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**Vector Analysis:** Differentiation of vectors with respect to time, Line integral, Surface integral, volume integral, Partial differentiation of a Vector, Gradient of a scalar point function, Divergence of a Vector, Curl of a vector point function, Introduction of Irrotational and Solenoidal vectors, related problems and Solutions, Illustrative Examples

## Unit-4: Mechanics

Teaching Hours: 15 (Weightage 25%)

### Mechanics of a single particle and of particles:

Motion of a particle subjected to a resistive force, mechanics of a system of particle, Motion of a system with variable mass.

### Motion in a central force field:

Equivalent one body problem, Motion in central force field, General features of the motion, Motion in an inverse square law force field, Equation of the orbit, Kepler's law of planetary motion, Illustrative Examples.

\*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) Elements of Properties of Matter – D. S. Mathur, S.Chand, New Delhi
- 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) Introduction to Classical Mechanics – R G Takwale & P S Puranik, McGraw Hill Education (India) Pvt. Ltd.

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Explain the principles of refraction through lenses and analyze optical parameters such as principal foci, cardinal points, and equivalent focal length.	PO1, PO2, PSO1	An	C	11
CO2	Apply the concept of interference in thin films to determine the wavelength of light and refractive index of liquids using Newton's Rings experiments.	PO1, PO2, PO3, PSO1, PSO2	Ap	P	9
CO3	Describe the fundamental concepts of elasticity, including stress, strain, elastic constants, and relate them to mechanical behavior of solids under deformation.	PO1, PO2, PSO1	U	C	12
CO4	Calculate Young's modulus, Poisson's ratio, and energy stored in elastic materials using standard experimental and mathematical methods.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap	P	8
CO5	Perform vector algebra and vector analysis to evaluate physical quantities such as gradient, divergence, and curl in scalar and vector fields.	PO1, PO2, PO3, PSO1, PSO2	Ap	P	11
CO6	Analyze the motion of particles in resistive media and central force fields, including the derivation of orbital equations and application of Kepler's laws.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	An	C/P	9
<b>Total hour of Instruction</b>					<b>60</b>



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

3:High,2:Medium,1:Low



# KADI SARVA VISHWAVIDYALAYA

## Physics Semester II - Major Course

### PHM214-1C Physics Practical - II

#### COURSE OUTCOMES:

- CO1: Demonstrate the characteristics and working of PN junction diodes, bridge rectifiers, and resonators using standard experimental setups.
- CO2: Verify Stefan's law of radiation and analyze the exponential decay of potential across a condenser in an RC circuit.
- CO3: Determine the refractive index of solids and liquids using a prism and convex lens, and explain light refraction through various optical media.
- CO4: Apply the principles of oscillatory motion in simple pendulum and Melde's string experiments to measure time period and frequency.
- CO5: Determine Young's modulus of materials using beam and cantilever methods, and evaluate elasticity-related properties of solids.
- CO6: Evaluate the moment of inertia of a flywheel and the electrostatic capacity of a condenser using mechanical and electrical techniques.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
				Practical Per Week	Hrs.	Max Marks	
		CCE				SEE	
PHM214-1C	Physics Practical - II	8	4	5	50	50	100

#### Unit-I

- 1) Study of PN junction Diode.
- 2) Study of Resonator.
- 3) Stephan's Law of radiation.
- 4) Decay of potential across condenser.
- 5) Simple Pendulum.
- 6) Refractive index of a Prism
- 7) Refractive index of a liquid using convex lens

(Weightage : 50%)

#### Unit-II

- 1) Melde's Experiment
- 2) Capacity of a Condenser
- 3) Young's modulus of Beam
- 4) Young's modulus of Cantilever
- 5) Bridge Rectifier
- 6) Calcite Prism as Polaroid
- 7) Moment of Inertia of a fly wheel.

(Weightage :50%)

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

\*SEE: Semester End Evaluation



# KADI SARVA VISHWAVIDYALAYA

**Note:**

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

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Demonstrate the characteristics and working of PN junction diodes, bridge rectifiers, and resonators using standard experimental setups.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	Ap	P	20
CO2	Verify Stefan's law of radiation and analyze the exponential decay of potential across a condenser in an RC circuit.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	An	P	20
CO3	Determine the refractive index of solids and liquids using a prism and convex lens, and explain light refraction through various optical media.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	Ap	P	20
CO4	Apply the principles of oscillatory motion in simple pendulum and Melde's string experiments to measure time period and frequency.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap	P	20
CO5	Determine Young's modulus of materials using beam and cantilever methods, and evaluate elasticity-related properties of solids.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap	P	20
CO6	Evaluate the moment of inertia of a flywheel and the electrostatic capacity of a condenser using mechanical and electrical techniques.	PO1, PO2, PO3, PO6, PSO1, PSO2	E	P	20
<b>Total hour of Instruction</b>					<b>120</b>

**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			3	3				3	3
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



# KADI SARVA VISHWAVIDYALAYA

## Mathematics Semester II – Major Course

### MTM215-1C Calculus and Differential Equations

#### Course Outcomes:

- CO1: Solve problems involving trigonometric integrals, definite integrals, and improper integrals using reduction formulas under specified conditions.
- CO2: Evaluate double and triple integrals to determine area and volume for given mathematical regions.
- CO3: Perform vector operations and compute gradient, divergence, and curl for given scalar and vector fields.
- CO4: Classify and solve first-order ordinary differential equations using appropriate methods such as separation of variables and homogeneity.
- CO5: Determine exact and non-exact differential equations and apply integrating factors to solve reducible forms.
- CO6: Solve linear and nonlinear higher-order differential equations including Bernoulli's, Clairaut's method, and Equations solvable for variables or derivatives.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Hrs.	Examination Scheme		Total Marks
		Theory Per Week			Max Marks		
					CCE	SEE	
MTM215-1C	Calculus and Differential Equations	4	4	2.5	50	50	100

#### Unit 1 Integral Calculus

Teaching Hours:15

Integration of trigonometric functions  $\sin^n x, \cos^n x, \sin^n x \cos^q x$  (Reduction formula), Evaluation of definite integrals, Improper integrals, Multiple integrals.

#### Unit 2 Vector Calculus

Teaching Hours:15

Scalar and vector, Addition of vectors, Unit vector, Position vector of a point, Product of three vectors, Product of four vectors, Differentiation of vectors, Gradient, Divergence, Curl and their geometrical interpretation.

#### Unit 3 Ordinary Differential Equations of First Order and First Degree

Teaching Hours:15

Introduction, Order and degree of a differential equation, Linear and non-linear differential equations, Solution of a differential equation, Types of solution of differential equation, Formation of a differential equation, The Wronskian, Method of solution of ordinary differential equation of first order and first degree, Variable separable form, Homogeneous differential equation, Non homogeneous differential equation.

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## KADI SARVA VISHWAVIDYALAYA

### Unit 4 Linear and Nonlinear Differential Equations

Teaching Hours:15

Exact differential equation, Non exact differential equation reducible to exact differential equation by multiplying with an integrating factor, Linear differential equation (Leibnitz's equation), Nonlinear differential equation reducible to linear form (Bernoulli's differential equation), Clairaut's equation, Equations solvable for  $p(dy / dx)$ , Equations solvable for  $y$ , Equations solvable for  $x$ .

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

\*SEE: Semester End Evaluation

### Reference Books:

1. Differential Equations, Dr. R.C.Shah, Books India Publications.
2. Linear Algebra and Vector Calculus, Ravish R. Singh, Mukul Bhatt, McGraw Hill Education (India) Private Limited.
3. Calculus, Dr. R. C. Shah, Books India Publication.
4. Integral Calculus, Shanti Narayan and Dr. P.K.Mittal, S. Chand Publication.
5. Ordinary and Partial Differential Equations, M.D. Raisinghania, S.Chand Publications



# KADI SARVA VISHWAVIDYALAYA

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Solve problems involving trigonometric integrals, definite integrals, and improper integrals using reduction formulas under specified conditions.	PO1, PO2, PO3, PSO1, PSO2	Ap, E	C, P	7
CO2	Evaluate double and triple integrals to determine area and volume for given mathematical regions..	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, E	C, P	8
CO3	Perform vector operations and compute gradient, divergence, and curl for given scalar and vector fields.	PO1, PO3, PO6, PSO1, PSO2	Ap, E	C, P	15
CO4	Classify and solve first-order ordinary differential equations using appropriate methods such as separation of variables and homogeneity.	PO1, PO2, PO3, PO6, PSO1, PSO2	R, U, Ap	C, P	15
CO5	Determine exact and non-exact differential equations and apply integrating factors to solve reducible forms.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, E	C, P	6
CO6	Solve linear and nonlinear higher-order differential equations including Bernoulli's, Clairaut's method, and Equations solvable for variables or derivatives.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, E	C, P	9
<b>Total hours of instruction</b>					<b>60</b>

## Mapping of COs with POs & PSOs

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

3:High, 2:Medium, 1:Low

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# KADI SARVA VISHWAVIDYALAYA

## Mathematics Semester II – Major Course

### MTM216-1C Application of Calculus and Differential Equations

#### Course Outcomes:

- CO1: Calculate area between curves and volumes of solids using disk, washer, and cylindrical shell methods.
- CO2: Evaluate volumes by slicing, and solve double and triple integrals.
- CO3: Compute divergence and curl of vector fields and interpret results in geometric or physical contexts.
- CO4: Solve real-life problems using first-order differential equations of separable, homogeneous, and non-homogeneous types.
- CO5: Apply methods like Leibnitz's and Bernoulli's to solve differential equations.
- CO6: Identify and solve exact and non-exact differential equations, and analyze trajectories using differential models.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
				Practical PerWeek	Max Marks		
		Hrs.			CCE	SEE	
MTM216-1C	Application of Calculus and Differential Equations	8	4	5	50	50	100

#### Unit 1 Applications of Integration

Teaching Hours:60

1. Finding area between curves.
2. Finding volume by slicing.
3. Finding volume of solids of revolution by disk method.
4. Finding volume of solids of revolution by Washer method.
5. Finding volume by cylindrical shells.
6. Evaluation of double integrals.
7. Evaluation of triple integrals.
8. To find divergence of vector point function.
9. To find curl of vector point function.

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## KADI SARVA VISHWAVIDYALAYA

### Unit 2 Applications of Differential Equations

Teaching Hours:60

1. Application of differential equation of first order and first degree of variable separable form.
2. Application of Leibnitz's equation.
3. Examples on Bernoulli's equation.
4. Application of homogeneous differential equation.
5. Examples on non-homogeneous differential equation.
6. Examples on exact differential equation.
7. Examples on non-Exact differential equation.
8. Trajectories.

### ReferenceBooks:

1. Differential Equations, Dr. R.C. Shah Books India Publications.
2. Linear Algebra and Vector Calculus, Ravish R. Singh, Mukul Bhatt, McGraw Hill Education(India) Private Limited.
3. Calculus, Dr. R. C. Shah, Books India Publication.
4. Integral Calculus, Shanti Narayan and Dr. P. K. Mittal, S. Chand Publication.
5. Ordinary and Partial Differential Equations, M. D. Raisinghania, S. Chand Publications.
6. Advanced Engineering Mathematics, H. K. Dass, S. Chand Publications.

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## KADI SARVA VISHWAVIDYALAYA

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Calculate area between curves and volumes of solids using disk, washer, and cylindrical shell methods.	PO1, PO2, PO3, PSO1	U, Ap	C, P	20
CO2	Evaluate volumes by slicing, and solve double and triple integrals.	PO1, PO2, PO3, PO6, PSO1	Ap, E	C, P	20
CO3	Compute divergence and curl of vector fields and interpret results in geometric or physical contexts.	PO1, PO2, PO3, PSO1, PSO2	Ap, An, E	C, P	20
CO4	Solve real-life problems using first-order differential equations of separable, homogeneous, and non-homogeneous types.	PO1, PO2, PO3, PO4, PSO1	Ap, E	C, P	16
CO5	Apply methods like Leibnitz's and Bernoulli's to solve differential equations.	PO1, PO2, PO3, PSO1, PSO2	Ap, E	C, P	22
CO6	Identify and solve exact and non-exact differential equations, and analyze trajectories using differential models.	PO1, PO2, PO3, PO6, PSO1	Ap, An, E	C, P	22
<b>Total hours of instruction</b>					<b>120</b>

### 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	0
CO2	3	3	3	0	0	2	0	0	0	0	3	0
CO3	3	3	3	0	0	0	0	0	0	0	3	2
CO4	3	3	3	1	0	0	0	0	0	0	3	0
CO5	3	3	3	0	0	0	0	0	0	0	3	2
CO6	3	3	3	0	0	2	0	0	0	0	3	0

**3:High, 2:Medium, 1:Low**

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# KADI SARVA VISHWAVIDYALAYA

## Microbiology Semester II Minor Course MBE206-1C - Fundamentals of Microbial Physiology

### COURSE OUTCOMES:

- CO1: Describe the nutritional requirements and classify microbes based on their nutritional requirements and environmental conditions.
- CO2: Understand the mechanisms of nutrient uptake and transport in microbial cells.
- CO3: Describe the bacterial growth cycle, mathematical expression of microbial growth, culturing techniques and the methods for measuring microbial growth.
- CO4: Demonstrate safe practices in a microbiology lab and develop proficiency in cultivation and isolation of bacteria.
- CO5: Demonstrate growth curve of bacteria.
- CO6: Analyze the effect of physical and chemical environmental conditions on microbial growth.

### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	
			Theory	Practical
MBE206-1C	Fundamentals of Microbial Physiology	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: Nutritional requirement and Transport** **Teaching Hours: 15 (Weightage 25%)**

- Nutritional requirements of micro-organism.
- Nutritional types of bacteria (Phototrophs, Chemotrophs, Autotrophs and Heterotrophs).
- Classification of bacteria on the basis of growth supporting environmental factors such as Oxygen, Temperature, pH, osmotic pressure, Salt and Hydrostatic pressure.
- Uptake of nutrients by cell
  - Passive and facilitated diffusion,
  - Primary and secondary active transport,
  - Concept of uniport, symport and antiport,
  - Group translocation

#### **Unit 2: Microbial Growth**

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

- Microbial Growth: Definition and Introduction.
  - Modes of cell division in bacteria.
- Mathematical Expressions of Microbial Growth.



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- Normal Growth Cycle of Bacteria, generation time and specific growth rate.
- Batch culture, Continuous culture, synchronous growth, diauxic growth.
- Methods for the Measurement of microbial growth
  - Total cell count,
  - Viable cell count,
  - Biomass determination and Biological assay,
  - Kjeldahal's method (C and N content),
  - ATP Bioluminetry Method

### Practicals

Teaching Hours: 60( Weightage 50%)

1. Safety precautions to work in Microbiology Laboratory.
2. Cultivation techniques- Broth culture, Agar slope culture.
3. Isolation of bacteria: Streak Plate, Pour Plate, Spread Plate technique.
4. To study growth curve of *E. coli*.
5. To study effect of temperature on bacterial growth.
6. To study effect of pH on bacterial growth.
7. To study effect of osmotic pressure (salt and sugar concentration) on bacterial growth.

\*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. (1993). 5<sup>th</sup> edition. McGraw Hill Book Company, USA
2. General Microbiology- Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). 5<sup>th</sup> edition, McMillan.
3. Experimental Microbiology- Patel R.J. and Patel R.K., Volume I and II, 9<sup>th</sup> Edition, Aditya Publisher, India.
4. Prescott Harley Kleins Microbiology- Willey, Joanne M; Sherwood, Linda; Woolverton, Christopher J; Prescott, Lansing M, 7<sup>th</sup> edition, McGraw-Hill Higher Education, USA.

### Suggested Reference Books:

1. General Microbiology- Powar CB, Dagainawala HF, Himalaya Publishing House, India
2. Elementary Microbiology- H.A. Modi, Ekta Prakashan, India
3. Practical Microbiology- Dubey R. C. and Maheshwari D. K., S. Chand and Company Limited, New Delhi, India
4. Microbiology: A Laboratory Manual- James G. Cappuccino and Chad Wels, 11th Edition, Global edition, Pearson Education, USA.



## KADI SARVA VISHWAVIDYALAYA

	Course Outcome	POs/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Describe the nutritional requirements and classify microbes based on their nutritional requirements and environmental conditions.	PO1, PO2 PSO1	U, R	C	7
CO2	Understand the mechanisms of nutrient uptake and transport in microbial cells.	PO1, PO2 PSO1	U, R	C	8
CO3	Describe the bacterial growth cycle, mathematical expression of microbial growth, culturing techniques and the methods for measuring microbial growth.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	U, R, Ap, An, Cr	C, P	15
CO4	Demonstrate safe practices in a microbiology lab and develop proficiency in cultivation and isolation of bacteria.	PO1, PO2, PO3, PO6, PO4, PSO1, PSO2	U, R, Ap, An, Cr	C, P	32
CO5	Demonstrate growth curve of bacteria.	PO1, PO2, PO4, PO6, PSO1, PSO2	U, Ap, Cr	C, P	8
CO6	Analyze the effect of physical and chemical environmental conditions on microbial growth.	PO2, PO3, PO4, PO6, PSO2	Ap, An, E, Cr	C, P	20
	<b>Total hour of Instruction</b>				<b>90</b>

### 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		3					3	3
CO4	3	3	3	3		3					3	3
CO5	3	3		3		3					3	3
CO6		3	3	3		3						3

3: High, 2: Medium, 1: Low

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# KADI SARVA VISHWAVIDYALAYA

## Chemistry Semester II Minor Course

### CHE207-1C BASICS OF CHEMISTRY- II

#### Course Outcomes:

- CO1: Describe the properties and oxidation states of the d-block, lanthanides, and actinides, and explain lanthanide contraction and separation methods.
- CO2: Explain the classification and orientation effects of substituent groups in electrophilic aromatic substitution reactions.
- CO3: Describe the mechanisms of nitration, sulfonation, halogenation, and Friedel-Crafts reactions, including the factors influencing reactivity and substitution patterns.
- CO4: Perform functional group analysis to identify unknown organic compounds.
- CO5: Determine the melting and boiling points of organic compounds.
- CO6: Prepare suitable derivatives to confirm the identification of organic Compounds.

Course Code	Course Title	Teaching Scheme		Credits	
		Theory hrs Per Week	Practical hrs Per Week		
CHE207-1C	Basics of Chemistry-II	2	4	4	
Examination Scheme					
Theory			Practical		Total Marks
Hrs.	Max Marks		Hrs.	Max Marks	
	CCE	SEE		CCE	
2	25	25	2.5	25	100

#### Unit1: Chemistry of Elements

Teaching Hours: 15

- d-block elements-Electronic Configuration, Oxidation state, periodic properties, Basic properties
- Lanthanides and Actinides-Electronic Configuration, Oxidation state, Contraction, Separation methods

#### Unit2: Electrophilic Aromatic Substitution

Teaching Hours: 15

- Introduction, Effect of substituent groups, Determination of orientation and relative reactivity, Classification of substituent groups, Orientation and synthesis, Mechanism of nitration, Sulfonation, Friedel-Craft alkylation and halogenations, Orientation in mono and disubstituted benzenes, Electrophilic aromatic substitution (Two steps), Theory of reactivity, Theory of orientation, Electron release via resonance

#### UNIT3: Practical (Organic),

Any Ten

Teaching Hours: 60

- Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point, Preparation of suitable derivative.
- List of compounds  
Acids: Benzoic acid, Cinnamic acid, Phthalic acid, Oxalic acid, Succinic acid.
- Phenols:  $\alpha$ -Naphthol,  $\beta$ -Naphthol.
- Bases: p-Toluidine, Diphenylamine, Aniline.
- Neutrals: Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene, Acetone, Benzaldehyde, Methyl acetate, Ethyl acetate, Ethanol, 1-Propanol, Glycerol, Chloroform, Carbon tetrachloride, Chlorobenzene, Nitrobenzene.

*Signature*



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

\*SEE: Semester End Evaluation

## REFERENCEBOOKS:

1. 'ConciseInorganicChemistry'J.D.Lee,5th edn.
2. Text book of Organic Chemistry, ArunBahal, S.Chand.
3. Principle of Physical Chemistry by Puri, Sharma, Pathania.
4. Analytical Chemistry, GarryD. Christain

## SUGGESTED BOOKS:

1. Fundamentals of Analytical Chemistry D.A.Skoog, D.M. West & F.J. Holler
2. Principles of Analytical Chemistry J.H. Kennedy
3. Analytical Chemistry- Principles & Techniques L.G.Hargis

CO	Course Outcome	POs/ PSOs	CL Cognitive level	Knowled ge Category	Class Session
CO1	Describe the properties and oxidation states of the d-block, lanthanides, and actinides, and explain lanthanide contraction and separation methods.	PO1, PO2, PSO1	U	C	15
CO2	Explain the classification and orientation effects of substituent groups in electrophilic aromatic substitution reactions.	PO1, PSO1	U	C	6
CO3	Describe the mechanisms of nitration, sulfonation, halogenation, and Friedel-Crafts reactions, including the factors influencing reactivity and substitution patterns.	PO1, PO2, PSO1	U, Ap	C	9
CO4	Perform functional group analysis to identify unknown organic compounds.	PO1, PSO2	Ap, An	C, P	20
CO5	Determine the melting and boiling points of organic compounds.	PO1, PSO2	Ap, An	P	20
CO6	Prepare suitable derivatives to confirm the identification of organic Compounds.	PO1, PSO2	Ap, An	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	2									2	
CO2	3										2	
CO3	3	2									2	
CO4	3											3
CO5	3											3
CO6	3											3

3: High, 2: Medium, 1: Low

*Dr. P. Patel*



# KADI SARVA VISHWAVIDYALAYA

## Physics Semester II - Minor Course

### PHE208-1C Fundamentals of Physics -II

#### COURSE OUTCOMES:

- CO1: Explain the principles of refraction through lenses and analyze optical parameters such as principal foci, cardinal points, and equivalent focal length.
- CO2: Apply the concept of interference in thin films to determine the wavelength of light and refractive index of liquids using Newton's Rings experiments.
- CO3: Describe the fundamental concepts of elasticity, including stress, strain, elastic constants, and relate them to mechanical behaviour of solids under deformation.
- CO4: Demonstrate the characteristics and working of PN junction diodes, bridge rectifiers, and resonators using standard experimental setups.
- CO5: Verify Stefan's law of radiation and analyze the exponential decay of potential across a condenser in an RC circuit.
- CO6: Determine the refractive index of solids and liquids using a prism and convex lens and explain light refraction through various optical media.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits		
		Theory Per Week	Practical Per week			
PHE208-1C	Fundamentals of Physics - II	2	4	4		
Examination Scheme						
Theory			Practical		Total Marks	
Max Marks			Max Marks			
Hrs.	CCE	SEE	Hrs.	CCE		SEE
2	25	25	2.5	25		25
					100	

#### Unit 1: Refraction through Lenses & Interference

Teaching Hours: 15 (Weightage 25%)

Introduction Principal Foci, least possible distance between an object & it's real image in a convex lens, Derivation produced by a thin lens, Equivalent Focal Length of Two Thin Lenses Separated by a Finite Distance, Cardinal Points of an Optical system, Principal Foci and Focal Planes, Principal Points and Principal Planes, Nodal Points, Illustrative Problems.

Interference in thin films, Interference due to reflected light, Interference due to transmitted light, Interference due to wedge shaped thin film, Newton's Rings, Determination of the wavelength of sodium light using Newton's Rings, Refractive Index of a Liquid using Newton's Rings, Illustrative Problems

#### Unit 2: Basics of Elasticity

Teaching Hours: 15 (Weightage 25%)

Introduction, Load, Stress and Strain, Hooke's law, Elastic limit, Behavior of a wire or a bar under increasing stress, Elastic behavior or solids in general, Different types of elasticity, Equivalence of a shear to a tensile and a compressive strain at right angles to each other and each equal to half the shear, Work done per unit volume (or energy per unit volume) in a strain, Poisson's ratio, Relations connecting the elastic constants-deformation of a cube, Limiting values of Poisson's ratio(s), Determination of Young's modulus for a material-wire, Determination of Poisson's ratio (s), Relation between volume strain and linear strain, Ratio of Adiabatic And Isothermal Elasticities of A Gas, cantilever, Illustrative Examples.



## KADI SARVA VISHWAVIDYALAYA

### Practical

Teaching Hours: 30

- 1) Study of PN junction Diode.
- 2) Study of Resonator.
- 3) Stephan's Law of radiation.
- 4) Decay of potential across condenser.
- 5) Simple Pendulum.
- 6) Refractive index of a Prism
- 7) Refractive index of a liquid using convex lens

### 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 refraction through lenses and analyze optical parameters such as principal foci, cardinal points, and equivalent focal length.	PO1, PO2, PSO1	An	C	10
CO2	Apply the concept of interference in thin films to determine the wavelength of light and refractive index of liquids using Newton's Rings experiments.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap	C/P	11
CO3	Describe the fundamental concepts of elasticity, including stress, strain, elastic constants, and relate them to mechanical behaviour of solids under deformation.	PO1, PO2, PO3, PO6, PSO1, PSO2	U	C	9
CO4	Demonstrate the characteristics and working of PN junction diodes, bridge rectifiers, and resonators using standard experimental setups.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	Ap	P	20
CO5	Verify Stefan's law of radiation and analyze the exponential decay of potential across a condenser in an RC circuit.	PO1, PO2, PO3, PO6, PO7, PSO1, PSO2	An	P	20
CO6	Determine the refractive index of solids and liquids using a prism and convex lens and explain light refraction through various optical media.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap	P	20
<b>Total hour of Instruction</b>					<b>90</b>



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

3:High,2:Medium,1:Low



# KADISARVAVISHWAVIDYALAYA

## Semester II - Minor Course

### BTE209-1C BASICS OF BOTANY II

#### COURSEOUTCOMES:

- **CO1:** Analyze Mendel's laws of inheritance, gene interactions, and experimental crosses using monohybrid/dihybrid ratios.
- **CO2:** Classify leaf structures based on phyllotaxy, stipule modifications, venation patterns, incision types, and complexity (simple/compound).
- **CO3:** Describe the life cycle, reproduction, and evolutionary adaptations of bryophytes with emphasis on *Marchantia*.
- **CO4:** Compare the reproductive biology and sporophyte-gametophyte dynamics of pteridophytes using *Nephrolepis* as a model.
- **CO5:** Demonstrate Mendelian principles through monohybrid/dihybrid crosses, test/back crosses, and statistical validation of genetic ratios.
- **CO6:** Identify taxonomic and morphological features of cryptogams (bryophytes, pteridophytes) and angiosperm leaves using specimens, mounts, and microscopic slides.

Course Code	Course Title	Teaching Scheme		Credits		
		Theory Hrs. Per Week	Practical Hrs. Per Week			
BTE209-1C	BASICS OF BOTANY- II	2	4	4		
Examination Scheme						
Theory			Practical			Total Marks
Max Marks			Max Marks			
Hrs.	CCE	SEE	Hrs.	CCE	SEE	
2	25	25	2.5	25	25	100

#### Contents

#### **Unit-I: Genetics and Morphology Teaching Hours: 15**

- **Genetics:** Introduction to genetics, Mendel's work and its results
- **Mendel's Experiments:**
  - Law of Dominance and Law of Segregation
    - Monohybridization and its experiment,
    - Monohybrid ratio (3:1, 1:2:1)
  - Law of Independent Assortment
    - Dihybridization and its experiment
    - Dihybrid ratio (9:3:3:1)
  - Backcross and Testcross
  - Gene Interactions: Incomplete Dominance and Co-dominance
- **Leaf:**
  - Phyllotaxy,
  - Stipules: Types and Modifications,
  - Venation,
  - Incision,
  - Simple and Compound leaves



# KADISARVAVISHWAVIDYALAYA

## Unit-2 Biology of Cryptogams (Bryophytes & Pteridophytes) Teaching Hours: 15

- Salient features of Bryophytes
  - Life history of *Marchantia* with reference to: Systematic position (Rothmaler and Proskauer) with reasons,
  - Habit and Habitat,
  - External and Internal structure of vegetative and reproductive organs,
  - Fertilization,
  - External and Internal structure of mature Sporophyte,
  - Germination of Spores
- Salient features of Pteridophytes
  - Life history of *Nephrolepis* with reference to: Systematic position (Smith) with reasons,
  - Habit and Habitat,
  - External structure of vegetative organs,
  - External and Internal structure of fertile (reproductive) leaflet,
  - Structure of mature Gametophyte along with sex organs and Fertilization.

### Practical:

Teaching Hours: 60

1. To study Mendelian Genetics through Examples:
  - Monohybrid ratio (3:1/1:2:1),
  - Dihybrid ratio (9:3:3:1)
  - Backcross and Testcross
2. To study the Life history of *Marchantia* through:
  - Specimen – Vegetative Thallus and thallus with Gemmacup
  - Mountings – Thallus and Reproductive organs
  - Permanent Slides – Thallus, Gemmacup, Antheridia, Archegonia, Sporophyte
3. To study the Life history of *Nephrolepis* through:
  - Specimen – Sporophytic plant (with Vegetative and Fertile leaflets)
  - Mountings – Hydranthode, T.S. of leaflet passing through sori, Sporangia, Spores
  - Permanent Slides – T.S. of leaflet passing through sori, Prothallus: young and mature with Antheridia, Archegonia and Sporophyte
4. To study Leaf Phyllotaxy:
  - Alternate: Distichous – *Polyalthia*; Tristichous – *Cyperus*; Pentastichous – Shoe flower,
  - Opposite: Superposed – *Quisqualis*; Decussate – *Calotropis*;
  - Verticillate (Whorled) – *Nerium/Alstonia*,
  - Mosaic – *Acalypha*
5. To study Leaf Stipules:
  - Freelateral – Shoe flower; Adnate – *Rosa*;
  - Interpetiolar – *Ixora*; Intrapetiolar – *Gardenia*;
  - Ochreate – *Polygonum*; Foliaceous – *Pisum*;
  - Spinous – *Zizyphus, Acacia*; Tendillar – *Smilax*;
  - Convolute (scaly) – *Ficus*
6. To study Leaf Venation:
  - Reticulate: Pinnate (Unicostate) – *Ficus*; Palmate (Multicostate) convergent – *Zizyphus*;
  - Palmate (Multicostate) divergent – *Ricinus*
  - Parallel: Pinnate (Unicostate) – *Canna*; Palmate (Multicostate) convergent – Maize; Palmate (Multicostate) divergent – Fan palm



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## 7. To study Leaf Incision:

- Pinnatifid–*Chrysanthemum*; Pinnatipartite–*Argemone*; Pinnatisect–Marigold
- Palmatifid–Cotton; Palmatipartite–*Ricinus*; Palmatisect–*Ipomoea palmate*

## 8. To study simple and compound Leaf

- Simple leaf: Shoe flower
- Compound leaves:
  - Pinnate: Unipinnate–Paripinnate–*Cassia*; Imparipinnate–*Rosa*; Bipinnate– *Caesalpinia*; Tripinnate – *Moringa*; Decompound – Coriander.
  - Palmate: Unifoliolate–*Citrus*; Bifoliolate–*Hardwickia binmata*; Trifoliolate–*Aegle*;
  - Quadrifoliolate–*Paris quadrifolia*,
  - Multifoliolate (Digitate)–*Bombax*.

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

\*SEE: Semester End Evaluation

### Reference Books:

Genetics Author- P. K. Gupta

Taxonomy of Angiosperm Author- B. P. Pandey

Botany for degree students Bryophyte Author- P. C. Vashishta

Botany for degree students Pteridophytes Author- P. C. Vashishta

### Suggested Books:

College Botany Vol-I Authors- Das, Dutta and Ganguli

College Botany Vol-II Authors- Ganguli and Kar

	Course Outcome	POs/PSOs	Cognitive Level	Knowledge Category	Class Session
CO1	Analyze Mendel's laws of inheritance, gene interactions, and experimental crosses using monohybrid/dihybrid ratios	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10; PSO1, PSO2	An	C, P	10
CO2	Classify leaf structures based on phyllotaxy, stipule modifications, venation patterns, incision types, and complexity (simple/compound).	PO1, PO2, PO3, PO6; PSO1, PSO2	U	F, C	5
CO3	Describe the life cycle, reproduction, and evolutionary adaptations of bryophytes with emphasis on <i>Marchantia</i>	PO1, PO2, PO3, PO4, PO5, PO6; PSO1, PSO2	U	C	8



# KADISARVAVISHWAVIDYALAYA

<b>CO4</b>	Compare the reproductive biology and sporophyte-gametophyte dynamics of pteridophytes using <i>Nephrolepis</i> as a model	PO1, PO2, PO3, PO4, PO5, PO6; PSO1, PSO2	An	C	7
<b>CO5</b>	Demonstrate Mendelian principles through monohybrid/dihybrid crosses, test/back crosses, and statistical validation of genetic ratios	PO1, PO2, PO3, PO4, PO5, PO6; PSO1, PSO2	A	P, C	24
<b>CO6</b>	Identify taxonomic and morphological features of cryptogams (bryophytes, pteridophytes) and angiosperm leaves using specimens, mounts, and microscopic slides	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10; PSO1, PSO2	R	F, P	36
<b>Total Hours of Instructions</b>					<b>90</b>

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

3: High, 2: Medium, 1: Low



# KADI SARVA VISHWAVIDYALAYA

## Mathematics Semester II - Minor Course

### MTE210-1C Probability and Probability Distributions-I

#### Course Outcomes:

- CO1: Understand the basic concepts and significance of probability theory, including classical and modern definitions.
- CO2: Apply theorems of probability, including addition, multiplication, and conditional probability, and solve problems using Bayes' theorem.
- CO3: Analyze and compute expectations of random variables using laws of expectation and geometric progression series.
- CO4: Understand the meaning, characteristics, and structure of Binomial distribution and its probability function.
- CO5: Apply Binomial distribution to compute expected frequencies and constants, and solve related statistical problems.
- CO6: Apply statistical tools such as quartiles, percentiles, deviations, variance, and standard deviation in practical data analysis and use probability distributions.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits
		Theory Per Week	Practical Per week	
MTE210-1C	Probability and Probability Distributions-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 Probability Theory

Teaching Hours:15

Definition of probability, Importance of the concept of probability, Classical probability approach, Modern definition of probability, Objective and subjective approach to probability, Experiment, Event, Types of event, Theorems of probability, Addition and multiplication theorem, Conditional probability, Bayes' theorem, Random variable, Expected value, Addition and multiplication laws of expectation, Use of geometric progression series in probability, Probability distribution of a random variable.



# KADI SARVA VISHWAVIDYALAYA

## Unit 2 Binomial Distribution

Teaching Hours:15

Probability Distributions, Usefulness of theoretical distribution, Types of theoretical distributions, Meaning of Binomial distribution, Characteristics of Binomial distribution, Probability function of Binomial distribution, Various terms of Binomial distribution, Expected frequencies of Binomial distribution, Constants of Binomial distribution.

## Practicals

Teaching Hours: 60

1. Computation of Quartiles.
2. Computation of Percentile.
3. Computation of quartile deviation.
4. Computation of percentile deviation.
5. Computation of mean deviation.
6. Computation of standard deviation and variance.
7. Examples based on probability and conditional probability.
8. Examples based on Bayes' theorem.
9. Examples on Binomial distribution.
10. Examples to calculate constants of Binomial distribution.

\*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; McCabe, P. George W.H. Freeman and Company, New York.
3. Basic Statistics, Agarwal, B.L., New Age International(P)Ltd.
4. Introduction to the theory of Statistics, Mood, A. M., Greybill, 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.
6. Business Statistics, P. C. Tulsian and Bharat Jhunjhnuwala, S. Chand and Company Limited, New Delhi.



## KADI SARVA VISHWAVIDYALAYA

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Understand the basic concepts and significance of probability theory, including classical and modern definitions.	PO1, PO2, PSO1	R, U	C, P	5
CO2	Apply theorems of probability, including addition, multiplication, and conditional probability, and solve problems using Bayes' theorem.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, An	C, P	6
CO3	Analyze and compute expectations of random variables using laws of expectation and geometric progression series.	PO1, PO2, PO3, PO6, PSO1, PSO2	Ap, An, E	C, P	4
CO4	Understand the meaning, characteristics, and structure of Binomial distribution and its probability function.	PO1, PO3, PSO1, PSO2	R, U, An	C, P	6
CO5	Apply Binomial distribution to compute expected frequencies and constants, and solve related statistical problems.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, Ap, E	C, P	9
CO6	Apply statistical tools such as quartiles, percentiles, deviations, variance, and standard deviation in practical data analysis and use probability distributions.	PO1, PO2, PO3, PO5, PO6, PO7, PSO1, PSO2	Ap, An, E	C, P	60
<b>Total hours of instruction</b>					<b>90</b>

### Mapping of COs with POs & PSOs

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

3:High, 2:Medium, 1:Low

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# KADI SARVA VISHWAVIDYALAYA

## Microbiology Semester II Multidisciplinary Course

### MDC216-1C - Microbial Growth and its Control

#### COURSE OUTCOMES:

- CO1: Discuss the nutritional requirements and types of microorganisms, and describe environmental conditions that influence microbial growth and survival.
- CO2: Describe the bacterial growth cycle and calculate growth rate and generation time.
- CO3: Explain general principles of microbial control and compare physical methods and chemical agents for controlling microbial growth.
- CO4: Demonstrate safe practices in a microbiology lab and develop proficiency in cultivation and isolation of bacteria.
- CO5: Demonstrate growth curve of bacteria.
- CO6: Analyze the effect of physical and chemical environmental conditions on microbial growth.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	
			Theory	Practical
MDC216-1C	Microbial Growth and its Control	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: Nutritional requirement Microbial Growth Teaching Hours: 15( Weightage 25%)**

- Common Nutrient requirements and Nutritional types of bacteria.
- Physical conditions required for growth: Oxygen, Temperature, pH, osmotic pressure, Salt and Hydrostatic pressure.
- Normal growth curve of bacteria.
- Introduction to growth rate, generation time.

#### **Unit 2: Control of Microorganisms Teaching Hours: 15( Weightage 25%)**

- Overview of microbial control methods: Physical, Chemical, Mechanical
- Concept of sterilization, disinfection, aseptic and sanitation.
- Physical methods of control- Temperature, radiation, desiccation, osmotic pressure, filtration.
- Chemical methods of control Phenol, alcohol, halogens, heavy metals, dyes, detergents, Quaternary ammonium compounds, aldehydes and gaseous chemosterilizer

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## KADI SARVA VISHWAVIDYALAYA

### Practicals

Teaching Hours: 60( Weightage 50%)

1. Safety precautions to work in Microbiology Laboratory.
2. Cultivation techniques- Broth culture, Agar slope culture.
3. Isolation of bacteria: Streak Plate, Pour Plate, Spread Plate technique.
4. To study growth curve of *E. coli*.
5. To study effect of temperature on bacterial growth.
6. To study effect of pH on bacterial growth.
7. To study effect of osmotic pressure (salt and sugar concentration) on bacterial growth.

\*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. (1993). 5<sup>th</sup> edition. McGraw Hill Book Company, USA
2. General Microbiology- Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005), 5<sup>th</sup> edition. McMillan.
3. Experimental Microbiology- Patel R.J. and Patel R.K., Volume I and II, 9<sup>th</sup> Edition, Aditya Publisher, India.
4. Prescott Harley Kleins Microbiology- Willey, Joanne M; Sherwood, Linda; Woolverton, Christopher J; Prescott, Lansing M, 7<sup>th</sup> edition, McGraw-Hill Higher Education, USA,

### Suggested Reference Books:

1. General Microbiology- Powar CB, Dagainawala HF, Himalaya Publishing House, India
2. Elementary Microbiology- H.A. Modi, Ekta Prakashan, India
3. Practical Microbiology- Dubey R. C. and Maheshwari D. K., S. Chand and Company Limited, New Delhi, India
4. Microbiology: A Laboratory Manual- James G. Cappuccino and Chad Wels, 11th Edition, Global edition, Pearson Education, USA.



## KADI SARVA VISHWAVIDYALAYA

	Course Outcome	POs/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Discuss the nutritional requirements and types of microorganisms, and describe environmental conditions that influence microbial growth and survival.	PO1, PO2 PSO1	U, R	C	7
CO2	Describe the bacterial growth cycle and calculate growth rate and generation time.	PO1, PO2 PSO1	U, R	C	8
CO3	Explain general principles of microbial control and compare physical methods and chemical agents for controlling microbial growth.	PO1, PO2, PO3, PO4, PO6, PSO1, PSO2	U, R, Ap, An, Cr	C, P	15
CO4	Demonstrate safe practices in a microbiology lab and develop proficiency in cultivation and isolation of bacteria.	PO1, PO2, PO3, PO6, PO4, PSO1, PSO2	U, R, Ap, An, Cr	C, P	32
CO5	Demonstrate growth curve of bacteria.	PO1, PO2, PO4, PO6, PSO1, PSO2	U, Ap, Cr	C, P	8
CO6	Analyze the effect of physical and chemical environmental conditions on microbial growth.	PO2, PO3, PO4, PO6, PSO2	Ap, An, E, Cr	C, P	20
	<b>Total hour of Instruction</b>				<b>90</b>

### 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		3					3	3
CO4	3	3	3	3		3					3	3
CO5	3	3		3		3					3	3
CO6		3	3	3		3						3

3: High, 2: Medium, 1: Low



# KADISARVAVISHWAVIDYALAYA

## Semester II - Multidisciplinary Course

### MDC217-1C– FUNDAMENTALS OF BOTANY - II

#### Course Outcomes:

- **CO1:** Analyze Mendel's laws of inheritance, gene interactions, and experimental crosses using monohybrid/dihybrid ratios.
- **CO2:** Classify leaf structures based on phyllotaxy, stipule modifications, venation patterns, incision types, and complexity (simple/compound).
- **CO3:** Describe the life cycle, reproduction, and evolutionary adaptations of bryophytes with emphasis on *Marchantia*.
- **CO4:** Compare the reproductive biology and sporophyte-gametophyte dynamics of pteridophytes using *Nephrolepis* as a model.
- **CO5:** Demonstrate Mendelian principles through monohybrid/dihybrid crosses, test/back crosses, and statistical validation of genetic ratios.
- **CO6:** Identify taxonomic and morphological features of cryptogams (bryophytes, pteridophytes) and angiosperm leaves using specimens, mounts, and microscopic slides.

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory hrs. Per Week	Practical hrs. Per Week		Hrs.	Max Marks		
						Mid Term	End Term	
<b>MDC217-1C</b>	<b>FUNDAMENTALS OF BOTANY II</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>2.5</b>	<b>50</b>	<b>50</b>	<b>100</b>

#### **Unit-1:GeneticsandMorphologyTeachingHours:15**

- **Genetics:** Introduction to genetics, Mendel's work and its results
- **Mendel's Experiments:**
  - Law of Dominance and Law of Segregation
    - Monohybridization and its experiment,
    - Monohybrid ratio (3:1, 1:2:1)
  - Law of Independent Assortment
    - Dihybridization and its experiment
    - Dihybrid ratio (9:3:3:1)
  - Backcross and Testcross
  - Gene Interactions: Incomplete Dominance and Co-dominance
- **Leaf:**
  - Phyllotaxy,
  - Stipules: Types and Modifications,
  - Venation,
  - Incision,
  - Simple and Compound leaves



# KADISARVAVISHWAVIDYALAYA

## Unit-2 Biology of Cryptogams (Bryophytes & Pteridophytes) Teaching Hours: 15

- Salient features of Bryophytes
  - Life history of *Marchantia* with reference to: Systematic position (Rothmaler and Proskauer) with reasons,
  - Habit and Habitat,
  - External and Internal structure of vegetative and reproductive organs,
  - Fertilization,
  - External and Internal structure of mature Sporophyte,
  - Germination of Spores
- Salient features of Pteridophytes
  - Life history of *Nephrolepis* with reference to: Systematic position (Smith) with reasons,
  - Habit and Habitat,
  - External structure of vegetative organs,
  - External and Internal structure of fertile (reproductive) leaflet,
  - Structure of mature Gametophyte along with sex organs and Fertilization.

### Practical's:

Teaching Hours: 60

1. To study Mendelian Genetics through Examples:
  - Monohybrid ratio (3:1/1:2:1),
  - Dihybrid ratio (9:3:3:1)
  - Backcross and Testcross
2. To study the Life history of *Marchantia* through:
  - Specimen – Vegetative Thallus and thallus with Gemmacup
  - Mountings – Thallus and Reproductive organs
  - Permanent Slides – Thallus, Gemmacup, Antheridia, Archegonia, Sporophyte
3. To study the Life history of *Nephrolepis* through:
  - Specimen – Sporophytic plant (with Vegetative and Fertile leaflets)
  - Mountings – Hydathode, T.S. of leaflet passing through sori, Sporangia, Spores
  - Permanent Slides – T.S. of leaflet passing through sori, Prothallus: young and mature with Antheridia, Archegonia and Sporophyte
4. To study Leaf Phyllotaxy:
  - Alternate: Distichous – *Polyalthia*; Tristichous – *Cyperus*; Pentastichous – Shoe flower,
  - Opposite: Superposed – *Quisqualis*; Decussate – *Calotropis*;
  - Verticillate (Whorled) – *Nerium/Alstonia*,
  - Mosaic – *Acalypha*
5. To study Leaf Stipules:
  - Freelateral – Shoe flower; Adnate – *Rosa*;
  - Interpetiolar – *Ixora*; Intrapetiolar – *Gardenia*;
  - Ochreate – *Polygonum*; Foliaceous – *Pisum*;
  - Spinous – *Zizyphus, Acacia*; Tendillar – *Smilax*;
  - Convolute (scaly) – *Ficus*
6. To study Leaf Venation:
  - Reticulate: Pinnate (Unicostate) – *Ficus*; Palmate (Multicostate) convergent – *Zizyphus*;  
Palmate (Multicostate) divergent – *Ricinus*
  - Parallel: Pinnate (Unicostate) – *Canna*; Palmate (Multicostate) convergent – Maize; Palmate (Multicostate) divergent – Fan palm



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## 7. To study Leaf Incision:

- Pinnatifid–*Chrysanthemum*; Pinnatipartite–*Argemone*; Pinnatisect–Marigold
- Palmatifid–Cotton; Palmatipartite–*Ricinus*; Palmatisect–*Ipomoea palmate*

## 8. To study simple and compound Leaf

- Simple leaf: Shoe flower
- Compound leaves:
  - Pinnate: Unipinnate–Paripinnate–*Cassia*; Imparipinnate–*Rosa*; Bipinnate–*Caesalpinia*; Tripinnate – *Moringa*; Decomound – Coriander.
  - Palmate: Unifoliolate–*Citrus*; Bifoliolate–*Hardwickia binnata*; Trifoliolate–*Aegle*;
  - Quadrifoliolate–*Paris quadrifolia*,
  - Multifoliolate (Digitate)–*Bombax*.

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

\*SEE: Semester End Evaluation

### Reference Books:

Genetics Author- P. K. Gupta

Taxonomy of Angiosperm Author- B. P. Pandey

Botany for degree students Bryophyte Author- P. C. Vashishta

Botany for degree students Pteridophytes Author- P. C. Vashishta

### Suggested Books:

College Botany Vol-I Authors- Das, Dutta and Ganguli

College Botany Vol-II Authors- Ganguli and Kar

	Course Outcome	POs/PSOs	Cognitive Level	Knowledge Category	Class Session
CO1	Analyze Mendel's laws of inheritance, gene interactions, and experimental crosses using monohybrid/dihybrid ratios	PO1, PO2, PO3, PO4, PO5, PO6, PO8, PO9, PO10; PSO1, PSO2	An	C, P	10
CO2	Classify leaf structures based on phyllotaxy, stipule modifications, venation patterns, incision types, and complexity (simple/compound).	PO1, PO2, PO3, PO6; PSO1, PSO2	U	F, C	5
CO3	Describe the life cycle, reproduction, and evolutionary adaptations of bryophytes with emphasis on <i>Marchantia</i>	PO1, PO2, PO3, PO4, PO5, PO6; PSO1, PSO2	U	C	8



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CO4	Compare the reproductive biology and sporophyte-gametophyte dynamics of pteridophytes using Nephrolepis as a model	PO1, PO2, PO3, PO4, PO5, PO6; PSO1, PSO2	An	C	7
CO5	Demonstrate Mendelian principles through monohybrid/dihybrid crosses, test/back crosses, and statistical validation of genetic ratios	PO1, PO2, PO3, PO4, PO5, PO6; PSO1, PSO2	A	P, C	24
CO6	Identify taxonomic and morphological features of cryptogams (bryophytes, pteridophytes) and angiosperm leaves using specimens, mounts, and microscopic slides	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10; PSO1, PSO2	R	F, P	36
<b>Total Hours of Instructions</b>					<b>90</b>

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

**3: High, 2: Medium, 1: Low**



# KADI SARVA VISHWAVIDYALAYA

## Chemistry Semester II Multidisciplinary Course

### MDC218-1C INTRODUCTION TO CHEMISTRY - II

#### Course Outcomes:

- CO1: Explain the principles of acid-base theories and the factors affecting acidity and basicity in organic compounds.
- CO2: Describe the concept, classification of Hard and Soft Acids and Bases based on hardness, softness, and electronegativity.
- CO3: Apply rate equations to analyse zero, first, second, and third-order reactions and determine kinetic parameters through numerical problem-solving.
- CO4: Perform functional group analysis to identify unknown organic compounds.
- CO5: Determine the melting and boiling points of organic compounds.
- CO6: Prepare suitable derivatives to confirm the identification of organic Compounds.

Course Code	Course Title	Teaching Scheme		Credits		
		Theory hrs Per Week	Practical hrs Per Week			
MDC218-1C	Introduction to Chemistry-II	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	100	

#### Unit1: Acid Base Concept

Teaching Hours: 15 Hrs

- Proton Acids- Bases theory, Lewis Acids-Bases theory, Scale of acidity-basicity, Factors effecting acidity and basicity of organic compounds, Effect of hybridization, Steric effects, Effects by hydrogen bonding
- Hard and Soft Acids and Bases(HSAB)-Classification of Acid and Bases as hard and soft. Pearson's HSAB concept, Acid base strength vs hardness and softness, Relation of electronegativity with hardness and softness.

#### Unit2: Chemical kinetics

Teaching Hours: 15 Hrs

- Rate of reaction, Order of reaction, Molecularity, pseudo order reaction, Rate equation for zero, first and second order reaction. ( $a=b$ ), ( $a \neq b$ ) • Characteristics of second order reaction. • Rate equation for third order reaction ( $a=b=c$ ) • Characteristics of third order reaction. • Numerical

#### Unit3: Practical Organic (Any Ten)

Teaching Hours: 60

- Identification of an organic compound through the functional group analysis, Determination of melting point and boiling point, Preparation of suitable derivative.
- List of compounds
- Acids : Benzoic acid, Cinnamic acid, Phthalic acid, Oxalic acid, Succinic acid.
- Phenols:  $\alpha$ -Naphthol,  $\beta$ -Naphthol.
- Bases: p-Toluidine, Diphenylamine, Aniline.
- Neutrals: Naphthalene, Anthracene, Acetamide, Benzamide, Acetanilide, m-Dinitrobenzene, Urea, Thiourea, Toluene, Acetone, Benzaldehyde, Methylacetate, Ethylacetate, Ethanol, 1-Propanol, Glycerol, Chloroform, Carbon tetrachloride, Chlorobenzene, Nitrobenzene.

*Signature*



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

\*SEE: Semester End Evaluation

## REFERENCE BOOKS:

[1] Vogel AI, Furniss BS. Vogel's textbook of practical organic chemistry. 5th ed. London:Longman Scientific & Technical; 1989.

## SUGGESTED BOOKS:

[1] Principles of Physical Chemistry by Puri, Sharma, Pathania.

CO	Course Outcome	POs/ PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Explain the principles of acid-base theories and the factors affecting acidity and basicity in organic compounds.	PO1, PO2, PSO1	U	C	8
CO2	Describe the concept, classification of Hard and Soft Acids and Bases based on hardness, softness, and electronegativity.	PO1, PO3, PSO1	R, U	C	7
CO3	Apply rate equations to analyse zero, first, second, and third-order reactions and determine kinetic parameters through numerical problem-solving.	PO1, PO2, PO3, PSO1	U, Ap, An	C, P	15
CO4	Perform functional group analysis to identify unknown organic compounds.	PO1, PO2, PSO2	Ap, An	C, P	20
CO5	Determine the melting and boiling points of organic compounds.	PO1, PSO2	Ap, An	P	20
CO6	Prepare suitable derivatives to confirm the identification of organic Compounds.	PO1, PO6, PSO2	Ap, An	P	20
	<b>Total hours of Instruction</b>				<b>90</b>

## 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		1								2	
CO3	3	3	1								2	
CO4	3	3										3
CO5	3											3
CO6	3					1						3

3: High, 2: Medium, 1: Low

*Alp Patel*



# KADI SARVA VISHWAVIDYALAYA

## Physics Semester II - Multidisciplinary Course

### MDC219-1C Fundamentals of Computational Physics - II

#### COURSE OUTCOMES:

- CO1: Describe the fundamental concepts, data types, and array/matrix operations in GNU Octave and compare its capabilities with MATLAB.
- CO2: Develop Octave programs using variables, loops, conditional statements, and user-defined functions to solve basic mathematical and scientific problems.
- CO3: Visualize data using various plotting techniques in Octave including 2D, 3D, and statistical graphs for effective interpretation of computational results.
- CO4: Simulate physical systems such as radioactive decay, pendulum motion, and projectile motion using numerical methods like Euler's method.
- CO5: Analyze dynamic physical systems including RC circuits, planetary motion (Kepler's laws), and the motion of charged particles in electromagnetic fields through coding.
- CO6: Apply vector calculus concepts such as gradient, divergence, and curl to interpret spatial field variations in simulated environments.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits		
		Theory Per Week	Practical Per week			
MDC219-1C	Fundamentals of Computational Physics -II	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, Variables & Data types

Teaching Hours: 15

GNU Octave- general introduction, Applications of GNU Octave, Limitations and drawback of Octave, GNU Octave as alternative of MATLAB, Comparison Octave Vs MATLAB, Octave GUI, Simple Mathematical Operations, Built-in Mathematical Constants, Variables in GNU Octave, Global Variables, Conventions for Naming Variables, Data types in Octave, Arrays, Vector & Matrices, Indexing and operations of Arrays, Matrix manipulations functions

#### Unit-2 :Loops, Functions, Files & Data Visualization

Teaching Hours: 15

Decision Making with If Statements, Loops, User-Defined Functions, Global Variables, Simple Plots, Plotting Options, Error bars, Visualizations – ScatterGraphs, Histograms, Contours, Polar Graphs, pie chart, Visualizing Data as Images, 3D visualizations

#### List of Practical

Teaching Hours: 30

- 1) Uranium Decay
- 2) The Pendulum- solution using the Euler method
- 3) Kepler's Laws – simulation of Earth's orbit with some initial velocity and time step
- 4) Trajectories for idea projectile motion
- 5) RC Circuit – Charging of Capacitor



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- 6) Motion of a Charge particle in EM field  
7) Curl, Divergence and Gradient

### 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

### Reference Books

- 1) GNU Octave (A high-level interactive language for numerical computations) by John W. Eaton, David Bateman, Søren Hauberg, Rik Wehbring, Edition 8 for Octave version 8.3.0 August 2023 (The Octave Project Developers)
- 2) GNU Octave by Example - A Fast and Practical Approach to Learning GNU Octave by Ashwin Pajankar & Sharvani Chandu, Apress
- 3) Introduction to GNU Octave- A brief tutorial for linear algebra and calculus students by Jason Lachniet
- 4) Introduction to Octave by Dr. P.J.G. Long, Department of Engineering, University of Cambridge
- 5) Programming for Computations – MATLAB/Octave by Svein Linge · Hans Petter Langtangen, Springer Open

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Describe the fundamental concepts, data types, and array/matrix operations in GNU Octave and compare its capabilities with MATLAB.	PO1, PO2, PO7, PSO1	U	C	12
CO2	Develop Octave programs using variables, loops, conditional statements, and user-defined functions to solve basic mathematical and scientific problems.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	Ap	P	8
CO3	Visualize data using various plotting techniques in Octave including 2D, 3D, and statistical graphs for effective interpretation of computational results.	PO1, PO2, PO4, PO5, PO6, PO7, PSO1, PSO2	Ap	P	10
CO4	Simulate physical systems such as radioactive decay, pendulum motion, and projectile motion using numerical methods like Euler's method.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	Ap	P	20
CO5	Analyze dynamic physical systems including RC circuits, planetary motion (Kepler's laws), and the motion of charged particles in electromagnetic fields through coding.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	An	P	20
CO6	Apply vector calculus concepts such as gradient, divergence, and curl to interpret spatial field variations in simulated environments.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	Ap	C/P	20
<b>Total hour of Instruction</b>					<b>90</b>

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

3:High,2:Medium,1:Low



# KADI SARVA VISHWAVIDYALAYA

## Mathematics Semester II – Multidisciplinary Course

### MDC220-1C Object Oriented Programming using C++

#### Course Outcomes:

- CO1: Explain OOP features, basic C++ syntax, data types, and control structures.
- CO2: Use functions and classes to write simple programs demonstrating encapsulation and class structure.
- CO3: Construct and destroy objects using constructors and destructor in structured programs.
- CO4: Implement inheritance models (single, multiple, multilevel, etc.) and demonstrate correct derived class structures.
- CO5: Apply polymorphism via function and operator overloading to design reusable code.
- CO6: Integrate OOP concepts to build modular and reusable solutions for basic programming problems.

#### TEACHING AND EVALUATION SCHEME:

Course Code	Course Title	Teaching Scheme		Credits
		Theory Per Week	Practical Per week	
MDC220-1C	Object Oriented Programming using 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 Overview of C++ and basic Concepts

Teaching Hours:15

Introduction to features of Object-Oriented Programming v/s Procedural Programming, OOP basic concepts, C++ basic syntax and structure, Data types and modifiers, Variables, Operators, sizeof and typedef, Decision making, Loop types, Storage classes, Functions, Classes and Objects: Defining class and object, Access controls in classes, Accessing data members, Member functions in class

#### Unit 2 Constructor and Destructor, Inheritance and Overloading

Teaching Hours:15

Constructor and Destructor, Introduction of inheritance, Defining a derived class, Different kinds of inheritance: Single, Multilevel, Multiple, Hierarchical, Hybrid inheritances, Polymorphism, Function overriding, Operator overloading and Function overloading

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## Practicals

TeachingHours:60

1. Programs based on input and output.
2. Programs on iterations.
3. Programs on control structures.
4. Examples of all types of constructors.
5. Examples of all types of destructor.
6. Programs based on all types of Inheritance.
7. Programs based on function overloading.
8. Programs of operator overloading.

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

\*SEE: Semester End Evaluation

## Reference Books:

1. E. Balaguruswamy, Object Oriented Programming in C++.
2. Schaums Outline series, *Programming in C++*.
3. Venugopal, Rajkumar, Ravishankar, *Mastering C++*, Mc Graw Hill.
4. Stroustrup, Bjarne, *The C++ Programming Language*, Addison Wesley.
5. Robert Lafore, *Object Oriented Programming in C++*, McGraw Hill.

CO	Course outcome	POs / PSO's	Cognitive level	Knowledge category	Class session
CO1	Explain OOP features, basic C++ syntax, data types, and control structures.	PO1, PO2, PSO1	R, U	C, P	11
CO2	Use functions and classes to write simple programs demonstrating encapsulation and class structure.	PO1, PO2, PO3, PO7, PSO1	U, Ap	C, P	15
CO3	Construct and destroy objects using constructors and destructors in structured programs.	PO1, PO3, PO4, PO6, PSO1	Ap, An, C	C, P	15
CO4	Implement inheritance models (single, multiple, multilevel, etc.) and demonstrate correct derived class structures.	PO1, PO2, PO3, PO4, PO7, PSO2	U, Ap, An	C, P	17
CO5	Apply polymorphism via function and operator overloading to design reusable code.	PO1, PO3, PO4, PO6, PSO2	Ap, An	C, P	17
CO6	Integrate OOP concepts to build modular and reusable solutions for basic programming problems.	PO1, PO3, PO4, PO6, PO7, PSO1, PSO2	Ap, An, C	C, P	15
<b>Total hours of instruction</b>					<b>90</b>



# KADI SARVA VISHWAVIDYALAYA

## Mapping of COs with POs & PSOs

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

3:High, 2:Medium, 1:Low

Sheep



# KADI SARVA VISHWA VIDYALAYA

## Ability Enhancement Course – Semester 2

### AEC- 204-1C –Communication Skills

#### Course Outcomes:

- CO 1:** Discuss the major aspects of the process of communication, its importance and types of effective listening.
- CO 2:** Describe the input skills (Listening & Reading) in terms of their importance, types and improvement strategies.
- CO 3:** Distinguish between various forms of verbal and non-verbal communication, and implement their principles in diverse social and professional context.
- CO 4:** Paraphrase the major aspects of professional communication.

#### Teaching and Evaluation Scheme:

Course Code	Course Title	Teaching Scheme	Credits	Examination Scheme			Total Marks
		Theory Per Week		Hrs.	Max Marks		
					CCE	SEE	
AEC-204-1C	Communication Skills	2	2	2	25	25	50

#### Unit 1: Fundamentals of Communication

Teaching Hours: 07 (Weightage 23%)

- Meaning of communication (1 hr)
- Process of communication (1 hr)
- Seven C's of communication (1 hr)
- Barriers to effective communication: interpersonal, intrapersonal and organizational barriers (2 hr)
- Listening: difference between hearing and listening, importance of listening in communication, reasons for poor listening, active VS passive listening, types and barriers to listening (2 hr)

#### Unit 2: Types of Communication

Teaching Hours: 11 (Weightage 37%)

- Verbal communication: oral and written communication, its advantages and disadvantages (1 hr)
- Forms of non-verbal communication: kinesics, proxemics, chronemics and paralanguage (3 hr)
- Speaking skills: telephonic skills, do's and don'ts of telephonic skills, etiquettes. (1 hr)
- Conversations: purposes of general conversation, features of a good conversation, tips for improvement, 3 samples and points to observe (3 hr)
- Reading comprehension: Purpose, reasons for poor comprehension, ways to improve them, techniques for good comprehension (3 hr)

*Prasad Joshi*



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**Unit 3: Professional Communication in Practice Teaching Hours: 12 (Weightage 40%)**

- Presentation skills: Defining Purpose, analyzing audience and locale, organizing content, preparing outline, visual aids, mode of delivery, body language (3 hr)
- Group discussion: organizational (three techniques), as a part of selection process (Characteristics, evaluation components, tips) (3 hr)
- Email writing: reasons for popularity, common pitfalls, guiding principles, common etiquettes (3 hr)
- Meetings: purpose, preparation, notices, agenda and minutes (3 hr)

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

\*SEE: Semester End Evaluation

**Reference books:**

Khuman, Prakash, and Bhupesh Gupta. *Communicative English*. Books India Publications, 2015.

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

Raman, Meenakshi, and Prakash Singh. *Business Communication*. 2nd ed., Oxford University Press, 2012.

Rizvi, M. Ashraf, and Priyadarshi Patnaik. *Effective Technical Communication*. 3rd ed., McGraw Hill Education, 2024.

	Course Outcome	Pos/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO 1	Discuss the major aspects of the process of communication, its importance and types of effective listening.	PO1, PO5	U	C	5
CO 2	Describe the input skills (Listening & Reading) in terms of their importance, types and improvement strategies.	PO1, PO2, PO5	U, Ap	C, P	5
CO 3	Distinguish between various forms of verbal and non-verbal communication, and implement their principles in diverse social and professional context.	PO1, PO2, PO4, PO5	U, Ap, An	C, P	8
CO 4	Paraphrase the major aspects of professional communication.	PO1, PO2, PO3, PO4	U, Ap, C	C, P	12
<b>Total hour of instruction</b>					<b>30</b>

*Jinal Jaha*



# KADI SARVA VISHWA VIDYALAYA

## 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												1	2
CO2	3	3			3													
CO3	3	3		3	3													
CO4	3	3	2	3														

3:High,2:Medium,1:Low

CO		POs												PSOs				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	1	2			
CO1	05	Y				Y												
CO2	05	Y	Y			Y												
CO3	08	Y	Y		Y	Y												
CO4	12	Y	Y	Y	Y													
	30	30	25	12	20	18												
		3	3	2	3	3												

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

*James Joshi*



# KADI SARVA VISHWAVIDYALAYA

## Semester II - Value Added Course

### VAC201-1C ENVIRONMENTAL STUDIES

#### Course Outcomes:

- **CO1:** Analyze ecosystem dynamics and human-environment interactions
- **CO2:** Assess various types of pollution and their impact on health and ecosystems
- **CO3:** Understand the structure and functioning of ecosystems and explain the significance of biogeochemical cycles in maintaining ecological balance.

#### Teaching and Evaluation Scheme:

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	Max Marks		
						CCE	SEE	
VAC201-1C	Environmental Studies	2	0	2	2	25	25	50

#### CONTENT:

##### Unit I Teaching Hours: 15 (Weightage: 50%)

**Ecology and Environment:** Definition, scope, and basic principles of ecology and environment, Natural Resources – Renewable and Non-renewable resources, Current Environmental issues – climate change, Global warming, Acid rain, Ozone layer depletion, Pollution – Air, Water, Soil, Marine, Thermal, Noise pollution – causes and effects.

##### Unit II Teaching Hours: 15 (Weightage: 50%)

**Ecosystem:** Basic concepts, components of the Ecosystem, Trophic levels, food chains and food web, Ecological pyramids, ecosystem functions, Energy flow in ecological systems, energy efficiencies.

**Biogeochemical Cycles:** Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus, Hydrogen, and Sulphur Cycles.

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

\*SEE: Semester End Evaluation

#### Reference Book:

- Basics of Environmental Studies, 4th Edition, B.R. Shah, Snehal Popli, Mahajan Publishing House.



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	Course Outcome	POs/ PSOs	CL Cognitive Level	Knowledge Category	Class Session
CO1	Analyze ecosystem dynamics and human-environment interactions	PO1, PO2, PO9, PSO1, PSO2	An, Ap, E	C,P	10
CO2	Assess various types of pollution and their impact on health and ecosystems	PO1, PO2, PO9, PSO1, PSO2	U, An, E	C,P	05
CO3	Understand the structure and functioning of ecosystems and explain the significance of biogeochemical cycles in maintaining ecological balance.	PO1, PO2, PO9, PSO1, PSO2	U, E, An	C,P	15
<b>Total Hours of Instructions</b>					30

### Mapping of COs with POs and PSOs

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

3: High, 2: Medium, 1: Low



# KADI SARVA VISHWAVIDYALAYA

## Microbiology Semester II Skill Enhancement Course

### SEC216-1C-Basic Mycology

#### COURSE OUTCOMES:

- CO1: Describe the distinguishing features, morphology, habitat, and classification of major fungal groups.
- CO2: Describe fungal reproductive strategies (sexual and asexual) and their life cycles with economic importance.
- CO3: Explain ecological imperfect fungi, media for cultivation of fungi and their association with other organisms.

#### TEACHING AND EVALUATION SCHEME:

Course code	Course Title	Credit	Teaching Scheme (Hrs. Per Week)	Examination Scheme			Total Marks
				Hrs.	Max Marks		
			Theory		CCE	SEE	
SEC216-1C	Basic Mycology	2	2	2	25	25	50

#### Unit 1:

Teaching Hours: 15( Weightage 50%)

- Introduction and distinguish features of Fungi
- Habit and Morphology
- Reproduction-Sexual and Asexual reproduction
- Classification of fungi (Chytridiomycota(chytrids), Zygomycota(breadmolds), Ascomycota (yeasts and sac fungi), and the Basidiomycota (club fungi)).
- Economic importance of Fungi

#### Unit 2:

Teaching Hours: 15 ( Weightage 50%)

- Ecological imperfect fungi.
- Cultivation of Fungi using different media
- Molds and their association with other organisms.
- Positive interactions: Fungi as symbionts (Lichen, Mycorrhizae).
- Negative interactions: Parasitism

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

\*SEE: Semester End Evaluation

#### Reference Books:

1. Microbiology-Pelczar M.J., Chan E.C.S., and Krieg N.R., 5<sup>th</sup> edition, McGraw-Hill Book Company.
2. Prescott, Harley and Klein's Microbiology- Willey Joanne M., Sherwood Linda, Woolverton Christopher J., and Prescott Lansing M., 7<sup>th</sup> edition, McGraw-Hill Higher Education.

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## Suggested Reference Books:

1. Principles of Microbiology- Atlas R.M., 2<sup>nd</sup> edition. M.C. Brown Publishers.

	Course Outcomes	POs/PSOs	CL Cognitive level	Knowledge Category	Class Session
CO1	Describe the distinguishing features, morphology, habitat, and classification of major fungal groups.	PO1, PO2, PSO1	U, R	C	6
CO2	Describe fungal reproductive strategies (sexual and asexual) and their life cycles with economic importance.	PO1, PO2, PO3, PO6, PSO1, PSO2	U, R, Ap	C	9
CO3	Explain ecological imperfect fungi, media for cultivation of fungi and their association with other organisms.	PO1, PO2, PO3, PO4, PO6, PO9, PSO1, PSO2	U, R, An, Cr	C, P	15
	<b>Total hours of Instruction</b>				<b>30</b>

## Mapping of COs with POs & PSOs

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

3: High, 2: Medium, 1: Low

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# KADI SARVA VISHWAVIDYALAYA

## Chemistry Semester II Skill Enhancement Course

### SEC217-1C-CHEMISTRY INSTRUMENTATION AND LABORATORY SKILLS-II

#### Course Outcomes:

- CO1: Describe and apply various separation techniques, including thin-layer chromatography, for the purification and analysis of chemical substances.
- CO2: Explain gravimetric and volumetric analytical methods used in chemical analysis.
- CO3: Describe the role of quality control chemists, regulatory standards, and quality management systems in life-science industries like pharmaceuticals, food, and cosmetics.

Course Code	Course Title	Teaching Scheme		Credits	Examination Scheme			Total Marks
		Theory hrs Per Week	Practical hrs Per Week		Hrs.	Max Marks		
						CCE	SEE	
SEC217-1C	Chemistry Instrumentation and Laboratory skills-II	2	0	2	2	25	25	50

#### Unit1: Separation and Purification Techniques

Teaching Hours : 15

(Weightage:50%)

Characterization, uses and selection of separation process, filtration techniques, filter paper, simple filtration, filtration through vacuum pump, distillation- types of distillation, simple distillation, fractional distillation, difference between simple and fractional distillation. Paper chromatography, Thin Layer Chromatography

#### Unit2. Lab Testing and Quality Assurance

Teaching Hours : 15 (Weightage:50%)

Gravimetric methods, volumetric methods  
Industry and sub-sectors, Standards for manufacturing in life-sciences, drug regulatory agencies, Quality control, Role of quality control chemist, Quality management systems, Productivity concept, Government regulations in industries like pharmaceuticals, food supplements, and cosmetics.

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

\*SEE: Semester End Evaluation

#### REFERENCEBOOKS:

1. Vogel, Arthur I: A Testbook of Quantitative Inorganic Analysis (Rev. by G.H. Jeffery and others) 5th Ed. The English Language Book Society of Longman
2. Willard, Hobert H. et al: Instrumental Methods of Analysis. 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.

#### SUGGESTED BOOKS:

1. Skoog D.A., West D.M., Holler F.J., Crouch S.R., Fundamentals of Analytical Chemistry, 9<sup>th</sup> Edition, Cengage learning.
2. Quality control chemist participant manual prepared by LSSSDC in collaboration with NSDC India.
3. iso.org



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CO	Course Outcome	POs/ PSOs	CL Cogniti ve level	Knowle dge Categor y	Class Session
CO1	Describe and apply various separation techniques, including thin-layer chromatography, for the purification and analysis of chemical substances.	PO1, PO2, PO6, PSO1	U, Ap, An	C, P	15
CO2	Explain gravimetric and volumetric analytical methods used in chemical analysis.	PO1, PSO1, PSO2	U, Ap	C, P	8
CO3	Describe the role of quality control chemists, regulatory standards, and quality management systems in life-science industries like pharmaceuticals, food, and cosmetics.	PO1, PO10, PSO1, PSO2	U, Ap, An	C, P, Factual	7
	<b>Total hours of Instruction</b>				<b>30</b>

## 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					3	
CO2	3										3	
CO3	3									1	3	3

3: High, 2: Medium, 1: Low



# KADI SARVA VISHWAVIDYALAYA

## Physics Semester II - Skill Enhancement Course

### SEC218-1C Introductions to Measurements & Instrumentation-I

#### COURSE OUTCOMES:

- CO1: Explain the working principles, classifications, and applications of various transducers including pneumatic, optical, ultrasonic, and proximity sensors.
- CO2: Apply appropriate transducer selection criteria and standards for specific industrial applications involving measurement of displacement, force, and pressure.
- CO3: Evaluate different methods and devices used for measuring pressure, force, torque, and acceleration in industrial systems, including unit conversions and calibrations.

#### 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	
SEC218-1C	Introductions to Measurements & Instrumentation-I	2	0	2	2	25	25	50

#### Unit-1: TRANSDUCERS (Weightage :50%)

Introduction, Classification of Transducers, A Few Phenomena, Selection of Transducers, Selection of Transducers & standards, Pneumatic Transducers, Electrical Transducers, Optical Transducers, Ultrasonic Transducer, Magnetostrictive Transducer, Digital Displacement Transducers, Proximity Sensors.

#### Unit-2: PRESSURE & FORCE MEASUREMENT (Weightage :50%)

Introduction, Definitions, Pressure Units and Their Conversions, Comparison with Known Dead-weights, Force-summing Devices, Secondary Transducers, Vacuum Measurement, Accessories, Acceleration Measurement, Force Measurement, Industrial Weighing Systems, Torque Measurement, Tachometers.

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

\*SEE: Semester End Evaluation



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## Reference Books

- 1) Introductions to Measurements And Instrumentation, Arun K. Ghosh, PHI Learning Pvt. Ltd., New Delhi
- 2) Fundamentals of Instrumentation and Measurement, Dominique Placko, British Library Cataloguing-in-Publication Data, Great Britain

CO No.	Course Outcomes (COs)	Mapped POs/PSOs	CL Cognitive level	KC Knowledge Category	Class Session
CO1	Explain the working principles, classifications, and applications of various transducers including pneumatic, optical, ultrasonic, and proximity sensors.	PO1, PO2, PO4, PO6, PO7, PSO1	U	C	10
CO2	Apply appropriate transducer selection criteria and standards for specific industrial applications involving measurement of displacement, force, and pressure.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	Ap	P	12
CO3	Evaluate different methods and devices used for measuring pressure, force, torque, and acceleration in industrial systems, including unit conversions and calibrations.	PO1, PO2, PO3, PO4, PO6, PO7, PSO1, PSO2	E	P	8
<b>Total hour of Instruction</b>					<b>30</b>

## 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	3	3		3	3				3	3
CO3	3	3	3	3		3	3				3	3

3:High,2:Medium,1:Low



# KADI SARVA VISHWAVIDYALAYA

## Mathematics Semester II - Skill Enhancement Course

### SEC219-1C Cyber Sphere and Security: Global Concern

#### Course Outcomes:

- CO1: Describe fundamental concepts of cyber security, types of cyber threats, and mechanisms like firewalls, anti-virus, and intrusion detection systems.
- CO2: Explain the functioning of the internet and identify various cyber vulnerabilities, including threats related to networks, websites, mobile devices, and email systems.
- CO3: Classify different types of cyber crimes and analyze their technical aspects, legal implications, and impact on privacy and digital infrastructure.

#### 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	
SEC219-1C	Cyber Sphere and Security: Global Concern	2	0	2	2	25	25	50

#### Unit 1 Introduction to Cyber Security

Teaching Hours: 15

Types of Threats: Malware, Viruses, Trojan horses, Spyware, Denial of service attacks, Web attacks, Networks and the Internet, How the internet works, IP addresses, Cyber stalking, Fraud, and abuse industrial espionage in cyberspace, Cryptography basics, Computer security software, Virus scanners, Firewalls, Anti spyware intrusion-detection software, Website security, Email, Mobile devices, Employees facility, Security, Operational security, Payment cards incident response and reporting.

#### Unit 2 Cyber Crime

Teaching Hours: 15

Introduction, Categorization of cyber crimes, Technical aspects of cyber crimes: Unauthorized access & Hacking, Trojan attack, Virus and worm attack, E-mail & IRC related crimes, Forgery, IPR violations, Cyber terrorism, Banking/Credit card related crimes, E-commerce/ Investment frauds, Sale of illegal articles, On line gambling, Defamation, Pedophiles, Identity theft, Data diddling, Theft of internet hours, Theft of computer system (Hardware), Physically damaging a computer system, Breach of privacy and confidentiality.

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

\*SEE: Semester End Evaluation



# KADI SARVA VISHWAVIDYALAYA

## Reference Books:

1. Computer Security Fundamentals, by Chuck Easttom, Pearson Education.
2. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill.
3. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley.

CO	Course outcome	POs / PSOs	Cognitive level	Knowledge category	Class session
CO1	Describe fundamental concepts of cyber security, types of cyber threats, and mechanisms like firewalls, anti-virus, and intrusion detection systems.	PO1, PO2, PO6, PO7, PO8, PSO1	R, U	C,P	8
CO2	Explain the functioning of the internet and identify various cyber vulnerabilities, including threats related to networks, websites, mobile devices, and email systems.	PO1, PO2, PO3, PO5, PO6, PO7, PSO1, PSO2	U, An	C, P	7
CO3	Classify different types of cyber crimes and analyze their technical aspects, legal implications, and impact on privacy and digital infrastructure	PO1, PO2, PO3, PO5, PO6, PO7, PO8, PSO1, PSO2	An	C, P	15
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	0	0	0	3	3	3	0	0	3	0
CO2	3	3	3	0	3	3	3	0	0	0	3	3
CO3	3	3	3	0	3	3	3	3	0	0	3	3

3:High, 2:Medium, 1:Low

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