First Year Curriculum

Admission Year 2026-27

Diploma
Dairy Technology

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Semester 1

a. **Course Name:** Physics and Physics Lab
b. **Course Code:** 03604113 and 03604114
c. **Prerequisite:** Knowledge of Mathematics and science up to 10^{th} standard.
d. **Rationale:** Physics is significant in Diploma Dairy Technology for understanding the core concepts of design and operation of processing equipment's, ensuring accurate understanding of physical processes involved in dairy processes.

e. **Course Learning Objective:**

CLOBJ 1	To understand the fundamental principles of measurement and unit systems.
CLOBJ 2	To study kinematics and the laws of motion for analyzing real-worldscenarios.
CLOBJ 3	To explore the concepts of work, energy, and power, and their conservation.
CLOBJ 4	To analyze the elastic properties and stress-strain relationship inmaterials.
CLOBJ 5	To learn the basics of light, sound, and their propagationphenomena.
CLOBJ 6	To understand electrostatics and electric current, including Ohm'slaw.

f. **Course Learning Outcomes:**

CLO 1	Apply accurate measurement techniques and understand the SI system of units.
CLO 2	Solve problems related to motion, force, and energy in daily life and technical settings.
CLO 3	Use principles of conservation of energy in practical and industrial applications.
CLO 4	Analyse material properties such as elasticity and fluid pressure.
CLO 5	Demonstrate an understanding of optical and sound phenomena, including reflection and refraction.
CLO 6	Apply electrostatics and electric current concepts to solve circuit-related problems.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
3	**-**	**2**	**4**	**60**	**-**	**20**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

SN	**Content**	**Weightage**	**Teaching Hours**

1	Units of Measurement: Units of measurement, systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement: significant figures. Dimensions of physical quantities.	15 %	05
2	Kinematics and motion: Motion in a straight line: speed and velocity. Uniform andnon- uniform motion, average speed and instantaneous velocity. Acceleration, Scalar and vector quantities Force. Inertia, Newton's laws of motion; momentum; impulse, torque, angular momentum Equilibrium of concurrent forces. Static and kinetic friction, laws of friction, rolling friction, lubrication.	15 %	05
3	Energy and Power - Work done by a force, energy, power; kinetic and potential energy, law of energy conservation	10 %	02
4	Elastic behavior, Stress-strain relationship, Hooke's law, young's modulus, Pressure due to a fluid column; Pascal's law and its applications	15 %	05
5	Light-reflection, refraction, velocity of light; refractive index; scattering of light, diffraction, Convergence and divergence of light, Nature of sound and its propagation, speed of sound, ultrasound; reflection of sound; echo and sonar.	15%	05
6	Electric charges and their conservation. Coulomb's law Electric field, Electric potential, potential difference Conductors and insulators Electric current and resistance, Ohms law	15 %	05
7	Magnetism and electro magnets: Concept of magnetic field, Field lines Field due to a current carrying wire, Fielddue to current, carrying coil or solenoid. Electromagnets and Permanent magnets. Force on current carryingconductor Fleming's left-hand rule. Faraday's Law, Inductance, induced potential differences, induced current.	15 %	05
	Total	**100 %**	**32**

i. Text Book and Reference Book:

1. Engineering physics for diploma, Ranjan kumar Bhuyan PHI publication.
2. Physics NCERT Class 11 & 12 Books.

j. List of Experiment:

SN	Experiment List
1	Measurement of diameter of a small spherical/cylindrical body using Vernier callipers.
2	Measurement of internal diameter and depth of a given beaker/calorimeter using Vernier calipers and its volume.
3	Measurement of diameter of a given wire/Sphere using screw gauge.
4	Measurement of thickness of a given sheet using screw gauge.
5	To verify Ohm's law by plotting graphbetween current and potential difference.
6	Determination of coefficient of viscosityof a given viscous liquid by assuring terminal velocity of given spherical body.
7	To calculate SA/V ratio of simple objects to understand nanotechnology.
8	To find the moment of inertia of a flywheel.
9	To determine force constant of a spring using Hook's Law

a. **Course Name:** Chemistry and Chemistry Lab
b. **Course Code:** 03604115 and 0360411
c. **Prerequisite:** Knowledge of Chemistry up to 10th standard is essential.
d. **Rationale:** The subject of Chemistry in Diploma Dairy Technology is significant as it provides foundational knowledge of chemical principles essential for understanding milk composition, processing, preservation, and quality control in dairy products.

e. **Course Learning Objective:**

CLOBJ 1	Understand fundamental concepts in chemistry, including elements, atoms, molecules, and their properties
CLOBJ 2	Learn to calculate molecular masses, and molar masses, and solve problems using the mole concept and chemical formulas
CLOBJ 3	Analyze the types of solutions and their properties, focusing on solubility and colligative properties
CLOBJ 4	Gain foundational knowledge of organic chemistry principles, including nomenclature, methods of preparation, and reactions of hydrocarbons
CLOBJ 5	Explore the role of chemicals in everyday life, including medicines, food additives, and cleansing agents
CLOBJ 6	Develop practical skills in standard solution preparation, titration, pH analysis, and determination of physical properties of compounds

f. **Course Learning Outcomes:**

CLO 1	Explain the significance of chemistry in various contexts and apply basic principles to describe chemical systems
CLO 2	Perform stoichiometric calculations and determine the empirical and molecular formulas of compound
CLO 3	Analyze solutions and their behaviors, utilizing concepts such as concentration and colligative properties to predict physical changes
CLO 4	Apply IUPAC nomenclature and reaction mechanisms to classify and predict the behavior of organic compounds
CLO 5	Evaluate the applications and impact of chemicals in daily life, particularly in healthcare, food, and hygiene
CLO 6	Conduct laboratory experiments to measure physical and chemical properties of substances, ensuring accurate data collection and interpretation

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	-	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Some Basic Concepts of Chemistry** General Introduction: Importance and scope of chemistry. Concept of elements, atoms and molecules. Atomic and molecular masses. Mole concept and molar mass; percentage composition and empirical and molecular formula; chemical reactions	10 %	05
2	**Solutions** Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions	06 %	03
3	**Colligative properties** Relative lowering of vapour pressure, Raoult's law, elevation of B.P., depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Vant Hoff factor	10 %	05
4	**Organic Chemistry – Some Basic Principles and Techniques** General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds	07 %	04
5	**Hydrocarbons - Aliphatic Hydrocarbons** Alkanes – Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis	08 %	04
6	**Hydrocarbons – Alkenes** Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation; chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition	12 %	06
7	**Hydrocarbons - Aldehydes and Ketones** Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, and mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses	09 %	05
8	**Hydrocarbons - Carboxylic Acids** Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses	04 %	02
9	**Chemistry in Everyday Life - Chemicals in medicines** analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines. Chemicals in food – preservatives, artificial sweetening agents, elementary idea of antioxidants. Cleansing agents – soaps and detergents, cleansing action.	10 %	05

i. Text Book and Reference Book:

1. **Chemistry: The Central Science** (Textbook) Brown, LeMay, Bursten, and Murphy

2. **Organic Chemistry** (Textbook) Morrison and Boyd

j. List of Experiment:

Sr. NO.	Experiment List
1	Preparation of standard solution of oxalic acid
2	Determination of strength of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid
3	Preparation of standard solution of sodium carbonate
4	Determination of melting point of an organic compound
5	Determination of boiling point of an organic compound
6	Determination of pH of some solutions obtained from fruit juices, solutions of known and varied concentrations of acids, bases and salts using pH paper or universal indicator
7	Comparing the pH of solutions of strong and weak acid of same concentration
8	Study the pH change in the titration of a strong acid with a strong base using universal indicator
9	Study of pH change by common-ion effect in case of weak acids and weak bases
10	Acidity determination of different samples of the tea leaves
11	Analysis of fruit and vegetable juices for their acidity

a. **Course Name:** Mathematics and Mathematics Lab
b. **Course Code:** 03604117
c. **Prerequisite:** Knowledge of Mathematics up to 10th standard.
d. **Rationale:** Knowledge of mathematics is necessary for diploma

e. **Course Learning Objective:**

CLOBJ 1	Develop an understanding of trigonometric functions and their applications in solving problems. Apply trigonometric concepts in real-world and mathematical problems
CLOBJ 2	Understand the algebra of complex numbers and their geometric representation. Apply complex numbers in solving polynomial equations and mathematical problems.
CLOBJ 3	Develop problem-solving skills using differential equations in physical and engineering contexts.
CLOBJ 4	Apply matrices to solve linear equations and transform geometric problems.
CLOBJ 5	Understand vector algebra and its applications in physics and geometry. Analyze vector equations in various physical contexts.
CLOBJ 6	Apply statistical methods to analyze data and draw conclusions. Understand the basic principles of probability and its applications in uncertain scenarios.

f. **Course Learning Outcomes:**

CLO 1	Solve equations using trigonometric identities and functions. Analyze and graph trigonometric functions.
CLO 2	Perform arithmetic operations on complex numbers. Represent complex numbers in polar form and interpret their significance.
CLO 3	Solve first-order and higher-order differential equations. Model real-world problems using differential equations.
CLO 4	Perform operations such as addition, multiplication, and inversion of matrices. Use matrices in computer graphics and network analysis.
CLO 5	Perform vector operations such as addition, scalar multiplication, and dot/cross product. Solve problems involving vector projection and planes.

CLO 6	Summarize data using measures of central tendency and dispersion. Construct and interpret histograms, box plots, and scatter plots.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	50	60	-	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Trigonometric Functions:** Introduction of trigonometric functions, angles, expressing sin and cos, trigonometric equations, introduction to inverse trigonometric functions.		4
2	**Complex Numbers and Quadratic Equations:** complex numbers; quadratic equations, algebra of complex numbers, quadratic equations, square-root of a complex number.	9%	4
3	**Binomial Theorem:** Introduction, binomial theorem for positive integral indices, general andmiddle term, simple applications.	7%	3
4	**Limits and derivatives:** Introduction, intuitive idea of derivatives, limits, derivatives, derivativeof sum, difference, product and quotient of functions, derivatives of polynomial and trigonometric functions.	10%	5
5	**Matrices:** Introduction of matrices, types and operations of matrices, transpose of matrices, transformation of a matrix, invertible matrices.	7%	4
6	**Continuity and Differentiability:** Continuity, differentiability, concepts of exponential and logarithmicfunction, brief introduction of order derivative	7%	3
7	**Integrals:** Integration as inverse process of differentiation, methods of integration, integration of a variety of functions by substitution, basic properties of definite integrals.	10%	5
8	**Differential equations:** Definition, order and degree, general and particular solutions of a differential equation.	6%	3
9	**Vectors:** Vectors and scalars; types of vectors, position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, scalar (dot) , product of	17%	8

	vectors,cross product of vectors.		
10	**Statistics:** definition of statistics, mean, mode, median, measures of dispersion, range, mean deviation, variance and standard deviation, analysis of frequency distribution.	**9%**	**4**
11	**Probability:** probability, conditional probability, multiplications theorem on probability, independent events, total probability, random variable and its probability distribution, repeated independent (Bernoulli) trials and Binomial distribution.	**10%**	**5**

i. Text Book and Reference Book:

1. Mathematics 1 by Deepak singh
2. Diploma engineering Mathematics by B.K Pal

j. List of Experiment:

Sr. NO.	Experiment List
1	Tutorial on trigonometric equations; tutorial on algebra of complex numbers and quadratic equations.
2	Tutorial on derivatives of polynomial and trigonometric functions, operations of matrices
3	Analysis of frequency distribution

a. **Course Name:** Introduction of Dairy Technology
b. **Course Code:** 03604119
c. **Prerequisite:** Knowledge of Basic Sciences
d. **Rationale:** Introduction to Dairy Technology provides students with fundamental knowledge of milk composition, dairy processing, preservation, quality control, and dairy products. The subject helps students understand the scientific and technological aspects of the dairy industry, developing essential skills required for efficient dairy production, processing, and maintenance of quality and safety standards in dairy-based products.

e. **Teaching & Examination Scheme:**

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/	Lab Hrs/		External		Internal			
				T	P	T	CE	P	
2	-	-	2	70	-	30	-	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

f. **Course Content:**

Introduction to the Dairy Industry: Overview of the dairy industry: Global and national perspectives, Historical evolution of dairy farming and processing, Structure and scope of the dairy sector

Dairy Production Systems: Types of dairy farming: Traditional, intensive, and organic systems, Breeds of dairy animals and their characteristics, Farm management practices: Feeding, housing, and health
Milk Composition and Properties: Chemical and physical properties of milk, Nutritional components: Proteins, fats, lactose, and minerals, Factors affecting milk quality and yield
Milk Collection and Handling: Milk collection systems and transportation, Milk testing and grading, Hygiene and safety standards in milk handling
Dairy Processing Techniques: Basic processing: Pasteurization, homogenization, and standardization, Introduction to dairy products: Butter, cheese, yogurt, and powdered milk, Equipment and technology used in dairy processing
Quality Control and Safety: Quality assurance in dairy production, Microbial and chemical safety standards, Regulatory frameworks and certifications (e.g., FSSAI, HACCP)
Emerging Trends and Sustainability: Innovations in dairy technology: Automation and smart farming, Sustainable practices: Waste management and eco-friendly processing, Challenges: Climate change, animal welfare, and market competition

g. Textbooks:

a. Applied Dairy Technology (Text Book) By Marth, E.H. and Steele,
b. Advanced Dairy Science and Technology (Textbook) By Britz, T.J. and Robinson, R.K

a Course Name: Fundamentals of Microbiology and FOM lab

b. Course Code: 03604121 and 03604122

c. Prerequisite: Knowledge of Science and Mathematics up to 12th science level.

d. Rationale: Fundamentals of Microbiology in Diploma Dairy Technology equips students with essential knowledge of microbial aspects crucial for quality control and safety in dairy production, ensuring proficiency in managing microbial processes vital to the dairy industry.

e. Course Learning Objective:

CLOBJ 1	Understand the foundational principles of microbiology, including the classification, morphology, and physiology of microorganisms relevant to dairy technology.
CLOBJ 2	Demonstrate knowledge of the role of microorganisms in dairy processes, such as fermentation, spoilage, and pathogenicity, and their impact on product quality and safety.

CLOBJ 3	Develop proficiency in microbiological techniques, including microbial isolation, identification, and enumeration, to assess and control microbial populations in dairy products.
CLOBJ 4	Explore the application of beneficial microorganisms in dairy fermentations, emphasizing the role of starter cultures and probiotics in enhancing product flavour, texture, and nutritional value.

f. Course Learning Outcomes:

CLO 1	Understanding about history and scope of microbiology
CLO 2	Study the electron microscopy and various microbiological staining methods
CLO 3	Understand the difference between prokaryotes and eukaryotic organisms.
CLO 4	Learn the microbial growth, nutrition and bacterial genetics

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
L	T	P	C	MSE	CE	P	Theory	P	
2	-	2	3	20	20	50	60	-	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Overview of history and scope of microbiology** Discovery of Microorganisms and Microscopy (types, working principles and applications); Theories of Biogenesis and abiogenesis; Contributions of Leeuwenhoek, Pasteur, Tyndal, Joseph Lister, Robert Koch, Edward Jenner and Alexander Fleming; Scope and application of microbiology in fields like Dairy, Food, Pharmaceutical, Industrial, Medical and agriculture	**18 %**	**06**
2	**Classification of Microbes** Microbial classification systems, numerical taxonomy, General properties and principles of microbial classification; Whittaker's five kingdom and Carl Wiese's three domain classification system; Systematics of bacteria and Bergey's manual of systematic bacteriology, Phylogenetic tree	**12 %**	**04**
3	**Prokaryotic and Eukaryotic microorganisms** Structure and functions of prokaryotic cells; Differences between prokaryotes and eukaryotes; Differences between cell wall of Gram positive and Gram-negative bacteria; Structure of	**15 %**	**05**

	Racheal cell wall		
4	**Microbial growth and nutrition** Bacterial growth curve; factors affecting growth of bacteria, direct and indirect methods of measurement of bacterial growth; Bacteriostatic and bactericidal agents; Common nutrient requirements and nutritional types of microorganisms	**15 %**	**05**
5	**Diversity of Microorganisms**	**12 %**	**04**
6	**Microbial Ecology and Environmental Microbiology** Microflora of air, soil and water and Microbes of Extreme environment like Archea	**8 %**	**02**
7	**Basics of Microbial Genetics and Host-Microbe interactions** DNA as the genetic material, Structure of DNA/ RNA, DNA replication; transcription and translation	**12%**	**04**
8	**Basic concepts of immunology** Role of immune system in governing host- microbe interactions, Microbial Commensalism, Colonization, Infection, Disease and Vaccines	**08 %**	**02**
Total		**100**	**32**

i. Text Book and Reference Book:

a. Applied Dairy Microbiology (Text Book) By Marth, E.H. and Steele,
b. Advanced Dairy Science and Technology (Textbook) By Britz, T.J. and Robinson, R.K
c. Dairy Bacteriology (Text Book) By Su Kumar De

a. Course Name: Environmental Science

b. Course Code: 03605101

c. Prerequisite: Basic understanding of environmental science principles and their application to dairy industry sustainability.

d. Rationale: Environmental Science in Diploma Dairy Technology ensures graduates comprehend ecological implications of dairy practices, promoting sustainable and ethical approaches for responsible environmental stewardship within the dairy industry.

e. Course Learning Objective:

CLOBJ 1	Attain an exhaustive understanding of environmental science concepts, with an emphasis on their applicability to the ecological impact.

CLOBJ 2	Develop the ability to assess and analyse the environmental footprint of dairy operations, identifying potential areas for improvement and sustainable practices.
CLOBJ 3	Understand and adhere to environmental regulations and policies relevant to the dairy sector, ensuring ethical and legal practices in environmental management.
CLOBJ 4	Explore and propose innovative technologies and strategies to minimize environmental impact in dairy production, including waste management.
CLOBJ 5	Cultivate effective communication skills to articulate environmental issues within the dairy industry, fostering awareness, and advocating for responsible and sustainable practices among stakeholders.

f. Course Learning Outcomes:

CLO 1	Understand the various natural resources and its uses
CLO 2	Introduction, structure, and function of an ecosystem
CLO 3	Learn the basics of biodiversity and its conservation
CLO 4	Distinguish the various pollutants and learn the role of an individual in prevention of pollution
CLO 5	Establish an understanding of the function of information technology (IT) in the environment.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
L	T	P	C	MSE	CE	P	Theory	P	
2	-	-	0	20	20	-	-	-	40

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Environmental Health and Quality of Life:** Environmental education: Objective and scope, Impact of technology on the environment. Environmental disasters: Case studies, Global environmental awareness to mitigate stress on environment	**10 %**	**04**
2	**Ecology and Ecosystem:** Interdependence of organisms, Structure and function of an ecosystem, Ecological pyramids, Pyramid of number, Pyramid of energy and pyramid of biomass	**25 %**	**07**
3	**Natural resources and their managements**: Water resources: Sources of water, Stress on water resources, The story of Cherapunji. Energy resources: Classification, advantages, limitations and future scope of conventional and non-conventional. resources	**15 %**	**05**
4	**Environmental Pollution:** Air pollution, Water pollution, Solid waste pollution, Noise pollution, Soil pollution, Radioactive pollution	**15 %**	**05**
5	**Waste Management:** Food processing industry waste and its management, Management of urban waste water, Recycling of	**25 %**	**07**

	organic waste, Recycling of factory effluent		
6	**Environmental Protection Though Environmental Legislation:** Control of environmental pollution through low, Composting of biological waste and Sewage, uses of water disposal effluent treatment, microbial examination	**10 %**	**04**
Total		**100 %**	**32**

i. Text Book and Reference Book:

1. Environmental Studies: From Crisis to Cure by R. Rajagopalan
2. Environmental Science and Engineering by J. Glynn Henry and Gary W. Heinke
3. Environmental Management in Dairy Industry by P. Sampath Kumar and R. B. Singh.
4. Sustainable Dairy Production by Nico van Belzen.
5. E-course of ICAR. Cited from: www.agrimoon.com

a. **Course Name:** Introduction to IT Systems Lab
b. **Course Code:** 03606102
c. **Prerequisite:** Basic knowledge of computer fundamentals, operating systems, and common software applications is helpful for this laboratory course. Familiarity with basic hardware components, file management, and safe computer usage practices is also beneficial.
d. **Rationale:** Introduction to IT Systems Lab provides practical understanding of computer hardware, software, operating systems, and basic networking concepts through hands-on activities. It develops technical skills, problem-solving ability, and familiarity with IT tools essential for academic and professional applications**.**

e. Course Learning Objective:

CLOBJ 1	Demonstrate basic skills in operating computer systems, managing files, and using common software applications effectively.
CLOBJ 2	Perform basic hardware, operating system, and networking tasks using appropriate IT tools and laboratory practices.
CLOBJ 3	Apply troubleshooting and problem-solving skills to identify and resolve common IT system issues.

f. Course Learning Outcomes:

CLO 1	Develop practical understanding of computer hardware, software, operating systems, and basic networking concepts.
CLO 2	Build hands-on skills in using IT tools, system management, and routine troubleshooting techniques.
CLO 3	Enhance technical competency, problem-solving ability, and safe laboratory practices in IT system operations.

g. Teaching Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L				**MSE**	**CE**		**Theory**	**P**	**Total**
0				**0**	**0**		**0**	**-**	**100**

L- Lectures; T- Tutorial; P- Practical; C- Credit; CE- Continuous Evaluation, ESE- End Semester Examination

h. Course Content:

	Topics		

	Introduction to Computers: Basic applications of computer. Computer organization and its components - Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output devices, Computer Memory.		
	Hardware and software concepts and Terminologies: Introduction about Operating Systems.		
	Introduction about Programming languages: Database concepts - definition different types hierarchical, network and relational databases		
	Introduction to commonly used MS Office application software's MS Word, Power Point, Excel.: Introduction to commonly used MS Office application software's MS Word, Power Point, Excel.		
	Introduction to management information: systems concepts, development of MIS of dairy industry.		
	Basic of Computer networks: LAN, WAN; Application of modern Information Communication Technologies (ICT) tools/software in Dairy Industry		
	Concept of Internet: Applications of Internet; Connecting to Internet; World Wide Web (WWW); Web Browsing software URL; Domain name; IP Address		
	Introduction about HTTP and HTML: Introduction to Blogs and web page development.		
	Basics of Electronic mail: Instant Messaging and Chatting.		
	Video Conferencing Basics: requirements, applications and Its potential Use		

i. Reference Books:

1. Andrews, J., Dark, J., & West, J. (2019). CompTIA A+ guide to IT technical support (10th ed.). Cengage Learning.
2. Mueller, S. (2015). Upgrading and repairing PCs (22nd ed.). Pearson.
3. Shelly, G. B., Vermaat, M. E., & Quasney, J. J. (2018). Discovering computers: Digital technology, data, and devices. Cengage Learning.
4. White, C. M. (2017). Data communications and computer networks: A business user's approach (8th ed.). Cengage Learning.
5. Andrews, J. (2016). A+ guide to hardware: Managing, maintaining, and troubleshooting (9th ed.). Cengage Learning.

a. **Course Name:** Communication Skills - I
b. **Course Code:** 03693103
c. **Prerequisite:** Knowledge of English up to 12thscience level.
d. **Rationale:** The Communication Skills course in Diploma Dairy Technology is of paramount importance as it equips students with the essential abilities to effectively convey technical knowledge collaborate with industry stakeholders, and articulate ideas crucial for success in the dairy technology field. This course not only enhances written and verbal communication proficiency but also fosters interpersonal skills, empowering students to engage in impactful communication within the dairy industry, research, and broader professional contexts, thereby facilitating their comprehensive development as successful dairy technologists and communicators.

e. **Course Learning Objective:**

CLOBJ 1	Develop the ability to express thoughts and ideas clearly and concisely through spoken language.
CLOBJ 2	Improve written communication skills, including composing clear and professional emails, reports, and other written documents.
CLOBJ 3	Explore and employ digital communication tools, platforms, and multimedia aids for professional communication, including virtual meetings, collaboration software, and social media.
CLOBJ 4	Cultivate interpersonal skills, including empathy and conflict resolution, to navigate various communication scenarios effectively.

f. **Course Learning Outcomes:**

CLO 1	Understand basics of English grammar
CLO 2	Display basic level of communication confidence
CLO 3	Study the basics of communication, types of communication, models of communication and barriers to communication
CLO 4	Distinguish the technical writing, scientific writing and resume writing

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
1	**0**	**0**	**1**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr. No.	**Content**	**Weightage (%)**	**Teaching Hours**
1	**Crazy Scientist** The students will be taught the importance of invention and innovation using some examples that changed the	**4**	**2**

	world the way it worked.		
2	**Phonetics** IPA Introduction (listening tracks), Phonic Sounds, Listening Activity, Pronunciation Practice	**4**	**2**
3	**Vocabulary Building** Word formation process: Compounding, clipping, blending, derivation, creative respelling, coining and borrowing. Prefixes & suffixes, synonyms & antonyms, standard abbreviations (related activities will be provided) Methods to enhance Vocabulary	**12**	**5**
4	**Speaking Activity:** Role play	**10**	**2**
5	Identifying Common Errors in Writing: Sentence structure Punctuations. Subject-Verb Agreement Noun-Pronoun Agreement	**10**	**2**
6	Reading Comprehension: The art of effective reading, Employing different reading skills, Practice	10	2
7	Speech a Spoken Exchanges Stage; Delivering different types of speeches: Welcome /Introductory speech, Vote of Thanks speeches, Farwell speeches	12	5
8	**Professional Presentations:** Combating stage fright, preparing power point presentation,	**10**	**4**
9	**Picture Connector:** In this class the students will be trained to form a logical connection between a set of pictures which will be shared with them. This is geared towards building creativity and presentation skills	**4**	**2**
10	**Movie Review**	**10**	**2**
11	**Error analysis:** Tenses, Active passive voice, Direct indirect speech	**10**	**2**
12	**Reporter:** Classroom Activity to encourage, Communication and Convincing Skills.	**4**	**2**
Total		**100 %**	**32**

i. Text Book and Reference Book:

1. Business Correspondence and Report Writing SHARMA, R. AND MOHAN, K
2. Communication Skills
3. Kumar S and Lata P; New Delhi Oxford University Press
4. Practical English Usage MICHAEL SWAN
5. A Remedial English Grammar for Foreign Student F.T. WOOD
6. On Writing Well William Zinsser; Harper Paperbacks,2006; 30th anniversary edition
7. Oxford Practice Grammar, By John Eastwood | Oxford University Press

Semester 2

a. **Course Name: Physical Chemistry of Milk**
b. **Course Code:** 03604169 and 03604170
c. **Prerequisite:** Knowledge of Physics and Mathematics up to 12th science level.
d. **Rationale:** The physical chemistry of milk involves the colloidal nature of its proteins and fat globules, influencing properties like stability and viscosity, while pH and temperature dynamics play critical roles in modulating its colloidal stability and enzymatic reactions.

e. **Course Learning Objective:**

CLOBJ 1	Acquire knowledge pertaining to the chemical composition of milk, encompassing both its major and minor constituents, in order to grasp the complex interrelationships among minerals, proteins, lipids, and carbohydrates that govern the physical attributes of milk.
CLOBJ 2	Explore the molecular interactions, chemical reactions, and physical transformations occurring in milk during various processing stages, providing insight into the factors influencing the stability, texture, and flavour of dairy products.
CLOBJ 3	Develop proficiency in applying thermodynamic principles to assess energy changes and understand kinetic aspects governing milk processing operations, crucial for optimizing process efficiency and ensuring the quality of end products.
CLOBJ 4	Acquire skills in utilizing physical chemistry principles for quality control and assurance in dairy production, including the analysis of chemical parameters, monitoring changes during storage and transportation, and implementing corrective measures to ensure the consistent production of safe and high-quality dairy products.

f. **Course Learning Outcomes:**

CLO 1	Understand the basics of milk composition and its colloidal chemistry.
CLO 2	Study the various physical and colligative properties of milk.
CLO 3	Learn the basics about nuclear chemistry and molecular spectroscopy.
CLO 4	Compare the normal and adulterated milk.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**		
L	**T**	**P**	**C**	**Internal Evaluation**	**ESE**	**Total**

				MSE	CE	P	Theory	P	
2	**-**	**2**	**3**	**20**	**20**	**50**	**60**	**-**	**150**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Composition of milk** Constituents and gross composition of milk of different species and breeds of milch animal	**03 %**	**01**
2	**Colloidal State** Distinction between true and colloidal solution, lypophilie & lypophobic solution, properties of colloidal system. Properties of colloidal systems, Gels-their formation and properties. Milk as a colloidal system and its stability. Elementary idea about emulsion	**13 %**	**04**
3	**Density** Density and specific gravity, pyknometer method, hydrometer lactometer. Density and specific gravity of milk, effect of various processing variables on the density and specific gravity of milk	**09 %**	**03**
4	**Liquid State** Surface tension, surface energy interfacial tension. Surface tension of mixtures. Surface tension of milk and the factors affecting it	**07 %**	**02**
5	**Viscosity** Definition of viscosity, Newtonian and Non-Newtonian liquids, Stokes Law, influence of temperature and concentration of solute on viscosity. Viscosity of milk, evaporated milk and condensed milk.	**09 %**	**03**
6	**Refractive index and Colligative Properties of Dilute Solution** Vapour pressure, Raoults Law, Depression of freezing point, Elevation of boiling point. Freezing point and boiling point of milk. Osmosis and Osmotic pressure. Inter-relation of colligative properties.	**13 %**	**04**
7	**Aqueous solution of Electrolytes** Electrolytes; non-electrolytes, ionic mobility, electrical conductance, Ostwald Dilution Law, Kohlrawsch Law, Electrical conductance of milk.	**07 %**	**02**
8	**Ionic Equilibria** Dissociation of water, ionic product of water, concept of pH and pOH and their scale. Acids and bases: Bronsted Lewis concepts of acids and bases, dissociation constants of acids and bases. Salt-their hydrolysis.	**09 %**	**03**
9	**Buffer solutions** Derivation of Henderson Hasselbach equation and its application, buffer capacity and buffer index, milk as a buffer system. Equilibrium of electrolytes. pH indicators.	**09 %**	**03**
10	**Oxidation- Reduction** Redox potential, Nernst equation, electrochemical cells. Hydrogen, glass and calomel electrodes. Redox system of milk.	**06 %**	**02**
11	**Nuclear Chemistry** The nature of isotopes, radio isotopes. Half-life period of radio isotopes. Some of the important radio isotopes. Occurrence of radio nuclide in milk & milk products.	**06 %**	**02**
12	**Molecular Spectroscopy**	**09 %**	**03**

	The spectrum of electro- magnetic radiation, the laws of Lambert and Beer, visible, and ultra-violet Spectroscope. Mention of mass, NMR spectroscopy		
Total		**100 %**	**32**

i. Text Book and Reference Book:

1. Dairy Chemistry and Bio-Chemistry by Fox, P.F. and Sweeny, Mc
2. Dairy Chemistry and Physics by Walstra, P. and Jenness, R
3. Principles of Dairy Chemistry by Jenness, R. and Patton, S.
4. Text book of Dairy Chemistry by Mathur, M.P., Datta, D. R., and Dinakar,

a. Course Name: Milk Production Managements and Dairy Development

b. Course Code: 03604171 and 03604172

c. Prerequisite: Knowledge of Science and Mathematics up to 12th science level.

d. Rationale: Milk Production Management and Dairy Development course teaches students how to produce milk efficiently and sustainably, improving dairy farming practices and the dairy industry.

e. Course Learning Objective:

CLOBJ 1	Develop a comprehensive understanding of dairy farm management principles, encompassing animal husbandry, nutrition, health care, and breeding practices, to optimize milk production and ensure the overall well-being of dairy cattle.
CLOBJ 2	Acquire knowledge and skills in implementing sustainable and ethical milk production practices, including the integration of modern technologies, environmental considerations, and animal welfare standards to enhance productivity while minimizing environmental impact.
CLOBJ 3	Explore strategies for dairy industry development, including market analysis, value chain management, and the application of innovative technologies, to contribute to the growth and competitiveness of the dairy sector on both regional and global scales.
CLOBJ 4	Develop entrepreneurial skills by understanding the economic aspects of dairy farming, market dynamics, and value addition opportunities, enabling students to identify and pursue business prospects in the dairy industry and contribute to its sustainable development.

f. Course Learning Outcomes:

CLO 1	Understand the basic concepts of animal husbandry, systems of breeding, methods of selection of dairy animals, their reproductive system, common diseases in dairy animals, prevention and control.
CLO 2	Explain general dairy farm practices, methods of milking, milking procedure practices for quality milk production, maintenance of hygiene and sanitation of dairy farm premises as well as animals.
CLO 3	Understand about the Dairy development in India and Key village scheme
CLO 4	Evaluate the role of NDDB, Operation Floods, Co-operative dairy organizations and new developments for improvement of dairy cooperative organizations.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	2	3	20	20	50	60	-	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Animal Husbandry**	05 %	03
2	**Characteristics of India and exotic breeds** Distinguishing characteristics of India and exotic breeds of dairy animals and their performance.	15 %	04
3	**Breeding and methods and General dairy farm practices** Systems of breeding and methods of selection of dairy animals. General dairy farm practices - Identification, dehorning, castration, exercising, grooming, weighing.	20 %	06
4	**Care of animals** Care of animals at calving and management of neonates. Management of lactating and dry cows and buffaloes. Methods of milking, milking procedure and practices for quality milk production.	15 %	04
5	**Dairy farm** Dairy farm records and their maintenance. Systems of housing dairy animals and maintenance of hygiene and sanitation at dairy farm premises.	10 %	03
6	**Common disease problems:** Common disease problems in dairy animals, their prevention and control.	10 %	04
7	**Digestive system of ruminants:** Digestive system of ruminants and measures of feed energy. Nutrients requirements for growth and milk production.	10%	04
8	**Artificial insemination and embryo transfer:** Artificial insemination and embryo transfer and their role in animal improvement introduction to biotechniques in dairy animal production.	15 %	04

Total	100 %	32

i. Text Book and Reference Book:

1. A Textbook of Animal Husbandry by G C Banerjee.
2. Introduction to Dairy Science and Technology: Milk Production, Processing and Dairy-Based Products" by C.P. Bhadani.
3. "Dairy Farming: The Beautiful Way" by Anoop Bishnoi.
4. "Dairy Cattle Science" by Howard Tyler and Thomas Ensminger.
5. "Dairy Cooperatives and Development: A Study of Tribal Dairy Cooperative Societies in Gujarat" by J.V. Singh and A.K. Misra.

a. Course Name: Fluid Mechanics

b. Course Code: 03604177 and 03604178

c. Prerequisite: Knowledge of Physics and Mathematics up to 12thscience level.

d. Rationale: Fluid mechanics is significant in Diploma Dairy Technology for optimizing the design and operation of processing equipment, ensuring efficient transport of liquids in dairy processes crucial for product quality and safety.

e. Course Learning Objective:

CLOBJ 1	Understand the fundamental principles of fluid mechanics and their application in dairy technology, emphasizing viscosity, flow behaviour, and fluid properties.
CLOBJ 2	Analyse and design dairy processing equipment by applying fluid mechanics concepts to ensure efficient and hygienic operations.
CLOBJ 3	Demonstrate proficiency in calculating and predicting fluid flow parameters in dairy systems, including pipe flow, pump selection, and pressure losses.
CLOBJ 4	Evaluate heat transfer mechanisms related to fluid flow in dairy processes, considering thermal processing and pasteurization for product safety and quality.
CLOBJ 5	Apply mathematical modelling techniques to simulate and optimize fluid flow in dairy systems, fostering problem-solving skills for real-world applications.
CLOBJ 6	Demonstrate knowledge of rheology and its impact on dairy product texture, stability, and sensory attributes, facilitating the production of high-quality dairy products.

f. Course Learning Outcomes:

CLO 1	Elaborate the different properties of fluids and compute the dimensions of various units
CLO 2	Distinguish the various pressure of liquids and learn the different pressure measuring devices
CLO 3	Study the Archimedes principle, Continuity equation, Bernoulli's theorem, Buckingham's theorem, Dimensionless numbers and its practical application
CLO 4	Describe various head losses in fluid flow and calculate the problems on head loss
CLO 5	Explain the difference between various notches, orifices, vena contract, mouthpiece and also compute the problems
CLO 6	Describe about the various application of pumps and learn the its efficiency as well as numerical

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
L	T	P	C	MSE	CE	P	Theory	P	
2	-	2	3	20	20	50	60	-	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr.	Topics	W	T
1	**USE OF DRAWING INSTRUMENTS**Teacher will demonstrate: Use of drawing instruments, Planning and layout as per IS, Scaling technique. Draw following: - Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter, Types of lines, Types of dimensioning. Alphabets & numerical (Vertical& inclined as Per I.S.).	27	4
2	**GEOMETRIC CONSTRUCTION**Drawing of set of lines with different conditions (Two problems). Drawing Polygons (Three Problems). Drawing circles and arcs with different geometric. Conditions and with line constraints (Three problems).	13	2
3	**ENGINEERING CURVES ´ I**Construction of ellipse using any two methods from arc of circle method, four centre method, rectangular method, eccentricity method and concentric circle method. Construction of parabola with any one method from rectangular method, tangent method and eccentricity method. Construction of hyperbola with any one method from eccentricity method and rectangular method. Construction of spiral.	13	2
4	**ENGINEERING CURVES ´ II**Construction of cycloid. Construction of hypocycloid & epicycloids. Construction of involute (circle). Construction of involute (polygon).	7	1
5	**PROJECTIONS OF POINTS AND LINE**Draw projection of points-For 10 various conditions (One problem). Draw projection of lines with different conditions (Four problems).	7	1
6	**PROJECTIONS OF PLANE**Draw projection of different planes with different conditions (triangle, square / rectangular, pentagonal / hexagonal, and circular -one for each) (Four problems).	7	1
7	**ORTHOGRAPHIC PROJECTIONS**Draw Orthographic projections of different objects (Two problems) (Draw four views of each object).	7	1
8	**ISOMETRIC DRAWINGS**Draw isometric drawings from given orthographic views (Three problems).	7	1
	Total	88	13

i. Text Book and Reference Book:

1. Fluid Mechanics (Textbook) D.S. Kumar; S. K. Kataria and Sons.
2. Fluid Mechanics (Textbook) R.K. Bansal; Laxmi Publications

a. **Course Name:** Engineering Workshop Practice Lab
b. **Course Code:** 03604176
c. **Prerequisite:** Knowledge of Physics and Mathematics up to 12thscience level.
d. **Rationale:** Engineering Workshop practice in Diploma Dairy Technology is crucial for hands-on skill development, fostering practical knowledge, and ensuring proficiency in dairy processing techniques essential for the industry.

e. Course Learning Objective:

CLOBJ 1	Acquire proficiency in using various dairy processing equipment and tools through practical exercises in the workshop.
CLOBJ 2	Demonstrate an understanding of safety measures and protocols related to dairy processing to ensure a secure working environment.
CLOBJ 3	Learn to maintain and enhance product quality by mastering techniques for monitoring and controlling different aspects of dairy processing.
CLOBJ 4	Develop problem-solving skills by identifying and resolving issues that may arise during dairy processing operations in a controlled workshop setting.

f. Course Learning Outcomes:

CLO 1	Learn the basics of workshop practice, safety, precaution in workshop and bench work tools, its uses and processes
CLO 2	Study the operations of Smithy, forgoing tools, Lathe machine, drilling machine and welding
CLO 3	Elaborate the wood working tools and practice their application
CLO 4	Compare different types of machine tools (lathe, milling, drilling machines etc.)

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
-	**-**	**4**	**2**	**-**	**-**	**100**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours

1	**Introduction**: workshop practice, safety, care and precautions in workshop	**06 %**	**02**
2	**Wood work**: Wood working tools and their use, Carpentry	**06 %**	**02**
3	**Heat treatment process**: Hardening, tempering, annealing and normalizing etc.	**13 %**	**04**
4	**Metal work**: Metal cutting. Soldering, Brazing	**13 %**	**04**
5	**Welding**: Electric arc and Gas welding. Smithy and forging operations: tools and equipment's	**13 %**	**04**
6	**Bench work**: The bench, flat surface filing, chipping, scrapping, marking out, drilling and screwing	**13 %**	**04**
7	**Introduction to following tool machines**: (a) Lathe Machine (b) Milling Machine (C) Shaper and Planner (d) Drilling and Boring machines (e) Grinder (f) CNC Machines etc.	**36 %**	**12**
Total		**100 %**	**32**

i. Text Book and Reference Book:

1. Hazara Choudhary 2nd edition
2. E-course of ICAR. Cited from: www.agrimoon.com

a Course Name: Fluid Mechanics

b Course Code: 03604177 and 03604178

c Prerequisite: Knowledge of Physics and Mathematics up to 12thscience level.

d Rationale: Fluid mechanics is significant in Diploma Dairy Technology for optimizing the design and operation of processing equipment, ensuring efficient transport of liquids in dairy processes crucial for product quality and safety.

e Course Learning Objective:

CLOBJ 1	Understand the fundamental principles of fluid mechanics and their application in dairy technology, emphasizing viscosity, flow behaviour, and fluid properties.
CLOBJ 2	Analyse and design dairy processing equipment by applying fluid mechanics concepts to ensure efficient and hygienic operations.
CLOBJ 3	Demonstrate proficiency in calculating and predicting fluid flow parameters in dairy systems, including pipe flow, pump selection, and pressure losses.
CLOBJ 4	Evaluate heat transfer mechanisms related to fluid flow in dairy processes, considering thermal processing and pasteurization for product safety and quality.
CLOBJ 5	Apply mathematical modelling techniques to simulate and optimize fluid flow in dairy systems, fostering problem-solving skills for real-world applications.
CLOBJ 6	Demonstrate knowledge of rheology and its impact on dairy product texture, stability, and sensory attributes, facilitating the production of high-quality dairy products.

f Course Learning Outcomes:

CLO 1	Elaborate the different properties of fluids and compute the dimensions of various units
CLO 2	Distinguish the various pressure of liquids and learn the different pressure measuring devices
CLO 3	Study the Archimedes principle, Continuity equation, Bernoulli's theorem, Buckingham's theorem, Dimensionless numbers and its practical application
CLO 4	Describe various head losses in fluid flow and calculate the problems on head loss
CLO 5	Explain the difference between various notches, orifices, vena contract, mouthpiece and also compute the problems
CLO 6	Describe about the various application of pumps and learn the its efficiency as well as numerical

g Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**		
L	**T**	**P**	**C**	**Internal Evaluation**	**ESE**	**Total**

				MSE	CE	P	Theory	P	
2	**-**	**2**	**3**	**20**	**20**	**50**	**60**	**-**	**150**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction**: Units and dimensions, Properties of fluids.	**06 %**	**02**
2	**Static pressure of liquids**: Hydraulic pressure, absolute and gauge pressure, pressure head of a liquid. Pressure on vertical rectangular surfaces. Compressible and non-compressible fluids. Surface tension, capillarity	**12 %**	**04**
3	**Pressure measuring devices**: simple, differential, micro, inclined manometer, mechanical gauges, Piezometer	**09 %**	**03**
4	**Fluid flow**: Classification, steady uniform and non-uniform flow, Laminar and turbulent, continuity equation, Bernoulli's theorem and its applications	**12 %**	**04**
5	**Flow through pipes**: Loss of head, determination of pipe diameter. Determination of discharge, friction factor, critical velocity, Flow through orifices, mouthpieces, notches and weirs, Vena contracta, hydraulic coefficients, discharge losses. Time for emptying a tank. Loss of head due to contraction, enlargement at entrance and exit of pipe.	**16 %**	**05**
6	**Flow measurement**: Venturi meters, pitot tube, Rota meter. Water level point gauge, hook gauge	**13 %**	**04**
7	**Dimensional analysis**: Buckingham's theorem application to fluid flow phenomena. Froude Number, Reynolds number. Weber number and hydraulic similitude	**16 %**	**05**
8	**Pumps**: Classification, reciprocating, centrifugal pump. Pressure variation, work efficiency. Pump selection and sizing	**16 %**	**05**
Total		**100 %**	**32**

j. Text Book and Reference Book:

1. Fluid Mechanics (Textbook) D.S. Kumar; S. K. Kataria and Sons.
2. Fluid Mechanics (Textbook) R.K. Bansal; Laxmi Publications

a. **Course Name:** Economic Analysis
b. **Course Code:** 03604179
c. **Prerequisite:** Knowledge of Economic up to 12th science level.
d. **Rationale:** The Economic Analysis course is significant as it equips students with the essential skills to assess the economic viability, efficiency, and sustainability of dairy production, facilitating informed decision-making and strategic planning within the dairy industry.

e. **Course Learning Objective:**

CLOBJ 1	Develop a foundational understanding of economic principles and theories, including the recognition and analysis of human wants and the theory of consumer behaviour.
CLOBJ 2	Acquire the ability to articulate the law of demand, differentiate types of demand, analyse elasticity concepts, and apply techniques for demand forecasting.
CLOBJ 3	Demonstrate a comprehensive understanding of production theory, identify and analyse factors influencing production, and apply the law of return in agricultural and economic contexts.
CLOBJ 4	Develop the capability to distinguish and analyse various costs, differentiate cost curves, and apply cost-related concepts in economic decision-making.
CLOBJ 5	Learn about market systems, income types, and economic income measurement methodologies.
CLOBJ 6	Cultivate the ability to critically evaluate the unique characteristics and economic features of the dairy sector in India, analyse dairy development strategies, and assess the operational aspects of flood program implementation in the context of economic impact.

f. **Course Learning Outcomes:**

CLO 1	Understand the basics of economics and learn the human wants as well as theory of consumer behaviour
CLO 2	Explain the law of demand, types of demand, elasticity of demand and learn the demand forecasting
CLO 3	Study the theory of production, factors affecting to the production and law of return
CLO 4	Distinguish the various costs and cost curves
CLO 5	Learn the concept of various market competition and differentiate the various income as well as gain the knowledge about various methods used for measuring of these income
CLO 6	Evaluate the characteristics and economic features of dairy sector in India as well as dairy development strategy and operation in flood programme

g. **Teaching & Examination Scheme:**

Teaching Scheme	**Evaluation Scheme**

L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	0	2	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Basic concepts-wants** Basic concepts-wants, goods, wealth, utility, consumption, demand and supply	**15 %**	**5**
2	**Consumer behaviour** Consumer behaviour-law of diminishing marginal utility and equi-marginal utility, cardinal and ordinal utility approach for consumer's behaviour	**20 %**	**6**
3	**Theory of demand** Theory of demand-law of demand, demand schedule, demand function, determinates of demand, individual consumer demand and market demand, demand forecasting, elasticity of demand, price elasticity, income elasticity and cross elasticity, Consumer's surplus.	**25 %**	**8**
4	**Theory of production** Theory of production- concepts of firm and industry, basic factors of production and their role, production function for a single product, nature of production function, laws of returns.	**25 %**	**8**
5	**Concepts of costs** Concepts of costs-fixed and variable costs, short run and long run costs	**15 %**	**5**
Total		**100 %**	**32**

i. Text Book and Reference Book:

1. Principles of Economics" by N. Gregory Mankiw
2. Microeconomics" by Paul Krugman and Robin Wells
3. Macroeconomics" by N. Gregory Mankiw
4. Managerial Economics & Business Strategy" by Michael R. Baye
5. Environmental Economics: An Introduction" by Barry C. Field and Martha K. Field

a. **Course Name:** Introduction to Dairy Microbiology
b. **Course Code:** 03604181
c. **Prerequisite:** Knowledge of Basic Microbiology
d. **Rationale:** Dairy Microbiology equips the students with the knowledge of basic microbial testing and basic microorganisms knowledge. Also it will improve the knowledge of antimicrobial substances.

e. **Course Learning Objective:**

CLOBJ 1	To understand hygienic milk production systems and sources of milk contamination
CLOBJ 2	To study the classification and characteristics of dairy microorganisms.
CLOBJ 3	To understand microorganisms associated with milk and their significance.
CLOBJ 4	To gain knowledge about mastitic milk, milk-borne diseases, and antimicrobial substances in milk.

f. **Course Learning Outcomes:**

CLO 1	Learn hygienic milk production practices and identify sources of contamination in milk.
CLO 2	Classify dairy microorganisms based on morphological and biochemical characteristics.
CLO 3	Perform and interpret microbiological methods of milk testing such as DMC, SPC, dye reduction, and coliform count.
CLO 4	Identify microorganisms associated with raw milk and explain their significance.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
1	**-**	**-**	**1**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr.	**Topics**	**W**	**T**
1	**Hygienic milk production system**Contamination: microbial and non microbial contaminants, their sources and entry points in milk during various stages of production; Good Hygiene Practices (GHP) during milk production operations	**10**	**3**
2	**Classification of dairy microorganism**Morphological and biochemical classification of dairy bacteria. Introduction of important microorganism	**24**	**7**

3	**Microorganisms associated with milk**Microorganisms associated with raw milk and their significance	**14**	**4**
4	**Microbiological methods of milk testing:**Qualitative and quantitative methods of milk testing Dye reduction test Direct microscopic count (DMC) Standard plate count (SPC) Coliform counts in Milk	**24**	**7**
5	**Microbial spoilage of milk:**Role of microorganisms in spoilage of milk Milk fermentation Abnormal milk fermentation	**10**	**3**
6	**Mastitic milk** Mastitic milk-suitability for processing and public health significance. Detection of mastitic milk.	**7**	**2**
7	**Milk borne diseases:**Food infection, intoxication and toxi-infection Milk borne disease	**7**	**2**
8	**Antimicrobial substances**Antimicrobial substances associated with milk	**4**	**1**
	Total	**100**	**29**

i. Text Book and Reference Book:

1. How to Win Friends and Influence People by Dale Carnegie
2. The 7 Habits of Highly Effective People by Stephen R. Covey
3. The Art of Communicating by Thich Nhat Hanh
4. Personality Development and Soft Skills by Barun K. Mitra
5. Communication Skills for Dummies by Elizabeth Kuhnke

a Course Name: Communication Skills – II

b Course Code: 03693153

c Prerequisite: Knowledge of Science and Mathematics up to 12th science level.

d Rationale: Communication Skills – II in Diploma Dairy Technology equips students with essential interpersonal abilities and a polished demeanour, fostering effective communication and professional growth crucial for success in the dynamic dairy industry.

e Course Learning Objective:

CLOBJ 1	Develop proficiency in articulating ideas clearly, employing effective body language, and refining overall communication techniques to convey information with precision and impact.
CLOBJ 2	Acquire the knowledge and skills necessary for presenting oneself professionally, including proper etiquette, grooming, and presentation techniques, fostering a positive and lasting impression in professional settings.
CLOBJ 3	Build the ability to work collaboratively in diverse teams, fostering effective teamwork, conflict resolution, and interpersonal relationships to enhance productivity and synergy within the dairy technology field.
CLOBJ 4	Improve proficiency in written communication, including report writing, documentation, and effective use of technology, to ensure clarity, precision, and compliance with industry standards.

f Course Learning Outcomes:

CLO 1	Study the basics of communication, types of communication, models of communication and barriers to communication
CLO 2	Distinguish the technical writing, scientific writing and resume writing
CLO 3	Learn the oral communication, oral presentation tips and public speaking
CLO 4	Introduction to sentence structure and functional grammar

g Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
1	**-**	**-**	**1**	**-**	**100**	**-**	**-**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h Course Content:

Sr. No.	Content	Weightage	Teaching Hours

1.	**Email etiquette & Email writing:** Trains students on detailed email and letter writing etiquette.	**5%**	**2**
2.	**Interpersonal Communication at Workplace:** Dynamics of communication: process, concept, nature and barriers to communication. Non-verbal Communication Activity	**5%**	**2**
3.	**Précis Writing** Develop adequate knowledge of precis writing techniques.	**5%**	**2**
4.	**Paragraph Development:** Structure of Paragraph Construction of Paragraph, using transitions and connecting Devices	**5%**	**2**
5.	**Paragraph Jumbles:** Students will be able to solve the jumbled paragraph which comes in different exams by solving the worksheet	**10%**	**3**
6.	**Public Speaking:** Choosing appropriate pattern Selecting appropriate method Art of persuasion, making speeches effective, Delivering different types of speeches	**10%**	**3**
7.	**Reading Comprehension: Worksheets:** To enable the students, develop the knowledge, skills, and strategies they must possess to become proficient and independent readers	**5%**	**2**
8.	**Listening Skills (practice & test):** Small everyday conversation & comprehension Inquiry based listening questions	**10%**	**3**
9.	**Misplaced Modifiers:** Students will understand how to place the improperly separated word, phrase or clause from the word it describes.	**5%**	**2**
10.	**Advanced vocabulary Building:** Phrasal verbs, Idiotic Expression (Chart Activity), Developing, Technical vocabulary (Memory Game) Homophones, Homonyms & Confusable	**10%**	**3**
11.	**Letter writing:** Layout Appreciation letter Apology letter Acknowledgement letter	**14 %**	**4**
12.	**Resume Building:** Cover letter resume	**08 %**	**2**
13.	**Group Discussion:** Communication core, Definition, types, process, guidelines Mock round	**08 %**	**2**
Total		**100 %**	**32**

i Text Book and Reference Book:

1. How to Win Friends and Influence People by Dale Carnegie
2. The 7 Habits of Highly Effective People by Stephen R. Covey
3. The Art of Communicating by Thich Nhat Hanh
4. Personality Development and Soft Skills by Barun K. Mitra
5. Communication Skills for Dummies by Elizabeth Kuhnke