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SWAMI VIVEKANAND SUBHARTI UNIVERSITY,
MEERUT



FACULTY OF ENGINEERING & TECHNOLOGY

ORDINANCE No. V-2 (B7)

**RELATING TO COURSE CURRICULUM & SYLLABUS
OF UG PROGRAM**

BACHELOR OF TECHNOLOGY (B.Tech.) FOOD TECH.

(Effective from the Session – 2025-26)

Apporved by the Academic Council of the Meeting held on 06 May 2025

Apporved by the Executive Council of the Meeting held on 28 June 2025

(Dr. Lalit Kumar)

Dr. Kabil Kumar

Dr. Shobha Mishra



FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
(As per NEP 2020 and AICTE Guidelines)
B.Tech 1st Year/1st Semester (Common to All Branches)
w.e.f. academic Session 2026-27

SEMESTER I

3-WEEKS INDUCTION PROGRAMME
in the beginning of the session

S. No.	Course Code	Course Name	Course Domain	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UAS-101/ UAS-102	Engineering Physics/Engineering Chemistry	BS	4	0	0	20	10	30	-	70	-	100	4
2	UAS-103	Engineering Mathematics-I	BS	4	0	0	20	10	30	-	70	-	100	4
	UECE-101/ UEEE-101	Basic Electronics Engineering/ Basic Electrical Engineering	ES	3	0	0	20	10	30	-	70	-	100	3
3	UCSE-101	Programming For Problem Solving	ES	3	0	0	20	10	30	-	70	-	100	3
4	UME-151/ UME-152	Engineering Graphics & Design Lab /Workshop Practices Lab	SEC	0	0	4	-	-	-	15	-	35	50	2
5	UAS-151/ UAS-152	Engineering Physics Lab/ Engineering Chemistry Lab	BS	0	0	2	-	-	-	15	-	35	50	1
6	UECE-151/ UEEE-151	Basic Electronics Engineering Lab/ Basic Electrical Engineering Lab	ES	0	0	2	-	-	-	15	-	35	50	1
7	UCSE-151	Programming for Problem Solving Lab	ES	0	0	2	-	-	-	15	-	35	50	1
8	UVA-101/ UVA-102	IDEA Lab Workshop/ Introduction to Generative AI Lab	VAC-1/ VAC-2	0	0	4	-	-	-	15	-	35	50	2
Total													650	21

***Compulsory Qualifying Audit Course**

Abbreviation Used:

BS: Basic Science Course

ES: Engineering Science Course

HS: Humanities and Social Sciences including Management Course

AU: Audit Course


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FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

STUDY & EVALUATION SCHEME

(As per NEP 2020 and AICTE Guidelines)

B.Tech 1st Year/2nd Semester (Common to All Branches)

w.e.f. academic Session 2026-27

SEMESTER II														
S No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UAS-201/ UAS-202	Engineering Physics/Engineering Chemistry	BS	4	0	0	20	10	30	-	70	-	100	4
2	UAS-203	Engineering Mathematics-II	BS	4	0	0	20	10	30	-	70	-	100	4
3	UECE-201/ UEEE-201	Basic Electronics Engineering/ Basic Electrical Engineering	ES	3	0	0	20	10	30	-	70	-	100	3
4	UCSE-201	Python Programming	ES	3	0	0	20	10	30	-	70	-	100	3
5	UHU-201	Professional Communication	AEC	2	0	0	20	10	30	-	70	-	100	2
6	UME-151/ UME-152	Engineering Graphics & Design Lab /Workshop Practices Lab	SEC	0	0	4	-	-	-	15	-	35	50	2
7	UAS-151/ UAS-152	Engineering Physics Lab/ Engineering Chemistry Lab	BS	0	0	2	-	-	-	15	-	35	50	1
8	UECE-151/ UEEE-151	Basic Electronics Engineering Lab/ Basic Electrical Engineering Lab	ES	0	0	2	-	-	-	15	-	35	50	1
9	UCSE-251	Python Programming Lab	ES	0	0	2	-	-	-	15	-	35	50	1
10	UHU-251	Professional Communication Lab	AEC	0	0	2	-	-	-	15	-	35	50	1
11	UVA-201/ UVA-202	IDEA Lab Workshop/ Introduction to Generative AI Lab	VAC-1/ VAC-2	0	0	4	-	-	-	15	-	35	50	2
12	UAU-202*	Sports and Yoga/NSS or NCC	AU	0	0	3	-	-	-	100	-	-	100	0
Total													900	24

*Compulsory Qualifying Audit Course

Abbreviation Used:

BS: Basic Science Course

ES: Engineering Science Course

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AU: Audit Course



UEEE-101/ UEEE-201	Basic Electrical Engineering	L	T	P	3 Credits
		3	0	0	

Objectives: The expected student learning outcomes of this goal are to graduate engineers who have:

- The ability to apply science, engineering science, and mathematics to solve engineering problems.
- The ability to put their engineering and design skills into practice.
- The ability to use industrial-quality laboratory equipment and engineering software for analysis, testing, design, and communication.
- The ability to design systems, components, and processes that satisfy predetermined constraints.
- The ability to put engineering problems, put them in solvable form, and develop and evaluate alternative solutions.

Prerequisites of the course: Concepts of electricity and Magnetism, Electromagnetic Induction,

Course Outcome		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.	K3
CO2	Analyze the steady state behavior of single phase and three phase AC electrical circuits.	K4
CO3	Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.	K4
CO4	Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.	K2
CO5	Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.	K2, K3

KL-Bloom's Knowledge Level (K1, K2, K3, K4, K5, and K6)

K1-Remember K2-Understand K3-Apply K4-Analyze K5-Evaluate K6-Create

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Detailed contents:

UNIT 1: DC Circuits

[08]

Concept of potential difference, current, resistance. Ohm's law, effect of temperature on resistance. Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

UNIT - 2: Steady- State Analysis of Single Phase AC Circuits [10]

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits.

UNIT - 3 : Transformers

[08]

Introduction to magnetism, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer.

UNIT -4 : Electrical machines

[08]

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems).

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

UNIT -5: Emerging Electrical Trends

[06]

Types of Batteries, Characteristics for Batteries, Basic Concept of Solar Photo-Voltaic Cell, Types of PV- Cells. Installation of Solar Panel.

Text Books:

1. RituSahdev, "Basic Electrical Engineering", Khanna Publishing House.
2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.



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UEEE-151/ UEEE-251	Basic Electrical Engineering Lab	L	T	P	1 credit
		0	0	2	

Course Outcome		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Apply Kirchhoff's Voltage and Current Laws (KVL/KCL) and network theorems (Superposition and Thevenin's) to DC electrical circuits through experimental validation.	K3
CO2	Analyze the behavior of AC circuits and <i>measure</i> power and power factor in single-phase and three-phase systems using wattmeters and capacitors.	K3, K4
CO3	Demonstrate and interpret the B-H curve characteristics of ferromagnetic materials using CRO.	K3, K4
CO4	Calculate the efficiency of a single-phase transformer and a DC shunt motor using load test data.	K3, K5
CO5	Perform and explain the working principle of a Solar Photo-Voltaic Cell through a basic laboratory experiment.	K2, K3

LIST OF EXPERIMENTS

Note: A minimum of eight experiments from the following should be performed.

1. Verification of Kirchhoff's laws.
2. Verification of Superposition and Thevenin's Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor.
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 1- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
6. Determination of parameters of ac single phase series RLC circuit.
7. To observe the B-H loop of a ferromagnetic material in CRO.
8. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer.
9. Determination of efficiency of a dc shunt motor by load test.
10. To study the basic Concept of Solar Photo-Voltaic Cell.



UECE-101/ UECE-201	BASIC ELECTRONICS ENGINEERING	3 L: 0 T: 0 P	3 Credits
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Course Outcomes:

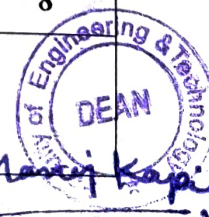
On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To understand basics of semiconductor, devices and their applications in different areas	K1, K2
CO2	To implement and understand different biasing techniques of BJTs, FETs, and operational amplifiers	K2
CO3	To analyze output in different operating modes of different semiconductor devices	K3
CO4	To implement circuits and evaluate different parameters of electronic devices	K4
CO5	To compare design issues, advantages, disadvantages and limitations of basic electronics	K5
		K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit -1: Semi-conductors and Diodes	10
Conductors, Semiconductors, Intrinsic Semiconductors, Extrinsic Semi Conductors. Diode Theory: Basic Ideas, The ideal Diode, Forward and Reverse Bias, Diode Equation, Volt-Ampere Characteristic. Special diodes: symbol of Zenner diode, operation, V-I characteristics, symbol of photo diode, working principle, LED symbol and principle. Diode break down and capacitances	
Unit-2: Applications of Diodes	6
Half-wave Rectifier, Full-wave and Bridge Rectifier, derivation of Ripple factor, efficiency of Half-wave, full-wave and Bridge rectifiers, Merits and demerits of Half-wave, full-wave and Bridge rectifiers, Comparisons of rectifiers, Clippers and Clampers	
Unit-3: Bipolar Junction Transistors	8
Symbols of p-n-p and n-p-n transistors and their working principles, Transistor currents, input and output characteristics of Common base configuration, Common Emitter configuration Transistor Switch, Amplifiers: working principles of Common base amplifier, Common Emitter amplifier, Common collector amplifier and their applications	
Unit 4: Field Effect Transistors	8
Classification of FET – Comparative study of BJT and JFET – Merits and demerits of FET – Construction of JFET – JFET Characteristics – MOSFET (Enhancement & Depletion), working and IV characteristics	



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Introduction to OP-amp, Op-amp Block Diagram, ideal and practical Op-amp specifications, 741 op-amp & its features, Op-Amp parameters & Measurement, Input & Output offset voltages & currents, slew rates, CMRR, PSRR.

Applications of Op-Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Comparators.

Introduction to Electronic Instruments: CRO, Multi meter, Signal Generators.

Text Books:

1. Electronic Principles, Albert Malvino and David J Bates, 7th Edition, Tata McGraw-Hill.
2. Electronic Devices and Circuits Theory, Boylestad, Pearson Education, 8th Edition, September 2011.
3. Op-Amps and Linear Integrated Circuits, - Ramakanth A. Gayakwad, PHI, 4th Edition, 2009
4. Linear Integrated Circuits-D. Roy Chowdhury, New Age International Pvt. Ltd., 2nd Edition, 2003.

Reference Books:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 10th Edition (2010), Pearson/PHI
2. Electronic Devices and Circuits, David A. Bell, Oxford, 5th edition, 2009.
3. Electronic Devices and Circuits, S. Salivahanan, Kumar, Vallavaraj, TATA McGraw Hill, 2nd Edition, 2003.
4. Operational Amplifiers & Linear ICs, David A Bell, Oxford Uni. Press, 3rd Edition, 2005.

Spoken Tutorial (MOOCs):

1. <http://nptel.ac.in/courses.php> <http://jntuk-coeerd.in/>



UECE-151/ UECE-251	BASIC ELECTRONICS ENGINEERING LAB	0L:0T:2P	1 Credit
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Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.	K3
CO2	Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.	K4
CO3	Perform experiment illustrating BH curve of magnetic materials.	K3
CO4	Calculate efficiency of a single phase transformer and DC machine.	K4
CO5	Understand the principles, operation and application of the basic electronic component/devices and the Characteristics of the active and passive devices. And create a working mini-project	K2, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

LIST OF EXPERIMENTS

Note: A minimum of ten experiments, five from each section from the following should be performed.

(A) Section A

1. Verification of Kirchhoff's laws
2. To assemble and test 5V/9V DC regulated power supply
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two-wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit.
8. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase Transformer
9. Determination of efficiency of a dc shunt motor by load test.
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

(B) Section B

1. To get familiar with the working of the following instruments:
 - a) Cathode ray oscilloscope (CRO)

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- b) Multimeter (Analog and Digital)
 - c) Function generator
 - d) Power supply.
2. a) Plot the forward and reverse V-I characteristics of P-N junction diode
b) Study of Zener diode in breakdown region
 3. Applications of PN Junction diode: Half & Full wave rectifier-Measurement of V_{rms} , V_{dc} .
 4. To assemble and test 5V/9V DC regulated power supply.
 5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
 6. Soldering shop: Soldering and disordering of Resistor in PCB. Soldering and disordering of IC in PCB. Soldering and disordering of Capacitor in PCB
 7. Micro project (Submit any circuitry on general purpose PCB based on experiment number 2-4)

(C) Experiments available on virtual lab

1. **Kirchhoff's laws. Virtual lab link:**
<http://vlab.amrita.edu/?sub=3&brch=75&sim=217&cnt=2>
2. **Thevenin Theorem. Virtual lab link:**
<https://vlab.amrita.edu/?sub=1&brch=75&sim=313&cnt=1>
3. **RLC series resonance. Virtual lab link:**
<https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1>
4. **Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load. Virtual lab link:** <http://vp-dei.vlabs.ac.in/Dreamweaver/measurement.html>
5. **Determination of parameters of ac single phase series RLC circuit. Virtual lab link:**
<https://vlab.amrita.edu/?sub=1&brch=75&sim=332&cnt=1>
6. **To observe the B-H loop of a ferromagnetic material in CRO. Virtual lab link:**
<https://vlab.amrita.edu/?sub=1&brch=282&sim=1507&cnt=2>
7. **Determination of the efficiency of a dc motor by loss summation method (Swinburne's test). Virtual lab link:**
<http://em-iitr.vlabs.ac.in/exp5/index.php?section=Theory>



UME-151/ UME -251	ENGINEERING GRAPHICS & DESIGN LAB	1L:0T:4P	3 Credits
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Course Outcomes:

On completion of course the students are able:

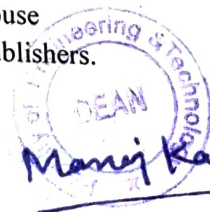
CO	CO Statement	Bloom's Level
CO1	Use scales and draw projections of objects.	K1,K2,K6
CO2	Explain views of solids and their sectional surfaces.	K2,K3
CO3	Analyze and draw isometric projections of objects.	K4,K6
CO4	Demonstrate orthographic representation of perspective views using modern tools.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Content
Unit-1: Introduction to Engineering Drawing (8 hours)
Principles of Engineering Graphics and their significance. Dimensioning, Lettering. Scales: Plain, Diagonal and Engineering Scales.
Unit-2: Projection of Points and Lines (8 hours)
Orthographic Projection, Projection of Point, Projection of Lines: Projection of straight lines; Projection of lines inclined to one plane and both planes.
Unit-3: Projection of Planes and Solids (8 hours)
Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes. Classification of solids, Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.
Unit-4: Sections of Regular Solids and development of Surfaces (8 hours)
Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections such as Prism, Cylinder, Pyramid, and Cone. Development of surfaces for various regular solids such as Prism, Cylinder, Pyramid and Cone.
Unit-5: Isometric Projection (8 hours)
Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids. Perspective Projection: Orthographic representation of perspective views — Plane figures and simple solids — Visual Ray Method. Conversion of pictorial view into orthographic Projection.

Suggested Text/ Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
4. Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
6. (Corresponding set of) CAD Software Theory and User Manuals.



UME-152/ UME -252	WORKSHOP PRACTICES LAB	1L:0T:4P	3 Credits
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Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Use various engineering materials, tools, machines and measuring equipments.	K3
CO2	Perform machine operations in lathe and CNC machine.	K3
CO3	Perform manufacturing operations on components in fitting and carpentry shop.	K3
CO4	Perform operations in welding, moulding, casting and gas cutting.	K3
CO5	Fabricate a job by 3D printing manufacturing technique	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

S. No.	Mechanical Workshop	Duration
1	Introduction to Mechanical workshop material, tools and machines	3 Hrs
	To study layout, safety measures and different engineering materials (mild steel, medium carbon steel, high carbon steel, high speed steel and cast iron etc) used in workshop.	
	To study and use of different types of tools, equipment, devices & machines used in fitting, sheet metal and welding section.	
	To determine the least count of Vernier calliper, vernier height gauge, micrometer (Screw gauge) and take different reading over given metallic pieces using these instruments.	
2	Machine shop	6 Hrs
	Demonstration of working, construction and accessories for Lathe machine	
	Perform operations on Lathe - Facing, Plane Turning, step turning, taper turning, threading, knurling and parting.	
3	Fitting shop	6 Hrs
	1. Practice marking operations. 2. Preparation of U or V -Shape Male Female Work piece which contains: Filing, Sawing, Drilling, Grinding.	
4	Carpentry Shop	3 Hrs
	Study of Carpentry Tools, Equipment and different joints.	
	Making of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint	
5	Welding Shop	6 Hrs



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	Introduction to BI standards and reading of welding drawings.	
	Practice of Making following operations Butt joint, Lap Joint using ARC Welding, MIG Welding	
6	Moulding and Casting Shop	6 Hrs
	Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes Demo of mould preparation and Aluminum casting Practice – Study and Preparation of mould for Plastic	
7	CNC Shop	6 Hrs
	Study of main features and working parts of CNC machine and accessories that can be used. Perform different operations on metal components using any CNC machines	
	Total	36 Hrs

Reference Books:

1. Workshop Practice, H S Bawa, McGraw Hill
2. Mechanical Workshop Practice, K C John, PHI
3. Workshop Practice Vol 1, and Vol 2, by HazraChoudhary , Media promoters and Publications
4. CNC Fundamentals and Programming, By P. M. Agrawal, V. J. Patel, Charotar Publication.



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Course Outcomes:

On completion of course the students are able to:

CO	CO Statement	Bloom's Level
CO1	Get an understanding of the theoretical principles of chemistry of molecular structure, bonding and properties, Chemistry of advanced materials (Nanomaterials and Graphite) as well as the Principles of Green Chemistry.	K3
CO2	Apply the fundamental concepts of determination of structure with various spectral techniques.	K4
CO3	Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.	K3
CO4	Develop understanding of the sources, impurities and hardness of water, apply the concepts of determination of calorific values and analyze the coal.	K3
CO5	Develop the understanding of Chemical structure of polymers and its effect on their various properties when used as engineering materials. Understanding the applications of specific polymers and Chemistry applicable in industrial process.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	8
Atomic and Molecular Structure: Molecular orbital's of diatomic molecules, Bond Order, Magnetic characters and numerical problems. Chemistry of Advanced Materials: Graphite; Introduction, Structure and applications. Nanomaterials; Introduction, Preparation, characteristics of nanomaterials and applications of nanomaterials, Carbon Nano Tubes (CNT), Green Chemistry: Introduction, 12 principles and importance of green Synthesis, Green Chemicals, Synthesis of typical organic compounds by conventional and Green route (Adipic acid and Paracetamol), Environmental impact of Green chemistry on society.	8
Unit-2:	8
Spectroscopic Techniques and Applications: Atomic spectroscopy: Introduction to spectroscopy, atomic absorption spectrophotometry and its application. Molecular Spectroscopy: Beer-Lambert's Law, molecular spectroscopy, principle, instrumentation and applications of UV-Vis and IR spectroscopy	8
Unit-3:	



Electrochemistry and Batteries: Basic concepts of electrochemistry, Nernst Equation. Batteries; Classification and applications of Primary Cells (Dry Cell) and Secondary Cells (Lead Acid battery). Corrosion: Introduction to corrosion, Types of corrosion, Cause of corrosion, Corrosion prevention and control, Corrosion issues in specific industries (Power generation, Chemical processing industry, Oil & gas industry and Pulp & paper industries). Phase Rule: States of matter; phase; component and degree of freedom; Gibb's phase rule; one component and two component systems.	
Unit-4:	8
Water Technology: Sources and impurities of water, Hardness of water, Boiler troubles (Scale and Sludge Formation in boiler and its prevention) Techniques for water softening (Lime-Soda, Zeolite, Ion Exchange and Reverse Osmosis process), Determination of Hardness and alkalinity, Numerical problems. Fuels and Combustion: Definition, Classification, Characteristics of a good fuel, Calorific Values, Gross & Net calorific value, Determination of calorific value by Bomb Calorimeter and Dulong's method, Analysis of coal by Proximate and Ultimate analysis method, Numerical problems.	
Unit-5:	8
Materials Chemistry: Polymers; Classification, Polymerization processes, Thermosetting and Thermoplastic Polymers, Polymer Blends and Composites, Conducting and Biodegradable polymers, Preparation, properties, industrial applications of Teflon, Lucite, Bakelite, Kelvar, Dacron, Thiokol, Nylon, Buna-N and Buna-S and their environmental impact on society, Speciality polymers. Organometallic Compounds: General methods of preparation and applications of Organometallic compounds (RMgX and LiAlH₄).	

Reference Books:

1. Engineering Chemistry by Rath & Singh, 2nd Edition, Cengage Learning India Pvt Ltd Delhi.
2. Engineering Chemistry by SS Dara, S Chand & Co Ltd
3. Engineering Chemistry by Jain & Jain, S.Chand & Comp, New Delhi
4. Engineering Chemistry by K. Sesha Maheswaramma, Pearson
5. Engineering Chemistry by OG Palanna, Mc Graw Hill Education, New Delhi
6. Engineering Chemistry by Shashi Chawala, Dhanpat Rai Publishing Comp, New Delhi
7. University Chemistry by BH Mahan
8. University Chemistry by CNR Rao

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AS-152/ UAS -252	ENGINEERING CHEMISTRY LAB	0L:0T:3P	1 Credit
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Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Get an understanding of the use of different analytical instruments.	K3
CO2	Measure the molecular / system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in the water.	K3
CO3	Measure the hardness and alkalinity of the water.	K3
CO4	Know the fundamental concepts of the preparation of phenol formaldehyde & urea formaldehyde resin, adipic acid and Paracetamol.	K3
CO5	Estimate the rate constant of reaction.	K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments

Instructor may choose any 10 experiments from above and may also change any two of the above.

1. Calibration of Analytical Equipment and apparatus.
2. Determination of Hardness of water sample by EDTA method.
3. Determination of Alkalinity of water sample.
4. Determination of pH by titrimetric method.
5. Determination of surface tension of given liquid.
6. Determination of Viscosity of a given liquid by viscometer.
7. Determination of the strength of Ferrous ammonium sulfate using external indicator.
8. Determination of the strength of Potassium dichromate using internal indicator.
9. Determination of available chlorine in bleaching powder.
10. Determination of chloride content in water sample.
11. Preparation of Phenol formaldehyde (PF) resin.
12. Preparation of Urea formaldehyde (UF) resin.
13. Preparation of Adipic acid / Paracetamol.
14. Determination of Cell Conductance of a solution.
15. Determination of Rate constant of hydrolysis of esters.
16. Element detection and identification of functional groups in organic compounds.

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UAS-103	Engineering Mathematics-I	3L:1T:0P	4 Credits
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Objectives:

- To acquaint the student with the essential tools of matrices, eigen values and its application in a Comprehensive-manner.
- To apply the knowledge of differential calculus in the various fields of engineering and have a basic understanding of Beta and Gamma functions and application of Dirichlet's integral.
- To deal with functions of several variables that is essential in optimizing the results of real life problems
- To deal with vector calculus that is required in different branches of Engineering to graduate engineer.

Unit No.	Particulars	Contact Hours
1	Matrices: Complex Matrices, Hermitian, Skew-Hermitian and Unitary Matrices, Elementary transformations, Inverse of a matrix, Rank of matrix, Solution of a system of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Linear Dependence and Independence of vectors, Eigen values and Eigen vectors, Linear Transformation and matrix representation, Applications to Engineering problems.	8
2	Differential Calculus- I: Successive Differentiation (nth order derivatives), Leibnitz theorem, Partial derivatives, Euler's Theorem for homogeneous functions, Total derivative, Change of variables, Curve tracing.	8
3	Differential Calculus-II: Expansion of functions by Taylor's and Maclaurin's theorems for functions of one and two variables, Maxima and Minima of functions of several variables, Lagrange's method of multipliers, Jacobians, Approximation of errors.	8
4	Multiple integration: Double integral, Triple integral, change of order of integration, Change of variables, Beta and Gamma functions and their properties, Dirichlet's integral and its applications to area and volume, Liouville's extensions of Dirichlet's integral.	8
5	Vector Calculus: Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem and Stoke's theorem (without proof) and their applications.	8



Course Outcomes:

	Course Outcome (CO)	Bloom's Level
At the end of this course, the students will be able to:		
CO 1	Understand the concept of complex matrices, Eigen values, Eigen vectors and apply the concept of rank to evaluate linear simultaneous equations	K2 & K5
CO 2	Remember the concept of differentiation to find successive differentiation, Leibnitz Theorem, and create curve tracing, and find partial and total derivatives	K1, K6 & K5
CO 3	Applying the concept of partial differentiation to evaluate extrema, series expansion, error approximation of functions and Jacobians	K3 & K5
CO 4	Remember the concept of Beta and Gamma function; analyze area and volume and Dirichlet's theorem in multiple integral	K1 & K4
CO 5	Apply the concept of Vector Calculus to analyze and evaluate directional derivative, line, surface and volume integrals.	K3, K4 & K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
6. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, McGraw-Hill; Sixth Edition
7. P. Sivaramakrishna Das and C. Vijaya Kumari, Engineering Mathematics, 1st Edition, Pearson Education.
8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.



UAS-101 / UAS-201	ENGINEERING PHYSICS	3L:1T:0P	4 Credits
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Course Objective:

The objective of the course is to understand the basic concepts of nature around us and to synthesize the knowledge from different areas of physics for analysing and solving various critical problems.

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand and apply the principle of conservation of momentum, the theory of relativity.	K1, K2
CO2	To explain the distribution of energy in black body radiation and to understand the difference in particle and wave nature with explanation of Compton effect and Schrodinger wave equation.	K1, K4
CO3	Understand Maxwell's equations of electromagnetic theory with the aim to apply them in a communication system.	K1, K2, K5
CO4	To understand the behavior of waves through various examples/applications of interference and diffraction phenomenon and the concept of grating and resolving power.	K2, K3
CO5	To know the functioning of optical fiber and its properties and applications. To understand the concept, properties and applications of Laser.	K1, K2

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1: Relativistic Mechanics	9
Inertial and Non- Inertial Frames of references, Galilean transformation equations, Michelson Morley Experiment, Lorentz Transformation equations, Length contraction, Time dilation and its experimental evidence, Relativistic velocity addition formula, Relativistic variation of mass with velocity, Evidence of variation of mass with velocity, Einstein's Mass-Energy equivalence, examples from nuclear physics, Relativistic energy momentum relation.	
Unit-2: Quantum mechanics	9
Inadequacy of classical mechanics, Planck's theory of black body radiation(qualitative), Compton effect, de-Broglie concept of matter waves, Davisson and Germer Experiment, Phase velocity and group velocity, Time-dependent and time-independent Schrodinger wave equations, Physical interpretation of wave function, Particle in a one-Dimensional box.	
Unit-3: Electromagnetic Field Theory	



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Ampere's law and Faraday's law of electromagnetic induction, Derivation of Maxwell's equations and their physical significance, Correction of Ampere's law by Maxwell, Concept of displacement current, Poynting theorem, Maxwell's equations in free space & velocity of electromagnetic waves, Transverse character of the wave and orthogonality of $\mathbf{E}$, $\mathbf{H}$ and $\mathbf{k}$ vectors, Maxwell's equation in dielectric medium and velocity of e.m. wave, Comparison with free space, Maxwell's equations in conducting media & solution of differential equation in this case, penetration depth & its significance.	
Unit-4: Wave Optics	10
Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications, Introduction to diffraction, Fraunhofer diffraction at single slit and double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power, Rayleigh's criterion of resolution, Resolving power of grating.	
Unit-5: Fiber Optics & Laser	9
Fibre Optics: Principle and construction of optical fiber, Acceptance angle, Numerical aperture, Acceptance cone, Step index and graded index fibers, Fiber optic communication principle, Attenuation, Dispersion, Application of fiber. Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Population inversion, Einstein's Coefficients, Principles of laser action, Solid state Laser (Ruby laser) and Gas Laser (He-Ne laser), Laser applications.	

Reference Books:

1. Concepts of Modern Physics - Aurther Beiser (Mc-Graw Hill)
2. Optics - Brijlal & Subramanian (S. Chand)
3. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
4. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
5. Engineering Physics-Malik HK and Singh AK (Mc Graw Hill)

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UAS-151/ UAS -251	ENGINEERING PHYSICS LAB	0L:0T:3P	1 Credit
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Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	<i>Apply</i> the principle of interference and diffraction to find the wavelength of monochromatic and polychromatic light.	Apply
CO2	<i>Compute</i> and <i>analyze</i> various electrical and electronic properties of a given material by using various experiments.	Analyze
CO3	<i>Verify</i> different established laws with the help of optical and electrical experiments.	Apply
CO4	<i>Determine</i> and <i>calculate</i> various physical properties of a given material by using various experiments.	Apply
CO5	<i>Study</i> and <i>estimate</i> the performance and parameter of given equipment by using graphical and computational analysis.	Apply

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments

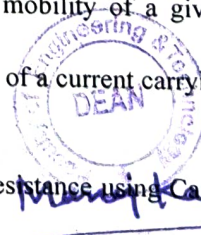
Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.



7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar & Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (Krishna Prakashan Meerut)



UVA-102/ UVA-202	Introduction to Generative AI Lab	0L:0T:4P	2 Credit
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Course Outcomes:

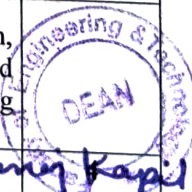
On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Describe foundational concepts and architectures of generative AI systems.	K1, K2
CO2	Apply prompt engineering techniques to generate coherent text and multimedia outputs using AI tools.	K3
CO3	Analyze and compare different generative model capabilities (text, image, audio, and video).	K4, K5
CO4	Demonstrate responsible use of generative AI by identifying and mitigating ethical and bias-related issues.	K5, K6
CO5	Design and implement a small-scale generative AI project integrating text and/or media generation.	K3, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit -1: Foundations of Generative AI	4
History and evolution of AI: discriminative vs. generative approaches, High-level survey: GANs, VAEs, Transformers, Diffusion Models, Use-cases: text, art, design, code, audio, simulation, Interactive demo with ChatGPT: Q&A, summarization, brainstorming, Group exercise: Compare outputs from two simple prompts	
Unit-2: Prompt Engineering for Text Generation	4
Anatomy of an effective prompt, Parameters: temperature, max tokens, context window, Techniques: zero-shot, few-shot, chain-of-thought, Common pitfalls and hallucinations, Craft prompts for tasks: email writing, story creation, code snippet generation, Evaluate and refine prompts based on output quality	
Unit-3: Image & Media Generation	4
Text-to-Image models: diffusion vs. GAN-based pipelines, Tools overview: DALL-E, Midjourney, Stable Diffusion, Bing Image Creator, Basics of AI audio/video generation (RunwayML, Synthesia), Create AI-generated images from thematic prompts, Edit or remix generated media into a poster or digital collage	
Unit-4: Ethics, Bias & Responsible AI	4
Understanding bias: data, algorithmic, societal impacts, Deepfakes, misinformation, copyright issues, Privacy and consent in AI-generated content, Governance frameworks and disclosure best practices, Case study analysis: real-world bias example, Debate: labeling requirements for AI-generated media	
Unit-5: Mini-Project: Creative Application	



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UVA-101/ UVA-201	IDEA Lab Workshop	0L:0T:4P	2 Credit
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Course Objectives:

1. To learn all the skills associated with the tools and inventory associated with the IDEA Lab.
2. Learn useful mechanical and electronic fabrication processes.
3. Learn necessary skills to build useful and standalone system/ project with enclosures.
4. Learn necessary skills to create print and electronic documentation for the system/project

Course Outcomes:

On completion of course the students are able to:

CO	CO Statement	Bloom's Level
CO1	To familiarize the students with basic electronic components, mechanical tools and basic Binary system	K1, K2
CO2	To understand working of Basic measuring instruments, power tools and five component model of a computer.	K2
CO3	To study basic building blocks of circuits, 3D printing and latest technology and equip oneself with MS office.	K2, K3
CO4	To apply the knowledge gained to plan and implement a mini project.	K3, K4, K5
CO5	To create a mini project replete with Report and video.	K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Course Contents:

Unit #	Topics		
1.	Electronic component familiarization, Understanding electronic system design flow. Schematic design and PCB layout	Introduction to basic hand tools - Tape measure, combination square, Vernier Calipers, Micrometers, Dial Gauges, Height Gauges, Depth Gauges, Slip gauge, Filler gauge, Thread Gauge, Dial Indicator, Surface plate, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading.	Number Systems and Codes:- Decimal, Binary, Octal and Hexadecimal Number systems, Codes-BCD, Gray Code, Excess-3 Code, ASCII, EBCDIC, Conversion between various Codes.
2.	Familiarization and use of basic measurement instruments: Signal and function generator. Circuit prototyping using (a) breadboard, (b) Zero PCB (d) custom PCB. Single. PCBs. Single and PCB prototype fabrication in the lab. Soldering using soldering iron/station.	Introduction to Power tools: Power saws, hand saw, jigsaw, Grinder. Various types of drill bits. Introduction of Injection molding machine. Basic welding and other joining techniques for assembly. Concept of Lab aboard a Box.	Five Component Model of a Computer: System and Application software (introduction) storage devices , primary (RAM, ROM, PROM, EPROM, cache) Memory and secondary (magnetic tape, hard disk, Compact disks) memory , peripheral devices , printers.

	Electronic circuit building blocks including common sensors Digital Input and output. Measuring time and events. PWM. Serial communication. Analog input. Power Supply design (Linear).	3D printing and prototyping technology – 3D printing using FDM, and SLA. Prototyping using subtractive cutting processes. Basics of IPR and patents; Accessing and utilizing patent information in IDEA Lab	Introduction to MS Office: Office Writer ; Editing and Reviewing, Drawing, Tables, Graphs, Templates, Office Excel ; Worksheet Management , Formulas, Functions, Charts Office Power Point; designing powerful power-point presentation
4.	Discussion and implementation of a mini project.		
5.	Documentation of the mini project (Report and video).		

Laboratory Activities:

S. No.	List of Lab activities and experiments
1.	Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
2.	Design of Half -Adder & Full-Adder using Logic Gates.
3.	Machining of 3-D geometry of soft material such as soft wood or modeling wax.
4.	3-D printing of scanned geometry using SLA printer.
5.	Familiarity and use Gauges, Vernier Calipers, micrometer, and dial indicator.
6.	Study of Computer Hardware: Dismantling and Installation of PC
7.	Understanding and working with MS Office, Inserting Table, Formatting
8.	Understanding and working with MS Excel: Worksheet Management, Formatting, working with numerical data
9.	Understanding and working with MS Excel: Formulas, Functions and Charts
10.	Understanding and working with MS Power Points: Preparing and presenting power point presentation

Reference Books:

1. AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual), Khanna Book Publishing.
2. All-in-One Electronics Simplified, A.K. Maini; 2021. ISBN-13: 978-9386173393, Khanna Book Publishing Company, New Delhi.
3. Simplified Q&A - Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Rajiv Chopra, ISBN: 978-9355380821, Khanna Book Publishing Company, New Delhi.
4. 3D Printing & Design, Dr. Sabrie Soloman, ISBN: 978-9386173768, Khanna Book Publishing Company, New Delhi.
5. The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018. ISBN-13: 978-1681884325.
6. The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan (Author). Weldon Owen; 2017. ISBN-13: 978-1681881584.
7. Make: Tools: How They Work and How to Use Them. Platt, Charles. Shroff/Maker Media. 2018. ISBN-13: 978-9352137374
8. The Art of Electronics. 3rd edition. Paul Horowitz and Winfield Hill. Cambridge University Press. ISBN: 9780521809269
9. Practical Electronics for Inventors. 4th edition. Paul Sherz and Simon Monk. McGraw Hill. ISBN-13: 978-1259587542



UCSE-101/ UCSE-201	PROGRAMMING FOR PROBLEM SOLVING	3L:1T:0P	4 Credits
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Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	To Develop Simple Algorithms for Arithmetic and Logical Problems.	K2, K3
CO2	To Translate the Algorithms to Programs & Execution (in C Language).	K3
CO3	To Implement Conditional Branching, Iteration and Recursion.	K3
CO4	To Decompose a Problem into Functions and Synthesize a Complete Program Using Divide and Conquer Approach.	K4
CO5	To Use Arrays, Pointers and Structures to Develop Algorithms and Programs.	K2, K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit -1:	8
Introduction to Components of a Computer System: Memory, Processor, I/O Devices, Storage, Operating System, Concept of Assembler, Compiler, Interpreter, Loader and Linker. Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo Code with Examples, From Algorithms to Programs, Source Code. Programming Basics: Structure of C Program, Writing and Executing the First C Program, Syntax and Logical Errors in Compilation, Object and Executable Code. Components of C Language. Standard I/O in C , Fundamental Data types, Variables and Memory Locations, Storage Classes.	
Unit-2:	8
Arithmetic Expressions and Precedence : Operators and Expression Using Numeric and Relational Operators, Mixed Operands, Type Conversion, Logical Operators, Bit Operations, Assignment Operator, Operator precedence and Associativity. Conditional Branching: Applying if and Switch Statements, Nesting if and Else and Switch.	
Unit-3:	8
Iteration and Loops: Use of While, do While and for Loops, Multiple Loop Variables, Use of Break , Goto and Continue Statements. Arrays: Array Notation and Representation, Manipulating Array Elements, using Multi Dimensional Arrays. Character Arrays and Strings, Structure, union, Enumerated Data types, Array of Structures, Passing Arrays to Functions.	
Unit-4:	8
Functions: Introduction, Types of Functions, Functions with Array, Passing Parameters to Functions, Call by Value, Call by Reference, Recursive Functions. Basic of searching and Sorting Algorithms: Searching & Sorting Algorithms (Linear	



Search , Binary search , Bubble Sort, Insertion and Selection Sort)	
Unit-5:	8
Pointers: Introduction, Declaration, Applications, Introduction to Dynamic Memory Allocation (Malloc, Calloc, Realloc, Free), String and String functions , Use of Pointers in Self-Referential Structures, Notion of Linked List (No Implementation) File Handling: File I/O Functions, Standard C Preprocessors, Defining and Calling Macros and Command-Line Arguments.	

Text Books:

1. Schaum's Outline of Programming with C by Byron Gottfried , McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
5. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
6. Let Us C By Yashwant P. Kanetkar.
7. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison- Wesley, 2006.
8. Programming in C by Kochan Stephen G. Pearson Education – 2015.
9. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
12. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication



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UCSE-151/ UCSE-251	PROGRAMMING FOR PROBLEM SOLVING LAB	0L:0T:3P	1 Credit
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Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.	K3, K4
CO2	Demonstrate an understanding of computer programming language concepts.	K3, K2
CO3	Ability to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.	K6, K4
CO4	Able to define data types and use them in simple data processing applications he/she must be able to use the concept of array of structures.	K1, K5
CO5	Develop confidence for self-education and ability for life-long learning needed for Computer language.	K3, K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

List of Experiments

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula $C/5 = (F-32)/9$.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%	Print 'A'
80-90%	Print 'B'
60-80%	Print 'C'
Below 60%	Print 'D'
11. WAP that takes two operands and one operator from the user, perform the operation, and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array.



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- array and prints them.
23. WAP to find the minimum and maximum element of the array.
 24. WAP to search an element in a array using Linear Search.
 25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
 26. WAP to add and multiply two matrices of order nxn.
 27. WAP that finds the sum of diagonal elements of a mxn matrix.
 28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
 29. Define a structure data type TRAIN_INFO. The type contain

Train No.: integer type

Train name: string

Departure Time: aggregate type

TIME Arrival Time: aggregate type

TIME Start station: string

End station: string

The structure type Time contains two integer members: hour and minute.

Maintain a train timetable and implement the following operations:

- a. List all the trains (sorted according to train number) that depart from a particular section.
 - b. List all the trains that depart from a particular station at a particular time.
 - c. List all the trains that depart from a particular station within the next one hour of a given time.
 - d. List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
 31. WAP to compare the contents of two files and determine whether they are same or not.
 32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

Note:

- a) The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner
- b) The subject teachers are suggested to use the concept of project based learning. The subject teacher may give certain use cases/case studies where student is able to apply multiple concepts in one single program
- c) It is also suggested that open source tools should be preferred to conduct the lab. Some opensource online compiler to conduct the C lab are as follows:

- ❖ <https://www.idoodle.com/c-online-compiler/>
- ❖ https://www.tutorialspoint.com/compile_c_online.php
- ❖ <https://www.programiz.com/c-programming/online-compiler/>
- ❖ <https://www.hackerrank.com/>

Mapping with Virtual Lab

Name of the Lab	Name of the Experiment
Problem Solving Lab	Numerical Representation
	Beauty of Numbers
	More on Numbers
	Factorials
	String Operations
	Recursion
	Advanced Arithmetic
	Searching and Sorting
	Permutation
	Sequences



Manoj Kapil

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UHU-201	Professional Communication	2L:0T:0P	2 Credits
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Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Understand and apply the formal elements of specific genres of Technical communication.	K2, K3
CO2	Understand and apply the formal elements of specific genres of written Technical communication.	K2, K3
CO3	Developing intellectual, personal and professional abilities through effective communication skills	K6
CO4	Analyse and evaluate different styles of spoken technical communication.	K4 & K6
CO5	Understand various elements of communication and create their own style of writing.	K1, K2 & K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Course Objectives:

1. Students will be enabled to understand the correct usage of technical communication.
2. Students will be able to converse well with effective speaking skills in English.
- 3. Students will be able to learn motivational skills.**
4. Student will be able to equip with basics of conversational & social skills and will apply it in their professional as well as personal level.
- 5. Students will be able to build up personal traits that will make the transition from institution to workplace smoother and help them to excel in their jobs.**

Course Content:

Unit	Description	Lectures
Unit-1	COMMUNICATION SKILLS	08
	Technical Communication: Introduction to Communication, Definition, Process of Communication & types of communication, Levels of communication, Flows of Communication, Barriers to communication. Mass Communication: Print media, Electronic media	
Unit-2	CONVERSATIONAL & SOCIALSKILLS	10
	Parts of speech: Review Advanced Vocabulary: Antonyms, Synonyms, Homophones, Homonyms, One word substitution, Abbreviations, New word Formation, Prefix and Suffix. Conversation: Definition, Speech and Conversation, Rules of Conversation, Conversation and Personality, Importance of Conversation Social Skills: Role of Communication; Purposeful Socializing.	
Unit-3	WRITING AND READING SKILLS	08



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 Manoj Kapi

	Letter Writing, Application writing, Report Writing, Paragraph Writing, Précis writing, Reading Comprehension	
Unit-4	WORK-PLACE SKILLS	08
	Managing Stress: Techniques: Application of 4A's; Avoid; Alter; Access; Adapt Resilience: Flexibility in Thought and Behavior; Tolerance and Self-Belief; Team-Work and Communication; Compassion in Leadership; Communication Skills; Listening and Responding; Speaking Skills; Positive Thinking; Controlling Mind.	
Unit-5	PRESENTATION SKILLS	09
	Introduction to oral communication, Nuances and Modes of Speech Delivery, Elements OF Non- verbal Communication: Kinesics, Proxemics, Chronemics, Paralinguistic features of Voice-Dynamics, and Presentation Strategies: planning, preparation, organization, delivery	

Text/Reference Books:

1. Personality Development & Soft Skills: Barun K. Mitra, Oxford University Press, New Delhi, 2012.
2. Technical Communication, (Second Ed.); O.U.P., Meenakshi Raman & S. Sharma, New Delhi, 2011.
3. Personality Development, Harold R. Wallace et.al, Cengage Learning India Pvt. Ltd; New Delhi, 2006.
4. Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Banerji; McMillan India Ltd, Delhi, 1990.
6. Communication Skills for Engineers and Scientists: Sangeeta Sharma et. al., THI Learning Pvt. Ltd, New Delhi, 2011.
7. Public Speaking, William S. Pfeiffer, Pearson, Delhi, 2012.
8. Human Values, A.N. Tripathi, New Age International Pvt. Ltd. Publishers NewDelhi, 2005.
9. Business Communication for Managers, Payal Mehra, Pearson, Delhi, 2012.

Alternative NPTEL/SWAYAM Course:

S. No.	NPTEL Course Name	Instructor	Host Institute
1	ENGLISH LANGUAGE FOR COMPETITIVE EXAMS	PROF. IQBAL AYSHA	IIT MADRAS
2.	TECHNICAL ENGLISH FOR ENGINEERS	PROF. IQBAL AYSHA	IIT MADRAS

Course Outcomes: The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.



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UHU-251	Professional Communication Lab	0L:0T:2P	1 Credit
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Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Get familiarized with English vocabulary and language proficiency.	K1, K2
CO2	Improve nature and style of sensible writing, acquire employment and workplace communication skills.	K2, K3
CO3	Improve their Technical Communication Skills through Technical Reading and Writing practices.	K3, K4
CO4	Identify common errors in spoken and written communication.	K4, K5
CO5	Perform well in campus recruitment, engineering and all other general competitive examinations.	K4, K5, K6

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

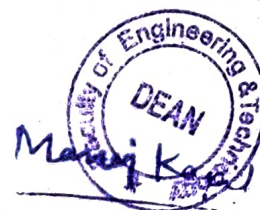
List of Experiments

1. Introduction to Phonetics- Speech Sounds- Vowels and Consonants.
2. Articles, Prepositions, Word Formation-Prefixes & suffixes, Synonyms & Antonyms.
3. Descriptions- Narrations- Giving directions and guidelines Sequence of Tenses, Question Tags and One Word Substitutes.
4. Extempore- Public Speaking Active and Passive Voice, Common Errors in English, Idioms and Phrases.
5. Information Transfer- Oral Presentation Skills Reading Comprehension and Job Application with Resume Preparation

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Objective of the Course:

1. To maintain mental and physical wellness upright and develop ability in the students to cope up with the stress arising in the life.
2. To create space in the curriculum to nurture the potential of the students in sports/games/yoga etc.
3. To introduce a practice oriented introductory course on the subject. More involved / advanced course may come up in subsequent years of study

Syllabus/ Guidelines

Part A: Sports/Games

Some form of Athletics would be compulsory for all students, unless restricted due to medical / physical reasons. In addition to this, student has to opt for at least one game out of the remaining mentioned below.

A fair theoretical knowledge and a reasonable amount of field / site practice of the chosen games will be essential.

1. Athletics **Compulsory**
2. Volleyball
3. Basketball
4. Handball
5. Football
6. Badminton
7. Kabaddi
8. Kho-kho
9. Table tennis
10. Cricket

Part B: Yoga

a. Introduction of Yoga

Introduction of Yoga, Origin of Yoga, Aims and Objective of Yoga, Patanjali Yoga darshan, Hathyoga, Gheranda Samhita, Karmyoga, Gyanyoga.

b. Asanas, Pranayam and Meditation Practices

Meaning of Asanas, Objective of Asanas, rules and regulations of Asanas and Pranayams, Types of Yogasana

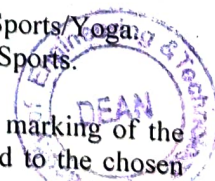
Yogic postures: Standing Posture, Sitting posture, Supine posture, Prone posture, balancing Postures, Pranayam according to Patanjali and Hath Yoga, Meditaion Mudras

c. Science of Yoga

Physiological effects of Asanas- Paranyama and meditation, stress management and yoga, Mental health and yoga practice, Health and Personality Development.

General Guidelines.

1. Institutes must assign minimum of three periods in the Time Table for the activities of Sports/Yoga.
2. Institutes must provide field/facility and offer a minimum of five choices of the Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.
4. Student must be made familiar with the terminologies, rules/regulations, dimension/ marking of the play field/area and general knowledge of national/international level facts/figures related to the chosen game.



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UAS-203	Engineering Mathematics-II	3L:1T:0P	4 Credits
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Objectives:

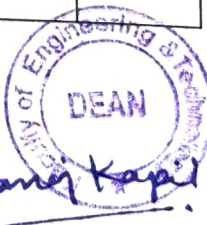
- To apply the effective mathematical tools for the solutions of differential equations that model physical processes.
- To introduce the basic knowledge of Laplace transform and its applications in solving differential equations.
- To apply the tools for convergence of series and expansion of function using Fourier series for learning advanced Engineering Mathematics.
- To deal with the tools of differentiation and integration of complex functions that are used in various techniques dealing with engineering problems.

Unit No.	Particulars	Contact Hours
1	Ordinary Differential Equation of Higher Orders: Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Solution of second order linear differential equations with variable coefficients by changing independent variable and method of variation of parameters, Cauchy-Euler equation, Application of differential equations in solving engineering problems.	8
2	Integral Transforms: Laplace transform, Properties of Laplace Transform, Laplace transform of derivatives and integrals, Unit step function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem. Application of Laplace Transform to solve ordinary differential equations and simultaneous differential equations, Z-transform, inverse Z-transform and its application to solve difference equations.	8
3	Sequence and Series: Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series by comparison test, D' Alembert's ratio test, Raabe's test, Fourier series, change of interval, half range Fourier sine and cosine series.	8
4	Complex Variable–Differentiation: Functions of complex variable, Limit, Continuity and differentiability, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Milne's Thompson Method, Conformal mapping, Mobius transformation and their properties.	8
5	Complex Variable –Integration: Complex integration, Cauchy- Integral theorem, Cauchy integral formula, Taylor's and Laurent's series, zeros of analytic functions, singularities and its classification, Residues, Cauchy's Residue theorem and its application to evaluate the real definite integrals $\int_0^{2\pi} f(\sin \theta, \cos \theta) d\theta$ and $\int_{-\infty}^{\infty} f(x) dx$.	8

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Course Outcomes:

	Course Outcome (CO)	Bloom's Level
At the end of this course, the students will be able to:		
CO 1	Remember the concept differentiation to evaluate LDE of nth order with constant coefficient and LDE with variable coefficient of 2nd order.	K1 & K5
CO 2	Understand and apply the concept of integral transforms to evaluate differential and difference equations	K2, K3 & K5
CO 3	Understand the concept of convergence to analyze the convergence of series and expansion of the function for Fourier series.	K2 & K4
CO 4	Apply the concept of analyticity, Harmonic function and create the image of function applying conformal transformation	K3, K6 & K3
CO 5	Apply the concept of Cauchy Integral theorem, Cauchy Integral formula, singularity and calculus of residue to evaluate integrals	K3 & K5

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. Veerarajan T., Engineering Mathematics for first year, McGraw-Hill, New Delhi, 2008.
6. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, McGraw-Hill; Sixth Edition
7. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
8. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, McGraw-Hill.
9. P. Sivaramakrishna Das and C. Vijaya Kumari, Engineering Mathematics, 1st Edition, Pearson Education.
10. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.
11. Laplace Transforms by Schaum's series, 2005 Edition, Spiegel Publication.



FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
EVALUATION SCHEME

B.Tech.2nd Year/3rd Semester (FOOD TECHNOLOGY)

w.e.f academic Session 2026-27

SEMESTER III															
S.No	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit	
				L	T	P	CT	AT	Total	PS	TE	PE			
1	UFD-301	Composition Quality & Safety of Foods	PCC-1	3	1	0	20	10	30	-	70	-	100	4	
2	UFD-302	Food Microbiology	PCC-2	3	0	0	20	10	30	-	70	-	100	3	
3	UFD-303	Principle of Heat & Mass Transfer	PCC-7	3	0	0	20	10	30	-	70	-	100	3	
4	UFD-304	Process Calculation	PCC-4	3	1	0	20	10	30	-	70	-	100	4	
5	UHU-305/ UAS-304	Soft Skill/ Environment Science	HS/BS	3	0	0	20	10	30	-	70	-	100	3	
6	UFD-351	Composition Quality & Safety of Foods Lab	PCC-5	0	0	2	-	-		15	-	35	50	1	
7	UFD-352	Food Microbiology Lab	PCC-6	0	0	2	-	-	-	15	-	35	50	1	
	UFD-353	Principle of Heat & Mass Transfer Lab	PCC-11	0	0	2	-	-	-	15	-	35	50	1	
8	UOE-3**/ UAS-303	Science Based Open Elective Course/ Mathematics-III	ES/BS	4	0	0	20	10	30	-	70	-	100	4	
9	UCC-351	Internship Assessment/Mini Project		-	-	-	-	-	-	100	-	-	100	2	
TOTAL													850	26	

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Manoj Kapi

FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
EVALUATION SCHEME

B.Tech^{2nd} Year/4th Semester (FOOD TECHNOLOGY)

w.e.f academic Session 2026-27

SEMESTER IV														
S.No	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	C T	A T	Total	P S	T E	P E		
1	UFD-401	Fluid Flow and Solid Handling	PCC-3	3	1	0	20	10	30	-	70	-	100	4
2	UFD-402	Food Chemistry & Nutrition	PCC-8	3	0	0	20	10	30	-	70	-	100	3
3	UFD-403	Food Biotechnology	PCC-9	3	0	0	20	10	30	-	70	-	100	3
4	UFD-404	Storage of Foods Products	PCC-10	2	1	0	20	10	30	-	70	-	100	3
5	UOE-4**/UAS-403	Science Based Open Elective/Mathematics -III	ES/BS	3	1	0	20	10	30	-	70	-	100	4
8	UFD-451	Food Chemistry Lab	PCC-12	0	0	2	-	-	-	15	-	35	50	1
9	UFD-452	Food Biotechnology Lab	PCC-13	0	0	2	-	-	-	15	-	35	50	1
10	UHU-405/ UAS-404	Soft Skills/ Environmental Science	HS/BS	3	0	0	20	10	30	-	70	-	100	3
TOTAL													700	22

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Mamta Kaur

B.TECH 2nd YEAR
SCIENCE BASED OPEN ELECTIVE COURSES
(Effective from the Session 2026-27)

SEMESTER - III/IV

S.No.	Subject Codes	Subject	To be offered to
1.	UOE301/UOE401	Electric and Hybrid Vehicles	Any Engg. Branch except ME and allied branches
2.	UOE302/ UOE402	Automation and Robotics	Any Engg. Branch except ME and allied branches
3.	UOE303/ UOE403	Material Science	Any Engg. Branch except ME/CE and allied branches
4.	UOE304/ UOE404	Energy Science & Engineering	Any Engg. Branch except EEE and allied branches
5.	UOE305/ UOE405	Sensor & Instrumentation	Any Engg. Branch except EEE and allied branches
6.	UOE306/ UOE406	Basics Data Structure & Algorithms	Any Engg. Branch except CSE and allied branches
7.	UOE307/ UOE407	Basics of Database Management Systems	Any Engg. Branch except CSE and allied branches
8.	UOE308/ UOE408	Analog Electronics Circuits	Any Engg. Branch except ECE and allied branches
9.	UOE309/ UOE409	Electronics Engineering	Any Engg. Branch except ECE and allied branches
10.	UOE310/ UOE410	Digital Electronics	Any Engg. Branch except ECE and allied branches
11.	UOE311/ UOE411	Polymer Science and Technology	Any Engg. Branch except Chemical Engg and Chemical Technology and allied branches
12.	UOE312/ UOE412	Laser System and Applications	Any Engg. Branch
13.	UOE313/ UOE413	Food Science and Nutrition	Any Engg. Branch except Food Technology/ Chemical Technology and allied branches
14.	UOE314/ UOE414	Building Science and Engineering	Any Engg. Branch except CE and allied branches

List of Mandatory Courses (non-credit)

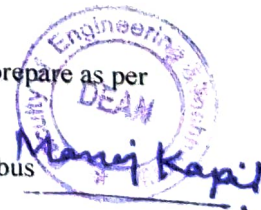
UMC-301/UMC-401/UMC-501: Constitution of India

UMC-302/UMC-402/UMC-502: Universal Human Values -I :- Syllabus will prepare as per scheduled

UMC-303/UMC-403/UMC-503: Environment Science

UMC-304/UMC-404/UMC-504: Essence of Indian Knowledge Tradition:-: Syllabus will prepare as per scheduled

UMC-305/UMC-405/UMC-505: Learning an art form (during Induction Program):-: Syllabus will prepare as per scheduled


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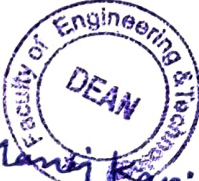
B.Tech. (FOOD TECHNOLOGY) TOTAL CREDITS – 159
COURSE TYPE NOMENCLATURE

Course Code	Definitions
BSC	BASIC SCIENCE COURSES
ESC	ENGINEERING SCIENCE COURSES
HSMC	HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES
PCC	PROFESSIONAL CORE COURSES
PEC	PROFESSIONAL ELECTIVE COURSE
OEC	OPEN ELECTIVE COURSE
MC	MANDATORY COURSES
PROJ	PROJECT
CCA	CONTINUATION COMPREHENSIVE ASSESSMENT
ESE	END SEMESTER EXAMINATION
L	LECTURE
T	TUTORIAL
P	PRACTICAL
CT	CLASS TEST
AT	ATTENDANCE
PS	PRACTICAL SESSIONAL
TE	THEORY EXAM
PE	PRACTICAL EXAM

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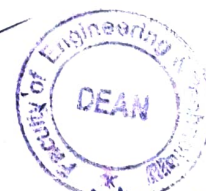
PROGRAMME CORE ELECTIVE COURSES (PCC)
[FOOD TECHNOLOGY]

Sr. No	Course Code	Course Title
01	UFD-301	COMPOSITION QUALITY & SAFETY OF FOODS
02	UFD-302	FOOD MICROBIOLOGY
03	UFD-303	PRINCIPLE OF HEAT & MASS TRANSFER
04	UFD-304	PROCESS CALCULATION
05	UFD-351	COMPOSITION QUALITY & SAFETY OF FOODS LAB
06	UFD-352	FOOD MICROBIOLOGY LAB
07	UFD-353	PRINCIPLE OF HEAT & MASS TRANSFER LAB
07	UFD-401	FLUID FLOW AND SOLID HANDLING
08	UFD-402	FOOD CHEMISTRY & NUTRITION
09	UFD-403	FOOD BIOTECHNOLOGY
10	UFD-404	STORAGE OF FOODS PRODUCTS
11	UFD-452	FOOD CHEMISTRY LAB
12	UFD-453	FOOD BIOTECHNOLOGY LAB

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BHAJ JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UFD-301**
2. Subject Name: **Composition, Quality & Safety of Foods**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objectives: This is an introductory course which gives the necessary details and information to get acquainted with the properties, composition, quality and safety of foods.

Unit 01:- Composition

Chemical constituents of foods: Desirable and Potentially undesirable food constituents and their importance. Recommended Dietary Allowances (RDA). Basal metabolic rate and dietary requirements of different age groups. Composition of foods – General and specific for different foods of plant and animal origin.

Unit 02:- Carbohydrates

Classes, Nomenclature and structure. Dietary utilization and disturbances. Lipids: Definition, Classification and structure: Fatty acids composition of natural lipids of plants and animal origin, Essential fatty acids. Role and use of natural lipids and tailor made fats in foods.

Unit 03:- Protein

Physico-chemical properties of amino acids, peptides and proteins, structure - function relationship of proteins, Essential Amino acids. Nutritional attributes of food and their implications

Unit 04:- Quality

Basic concepts. Nutritional and sensory attributes and their assessments, causes of undesirable changes leading to quality deterioration in foods and their implications. Determination of probable cause(s) of observed quality change in foods.

Unit 05:- Safety

Operational sense of food safety, Potential Food derived health hazards- Microbial contamination. Pesticide residues, Environmental Contamination. Risk and risk assessment. HACCP. Adulteration in Foods. Testing food for its safety.

Course Outcome:-

To provide guiding principles and tools for the development of the whole person recognizing that the individual is comprised of Physical, Intellectual, Emotional and Spiritual dimensions.

Text books:

1. Fennema OR. 1996. Food Chemistry. Marcel Dekker.
2. Meyer LH. 1987. Food Chemistry. CBS Publishers.
3. Krammer A & Twigg BA. 1973. *Quality Control in Food Industry*. Vol. I, II. AVI Publ.
4. Macrae R, Roloson R & Sadlu MJ. 1994. *Encyclopedia of Food Science & Technology & Nutrition*. Vol. XVI. Academic Press



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UFD-302**
2. Subject Name: **Food Microbiology**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objectives:- To make the student to understand the causes of food spoilage and predict the micro-organism that can spoil a given food, when prepared, processed and stored under given condition and take corrective measures to control the spoilage and pathogenic micro-organism in food.

Unit 01:- Microorganism

General characteristics of microorganism: Classification, morphology, physiology, growth, nutrition and reproduction; Pure culture techniques and maintenance of cultures, control of microorganisms.

Unit 02:- Characteristics

Incidence of microorganism in foods, Sources of contamination. Principles underlying spoilage of foods. Physical and Chemical methods to control microorganisms. Food poisoning and food borne infections, Microbial toxins, Indicator organisms.

Unit 03:- Contaminated Products

Contamination, spoilage and preservation of cereal products, sugar products, fruit and vegetable products, Bakery Products, Microbiological standard of foods.

Unit 04:- Contamination

Contamination, spoilage and preservation of Meat products, Fish and Sea foods, Egg and Poultry products, Milk and Milk products and other foods. Microbiological limits.

Unit 05:- Safety

Food plant sanitation, inspection and control, personnel hygiene, Microbes in food fermentation, putrefaction, Lipolysis; Antagonism and Synergism in microorganisms. Rapid methods in detection of microorganisms. Standard plate count; Yeast and mould count

Course Outcome:-

Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival. Describe the characteristics of food borne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification. Explain why microbiological quality control programmes are necessary in food production.

Text books:

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. Food Microbiology. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. Essentials of Food Microbiology. Arnold Heinemann.
4. Jay JM, Loessner MJ & Golden DA. 2005. Modern Food Microbiology. 7th Ed. Springer.
5. Ray B. 2004. Fundamentals of Food Microbiology. 3rd Ed. C



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UFD-303**
2. Subject Name: **Principal of Heat & Mass Transfer**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objectives:-

Students will understand the basic concepts of conduction, convection and radiation heat transfer and Students will understand how to formulate and be able to solve one and two dimensional conduction heat transfer problems. Solution techniques will include both closed form and numerical methods. Convection effects will be included as boundary conditions.

Unit 01:- Introduction

Introduction, Conduction: Basic concepts of conduction in solids, liquids and gases, One and two dimensional heat conduction. Critical and optimum insulation thickness. Introduction to unsteady state heat transfer.

Unit 02:- Heat Transfer

Basic laws of heat transfer by radiation, black body and gray body concepts, solar radiations, combined heat transfer coefficients by convection and radiation. Heat Transfer Equipments: Double pipe, Shell & tube and Plate type heat exchanger, Evaporator, Condenser.

Unit 03:- Drying Foods

Drying: Batch and freeze drying, rotary driers. Surface vs diffusion controlled operations. Principles of convection, Equations of forced and free convection, Heat flow due to conduction & convection

Unit 04:- Heat & Energy

Solid-gas equilibrium, Different modes of drying operation, Types of batch and continuous dryer Definitions of moisture contents, Rate of batch drying, Time of drying, Mechanism of batch drying, Continuous drying.

Unit 05:- Analytical Methods

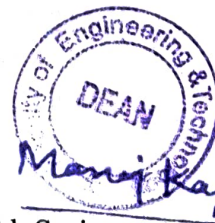
Classification of crystallizers, Equilibrium yield of crystallization, Heat and mass transfer rates in crystallization, Theories of crystallization, Factors governing nucleation and crystal growth rates, controlled growth of crystal.

Course Outcome:-

- Basic heat transfer mechanisms (conduction, convection and radiation).
- Heat transfer by conduction in solids for steady-state and transient conditions.
- Heat transfer by convection in closed conduits and on external surfaces.
- Heat transfer by thermal radiation.

Text books:

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. Food Microbiology. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. Essentials of Food Microbiology. Arnold Heinemann.
4. Jay JM, Loessner MJ & Golden DA. 2005. Modern Food Microbiology. 7th Ed. Springer.
5. Ray B. 2004. Fundamentals of Food Microbiology. 3rd Ed. CRC.



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UFD-304**
2. Subject Name: **Process Calculations**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objectives:-

To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

Unit 01:- Dimensions & Calculations

Units their dimensions and conversions, Mass and volume relations, law of thermodynamic, thermal treatment. Sterilisation. Blanching. Drying time calculation. Wet basis moisture content calculation, dry basis moisture calculation. Freeze drying, heat exchanger.

Unit 02:- Humidity & Temperature

Humidity and saturation, Relative Humidity and percent saturation, Dew point, Dry and Wet bulb temperatures, Use of humidity charts for engineering calculations.

Unit 03:- Engineering Properties

Engineering properties of agricultural materials: physical properties, shape and size, density, specific gravity, drag coefficient, frictional properties and angle of repose. Mechanical properties, thermal properties.

Unit 04:- Energy Balance

Rheological properties, heat transfer, conduction, convection, radiation, black body, white body, grey body, thermal radiation, emission, sensible heat, latent heat

Course Outcome:-

Get familiarized with experimental errors in various physical measurements and to plan / suggest on how the contributions could be made of the same order, so as to minimize the errors.

Text books:

1. Himmelblau, D.M. "Basic Principles & Calculations in Chemical Engineering", 6th ed. Prentice Hall (1996).
2. Felder & Rousseau, R.W. "Elementary Principles of Chemical Processes", 3rd edition. John Wiley.
3. Bhatt. B.I. and Vora S.M. "Stoichiometry" IInd edition, Tata McGraw Hill (1984) Reference Books.
4. Hougan D. A., Watson K.M. & Ragatz R. A. "Chemical Process Principles" Asia Publishing House.
5. Luben W.L. and Wenzel, L.A. "Chemical Process Analysis Mass and Energy Balance" Prentice Hall.



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UAS-304/404**
2. Subject Name: **Environment Science**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

1 Nature of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

2 Impact of Human Activity on Environment

Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics.

3 Environmental Changes and Human Health

Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution, Climate change– Greenhouse effect and global warming, acid rain, ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards.

4 Environmental Protection through Assessment and Education

Indicators and Impact Assessment – Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring.

- 5 Environmental Protection–** Role of individuals, organizations and government in pollution control Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education.



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **UFD-351**
2. Lab Name: **Composition, Quality & Safety of Food Lab**
3. Contact Hours: L: 0 T: 1 P: 3
4. Examination Duration (Hrs.): Practical 02
5. Credits: 2

Objectives:

This is a introductory course which gives the necessary details and information to get acquainted with the properties, composition, quality and safety of foods.

Experiment 01:-

Sampling requirements, procedures and methods

Experiment 02:-

Determination of moisture content of foods by oven drying and distillation methods.

Experiment 03:-

Determination of Total and Acid insoluble ash content in foods.

Experiment 04:-

Determination of Crude fat content by solvent extraction methods in foods.

Experiment 05:-

Determination of crude Protein by Kjeldhal Lowry methods.

Experiment 06:-

Determination of reducing and total sugar content in foods.

Experiment 07:-

Determination of crude Fibre content in foods.

Experiment 08:-

Determination of specific vitamin content of food such as ascorbic acid, carotenes etc.

Outcomes

- The students will have knowledge about different processing and preservation methods and principles involved.
- Students will get acquainted with analytical methods used for quality Transfer
- control analysis of raw material and processed food commodities.
- The students will have learnt about composition and processing of various cereals, pulses and oilseeds.

Text books:

1. Banawart GJ. 1989. *Basic Food Microbiology*. 2nd Ed. AVI Publ.
2. Frazier J & Westhoff DC. 1988. *Food Microbiology*. 4th Ed. McGraw Hill.
3. Garbutt J. 1997. *Essentials of Food Microbiology*. Arnold Heinemann.



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **UFD-352**
2. Lab Name: **Food Microbiology Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

Objectives:-

To enable the students to understand the basic concepts of food microbiology are involved in the analyses.

Experiment 01:-

Microscope its parts and utility in identification and differentiation of various microorganism as bacteria, yeast and mold.

Experiment 02:-

Determination of effect of temperature on enzyme activity.

Experiment 03:-

Determination of effect of pH on enzyme activity.

Experiment 04:-

Estimation of enzymatic browning in a food.

Experiment 05:-

Estimation of enhancement in an enzyme activity during ripening of a fruit.

Experiment 06:-

Preparation and sterilization of media and glass ware for microbial counts.

Experiment 07:-

Detection/ estimation of catalase and peroxidase activity in vegetable.

Experiment 08:-

Application of enzymes: Amylase in hydrolysis of starch. Invertase in hydrolysis of sucrose. Protease in hydrolysis of protein Lipase in hydrolysis of fat. Cellulase and hemicellulase for dehulling of a grain, etc.

Course Outcome:-

- Explain the significance and activities of microorganisms in food.
- Describe the characteristics of food borne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification.
- Explain why microbiological quality control programmes are necessary in food production.
- Explain the effects of fermentation in food production and how it influences the microbiological quality and status of the food product.

Text books:

1. An introduction to practical biochemistry by D.T.Plummer, III Ed. Tata McGraw Hill Publishing Co. New Delhi.
2. Principles of Enzymology for Food Science by J.R. Whitaker, Marcel Dekker Inc.
3. Methods in Enzymology by S.P.Colwick and N.O. Kaplan, Academic Press.



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **UFD-353**
2. Lab Name: **Principal of Heat & Mass Transfer Lab**
3. Contact Hours: L: 0 T: 1 P: 3
4. Examination Duration (Hrs.): Practical 02
5. Credits: 2

Objectives:-

To enable the students to understand the basic concepts of principle of heat and mass transfer are involved in the analyses.

Experiment 01:-

To find the thermal conductivity of metallic rod at different temperature and draw the temperature profile for steady and unsteady state conduction..

Experiment 02:-

To find out the thermal conductivity of insulating powder.

Experiment 03:-

To find the thermal conductivity of liquid / gases.

Experiment 04:-

To find the emissivity of grey plate with respect to black plate.

Experiment 05:-

To study the critical heat flux behaviour of a liquid.

Experiment 06:-

Determination of separation through membrane

Experiment 07:-

Determination of liquid extraction

Experiment 08:-

Determination of liquid solid extractions

Course Outcome:-

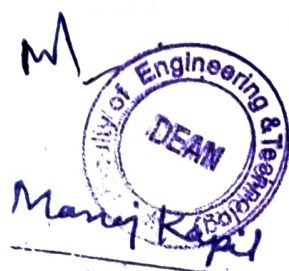
Students will understand the basic concepts of conduction, convection and radiation heat transfer and Students will understand how to formulate and be able to solve one and two dimensional conduction heat transfer problems. Solution techniques will include both closed form and numerical methods. Convection effects will be included as boundary conditions.

Text books:

1. Holman, J.P.: "Heat Transfer" 9 th ed. McGraw Hill (1989).
2. Treybal, R "Mass Transfer Operations", 3rd ed. New York: McGraw-Hill, (1980).
3. McCabe Smith: Unit Operations in Chemical Engineering, McGraw Hill
4. Foust A. S. et.al., "Principles of Unit Operations" John Wiley (1980).



M



Manoj K. Patel

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **UFD-353**
2. Lab Name: **Principal of Heat & Mass Transfer Lab**
3. Contact Hours: L: 0 T: 1 P: 3
4. Examination Duration (Hrs.): Practical 02
5. Credits: 2

Objectives:-

To enable the students to understand the basic concepts of principle of heat and mass transfer are involved in the analyses.

Experiment 01:-

To find the thermal conductivity of metallic rod at different temperature and draw the temperature profile for steady and unsteady state conduction..

Experiment 02:-

To find out the thermal conductivity of insulating powder.

Experiment 03:-

To find the thermal conductivity of liquid / gases.

Experiment 04:-

To find the emissivity of grey plate with respect to black plate.

Experiment 05:-

To study the critical heat flux behaviour of a liquid.

Experiment 06:-

Determination of separation through membrane

Experiment 07:-

Determination of liquid extraction

Experiment 08:-

Determination of liquid solid extractions

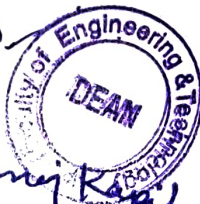
Course Outcome:-

Students will understand the basic concepts of conduction, convection and radiation heat transfer and Students will understand how to formulate and be able to solve one and two dimensional conduction heat transfer problems. Solution techniques will include both closed form and numerical methods. Convection effects will be included as boundary conditions.

Text books:

1. Holman, J.P.: "Heat Transfer" 9 th ed. McGraw Hill (1989).
2. Treybal, R "Mass Transfer Operations", 3rd ed. New York: McGraw-Hill, (1980).
3. McCabe Smith: Unit Operations in Chemical Engineering, McGraw Hill
4. Foust A. S. et.al., "Principles of Unit Operations" John Wiley (1980).

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Mary Kapi

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UFD-401**
2. Subject Name: **Fluid Flow and Solid Handling**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objectives:-

The objective of this course is to introduce the basic concepts of stress and strain caused by applied forces and to create a confidence in analysing simple structural components.

Unit 01:- Handling

Solids and their handling properties of solids, screening, industrial screening equipment. Determination of particle size, screen analysis, Size reduction of solids, stages of reduction, operating variables, intermediate and fine size reduction, power requirement and mechanism. Power driven machines: Crushers, grinders, and conveyors.

Unit 02:- Filtration

Filtration: Theory, continuous and batch equipment. Flow of solids through fluids, classification and sedimentation.

Unit 03:- Fluid Flow

Fluid flow: Properties of fluids. Fluid statics: Euler's equation, Hydrostatic Law and Pressure Measurement. Transport of fluids, energy relationships, pipe fittings, minor losses in pipe flow filtration: Theory, continuous and batch equipment. Flow of solids through fluids, classification and sedimentation.

Unit 04:- Flow Measurement

Flow measurements: Orifice meter. Nozzle and venturi meters, rotameter and pitot tube.

Unit 05:- Pump

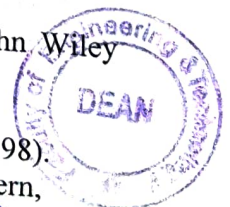
Pumping and compressing: reciprocating pumps, rotary pumps, centrifugal pumps and blowers. Introduction to fluidization.

Course Outcome:-

Develop the skills in arranging and handling different measuring instruments

Text books:

1. McCabe Smith: Unit Operations in Chemical Engineering, McGraw Hill.
2. Fox, R.A. & McDonald, A.T. "Introduction to Fluid Mechanics, 5th ed: John Wiley (1998).
3. Kumar D S "Fluid Mechanics", S.K, Katria and Sons, Delhi (1998.).
4. Rajput R.K. "Text book of Fluid Mechanics", S.Chand and Co., New Delhi, (1998).
5. Gupta, Vijay and SK Gupta, "Fluid Mechanics and its Applications" Wiley Eastern, New Delhi



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UFD-402**
2. Subject Name: **Food Chemistry & Nutrition**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objectives:- The main objectives of the Nutrition Science and Food Chemistry Nutrition are to provide a link to scientific information on diet and health for farmers, consumers, and scientists and to train future generations of students and scientists in the nutrition sciences.

Unit 01:- Food Structures

- (a) Water in Foods: Structure. Properties, Interactions, Water activity, Sorption Isotherms and food stability.
- (b) Carbohydrates: Functions, Reactions and properties of simple and complex carbohydrate, Browning reactions, Selection of Natural or Modified carbohydrates for incorporation into processed food.

Unit 02:- Lipids

Lipids: Consistency of commercial fats, Lipolysis, Auto oxidation, Thermal Decomposition and effect of ionizing radiation, Refining of oils, Modification of oils and fats, Role of food lipids in flavor, Nutritional aspects of natural and modified fats.

Unit 03:- Proteins

Proteins: Chemical reactions and interactions of amino acids and proteins, De-naturation and its implications, Functional properties of food proteins, Modification of food proteins in processing and storage and its implications. Nutritive value of food proteins.

Unit 04:- Vitamins

Vitamins, Minerals, Pigments and Flavours: Chemistry and stability of water and fat soluble vitamins, Chemical properties of minerals and their bioavailability, Enrichment and Fortification. Natural pigments in foods and their retention in processed foods. Flavoring constituents in foods, Development of process and reaction flavour volatiles.

Unit 05:- Food Groups

Food groups and their typical composition; essential nutrients- sources, functions, deficiency diseases; requirements and recommended dietary allowances. Malnutrition, Protein quality evaluation, Calorific value of foods.

Course Outcome:-

- Study that how to destroy the harm full enzymes
- How to protect the food from various enzymatic reactions
- Use of various type of vitamins in various human disease.
- Role of essential nutrients in human body.

Text Books:

1. Belitz HD.1999. Food Chemistry. Springer Verlag.
2. DeMan JM. 1976. Principles of Food Chemistry. AVI Publications.
3. Fennema OR.1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers.



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UFD-403**
2. Subject Name: **Food Biotechnology**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objectives: Lectures cover basic properties, characteristics, structures and functions of living cells (microbial) and enzymes; metabolic pathways and how these are harnessed, manipulated and applied through natural selection, genetic engineering, optimized reactor and environmental designs and controls to increase productivity.

Unit 01: Nomenclature

Nomenclature, Classification and specificity of enzymes and cofactors, Enzyme Kinetics: Factors affecting the rate of enzyme catalyzed reaction, regulation and control of enzyme action.

Unit 02: Metabolic Pathways

Metabolic Pathways: Carbohydrates, proteins and fats; catabolism and anabolism

Unit 03: Digestion

Digestion, Absorption, Assimilation and Transport of nutrients in human beings.

Unit 04: Food Purification

Downstream processing: separation of particles, disintegration of cells, extraction, concentration, purification, drying. Process development. Mechanism of enzyme action: use of enzymes in solution. Use of immobilized enzymes. Water quality.

Unit 05: Food Enzymes

Application of enzymes in food processing: Endogenous enzymes and their role in modification of foods, enzyme added to foods during processing sources, conversions and specific applications.

Course Outcome

The course discusses the microbiological and technological principles of industrial application of microorganisms and enzymes in food production and processing systems to provide useful products and services.

Text Books:

1. A.L. Lehninger Principle of Biochemistry.
2. Lubert Stryen Biochemistry.
3. Fennema OR. 1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers.
5. S.A. Joshi Nutrition and Dietetics.
6. J.H. Weil General Biochemistry



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UFD-404**
2. Subject Name: **Storage of Food Products**
3. Contact Hours: L: 2 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objective:-

Food is stored by almost every human society and by many animals. Storing of food has several main purposes: Storage of harvested and processed plant and animal food products for distribution to consumers.

Unit 01:-Unit Operation

Performance characteristics of different unit operations such as precleaning, grading, conveying, elevating, drying, treating, blending, packaging and storage, seed treater, weighing and bagging machines, their operation and maintenance, installation and determination of their capacity, seed quality maintenance during processing, plant design and layout, economy and safety consideration in plant design.

Unit 02:- Drying Method

Seed drying principles and methods, theory of seed drying, introduction to different types of heated air dryers, significance of moisture equilibrium, method of maintaining safe seed moisture, thumb rule and its relevance.

Unit 03:- Storage Structure

Importance of scientific seed storage, types of storage structures to reduce temperature and humidity; management and operation/cleanliness of seed stores, packaging-principles, practices, materials and hermetic packaging.

Unit 04:- Packaging Equipment

Packaging equipments: Food packages, bags, types of pouches, wrappers, carton and other traditional package; Retortable pouches; Shelf life of packaged foodstuff.

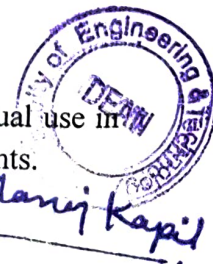
Unit 05:- Packaging Materials

Food containers: Rigid containers, glass, wooden boxes, crates, plywood and wire bound boxes, corrugated and fibre board boxes, textile and paper sacks, corrosion of containers (tin plate); Flexible packaging materials and their properties; Aluminium as packaging material; Evaluation of packaging material and package performance.

Course Outcome:-

Preserving pantry food, such as spices or dry ingredients like rice and flour, for eventual use in cooking. Increase the shelf life of the products. Protect food from Insect, Peat and Rodents.

Text Books:



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **UAS- 403**
2. Subject Name: **Mathematics III**
3. Contact Hours: L: 3 T: 1 P: 0
4. Credits: 4

Objective:

To enable the students to apply the knowledge of Mathematics in various engineering fields by making them to understand the method of solving algebraic, transcendental equations and determine the approximate value of the derivative & definite integral for a given data using numerical techniques.

Unit 01:- Basic Probability

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality

Unit 02:- Continuous Probability Distributions

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Unit 03:- Bivariate Distribution

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Unit 04:- Basic Statistics

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Unit 05:- Applied Statistics

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations

Unit 06:- Small samples

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes

Course Outcome:-

Students will demonstrate the ability to think critically, research, and reason. (Ethical)



Mamika

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **UFD-451**
2. Lab Name: **Food Chemistry Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

Objectives:-

To enable the students to understand the basic concepts of food chemistry of different food products are involved in the analyses.

Experiment 01:-

Analysis of water for potable and food purposes.

Experiment 02:-

Moisture content in foods in relation to their stability.

Experiment 03:-

Non-enzymatic browning reactions and its determinations.

Experiment 04:-

Determination of free fatty acid content in fats and oils..

Experiment 05:-

Determination of heat stability of vitamin C.

Experiment 06:-

Study of some reactions of proteins.

Experiment 07:-

Study of some processing changes in proteins.

Experiment 08:-

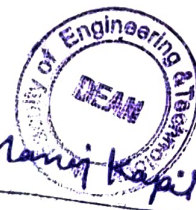
Study of some functional properties of proteins.

Course Outcome:-

Students will understand safety, transfer and measurement of chemicals, filtration, solution preparation, mass percent determination, titrations, redox reactions, enthalpy of reactions, spectrochemical analysis, gas stoichiometry and Operating pH meters, spectrophotometers, analytical balances, and other common laboratory equipment applications in an undergraduate laboratory.

Text Books:

1. Belitz HD.1999. Food Chemistry. Springer Verlag.
2. DeMan JM. 1976. Principles of Food Chemistry. AVI Publications.
3. Fennema OR.1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers.
5. Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh & Co.



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **UFD-452**
2. Lab Name: **Food Biotechnology Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

Objectives:-

To enable the students to understand the basic concepts of biotechnology are involved in the analyses.

Experiment 01:-

Study of laboratory equipments used in plant tissue culture lab.

Experiment 02:-

Preparation of stock solution.

Experiment 03:-

Preparation of growth media.

Experiment 04:-

Explants selection, treatment and inoculation.

Experiment 05:-

Study of Total dissolved and suspended solid in waste water.

Experiment 06:-

Study of acidity of waste water.

Experiment 07:-

Study of hardness of waste water.

Experiment 08:-

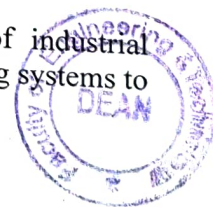
Study of microbial production from different selective strains.

Course Outcome:-

The course discusses the microbiological and technological principles of industrial application of microorganisms and enzymes in food production and processing systems to provide useful products and services.

Text Books:

1. Belitz HD.1999. Food Chemistry. Springer Verlag.
2. DeMan JM. 1976. Principles of Food Chemistry. AVI Publications.
3. Fennema OR.1996. Food Chemistry. Marcel Dekker.
4. Meyer LH. 1987. Food Chemistry. CBS Publishers.
5. Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh & Co.



Manoj Kapi

B.Tech.3rd Year/5th Semester (FOOD TECHNOLOGY)
w.e.f academic Session 2026-27

SEMESTER V														
S. No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KFD-501	Food Quality-Analysis & Assurance	PCC-14	3	1	0	20	10	30	-	70	-	100	4
2	KFD-502	Processing of Fruits and Vegetables	PCC-15	3	0	0	20	10	30	-	70	-	100	3
3	KFD-503	Processing of Milk & Milk Products	PCC-16	3	0	0	20	10	30	-	70	-	100	3
4	KFD-511- KFD-514-S	Professional Elective Course -I* (Bucket of 4 courses from SWAYAM)	PEC-1	3	0	0	20	10	30	-	70	-	100	3
5	KFD-521- KFD-523	Open Elective Course - II	OEC-1	3	0	0	20	10	30	-	70	-	100	3
6	KFD-551	Food Quality-Analysis & Assurance Lab	PCC-17	0	0	2	-	-	-	15	-	35	50	1
7	KFD-552	Processing of Fruits and Vegetables Lab	PCC-18	0	0	2	-	-	-	15	-	35	50	1
8	KFD-553	Processing of Milk & Milk Products Lab	PCC-19	0	0	2	-	-	-	15	-	35	50	1
9	KNC-501 / 502	Constitution of India / Essence of Indian Traditional Knowledge	MC	3	0	0	20	10	30	-	70	-	100	0
10	KCC-551	Internship Assessment / Mini Project#		-	-	-	-	-	-	100	-	-	100	2
TOTAL													850	21
# The project and internship (4 weeks) conducted during summer break after IV semester and will be assessed during V semester (*Will be offered through AWAYAM-NPTEL)														



Manoj Kapil

B.Tech.3rd Year/6th Semester (FOOD TECHNOLOGY)
w.e.f academic Session 2026-27

SEMESTER VI														
S. No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KFD-601	Food Engineering	PCC-20	3	1	0	20	10	30	-	70	-	100	4
2	KFD-611-KFD-613	Professional Elective Course -2	PEC-2	3	0	0	20	10	30	-	70	-	100	3
3	KFD-621-KFD-623	Professional Elective Course -3	PEC-3	3	0	0	20	10	30	-	70	-	100	3
4	KFD-004-KFD-006	Open Elective Course -2	OEC-2	3	0	0	20	10	30	-	70	-	100	3
5	KFD-651	Food Engineering Lab	PCC-21	0	0	2	-	-	-	15	-	35	50	1
6	KFD-652	Advance Food Technology Lab-I	PCC-22	0	0	2	-	-	-	15	-	35	50	1
7	KFD-653	Processing of Cereals Pulses & Oilseeds Lab	PCC-23	0	0	2	-	-	-	15	-	35	50	1
8	KHU-601 to 632	Slot for HSMC Course	HSMC-3	3	0	0	20	10	30	-	70	-	100	3
9	KFD-602-S	Cooling Technology- Why & How Utilized in Food Processing & Allied Industries	NEPTAL 3	0	0	20	10	30	-	70	-	100	3	
TOTAL														
9		Summer Internship	During Summer Vacations / Non-credit (4-6 Week)										650	19

List of Mandatory Courses (non-credit)

KMC-301/KMC-401/KMC-501: Constitution of India

KMC-302/KMC-402/KMC-502: Universal Human Values -I

:- Syllabus will prepare as per scheduled

KMC-303/KMC-403/KMC-503: Environment Science

KMC-304/KMC-404/KMC-504: Essence of Indian Knowledge Tradition:-: Syllabus will prepare as per scheduled

KMC-305/KMC-405/KMC-505: Learning an art form (during Induction Program):-: Syllabus will prepare as per scheduled



BHAI JAITA SUBHARTI ENGINEERING COLLEGE

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-501**
2. Subject Name: **Food Quality- Analysis & Assurance**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objective:

The objective of this course is to review the basic principles of the analytical procedures commonly used to analyze foods and to discuss their application to specific food laws, Standards and specifications.

Unit 01:- Food Quality

Ways of describing of Food Quality, Quality control and Quality Assurance functions. Total Quality Control (TQC) and the role of management/ TQM. Statistical quality control.

Unit 02:- Sensory Evaluation

Instrumental measurements of sensory attribute of foods: Appearance, colour, volume, density and specific gravity, Rheological and textural characteristics. Texture profile analysis. Correlation between instrumental and Sensory analysis of food quality attributes.

Unit 03:- Food Protein

Nutritional Quality of foods and its assessments: Food proteins (Digestibility, Biological value, NPU, PER), Modifications of foods constituents due to processing and storage and their nutritional implications.

Unit 04:- Food Specifications

Food standards and Specifications: Compulsory and voluntary trade and Company standards. Consumer, company, In-process and finished product specifications.

Unit 05:- Food Standards

Quality costs, Analysis and Interpretation of sensory scores. Application of sensory evaluation in Quality Management of foods. Relevant Food laws: PFA, FPO, SWMA, MPO, AgMark, and BIS Standards.

Course Outcome:-

Students will demonstrate the ability to think food quality, sensory evaluation, food protein, specifications and food standards.

Text books:

1. J.M.DeMan Rheology and Texture in Food Quality
2. Y.Pomeranz Food Analysis : Theory and practice IS: 6273 (Part-1& Part-2)
3. M.A. Amerine Principles of Sensory Analysis of Food



Mamaji Kapil

BHAJ JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-502**
2. Subject Name: **Processing of Fruits and Vegetables**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objective:

Processing of fruits and vegetables is very important to produce products for direct consumption and as food ingredients. During processing, the main objectives are to preserve the color, flavor, texture, and nutrition while prolonging the shelf life of perishable fruits and vegetables.

Unit 01:- Post harvest technology

Importance of post harvest technology of fruits and vegetables, structure, cellular components, composition and nutritive value of fruits and vegetables, fruit ripening, spoilage of fruits and vegetables, relationship between moisture content (wet basis and dry basis)

Unit 02:- Unit Operation

Harvesting and washing, pre-cooling, preservation of fruits and vegetables, blanching, commercial canning of fruits and vegetables, minimal processing of fruits and vegetables. Ohmic heating. Pulse electric field.

Unit 03:- Storage and Packaging

Cold storage of fruits and vegetables, controlled atmosphere packaging of fruits and vegetables, gas composition, quality of storage. Cold plasma technology

Unit 04:- Drying

Dehydration of fruits and vegetables, methods, osmotic dehydration, foam mat drying, freeze drying, microwave heating, applications, radiation preservation of fruits and vegetables, irradiation sources.

Unit 05:- Processing

Intermediate moisture foods, ohmic heating principle, high pressure processing of fruits and vegetables, applications, sensory evaluation of fruit and vegetable products, packaging technology for fruits and vegetables, general principles of quality standards and control, FPO, quality attributes.

Course Outcome:-

Be familiar with and understand the harvesting and storage methods used for fruit and vegetables and understand the physiological changes occurring to fruit and vegetables during harvesting and storage.

Text books:

1. Cruess WV. 2000. *Commercial Fruit and Vegetable Products*. Agrobios.
2. Mircea Enachescu Danthy. 1997. *Fruit and Vegetable Processing*. International Book Publ.
3. Srivastava RP and Sanjeev Kumar. 1994. *Fruit and Vegetable Preservation. Principles and Practices*. International Book Distr.
4. Sumanbhatti and Uma Varma. 1995. *Fruit and Vegetable Processing*. CBS.
5. Thompson A. K. 1996. *Post Harvest Technology of Fruits and Vegetables*. Blackwell.
6. Verma LR and Joshi VK. 2000. *Post Harvest Technology of Fruits and Vegetables*. Indus Publ.



Mamaj Kapil

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-503**
2. Subject Name: **Processing of Milk & Milk Products**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objective

To carry out activities for promoting production, procurement, processing and marketing of milk & milk products for economic development of the rural farming community.

Unit 01:- Milk Constituents

Fluid Milk: Composition of milk and factor affecting it. Physico-chemical characteristics of milk and milk constituents. Production and collection, cooling and transportation of milk. Packaging storage and distribution of pasteurized milk.

Unit 02:- Types of Milk

Whole, Standardized, Toned, Double toned and skim milk. Test for milk quality and Adulteration. UHT processed milk, flavoured, Sterilized milk. Cleaning and sanitization of dairy equipments. Definition, Classification, Composition and physico-chemical properties of cream. Production processes and quality control.

Unit 03:- Milk Products

Butter: Definition, Classification, Composition and methods of manufacture, Packaging and storage. Butter oil/Ghee. Ice cream: Definition, Classification and Composition, Constituents and their role. Preparation of mixes and freezing of Ice cream, Overrun, Judging, Grading, and defects of Ice cream.

Unit 04:- Evaporation and Condensation

Evaporated and Condensed milk: Method of manufacture, Packaging and storage. Defects, Causes, and prevention. Roller and Spray Drying of milk solids. Instantization. Flow ability, Dustiness, Reconstituability, Dispersability, Wet ability, Sink ability and appearance of milk powders.

Unit 05:- By-Products

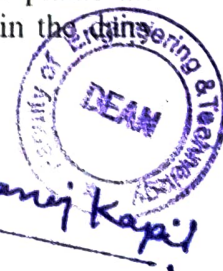
By-products of dairy industry and their effective utilization. Manufacture of casein, Whey protein, Lactose from milk and their use in formulated foods. Quality Control tests in Dairy industry.

Course Outcome:-

Be familiar with and understand the formation of milk and its components, explains the formation of milk, the sensory and physical properties of milk and also explain the processing technologies viz. Pasteurization, Sterilization and UHT Methods

Text books:

1. C.F.T.R.I. Mysore Manuals on Rice and its Processing



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-513**
2. Subject Name: **Engineering Properties of Food Materials**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Unit No.	Particulars	Contact Hours
1	Importance of engineering properties of biological materials, Study of different physical and thermal characteristics of important biological materials like shape, size, volume, density, roundness, sphericity, surface area, specific heat, thermal conductivity, thermal diffusivity, etc. measurement of colour, flavour, consistency, viscosity, texture and their relationship with food quality and composition.	9
2	Rheological characteristics like stress, strain time effects, rheological models and their equations. Aerodynamic characteristics and frictional properties. Application of engineering properties in handling processing machines and storage structures.	8
3	Concept, objectives and need of quality, quality control, methods of quality control, sampling; purpose, sampling techniques, requirements and sampling procedures for liquid, powdered and granular materials,	7
4	Food Laws and Regulations in India. Food grades and standards BIS, AGMARK, PFA,FPO, CAC (Codex Alimentarius Commission), sanitation in food industry , GMP,HACCP (Hazard analysis and critical control point) and ISO 9000 Series.	8
5	Sensory quality control, panel selection methods, interpretation of sensory results in statistical quality control, TQM and TQC, consumer preferences and acceptance,	8

Text books:

1. Physical properties of plant and animal materials by N.N. Mohenensin.
2. Engineering properties of foods by Rao, M.A and Rizvi.,S.S.H.



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **KFD-551**
2. Lab Name: **Food Quality- Analysis & Assurance Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 2

Objectives:-

To enable the students to understand the basic concepts of food quality and analysis of food products are involved in the analyses.

Experiment 01:-

Evaluation of quality of Dairy Products: Over run and fat content in Ice-cream, Specific gravity of Milks etc.

Experiment 02:-

Determination of the salt (NaCl) in meat processing.

Experiment 03:-

Determination of lycopene content in food samples.

Experiment 04:-

Determination of protein in food samples.

Experiment 05:-

Assessment of quality of Fruit & Vegetable Products: Tomato Products, Jam, Jelly, Marmalades, Squashes & Cordials, Canned Products.

Experiment 06:-

To study and determination the concept of moisture content.

Experiment 07:-

To determination the Estimation of Ash Content.

Experiment 08:-

Demonstration of the impact of salt, sodium phosphate and salt & phosphate on water holding capacity (WHC) in raw meat.

Course Outcome:-

To acquaint the students with various dairy engineering operations such as homogenization, pasteurization, thermal processing, evaporation, freezing and drying of milk and understand the principles and methods of Quality Control and Assurance in milk, sensory evaluation and HACCP in different food processing.

Text Books:

1. Belitz HD.1999. Food Chemistry. Springer Verlag.
2. Fennema OR.1996. Food Chemistry. Marcel Dekker.
3. Meyer LH. 1987. Food Chemistry. CBS Publishers.
4. Swaminathan M. 1974. Essentials of Foods and Nutrition. Vol. II. Ganesh & Co.



BHAI JAITA SUBHARTI ENGINEERING COLLEGE

DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **KFD-552**
2. Lab Name: **Processing of Fruit & Vegetables Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1
6. Instruction: Minimum five experiments from the followings.

Objectives:-

To enable the students to understand the basic concepts of Processing of Fruit & Vegetables products are involved in the analyses.

Experiment 01:-

Determination of size, shape, density of fruits and vegetables.

Experiment 02:-

Determination of density, area-volume-mass relationship of fruits and vegetables.

Experiment 03:-

Determination of sugar-acid ratio of fruits.

Experiment 04:-

Determination of grader and packaging methods.

Experiment 05:-

Assessment of quality of Fruit & Vegetable Products: Tomato Products, Jam, Jelly, Marmalades, Squashes & Cordials, Canned Products.

Experiment 06:-

Experiments on drying of fruits and vegetables.

Experiment 07:-

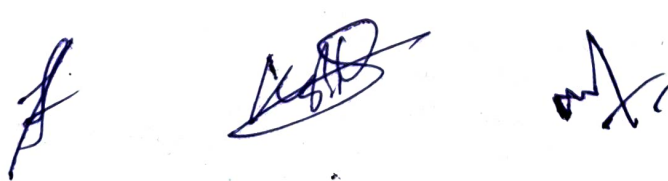
Determination of controlled atmosphere storage and quality evaluation.

Course Outcome:-

To acquaint the students with drying of food materials, traditional and modern storage structures, unit operation of processing the fruits and vegetables, post harvest losses of different fruits and vegetables during different unit operations and increase the self life of the value added food products.

Text Books:

1. BIS Specifications Morris B. Jacobs, The Chemical Analysis of Foods & Food Products
2. S. Ranganna Hand Book of Analysis and Quality Control for Fruit & Vegetable Products
3. Official Method of Analysis of AOAC



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **KFD-553**
2. Lab Name: **Processing of Milk & Milk Products Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1
6. Instruction: Minimum five experiments from the followings.

Objectives:-

To enable the students to understand the basic concepts of Processing of Milk & Milk Products Lab are involved in the analyses.

Experiment 01:-

Determination of the composition of milk and its properties (fat content, total solids, specific gravity, acidity, pH, viscosity etc.).

Experiment 02:-

Study of plate heat exchanger and tubular heat exchanger.

Experiment 03:-

HTST pasteurization of milk.

Experiment 04:-

Spray drying of milk.

Experiment 05:-

Design of food processing plant and preparation of layout

Experiment 06:-

Study of drum dryer

Experiment 07:-

Quality control of the different milk and milk products

Experiment 08:-

Study of microbial quality of milk and milk products.

Course Outcome:-

To acquaint the students with drying of milk, storage, unit operation of processing the milk and milk products and increase the self life of the value added food products.

Text Books:

1. BIS Specifications Morris B. Jacobs, The Chemical Analysis of Foods & Food Products
2. S. Ranganna Hand Book of Analysis and Quality Control for Fruit & Vegetable Products
3. Official Method of Analysis of AOAC



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-601**
2. Subject Name: **Food Engineering**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objective

Propose and conduct research on non thermal food processing methods, to improve and acquire processed foods with fresh-like quality. Extend the shelf life of foods. Assess the potential energy savings and favorable economics associated with combining non thermal processing methods with current commercial food preservation systems.

Unit-I:-Role Preservation in food processing industries

Preservation of foods – physical and chemical methods-microbiological aspects thermo bacteriology, process calculation and selection.

Unit-II:-Study on different method of preservation and its importance

Low temperature preservation - cooling and cold storage – freeze concentration and membrane separation process - hurdle technology - principles and applications - food irradiation - advantages and applications.

Unit-III:-Importance of heat and its application in food processing industries

Application of heat energy and ultrasound - inactivation of microorganisms and enzymes - electrical resistance heating of food - heat generation, ohmic heater, heating models.

Unit- IV:-Extrusion Technology and its importance in food industry

Extrusion: Theory, equipments, applications. Distillation and leaching: Phase equilibria, multistage calculations, equipments, solvent extraction. Extrusion cooking - recent developments, methods, design criteria of extruders.

Unit-V:-Introduction of microwave processing and its role in food industry

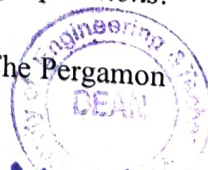
Microwave processing - interaction with food materials- microwave equipment - hydrostatic pressure treatment of food - equipment, processing and effect on microorganisms

Out Come

Understand and explain the importance of transport processes and unit operations in food processing as demonstrated both conceptually and practical in Laboratory. Use the principles of food preservation including effects of low and high temperatures and heat penetration to evaluate adequacy of thermal processing.

Text books:

1. Brennan JG, Butters JR, Cowell ND & Lilly AEI. 1990. *Food Engineering Operations*. Elsevier.
2. Coulson JM & Richardson JF. 1999. *Chemical Engineering*. VolS. II, IV. The Pergamon Press.
3. Earle RL. 1985. *Unit Operations in Food Processing*. Pergamon Press.
4. Fellows P. 1988. *Food Processing Technology: Principle and Practice*. VCH Publ.
5. Geankoplis J Christie. 1999. *Transport Process and Unit Operations*. Allyn & Bacon.
6. Henderson S & Perry SM. 1976. *Agricultural Process Engineering*. 5th Ed. AVI Publ.



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5. Geankoplis J Christie. 1999. *Transport Process and Unit Operations*. Allyn & Bacon.
6. Henderson S & Perry SM. 1976. *Agricultural Process Engineering*. 5th Ed. AVI Publ.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-611**
2. Subject Name: **Processing of Cereals, Pulses & Oilseeds**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objectives:

This course will impart knowledge to the students on cereal and millet processing. By the end of the course, the students will be able to understand traditional and improved methods of cereal processing and to develop good expertise on the technical aspects of preparation of cereal and millet based products.

Unit-I:-Composition and Structure

Composition, Structure and Processing characteristic of Cereal grains, Legumes and oilseeds, Post harvest, Post processing practices for their safe storage. Parboiling and Milling of paddy, Quality characteristics, curing and aging of rice, processed rice products.

Unit-II:- Wheat milling

Wheat and its quality characteristics for milling into flour and semolina, Flour milling, Turbo grinding and air classification, Flour grades and their suitability for baking purposes, Assessment of flour quality and characteristics, Milling of Durum wheat, Macaroni products.

Unit-III:-Dall mill and its by products

Dal mills, handling and storage of by-products and their utilization. Storage of milled products, Expeller and solvent extraction processing, assessment of processed product quality.

Unit -IV:- Legume Processing

Milling of legume-pulses by traditional and improved processes. Pearling of Millets.

Unit -V:- Oil Seeds Processing

Processing of oil seeds for direct use and consumption, Oil and protein products. Processing of extracted oil refining, hydrogenation, interestrification. Processing of deoiled cake into protein concentrates and isolates, Textured protein, Functional protein preparations. Peanut butter, Margarine and Spread.

Out Come:

Able to gain knowledge in different processing of plantation crops, spices and tuber crops and also its value added products. Able to acquire a confident to get placement in any kind of cereals and spices industry with minimum post harvest losses and maximum benefit to the industry. To develop an awareness of various processing procedure and processed cereal products.

Text books:

1. Asiedu JJ. 1990. *Processing Tropical Crops*. ELBS/MacMillan.
2. Chakraverty A. 1995. *Post-harvest Technology of Cereals, Pulses and Oilseeds*. Oxford & IBH.
3. Morris Lieberman. 1983. *Post-harvest Physiology and Crop Preservation*. Plenum Press.
4. Pandey PH. 1994. *Principles of Agricultural Processing*. Kalyani.
5. Pillaiyar P. 1988. *Rice - Post Production Manual*. Wiley Eastern.
6. Sahay KM & Singh KK. 1994. *Unit Operations in Agricultural Processing*. Vikas Publ. House.



BHAJ JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-612**
2. Subject Name: **Processing of Meat Fish and Poultry Products**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

Gain knowledge on the methods of grading meat. Study on different techniques available to slaughter animal. Quality control and standardization of meat, fish and poultry. Processing and preservation of egg and fish.

Unit-1:-Introduction and Kind of Meat and Poultry Products

Meat and poultry products: Introduction, kinds of meat animals and poultry birds, classification of meat, composition of meat.

Unit-II:-Study of Different Methods for Preservation of Poultry

Preservation of poultry: different methods, stuffed products, frozen products, poultry concentrates and flavours, synthetic poultry flavour.

Unit-III:-Study of Different Methods for Preservation of meat products

Different preservation methods of meat: Smoking, curing and freezing, chilling of meat and different methods of chilling, freezing of meat and different methods, packaging of meat and meat products, quality control.

Unit-IV:-Study of nutritional Quality and Preservation methods of Fish Products

Fish: Nutritional quality of fish and fish products, fillet and steaks, different preservation techniques, chilling, freezing, drying, canning, curing and smoking, quality control in fish processing.

Unit-V:-Classification and Composition of Egg

Classification, composition and nutritive value of eggs: Grading of eggs, different quality parameters of eggs, Haugh unit, processing of egg, yolk processing, egg breaking mechanisms, freezing of egg, pasteurization, different dehydration methods, quality control and specification of egg products.

Outcomes:

After completing this course students will get to know about the nutritional profile of meat, poultry, fish and egg. Increase the shelf life of the products..

Text Book:

1. Chooksey MK & Basu S. 2003. *Practical Manual on Fish Processing and Quality Control*. CIFE, Kochi.
2. Chooksey MK. 2003. *Fish Processing and Product Development*. CIFE, Kochi.
3. Hall GM. 1997. *Fish Processing Technology*. Blabie Academic & Professional.
4. Lawrie RS. 1985. *Developments in Meat Sciences*. Vol. III. Applied Science Publ.
5. Mead GC. 1989. *Processing of Poultry*. Elsevier.



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BHAJ JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: KFD-613
2. Subject Name: Fruits Vegetables and Plantation of the Products
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

The production of fruits and vegetables is highly located in favored situations of soil and climate. A crucial problem faced in the case of fruits and vegetables is that of the huge enormous losses that occur on account of spoilage.

Unit-I:- Structure Composition and Nutritional Aspect of Fruits and Vegetables

Structural, Compositional and Nutritional aspects of fruits and vegetables. Physiological development: Growth, Maturation, Ripening and Senescence. Post harvest handling including controlled and modified storage. Techniques of processing and preservation of fruits and vegetables by refrigeration and freezing, canning and bottling, drying and dehydration.

Unit-II:- Technology for Manufacture of Processed Food Products

Technology of fruits and vegetable products: Juices and pulps, Concentrates and powders, Squashes and cordials. Beverage: Still and carbonated. James, Jellies and Marmalades. Preserves, candies and crystallized fruits. Tomato products: Puree, Paste, Ketchup, Sauce and soup. Chutneys, pickles and other products.

Unit-III:- Spices: Composition, structure and methods of Preservation

Spices: Composition, Structure and characteristics. Preservation and processing of major and minor spices of India; whole spice, Spice powder, Paste and extracts, Spice oils and oleoresins. Composition, Structure, characteristics & processing of cashew nut and other dry fruits.

Unit-IV:- Composition, Production and Processing of Tea Leaves and Coffee

Composition, Production and processing of Tea leaves: Black tea, Green tea and Oolong tea. Instant tea. Production and processing of coffee cherries by wet and dry methods to obtain coffee beans, grinding, storage and preparation of brew, Soluble /Instant coffee, Use of chicory in coffee, decaffeinated coffee.

Unit-V:- Production, processing and chemical composition of cocoa beans.

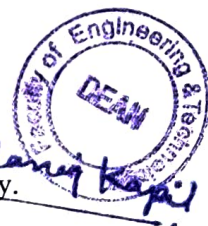
Production, processing and chemical composition of cocoa beans. Cocoa Processes: Cleaning, roasting, alkalization, cracking and fanning, Nib grinding for cocoa liquor, cocoa butter and cocoa powder. Manufacturing process for chocolate: Ingredients, Mixing, Refining, Conching, Tempering, Moulding etc. to obtain chocolate slabs, chocolate bars. Enrobed and other confectionary products.

Outcomes:

Students would have learnt different post harvest handling methods of fruits and vegetables. The students will have knowledge about different processing and preservation methods and principles involved. The students will gain information about various food constituents, and changes that occur in them during food processing.

Text Book

1. G. Lal, G.S. Siddappa and G.L. Tondan Preservation of fruits & vegetables.
2. B. Shrilakshimi Food Science.
3. Bernard. W. Minifie Chocolate, Cocoa and Confectionary: Science and Technology.



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-621**
2. Subject Name: **Food Additives**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objective:

Maintain or Improve Safety and Freshness. To Improve or maintain nutritional value, taste, texture and appearance.

Unit-I:-Introduction and classification of food additive

Definitions of Food Additives, Classification and Functions, Legitimate uses of Additives in foods, Intentional & Non Intentional additives, Indirect food additives; Difference between Additives & Adulterants, Food uses and functions in formulations; Toxicological evaluation of food additives.

Unit-II:-Functions of Food Additive

Uses & functions of: Acid, Base, Buffer systems, Salts and Chelating/Sequestering agents, Masticatory substances. Low calorie and non nutritive sweeteners, Polyols.

Unit-III:-Classes of Food Additive

Anti microbial agents / Class I and Class II preservatives as per PFA Act. Tracers and other additives.

Unit-IV:-Colouring and Flavouring Agents

Colorants, Flavoring agents and related substances, Clarifying agents. Gases and Propellants. Tracers and other additives.

Unit-V:-Emulsifiers and Anti-caking agents

Antioxidants, Emulsifying and stabilizing agents, Anti-caking agents, Thickeners, Firming agents. Flour bleaching agents and Bread improvers.

Course outcomes:

Food additives contribute to the overall quality, safety, nutritive value, appeal, convenience, and economy of foods. Explain what a food additive is and how it can protect the quality of food. Learning how to lead a healthier lifestyle. Describe the fundamentals in food toxicology and the important characteristics of common contaminants in food. Discuss the toxicology of different types of food contaminants.

Text books:

1. Brannen AL, Davidson PM & Salminen S. 2001. Food Additives. 2nd Ed. Marcel Dekker.
2. George AB. 1996. Encyclopedia of Food and Color Additives. Vol. III. CRC Press.
3. George AB. 2004. Fenaroli's Handbook of Flavor Ingredients. 5th Ed. CRC Press.
4. Morton ID & Macleod AJ. 1990. Food Flavours. Part A, BC. Elsevier



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-622**
2. Subject Name: **Packaging of Food Products**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

For most food products, the main objective of food packaging is to ensure the safety of the product and preserve it in good condition for the anticipated shelf life. The package should also minimize product losses (waste) throughout the food handling and distribution chain.

Unit-I:- Introduction and type of Packaging

Introduction of packaging: Types of Package, functions and design. Principle in the development of protective packaging. Deteriorative changes in foodstuff and packaging methods of prevention.

Unit-II:- Study on Different Packaging material

Cellulosic and Polymeric packaging materials and forms: Food grade polymeric packaging materials, rigid plastic packages. Films: Oriented, Co-extruded, Laminates and Metallised; Cellophane, Olefins, Polyamides, Polyesters, PVC, PVDC, PVA, Inomers, Copolymers, Polycarbonates, Phenoxy, Acrylic and Polyurethane. Their mechanical sealing and barrier properties.

Unit-III:- Different Packaging Standard and Regulations

Package standards and regulation; Shrink packaging; Aseptic packaging, CAP and MAP, Active packaging; Biodegradable packaging.

Unit-IV:- Role of packaging in Food Industry

Methods to extend shelf life; Packaging of perishables and processed foods; Special problems in packaging of food stuff. Package printing, Packaging Laws and Regulations, Evaluation of food packaging materials and package performance.

Unit-V:- Characteristics and packaging required of the food products

Food product characteristics and package requirement, Selection of materials, Forms, Machinery and methods for fresh produce (Fruits, Vegetables, Egg, Meat and Fish), Edible oils and Fats, Spice and spice products, Processed products (Fruit & Vegetable, Cereal & Pulse, Dairy, Confectionary & Snacks, Meat & Marine products).

Course outcomes:

Consumers demand products that fit into their lifestyles and the packaging industry has had to respond to this. Correct packaging prevents any wastage (such as leakage or deterioration) which may occur during transportation and distribution. It is strongly recommended that prior to filling, glass containers are heat sterilized.

Text Books:

1. Crosby NT. 1981. *Food Packaging Materials*. Applied Science Publ.
2. Mahadeviah M & Gowramma RV. 1996. *Food Packaging Materials*. Tata McGraw Hill.
3. Palling SJ. (Ed). 1980. *Developments in Food Packaging*. Applied Science Publ.
4. Sacharow S & Grittin RC. 1980. *Principles of Food Packaging*. AVI Publ.



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-623**
2. Subject Name: **Principle of Human Nutrition**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

Introduce students to the principle of human nutrition, Provide information on the relationship between nutrition and processed foods; and Expose students to the various methods of nutritional evaluations in human and animals.

Unit-I:-Introduction and Concepts of Nutrition

Concepts and content of nutrition: Nutrition agencies, Nutrition of community, Nutritional policies and their implementation, Metabolic functions of nutrients. Water and energy balance. Basal metabolism- BMR, Body surface area and factors affecting BMR.

Unit-II:-Energy Metabolism and method for requirement estimation of energy

Energy metabolism- Basal and resting metabolism – influencing factors, methods to determine energy requirements & expenditure, thermo genesis, adaptation to altered energy intake. Regulation of food intake. Basis for computation of nutrient requirements, latest concepts in dietary recommendations, RDA – ICMR and WHO their uses & limitations.

Unit-III:-Vitamins: Classifications, Functions and source and Diseases

Functions, types, classification, diseases, food sources and other benefits of vitamins, minerals, carbohydrates, proteins, fats and water. Effect of excess and deficiency.

Unit-IV:- Balance Diet for the human according to age Group

Classification of balanced diet, Preparation of balanced diet for various groups, Diets and disorders. Recommended dietary allowances: For various age group, According to physiological status, Athletic and sports man, Geriatric persons.

Unit-V:- Nutrition and its requirement for the Growth of Human Body

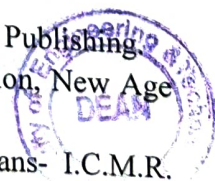
Growth and development, nutritional requirements, feeding pattern, compositional differences between human milk and milk substitute and their suitability for infant feeding. Weaning practices, weaning and supplementary foods.

Course Outcomes:

Describe the role and function of macronutrients and micronutrients, nutrient deficiencies and nutrient toxicity and Identify food groups, their type and nutrient contribution and their distinguishing nutrients

Text Books:

1. Guthrie Helen (1986) Introductory Nutrition. Times Mirror/ Mosby College Publishing
2. Mudambi, S.R., Rajgopal, M.V.(1990) Fundamentals of Foods and Nutrition, New Age International Pvt. Ltd.
3. Nutrient Requirements and Recommended Dietary Allowances for Indians- I.C.M.R. Publication 1999.
4. Banarsidas B. (1995): Park & Park- Textbook of Preventive and Social Medicine, Jabalpur.



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4. Banarsidas B. (1995): Park & Park- Textbook of Preventive and Social Medicine, Jabalpur.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-004**
2. Subject Name: **Rheological and Sensory Assessment**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

Objectively define and quantify categories of texture-modified food by conducting rheological measurements and sensory analyses. A further objective was to facilitate the communication and recommendations of appropriate food textures for patients with dysphasia.

Unit-I:-Mechanical and Rheological Properties

Mechanical properties of foods. Mechanical models to visualize behaviour of foods. Basic and applied rheological considerations and their application to foods

Unit-II:-Study on texture classification and characteristics of food material

Texture classification, relation of food texture with structure and rheology. Principles and practices of objective texture measurements, viscosity measurements.

Unit-III:-Function of Emulsifier in relation to food texture

Rheology of chocolate, Textural characteristics of food emulsions, Functions of emulsifiers in relation to food texture, Sensory measurement of food texture and texture profile.

Unit-IV:-Textural properties of various fruits, vegetables and dairy products

Texture Properties of fruits and vegetables, Dough, Pasta, Dairy Products, meat product fat and fat products and their instrumental managements

Unit-V:-Sensory Characteristics of the food products

Sensory methods of texture and viscosity measurements and their correlation.

Course outcomes:

Describe the principles and application of instrumental analytical techniques. Determine when a specific analytical technique is required. Perform fundamental lab skills including solution preparation, dilution and pH adjustment. Perform instrumental techniques used in the evaluation of foods

Text Books:

1. Bourne MC. 2002. *Food Texture and Viscosity: Concept and Measurement*. Academic Press.
2. Deman JM. *et al.* 1976. *Rheology and Texture in Food Quality*. AVI Publ.

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Manoj Kapi

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-006**
2. Subject Name: **Food Products and Process Development**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

Understand the basics of innovation in food industry and apply the stage-gate process to product development, Interpret a brief specifying the requirements for a product, Undertake a survey of similar products that are already in the marketplace, and identify the key product attributes, develop a sensory and/or instrumental profile that can be applied during product development trials.

Unit-I:-Innovation and product development concept

Innovation and product development concept. Generation of ideas. Desk Research. Screening/appraisal of initial ideas.

Unit-II:-Developing Planning and processing of the food products

Detailed study of product, process and market, Planning and developmental activities and evaluating them.

Unit-III:-Prototype Product and Its testing

Development of prototype product and its testing for acceptance.

Unit-IV:-Planning for production testing and trial

Development of process and planning for production trials. Planning the test market. Actual production trials and test marketing. Evaluation of test results.

Unit-V:-Launching of the product and Advertising of the product

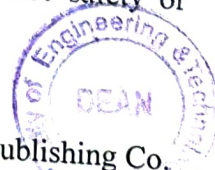
Launching of the product. Advertising and marketing plans. Suggestions for improving success.

Course Outcomes:

Develop an awareness of methods used in the development and testing New Food Products; including the characterisation of sensory attributes and determination of consumer preferences. Apply the new product development theories and manage a food product development project. Reflect on the interactions of ingredients and processes used in the development of New Food Products with potential hazards that could compromise safety or quality attribute.

Text Book:

1. Leniger HA & Beverloo WA. 1975. *Food Process Engineering*. D. Reidel Publishing Co.
2. Rao MA & Rizvi SSH.. 1986. *Engineering Properties of Foods*. Marcel Dekker.
3. Ronald Jowitt. 1984. *Extrusion Cooking Technology*. Elsevier.



Manoj Kapi

2. Rao MA & Rizvi SSH.. 1986. *Engineering Properties of Foods*. Marcel Dekker.
3. Ronald Jowitt. 1984. *Extrusion Cooking Technology*. Elsevier.

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **KFD-651**
2. Lab Name: **Food Engineering Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

Objectives:

This is a introductory course which gives the necessary details and information to get acquainted with the properties and determination of solving problems on single and multiple effect evaporator, distillation, crystallisation, extraction, leaching for safety of foods.

Experiment-I

Determination of solving problems on single and multiple effect evaporator, distillation, crystallisation, extraction, leaching.

Experiment-II

Determination of membrane separation and mixing.

Experiment-III

Preparation and quality testing of extruded foods.

Experiment-IV

Preparation and quality testing of different vegetable based instant soups, hard boiled candy/ tutti- fruity etc.

Experiment-V

Determination of reverse osmosis and ultra filtration - design of plate and packed tower.

Experiment-VI

Preparation and quality testing of food products from tropical fruits as sapota, karonda, ber, anola, mjamun etc.

Experiment-VII

Preparation and quality testing of instant mixes based on cereal & pulses like Halwa mix, Dosa mix, Idli mix etc.

Experiment-VIII

Preparation and quality testing of egg powder.

Experiment-IX

Analysis of milk, ghee and Egg quality.

Unit-X

Visit to related industry

Out Come

Understand and explain the importance of transport processes and unit operations in food processing as demonstrated both conceptually and practical in Laboratory. Use the principles of food preservation including effects of low and high temperatures and heat penetration to evaluate adequacy of thermal processing.

Text books:

1. Brennan JG, Butters JR, Cowell ND & Lilly AEI. 1990. *Food Engineering Operations*. Elsevier.
2. Coulson JM & Richardson JF. 1999. *Chemical Engineering*. VolS. II, IV. The Pergamon Press.
3. Earle RL. 1985. *Unit Operations in Food Processing*. Pergamon Press.
4. Fellows P. 1988. *Food Processing Technology: Principle and Practice*. VCH Publ.
5. Geankopolis J Christie. 1999. *Transport Process and Unit Operations*. Allyn& Bacon.


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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **KFD-652**
2. Lab Name: **Advance Food Technology Lab -I**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

Objectives:-

To enable the students to understand the basic concepts involved in the analyses.

Experiment-I

Processing and analysis method of digital pH meter for pH content

Experiment-II

Processing and analysis method of Acidity

Experiment-III

Processing and analysis method of TSS

Experiment-IV

Processing and analysis method of Vitamin-C

Experiment - V

Processing and analysis method of Protein

Experiment-VI

Processing and analysis method of Microbial Growth

Experiment-VI

Processing and analysis method of Ash Content

Experiment-VII

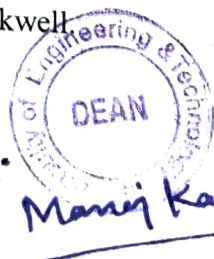
Processing and analysis method of Color measurement

Outcomes

Explain the advance significance and activities of food in industry. Describe the characteristics of food nutrients and methods for their isolation, detection and identification. Explain quality control programmes are necessary in food production. Explain the effects of fermentation in food production and how it influences the microbiological quality and status of the food product.

Text books:

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Srivastava RP & Sanjeev Kumar. 1994. Fruit and Vegetable Preservation. Principles and Practices. International Book Distr.
3. Sumanbhatti & Uma Varma. 1995. Fruit and Vegetable Processing. CBS.
4. Thompson AK. 1996. Post Harvest Technology of Fruits and Vegetables. Blackwell



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Lab Code: **KFD-653**
2. Lab Name: **Processing of Cereals Pulses & Oilseeds Lab**
3. Contact Hours: L: 0 T: 0 P: 2
4. Examination Duration (Hrs.): Practical 02
5. Credits: 1

Objectives:

To testing and quality evaluation of different processed products

Experiment-I

Preparation and quality testing of cookies, Cakes (Egg/ Egg less).

Experiment-II

Preparation and quality testing of RTS/RTC foods.

Experiment-III

Preparation and quality testing of cereals products (sweet buns, pizza base etc.).

Experiment-IV

Preparation and quality testing of pulses products (bread, biscuits etc.)

Experiment-V

Preparation and quality testing of oil seed products (Nan khatai etc.)

Experiment-VI

Determination of oil extraction methods.

Experiment-VII

Determination of cereals, pulses based RTC/RTE food products.

Outcomes

After completion of the laboratory work student can determine the various parameters of processed products.

Text books:

1. Banawart GJ. 1989. Basic Food Microbiology. 2nd Ed. AVI Publ.
2. Srivastava RP & Sanjeev Kumar. 1994. Fruit and Vegetable Preservation. Principles and Practices. International Book Distr.
3. Sumanbhatti & Uma Varma. 1995. Fruit and Vegetable Processing. CBS.
4. Thompson AK. 1996. Post Harvest Technology of Fruits and Vegetables. Blackwell.

STUDY & EVALUATION SCHEME
B.Tech.4thYear/7th Semester (FOOD TECHNOLOGY)
w.e.f academic Session 2026-27

SEMESTER VII														
S. No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KFD-711-KFD-713	Professional Elective Course - 4	PEC-4	3	0	0	20	10	30	-	70	-	100	3
2	KFD-721-KFD-723	Professional Elective Course - 5	PEC-5	3	0	0	20	10	30	-	70	-	100	3
3	KFD-007-KFD-009	Open Elective Course -3	OEC-3	3	0	0	20	10	30	-	70	-	100	3
4	KFD-010-KFD-012	Open Elective Course -4	OEC-4	3	0	0	20	10	30	-	70	-	100	3
5	KFD-752	Project Stage-I	PROJ	0	0	6	-	-	-	50	-	100	150	3
6	KFD-751	Summer Internship	PROJ	0	0	2	-	-	-	50	-	-	50	1
7	KHU-701 to KHU732	Slot for HSMC	HSMC-4	3	0	0	20	10	30	-	70	-	100	3
TOTAL													700	19

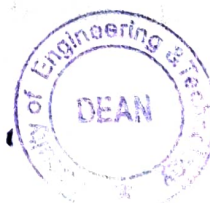
B.Tech.4thYear/8th Semester (FOOD TECHNOLOGY)
w.e.f academic Session 2026-27

SEMESTER VIII														
S. No.	Course Code	Course Title	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KFD-811-KFD-813	Professional Elective Course - 6	PEC-6	3	1	0	20	10	30	-	70	-	100	4
2	KFD-013-KFD-015	Open Elective Course-5	OEC-5	3	0	0	20	10	30	-	70	-	100	3
3	KFD-016-KFD-018	Open Elective Course -6	OEC-6	3	0	0	20	10	30	-	70	-	100	3
4	KFD-851	Project Stage-II	PROJ	0	0	16	-	-	-	100	-	200	300	8
TOTAL													600	18

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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: KFD-711
2. Subject Name: Crop Process Engineering
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives

Be able to apply new technology, design, plan, control and manage food process engineering system, be able to differentiate and select efficient technology in the development of agro industry processing to achieve profitable and environmentally safe outcome.

Unit: I:- Introduction

Introduction to food process engineering

Unit: II:- Basic principle of material and energy balance

Material and energy balances: Basic principles, total mass balance and component mass balance, Material balance calculations involved in dilution, concentration and dehydration, Heat balance calculations.

Unit: III:- Fluid flow and its application

Fluid flow theory and applications: Fluid statics and fluid dynamics, mass and energy balances in fluid flow, Newtonian and non-Newtonian fluids, streamline and turbulent flow, Fluid flow applications measurement of pressure and velocity.

Unit: IV:- Heat transfer in food processing

Heat transfer in food processing, thermal properties of foods, modes of heat transfer, conductive heat transfer in a rectangular slab, tubular pipe, and multilayered systems, Natural and forced convection, estimation of convective heat transfer coefficient in forced and natural convection, estimation of overall heat transfer coefficient, heat exchangers- Plate, tubular, scraped surface, and steam infusion heat exchangers.

Unit: V:- Study on Psychometric properties

Psychometrics: Properties of dry-air : composition of air, specific volume of air, specific heat of dry air, enthalpy of dry air, dry bulb temperature.

Course out comes:

To enumerate the unit and dimension of various physical quantities, to describe the type and properties of fluid flow, to appraise the performance of processing unit, to validate the energy balance involve in food processing operation.

Text books:

1. K.M. Sahay and K.K. Singh (2001). Unit operation of Agriculture Processing.
2. Food Process Engineering Lab manual, "Department of Food Process Engineering", SRM University.



Manoj Kapi

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject code: **KFD-712**
2. Subject Name: **Food Beverages**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

Food and Beverage Server Resume Objective Sample. A Food Server is tasked with serving patrons in a restaurant or other eating establishment. Specific job duties frequently include greeting customers, taking orders, serving food and beverages, and generally ensuring that customer needs are accommodated.

Unit-I:-Introduction and classification of beverage

Introduction: classification, production and consumption of beverages. Alcoholic beverages: Concept of fermentation for production of beer, wine and distilled beverages including their Packaging and maturation. Non-alcoholic beverages: carbonated and noncarbonated.

Unit- II:-Study the Water treatment and quality

Water treatment and quality. Specification for beverage water. Alkalinity reduction, filtration of water, water softening. Raw materials, equipment, quality control and legislation of beverage products.

Unit- III:-Natural and synthetic colorants used in soft drinks

Natural and synthetic colorants used in soft drinks. Acidulants, clouding and flavouring agents for soft drink. Carbon dioxide and carbonation for soft drinks. Equipments and machineries used in soft drink. Packaging aspects in soft drink.

Unit- IV:-Study on Quality control of soft drink

Quality control in soft drink –Chemical and sensory and microbiological quality. Sweeteners used in soft drink and their properties, non-nutritive sweeteners.

Unit -V:-Study on processing of Tea, Coffee and Cocoa

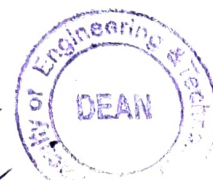
Tea, coffee and cocoa – processing, grading and quality. Miscellaneous beverages: coconut water, sweet toddy, sugar cane juice, coconut milk, flavoured syrups.

Out Come:

Provide quality food and beverage planning, preparation, and presentation for a food service operation, apply the principles of food and beverage cost control to assist in making decisions at an operational level and to contribute to the achievement of financial plans, contribute to food planning, preparation, and presentation for a food service operation, demonstrate application of food safety principles in the food production environment

Text books:

1. Levenspiel, O., Chemical Reaction Engineering, Willey Eastern Ltd.
2. Smith & Vanness, Thermodynamics for Chemical Engineers, MGH.
3. Food Science by Potter.
4. Principles of Food Science Vol. I by Fennema, Karrel.



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-713**
2. Subject Name: **Traditional and Fermented food**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To survey and enlist the traditional fermented foods of Himachal Pradesh and study their method of preparation. To isolate the microbial flora from inoculum used in the preparation of bhatooru, seera and siddu. To study the microbial profile during fermentation. To characterize the fermentation involved in the production of bhatooru, seera and siddu. To study the biochemical characteristics of fermented foods.

Unit- I:- Indian traditional sweets

Indian traditional sweet, savory and snack food products: Sweetmeats, Namkins, Papads Idli and Dosa.

Unit-II:-Study on Maintenance of different microorganism ad mushroom processing

Preparation and Maintenance of Bacterial, Yeast and Mold cultures for food fermentations. Lactic acid bacteria-activities and health-promoting effects. Mushrooms: Cultivation and preservation.

Unit-III:-Study on fermented dairy products

Fermented Dairy Products: Cheeses, Curd and Yoghurt, Butter milk and the fermented milks. Spoilages and defects of fermented dairy products and their control. Fermented meat and fish products.

Unit -IV:-Study on production of alcoholic fermented beverage

Fermentative Production of Beer, Wines, Cider and Vinegar. Fermented Vegetables (Pickles).

Unit -V:-Study on production of Production of Baker's Yeast and food enzymes

Production of Baker's Yeast, Microbial Proteins and fats, Food enzymes, and Food additives. Oriental fermented foods.

Outcomes:

One of the important outcomes of food fermentation is the food which use I production of traditional sweets, fermented dairy products, fermented ear, wine, pickle etc.

Book References

1. K.H. Steinkrus Handbook of Indigenous Fermented Foods.
2. Sukumar De Outlines of Dairy Technology.
3. Prescott & Dunn Industrial Microbiology L.E.

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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-721**
2. Subject Name: **Drying Processing**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To impart knowledge of different drying methods in food processing which use food processing viz. Sun drying, solar drying, freeze drying, osmotic drying, to study the different dryer viz. Tray dryer, cabinet dryer, tunnel dryer, spray dryer, and fluidized bed dryer and to study that how to determine the moisture content, the drying rate period and falling rate period.

Unit-I:-Drying and its importance in food processing industry

Drying definition, Moisture removal and its need, Dehydration of food, Evaporation of water below its boiling point, Utilities of drying, Theoretical aspects of drying, Thermal properties related to drying of foods.

Unit- II:- Moisture content and its methods

Moisture content measurement, representation and determination, Equilibrium moisture content (EMC), its determination, methods, models and importance, and importance, Moisture sorption curves, Hysteresis phenomenon.

Unit- III:-Drying process and methods

Drying process and methods, Drying rate periods – constant and falling rate periods and their calculation, Heat and mass transfer coefficient calculations, Capillary and diffusion theory, Thin layer and deep bed drying, Dryer performance indices – overall thermal efficiency, specific energy consumption, coefficient of performance.

Unit- IV:-Classification and Criteria for dryer selection.

Classification and selection, Quality criteria for dryer selection.

Unit- V:-Importance of dryers in food processing

Basic construction and application of the following dryers – Grain dryers, Tray dryers, Vacuum dryers, Spray dryers, Fluidized bed dryers, Freeze dryers, Flash Dryers, Superheated steam drying, Solar energy based dryers, Osmotic Dehydration, Drum dryer.

Unit -VI:-Study the different characteristics of food material

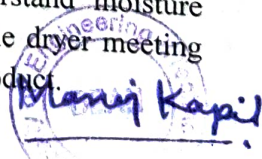
Physical, Chemical and Microbiological characteristics of dehydrated foods, re-hydration ratio, size and density, shelf-life, water activity, Microbial stability of selected foods.

Course Out Comes:

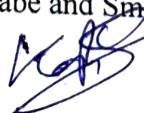
Understand moisture content, moisture removal and its requirement, Understand moisture content measurement and thermal properties related to drying, to select suitable dryer meeting requirement, to develop functional design of dryers, to judge quality of dried product.

Text books:

1. Unit operation of agriculture processing- K.M. Sahay and K.K. Singh.
2. Unit operations of chemical engineering by McCabe and Smith. McGraw-Hill


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Text books:

1. Unit operation of agriculture processing- K.M. Sahay and K.K. Singh.
2. Unit operations of chemical engineering by McCabe and Smith. McGraw-Hill

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-722**
2. Subject Name: **Food Process Engineering**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

Unit I:- Preservation methods in food industry

Process time calculations; Sterilizers and accessories used in canning industries; Engineering aspects of pasteurizer; homogenizer, evaporators (basic principle and single-effect evaporator) and concentrators used in food industries; Seaming machine.

Unit-II:- Freezing and their type

Construction of cold storage; Different types of freezers including plate contact freezer, air blast freezer, cryogenic freezing and refrigerated vans.

Unit- III:- Various type of dryer

Various types of driers (basic principle and drying time) – Tray drier, roller drier, spray drier, fluidized bed drier, freeze drier and solar drier.

Unit- IV: Heat Exchanger and Extruders

Heat exchangers (including paraflow HES); Extruders – Basic principles and types, Difference between single- and twin-screw extruders; Kneader; Oil expeller

Course Outcome:

Get familiarized with experimental errors in various physical measurements and to plan / suggest on how the contributions could be made of the same order, so as to minimize the errors.

Book:

1. The Fundamentals of Food Engineering; Charm SE; 1963, AVI Pub.
2. Bakery Technology & Engineering; Matz SA; 1960, AVI Pub.
3. Dictionary of Food Science & Technology, Blackwell Publishing
4. Engineering Properties of Foods; Rao MA & Rizvi SSH; 1986, Marcel Dekker Inc.
5. Fundamentals of Food Process Engineering; Toledo RT; 2nd ed, 2000, CBS Publishers.
6. Food process engineering, D.R.Heldman and R.P.Singh

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: - **KFD-723**
2. Subject Name: **Food Adulteration**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To protect the public from poisonous and harmful foods, to prevent the sale of substandard food, to protect the interest of the consumer by eliminating fraudulent practices.

Unit-I:- Introduction and classification of food adulteration

Food adulteration, identification, - classification and controls and effect of the food adulterates on human health.

Unit II:- Methods for evaluation of food adulterant

Nature of adulterants, methods of evaluation of food adulterants and toxic constituents. significance of Adulterants and their poisoning

Unit III:- PFA Act and its importance in food industry

Prevention Food Adulteration act and their role in food industry

Unit-IV:- Adulteration and its detection in oils and fats

Adulteration and its detection in oils and fats. Rancidity, auto oxidation and anti-oxidants. Detection of common food adulterants in (theoretical aspects) Spices ii. Grains iii. Coffee iv. Tea v. Food colours vii. Milk.

Unit-V:- Current scenario and types of adulteration

Current scenario, types of adulteration, food adulteration and food safety, drug adulteration, Petroleum adulteration method of detection and analyses of adulterated samples.

Course outcomes:

The significance of adulterants and their poisoning, understand the problems of food adulteration, How to protect the human health from different adulterate, forensic importance of food and cosmetic adulterants.

Text books:

1. Dr. Jagmohan Negi. Edition. 2004. Food & Beverage Laws - Food Safety and Hygiene. Media :Hard Back. ISBN : 9788182040007.



Manoj Kapi

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-007**
2. Subject Name: **Bakery Process Technology**
3. Contact Hours: L: 3 T: 1 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 4

Objectives:

Establish and maintain high standards of sanitation, exhibit a strong foundation of baking methodology, exhibit nutritional awareness and implement food-for-life principles, plan production of product and purchase, cost, and price product for profit, exhibit a solid foundation of techniques for food preparation, presentation, and service, including competence in baking and pastry production, line work, and basic grade.

Unit-I:- Wheat flour and its processing

Wheat flour and wheat flour treatments – Grade of flour, constituents of flour – ageing of flour – Tests for flour quality. Yeast: Characteristics, Preparation, Handling & Storage, Adequacy for use in bakery industry. Ingredients, Technology and quality parameters for baked products: Bread, Biscuits and cakes

Unit II:- Bakery equipments

Bakery equipment and machinery .Different types of Mixers, kneaders and cutters. Different types of ovens. Packaging machinery for bread and biscuits. 8. Quality control in bakery industry. Quality control of raw materials. Quality control of finished products. Quality control of packaging materials

Unit III:- Technology and methods of bread making

Technology of bread making, different methods. Process steps and their significance. Characteristics of good bread. Defects in bread their causes and remedies.

Unit IV:- Technology of Cakes Manufacture

Technology of Cakes Manufacture. Different cake making processes. Sugar batter method, Flour batter method, Modified sugar batter method Whipping method, Blending method etc. Process steps and their significance. Importance of baking time and temperature. Recipe balancing Defects in cakes, their causes and remedies.

Unit V:- Study on technology of Cakes Manufacture

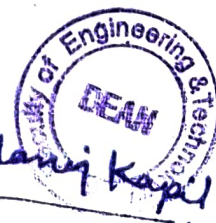
Biscuits definition and types. Fermented dough biscuits. Cookies, types of cookies and their manufacture cream biscuits, process steps and their significance, defects in biscuits their causes and remedies.

Out Come:

At the end of this module, the student will be able to: Understand the importance and role of various ingredients used in bakery and confectionary products, Understand the different methods of bread & cake making and their formulations, Understand the different types of biscuits, cookies and their methods of manufacturing, Understand the process of cocoa processing and chocolate manufacturing, Understand the different types of sugar confectionary production..

Text books:

1. Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.
2. Bakery Technology & Engineering; Matz SA; 1960; AVI Pub.
3. Up to-date Bread Making; Fance WJ & Wrogg BH; 1968, Macclasen & Sons Ltd.
4. Modern Cereal Chemistry; Kent-Jones DW & Amos AJ; 1967, Food Trade Press



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-008**
2. Subject Name: **Engineered, Textured and Fabricated of Foods**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

Study of the extrusion process and type of extruder, physical changes during extrusion, study of fabrication of different type of beverage and puffed products and also study the different bakery products

Unit-I:- Type of extruder and their processing

Extruders. Single Screw & Multiple Screw Extruders. Extrusion process. Extrusion cooking. Physical & Chemical Changes during Extrusion Process.

Unit -II:- Textural studies of paneer and different puffed products.

Textured vegetable protein products. Puffing Gun, Puffed Products. Meat Analogues., Imitation Paneer

Unit -III:- Beverages and Bakery Products

Fabricated RTS Beverages, Bakery Products, Margarine, Peanut Butter, Imitation Milks Designer Lipids etc.

Unit-IV:- Weaning Foods/ Baby Foods

Weaning Foods/ Baby Foods. Therapeutic Foods . Geriatric Foods.

Unit-V:-Fermented Foods

Technology and manufacture of Macaroni, Pasta, Noodles, Vermicelli etc.

Outcomes:

To learn that how to operate the extruder machine and analysis of different extruded products.

Text books:

1. Zeki Berk, Food Process Engineering and Technology, Academic Press
2. Shubhangini A. Joshi Nutrition and Dietetics, Tata McGraw-Hill Education, 2010
3. S.A.Matz, Cereal Technology, CBS Publishers.



Manoj Kapi

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-009**
2. Subject Name: **Transportation Process in Food Engineering**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To impart knowledge on principles of momentum, heat and mass transfer and its application in food processing, fundamental understanding of the laws of mass and energy balance, molecular diffusion and their application to food engineering; practical problems related to convective heat transfer process and its applications in food processing.

Unit-I:-Heat and Mass Transfer

Introduction to food engineering and transport phenomena: transport of mass, transport of heat, and transport of momentum: applications in the food industry. Units and dimensions in the international system of measurement. Material and energy balances.

Unit-II:- Transport of momentum

Viscosity concept for Newtonian and non-Newtonian foods.

Unit-III:- Fluid dynamics

Fluid Statics and dynamics, laminar flow and turbulent flow, Bernoulli equation, continuous and localised friction losses, dimensioning of fluid-dynamic circuits, operating equipment calculation.

Unit-IV:-Mode of heat transfer

Heat transfer: introduction to transfer mechanisms: conduction, convection, irradiation. Evaluation of transfer coefficients through rectangular and cylindrical walls.

Unit-V:-

Heat exchangers and its classification

Heat exchangers: classification and mechanical aspects, project equations, technical specifications.

Unit-VI:-Unit operations of agriculture processing

General aspects: definition of unit operation, plant and process, planning and design, review on economics, plant services, mass and energy balances.

Outcomes:

Understanding of transport processes, ability to do heat, mass and momentum transfer analysis, ability to analyze industrial problems along with appropriate boundary conditions, ability to develop steady and time dependent solutions along with their limitations.

Text Books:

1. K.J. VALENTAS-E. ROTSTEIN-R.P. SINGH, *Handbook of Food Engineering Practice*, CRC Press, New York, 1997.
2. W.L. MCCABE-J.C. SMITH-P. HARRIOT, *Unit Operations of Chemical Engineering*, McGraw-Hill, New York, 1993.
3. A. IBARZ-G.V. BARBOSA, *Unit Operations in Food Engineering*, CRC Press, 2003



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-010**
2. Subject Name: **Unit Operations in Food Process Engineering**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives

To impart knowledge of different unit operations of food industries like size reduction, evaporation, drying, fluid flow and food freezing, to introduce the concept of material and energy balance as applied to food engineering systems.

Unit-I:-Basic engineering mathematics

Review of basic engineering mathematics; units and dimensions; mass and energy balance. Principles of Fluid Flow - Introduction to stress strain behaviour in materials; properties of fluid viscosity; capillary tube viscometer; power law equation for pseudo plastic; Newtonian and dilatants fluids; flow in pipes-friction, laminar and turbulent flow equations, considerations in pumping fluid.

Unit- II:-Milling operations

Size Reduction-Principles, types of equipments, applications and energy laws, Screening of solids, size measurement and analysis, standard sieves, membrane separation processes.

Unit- III:- Freezing

Food freezing - Properties of frozen foods; freezing point depression, general introduction to enthalpy change during freezing, Plank's equation for predicting freezing time; food freezing equipment such as air blast freezers; plate freezers and immersion freezers.

Unit- IV:-Psychrometry chart principle and application in drying

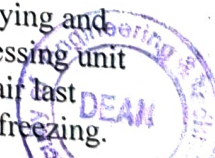
Psychrometry - Principles, air properties; application in drying of foods. Food dehydration Basic principles of dehydration; constant rate and falling rate periods of dehydration; equilibrium moisture content; fixed bed dehydration; drum dehydration, and fluidized bed drying; spray drying of liquid foods, different types of dryer and their specific applications in food processing sector.

Outcomes:

Study o the different drying operation and dryers ad difference in the drying ad drying and dehydration, study the size reduction, principle of size reduction, membrane processing unit Membrane Separation Processes, freezing and different Methods of freezing viz air last freezing, immersion freezing etc. plank equation. Changes in the products during freezing.

Text books:

1. Unit operation of agriculture processing- K.M.Sahay and K.K. singh.



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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-011**
2. Subject Name: **Post Harvest Technology**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objective:

To acquaint with different methods of food preservation, different groups of micro-organisms associated with food, sensory quality parameters, and methods of sensory evaluation of foods.

Unit-I:- Preserved food products

Composition of food and nutritive value of horticultural and arable crops. Methods of preservation, Contamination and spoilage of foods, spoilage of fresh fruits, vegetables, cereals and other crops, spoilage of various processed products, canned foods, dehydrated and frozen foods, pickles, chutneys and cereal products, intrinsic and extrinsic parameters that affect microbial growth and their control measures.

Unit-II:-Microorganism

Classification of microorganisms and their sources in food, various types of fermentation and their utilization, microbial examination of foods. Food borne diseases and poisoning.

Unit-III:-FoodHygiene

Food safety and quality, importance of hygiene and sanitation.

Unit-IV:- Role of microorganisms

Importance of micro organisms in industrial fermentation process and production of various by-products, production of vinegar, Fermented beverages, bread and traditional food products.

Outcomes:

Discover new ideas through group discussions, experiments, case study analysis and interactive learning. Improve the quality and safety of the food products and protect from spoilage by microorganisms.

Text books

1. Frazier, J. and Westhoff, D.C. 1988. *Food Microbiology*. 4th Ed. McGraw Hill.
2. Jay, J.M., Loessner, M.J. and Golden, D.A. 2005. *Modern Food Microbiology*. 7th Ed. Springer.
- Steinkraus, K.S. 1996. *Handbook of Indigenous Fermented Foods*. Marcel Dekker.
3. James, M.J., Loessner, M.J. and David, A. 2005. *Modern Food Microbiology*. 7th Ed.

Golden Food Science Text Studie



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-012**
2. Subject Name: **Food Fermentation Technology**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To understand the principles of food fermentation technology, to study the types of starters used in Food Industry, to study the production of various fermented food.

Unit: I:- Introduction of formation
Food Fermentation Technologies.

Unit: II:- Bio fermented – its design and operation
Study of a Bio fermented – its design and operation, down Stream Processing and Product recovery.

Unit: III:- Starter cultures
Starter cultures.

Unit: IV:- Baker's Yeast
Production of Baker's Yeast

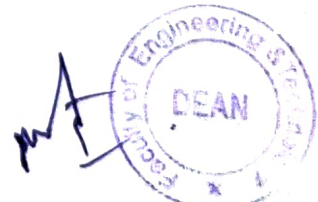
Unit: V:- Fermented food and it's by products
Development of a fermented food/drink utilizing plant products /animal products or by products as substrate

Outcomes:

Enhance the understanding of white wine making process, enhance sensory evaluation skills, gained experience in cellar safety procedure.

Text Books

1. Food Microbiology. 2nd Edition By Adams M & Moss, M. 2008. RSC Publishing.
2. Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology. Volume 2 by Joshi V. K. & Pandey, A., Sanjanya Books 1999.
3. Essentials of Food Microbiology. Edited by John Garbutt. Arnold International Students Edition. 1997



Manoj Kapil
Manoj Kapil

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-811**
2. Subject Name: **Food Preservation Technology**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives

To study the importance microorganisms in food preservation, to introduce the basics of various food processing and preservation technologies.

Unit-I:-Principles of Food Preservation

Principles of Food Preservation, microorganisms associated with foods- bacteria, yeast and mold, Importance of bacteria, yeast and molds in foods. Classification of microorganisms based on temperature, pH, water activity, nutrient and oxygen requirements, typical growth curve of micro-organisms. Classification of food based on pH, Food infection, food intoxication, definition of shelf life, perishable foods, semi perishable foods, shelf stable foods.

Unit-II:-Freezing

Freezing and Refrigeration :Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e. slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.

Unit- III:- Thermal Processing

Thermal Processing- Commercial heat preservation methods: Sterilization, commercial sterilization, Pasteurization, and blanching.

Unit-IV:- Drying and Dehydration

Drying and Dehydration - Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), heat and mass transfer, factors affecting rate of drying, normal drying curve, names of types of driers used in the food industry.

Unit-V:-Ionizing radiations and its processing in food industry

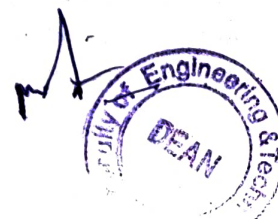
Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization.

Outcomes:

To impart knowledge on the causes of food spoilage and methods of processing and preserving food. To identify & select processing equipment and preservation methods appropriate for specific foods. To describe the effects of preservation methods on the quality of food.

Test books:

1. Fruits and vegetable – Principle ad Practices: R.P. Srivastava and Sanjeev kumar
2. Food Science by N.N.Potter
3. Food Processing Technology Principles & Practices by P J Fellows



Manoj Kapi

BHAJ JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-812**
2. Subject Name: **Food Hygiene and Plant Sanitation**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

Demonstrate in knowledge of sanitation regulations and standards, Explain the various issues of contamination and food borne illness disease, be able to apply sensory evaluation techniques to the study of food, to gain the ability to think critically about problems and issues in food processing. Gain an understanding of food hygiene, sanitation, and safety during food processing unit operations, Prevent food spoilage, i.e. changes that make food unfit for consumption due to microbial or chemical contamination.

Unit-I:- Role of Hygiene in food industry

Definitions general hygiene, health. Hygiene as an academic discipline in our country and the world. Legislation in the field of hygiene and health. Public health in national and EU state health policy, the role of chemistry and food.

Unit-II:- Chemical and biological factors

Chemical Biological factors of Hygiene Interior: comfort, discomfort, risk to health.

Unit-III

Hygiene and its effect o human health

Hygiene of foodstuffs. Personal hygiene and health status of workers.

Unit-IV:- Principles ad methods of sanitations

Principles for sanitation in industrial sectors. Methods industrial cleaning: Cleaning - out-of - Place (COP), Cleaning -in - Place (CIP), Central Cleaning System (CCS).

Unit-V:-Disinfection: Methods and means. Sterilization -In -Place (SIP)

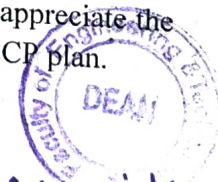
Disinfection: Methods and means. Sterilization -In -Place (SIP). Pest Control: Methods and means. Insect, Rodent, Birds: Methods and means. Checking hygiene of production. Methods, equipment: direct, indirect.

Outcomes:

Clearly understand food hygiene & safety standards required for licensed food premises to recognize the fundamentals of food hygiene management, especially for cleaning, sanitization as well as pest control operations in food processing and manufacturing industry, appreciate the major features of HACCP, demonstrate practical proficiency in developing a HACCP plan.

Text Books:

1. Principles of Food Sanitation by Marriott and Norman, G.
2. Hygiene and Sanitation in Food Industry by S. Roday, TMH
3. Guide to Improve Food Hygiene by Gaston and Tiffney,



Manoj Kapil

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BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-813**
2. Subject Name: **Quality Analysis**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To increase the self life of the products, developing a theoretical and practical understanding of the method used to analyses of food, to identified different problem associated with food contamination due to microorganism., to ensure high and consistent quality of food in the food industry.

Unit-I:- Terminologies of quality analysis

Introduction: Quality terminology; Quality Control; Quality Assurance; Quality Management; Sensory Analysis; Statistical Process Control; Good Manufacturing Practice-Good Hygiene Practice Principles of food analysis; analysis of moisture and ash; analysis of fats; determination of protein.

Unit-II:- Importance of (TQC) and TQM in food industries

Total Quality Control (TQC) and the role of management/ TQM.. Statistical quality control. Quality costs., Analysis and Interpretation of sensory scores. Application of sensory evaluation in Quality Management of foods.

Unit-III:- Analysis of food product

Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), developing specification (ICH Q6 and Q3), purchase specifications and maintenance of stores for raw materials. In process quality control and finished products quality control of the food products.

Unit-IV:-Sampling and Hazards of food material

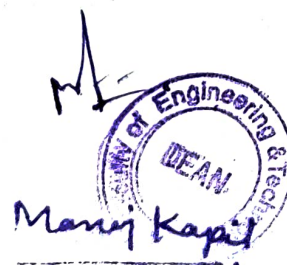
Sampling objectives and guidelines and methods. Hazards– Microbial, Physical, Chemical. Ensuring safe Food.

Outcomes:

The course provides the necessary information and methodology to: understand the concepts of quality systems and their requirements; be able to analyze related case studies.

Text Books:

1. Linden. G. 1996. Analytical techniques for food and agriculture products.
2. Ranganna.s. 2001. Hand book of analysis and quality control of fruits and vegetable products, 2nd ed. Tata mc graw hill publication.



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-013**
2. Subject Name: **Food Safety and Regulation**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

The objective of the food safety is to make available safe, pure, wholesome and nutritious food and protect the food from poisoning, contamination from microorganism.

Unit-I:- Food Safety & Hygiene

Importance of Food Safety, Food Hygiene, Food Poisoning, High risk food, Low risk food, Ready to eat foods, Danger Zone, Basic requirements for bacterial growth, Food contaminants. Physical, Chemical, Biological and Allergens; Personal hygiene.

Unit-II:- Food Safety and Quality Management

GHP, GMP, SOP, HACCP, ISO 22000, ISO 9001, Codex Alimentations Commission (Codex), FAO

Unit-III:- Food Plant Sanitation

Structural requirements, SSOP, CIP, Chlorination, Detergents, Disinfectants and Sanitizers.

Unit-IV:- Food Laws & Regulations

Food Safety and Standards Act, FDA, Evolution in Food laws and regulations- PFA, FPO, AGMARK, BIS, ISI.

Unit-V:- Food Adulteration

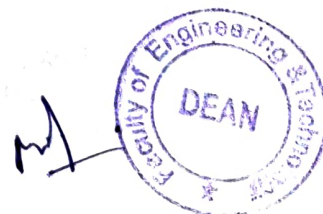
Common Food adulterants and their tests: Milk, Vegetable oil, Spices, Tea, Pulses, Sugar, Honey.

Outcomes:

After completion the course student learn how to protect the food from microorganism and how to increase the self life of the product without spoilage. Students also learn that what is role of different laws of food safety.

Text books:

1. Hand book of Hygiene Control in the Food Industry (Second Edition), 2016.



Manoj Kapil

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-014**
2. Subject Name: **Fat and Oil Technology**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To provide the basics of the critical parameters involved in the extraction, refining, bleaching, deodorization of fats and oils and their modifications (blending, interesterification, emulsification, vocation, fractionation and genetic manipulation) into functional shortenings and the subsequent handling and the preservation of their quality. To provide knowledge and understanding of the changes and reactions of fats and oils in the food system influencing the stability of the finished food. To provide the updated knowledge on the nutritional and health benefits of fats and oils focusing on the myths and realities of the ingredients.

Unit-I:-Sources of Fat

Fat consumption-nutritive value- chemical composition of fat and oil- types of fatty acid - sources of fat- Physical, thermal and chemical properties of fat and oil. Pretreatment and storage of oil seeds.

Unit-II:-Industrial Production of Oil

Production of oil-extraction of oil - cold pressing and hot pressing, solvent extraction, rendering-removal and recovery of solvent form miscella-removal and recovery of solvent from extracted residue-refining of oil-neutralization- degumming - bleaching - alkali refining-deodorization.

Unit-III:- Edible oil Production

Winterization of oil, hydrogenization of oil, generation and storage of hydrogen- production and regeneration of catalysts-filtration of hardened oil-production of palm oil -rice bran oil, soybean oil.

Unit-IV:- Processing of Animal Fats

Animal fats-sources-nutritive value- industrial application-Lards-tallow-physical nature-production and storage, production of margarine, partial sterilization- emulsification-chilling-kneading and cooling-Incorporation of salt and colouring agents.

UNIT-V:- Product made From Fat And Oil

Changes during storage of oil seeds-rancidity-causes-atmospheric oxidation and enzyme action-free fatty acids-Non edible oil-Castor oil- Linseed oil-vegetable waxes-production-industrial application of fats and oil-soap-candle -paints and varnishe.

Outcomes:

Impart knowledge on isolation and purification of fats and oils. Impart knowledge and skills in fat and oil products development. Impart skills in quality assurance, assessment and measurement of physical and chemical changes occurring in fat and oil products

Text Book:

1. Kirschentiuier, H.G, "Fats and Oils", Reinhold Publishing Corporation, New York 1944.
2. Weiss, T.J, "Food oils and their Uses". The AVI Publishing Company, Inc., Westport, Connecticut 1970.



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Mangal Kapti

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-015**
2. Subject Name: **Enzyme processing in Food Products**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To insure that learners have acquired the facts, concepts and principles necessary to understand various techniques of enzyme production and purification and fermentation process, to discuss the current advancement of enzyme and fermentation technology applications in industry.

Unit-I:- Introduction of Enzymes

Enzymes: Introduction, classification, properties, characterization, enzyme kinetics, enzyme concentration, substrate concentration, environment and enzyme immobilization, enzyme in food in industry: commercialization of enzyme processes, alternative methods to use the enzymes, type of reaction.

Unit-II:- Role of enzymes in food industry

Enzymes in milk production, enzyme in milk preservation: lactose, hydrolysis, use of enzyme for determine the milk quality, enzyme in chesses manufacturing: endogenous microbial enzymes, exogenous enzymes, coagulant technology, enzymes in chesses preservation.

Unit-III:- Role of enzymes in beverage industry

Enzymes in beverage, application of enzymes in tea and cocoa processing, application of enzymes in alcoholic beverages as beer, whisky, wine and ciders. Role of the enzymes in fruit juice production, factors affecting the enzymatic activity. Enzymatic clarification of apple and guava juices, factors affecting the clarity of fruit juices.

Unit-IV:-Enzymes in baking industry

Enzymes in baking industry: Introduction, Enzymes for baking industry, , Use of the proteinases, lipases and pentose's in baking industry.

Unit-V:-Enzymes in the processing of fats and oils

Enzymes in the processing of fats and oils: specificity, stability and application of lipases and related enzymes.

Outcomes:

Display the instructive and comprehensive current knowledge of enzyme technology and fermentation, explain the enzyme mechanisms and kinetics, production and recovery, Categorize enzymes, including the ones produced through the recombinant method.

Text books:

1. Flickinger MC & Drew SW. 1999. Encyclopedia of Bioprocess Technology. A Wiley- Inter Science Publicationn.
2. Kruger JE. et al. 1987. Enzymes and their Role in Cereal Technology. American Association of Cereal Chemists Inc.



DEAN
Mamaji Kapil

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-016**
2. Subject Name: **Nano Food Technology**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Course Objectives

Provide sound fundamental and applied understanding of the development, use, and analysis of nanotechnologies for application in food processing, Introduce students to regulatory, industrial, and economic aspects surrounding the use of nanotechnology in food systems, the developments in nanotechnology will have an impact on food science and the design of the next generation's food systems, Prepare students for exposure to engineered nanotechnologies for use in food processing.

Unit-I:-Nanotechnology and its composition

Introduction of Food Nanotechnology, Nano composites for Packaging Applications.

Unit-II:-Study different Nano scale properties of foods

Nano scale physicochemical properties of foods.

Unit-III:-Applications and analysis of nanotechnologies for food

Applications, manufacture, and analysis of nanotechnologies for food processing and preservation.

Unit-IV:-Characterization of Engineered Nano materials

Unique Issues for Characterization of Engineered Nano materials for Food Applications -Safety Assessment of Oral- Exposure Engineered Nano materials for Food Application.

Unit-V:-Importance of packaging material

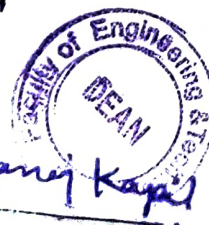
Crop improvement - Reasons to Package Food Products - Physical Properties of Packaging Materials - Strength - Barrier Properties Light Absorption - Structuring of Interior Surfaces - Antimicrobial Functionality - Visual Indicators

Course outcomes

Understand Nanotechnology in Agriculture, Nanotechnology in Food industry, Identify and describe significant physico-chemical properties of engineered food nanotechnologies, incorporating understanding of appropriate methods of analysis and impact of manipulation of these properties on stability and functionality, Compare and contrast differing engineered nanotechnologies within an application grouping (e.g., food antimicrobial encapsulation technologies) with regards to strengths and weaknesses, identifying key strengths/weaknesses as related to food industry concerns relevant to that grouping.

Text books:

1. Flickinger MC & Drew SW. 1999. Encyclopedia of Bioprocess Technology. A Wiley- Inter Science Publication.
2. Food Microbiology. 2nd Edition By Adams M & Moss, M. 2008. RSC Publishing.
3. Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology. Volume 2 by Joshi V. K. & Pandey, A., Sanjanya Books 1999.



BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-017**
2. Subject Name: **Specialty Foods**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives

The basic objectives of the report are to define, segment, and project the global market size for specialty food ingredients on the basis of type of ingredient, application, and region, other objectives are analyzing the opportunities in the market for stakeholders, providing a competitive landscape of market trends, and analyzing the macro and micro indicators of this market to provide factor analysis and to project the size of the market and its submarkets, in terms of value and volume.

Unit-I:-Infant, baby foods, Adolescent and their functions

Infant and baby foods, Adolescent / Teenage foods, Geriatric foods, Foods for pregnant ladies and nursing mothers. Functional foods and Probiotics.

Unit-II:-Role of food diet in human body

Foods / Diets in metabolic disorders and disturbances.

UNIT-III:-Recommended food for human body

Foods and Diets recommended and restricted in Gastrointestinal disorders; Fever and Infection; Liver, gallbladder and pancreatic disturbances.

Unit-IV:-Food diet recommended and restricted in blood circulation.

Foods and Diets recommended and restricted in blood, circulatory and Cardiac diseases; urinary and Musculoskeletal diseases. Allergies.

Unit-V:-Beneficial Effects of Spices and different food constituents

Beneficial Effects of Spices, gamma-linolenic acid, Spirulina, antioxidants and other food constituents. New Developments.

Outcomes:

Apply scientific thinking in the analysis, synthesis and evaluation of knowledge within the discipline of food science, nutritional sciences or dietetics. Effectively communicate discipline-specific information in written and oral forms to scientific audiences. Effectively interact within scientific teams.

Text books:

1. TadenszKudra& Majumdar AS. 2002. *Advanced Drying Technologies*. Marcel Dekker.
2. Wallace B Van Arsdel& Michael J Copley. 1963. *Food Dehydration*. AVI Publ.


Manoj Kapil

BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. Subject Code: **KFD-018**
2. Subject Name: **Enzyme Technology**
3. Contact Hours: L: 3 T: 0 P: 0
4. Examination Duration (Hrs.): Theory 03
5. Credits: 3

Objectives:

To insure that learners have acquired the facts, concepts and principles necessary to understand various techniques of enzyme production and purification and fermentation process, to discuss the current advancement of enzyme and fermentation technology applications in industry

Unit-I:- Introduction to Enzymes

Introduce the various aspects of enzyme production, purification, use in industry, and basics of fermentation technology. Enzyme technology covers the definition, classification, characteristics, extracellular enzyme, sources, the various techniques of enzyme production and purification, application of enzyme in industry; introduction to immobilized enzymes and cells as well as their advantages and disadvantages.

Enzyme activity- chemical nature of enzymes. Protein nature of enzymes Coenzymes and Cofactors- Prosthetic group, coenzymes involved in different metabolic pathways. Classification of coenzymes. Isozymes, Abzymes, Synzyme.

Unit-II:- Enzyme Catalysis and Inhibition

Lock and key, Induced fit and Transition state Hypotheses. Mechanism of enzyme catalysis- Acid-base catalysis, covalent catalysis, Metal ion catalysis, Proximity and orientation effects etc. Mechanism of Serine proteases-Chymotrypsin, Lysozyme, Carboxypeptidase A and Ribonuclease., Proenzymes (Zymogens).

Unit-III:- Enzyme Regulation

Feedback Regulation, Allosteric Regulation, Reversible Covalent Modification and Proteolytic Activation. Organisation of enzymes in the cell, Enzymes in the cell, localization, compartmentation of metabolic pathways, enzymes in membranes, concentrations. Mechanisms of enzyme degradation, lysosomal and nonlysosomal pathways, examples.

Unit-IV:- Enzyme Kinetics

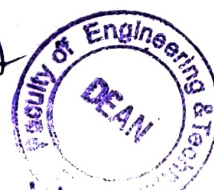
Factors affecting the enzyme activity- Concentration, pH and temperature. Kinetics of a single-substrate enzyme catalysed reaction, Michealis-Menten Equation, Km, Vmax, L.B Plot, Turnover number, Kcat. Kinetics of Enzyme Inhibition. Kinetics Allosteric enzymes.

Outcomes:

Display the instructive and comprehensive current knowledge of enzyme technology and fermentation, explain the enzyme mechanisms and kinetics, production and recovery, Categorize enzymes, including the ones produced through the recombinant method.

Text Books:

1. Fundamentals of Enzymology : Nicholas Price & Lewis Stevens
2. Enzymes : Biochemistry, Biotechnology and Clinical Chemistry- Trevor Palmer.
3. Buchholz, K., Kasche, V. and Bornscheuer, U.T. (2005) *Biocatalysts and Enzyme Technology*. John Wiley & Sons: UK.



Manoj Kapi

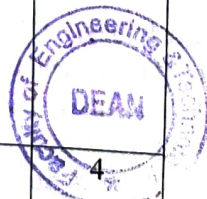
BHAI JAITA SUBHARTI ENGINEERING COLLEGE
DEPARTMENT OF FOOD TECHNOLOGY

1. **Course Code:** KMC-301/401/501
2. **Subject Name:** Constitution of India
3. **Contact Hours:** L: 3 T: 0 P: 0
4. **Examination Duration (Hrs.):** Theory 03
5. **Credits:** 3

Course Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

Unit No.	Particulars	Contact Hours
1	History of Making of the Constitution: Indian History, Drafting Committee (Composition & Working), Preamble, The Union and its territory, Citizenship	4
2	Contours of Constitutional Rights & Duties: Fundamental Rights-Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties	4
3	Organs of Governance: Parliament-Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Vice president, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions	4
4	State Legislation: Function and formation of state legislative, legislative council, Power of chief minister, union state relationship Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, Panchayati raj: Introduction, Block level: introduction, Village level: Role of Elected and Appointed officials, Importance of grass root democracy	4
5	Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning.	4



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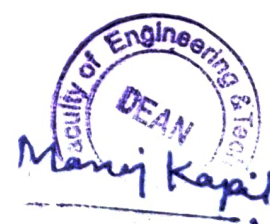
Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.



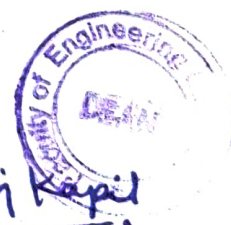
**PROFESSIONAL ELECTIVE COURSES (PE)
(FOOD TECHNOLOGY DEPARTMENT)**

S No	Course Code No	Course Title
PROGRAMME ELECTIVE 01		
01	KFD-511	FOOD BIOCHEMISTRY
02	KFD-512	FOOD PROCESSING AND PRESERVATION
03	KFD-513	ENGINEERING PROPERTIES OF FOOD MATERIALS
PROGRAMME ELECTIVE 02		
04	KFD-611	PROCESSING OF CEREALS, PULSES AND OILSEEDS
05	KFD-612	PROCESSING OF MEAT, FISH & POULTRY PRODUCTS
06	KFD-613	FRUITS, VEGETABLES & PLANTATION PRODUCTS
PROGRAMME ELECTIVE 03		
07	KFD-621	FOOD ADITIVIES
08	KFD-622	PACKAGING OF FOOD PRODUCTS
09	KFD-623	PRINCIPLE OF HUMAN NUTRITION
PROGRAMME ELECTIVE 04		
10	KFD-711	CROP PROCESS ENGINEERING
11	KFD-712	FOOD BEVERAGES
12	KFD-713	TRADITIONAL & FERMENTED FOODS
PROGRAMME ELECTIVE 05		
13	KFD-721	DRYING PROCESSING
14	KFD-722	FOOD PROCESS ENGINEERING
15	KFD-723	FOOD ADULTERATION
PROGRAMME ELECTIVE 06		
16	KFD-811	FOOD PRESERVATION TECHNOLOGY
17	KFD-812	FOOD HYGIENE AND PLANT SANITATION
18	KFD-813	QUALITY ANALYSIS

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OPEN ELECTIVE COURSES (OE)
[FOOD TECHNOLOGY]

S. No	Code No.	Subjects
		Open Elective 01
01	KFD-001	INTRODUCTION TO BIOTECHNOLOGY
02	KFD-002	INTRODUCTION TO FOOD TECHNOLOGY
03	KFD-003	FOOD PROCESSING & WASTE MANAGEMENT
		Open Elective 02
04	KFD-004	RHEOLOGICAL & SENSORY ASSESSMENT
05	KFD-005	FOOD PROCESS PLANT DESIGN AND LAYOUT
06	KFD-006	FOOD PRODUCTS & PROCESS DEVELOPMENT
		Open Elective 03
07	KFD-007	BAKERY PROCESS TECHNOLOGY
08	KFD-008	ENGINEERED, TEXTURISED & FABRICATED FOODS
09	KFD-009	TRANSPORT PROCESS IN FOOD ENGINEERING
		Open Elective 04
10	KFD-010	UNIT OPERATION IN FOOD PROCESSING
11	KFD-011	POST HARVEST TECHNOLOGY
12	KFD-012	FOOD FERMENTATION TECHNOLOGY
		Open Elective 05
13	KFD-013	FOOD SAFETY AND REGULATION
14	KFD-014	FAT & OIL TECHNOLOGY
15	KFD-015	ENZYME PROCESSING IN FOOD PRODUCTS
		Open Elective 06
16	KFD-016	NANO FOOD TECHNOLOGY
17	KFD-017	SPECIALITY FOODS
18	KFD-018	ENZYME TECHNOLOGY

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Manoj Kapi

HUMANITIES, SOCIAL SCIENCE INCLUDING MANAGEMENT COURSES (HSMC)

S.No	Subject Code	Subject Name
1	KHU-501/ KHU -601/ KHU -701	Humanities, Social Science including Management Courses
2	KHU -502/ KHU -602/ KHU -702	Foundational Course in Humanities (Development of Societies/Philosophy)
3	KHU -503/ KHU -603/ KHU -703	Education, Technology and Society
4	KHU -504/ KHU -604/ KHU -704	History of Science and Technology in India
5	KHU -505/KHU-605/KHU-705	Nyaya Logic Epistemology
6	KHU-506/KHU-606/KHU-706	Political and Economic Thought for a Humane Society
7	KHU-507/KHU-607/KHU-707	State, Nation Building and Politics in India
8	KHU-508/KHU-608/KHU-708	Psychological Process
9	KHU-509/KHU-609/KHU-709	Positive Psychology
10	KHU-510/KHU-610/KHU-710	Application of Psychology
11	KHU-511/KHU-611/KHU-711	Sociology, Society and Culture
12	KHU-512/KHU-612/KHU-712	Epochal Shift
13	KHU-513/KHU-613/KHU-713	Values and Ethics
14	KHU-514/KHU-614/KHU-714	Ethics and Holistic Life
15	KHU-515/KHU-615/KHU-715	Folk and Vernacular Expressive Tradition and Popular Culture
16	KHU-516/KHU-616/KHU-716	Universal Human Conduct
17	KHU-517/KHU-617/KHU-717	Gender Culture and Development
18	KHU-518/KHU-618/KHU-718	Introduction to Women's and Gender Studies
19	KHU-519/KHU-619/KHU-719	Advance Course in Peace Research
20	KHU-520/KHU-620/KHU-720	Contemporary India in Globalized Era: Challenges of Democracy and Development
21	KHU-521/KHU-621/KHU-721	Making Indian Culture: Epistemic Traditions, Literature and Performative Arts
22	KHU-522/KHU-622/KHU-722	Universal Human Values 2: Understanding Harmony
23	KHU-523/KHU-623/KHU-723	Human Relations at Work
24	KHU-524/KHU-624/KHU-724	Sanskrit Bhasa
25	KHU-525/KHU-625/KHU-725	Language and Communication
26	KHU-526/KHU-626/KHU-726	Language and Linguistics
27	KHU-527/KHU-627/KHU-727	Understanding Society and Culture through Literature
28	KHU-528/KHU-628/KHU-728	Fundamentals of Linguistics
29	KHU-529/KHU-629/KHU-729	Elements of Literature
30	KHU-530/KHU-630/KHU-730	Humanities and Multiple Dimensions of Ecology
31	KHU-531/KHU-631/KHU-731	Film Appreciation
32	KHU-532/KHU-632/KHU-732	Law and Engineering

- Syllabus will prepare as per scheduled

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