ANDHRAKESARI UNIVERSITY:: ONGOLE
(A State University, Recognized by UGC)
M.Sc. OILS, FATS & PETRO PRODUCTS SYLLABUS
Course Structure as per National Educational Policy-2020 under CBCS
(*For the students admitted from the academic year 2025-2026 onwards)*

Semester	Components of Study	Course Code	Title of the Course	No. of Credits	Hr/Week	Internal Assessment	Semester End Exams	Total
SEMESTER – I	Mandatory Core	R25 OF11	Chemistry and Composition of Oils and Fats	4	4	30	70	100
		R25 OF 12	Extraction Techniques of Oil bearing Materials	4	4	30	70	100
	Compulsory	R25 OF 13	Quality Control of Oil and Allied Products	4	4	30	70	100
	Elective Foundation	R25 OF 14A	Fluid Mechanics and Mechanical Operations	4	4	30	70	100
		R25 OF 14B	Basic Unit operations in Oil Industry					
		R25 OF 14C	Material and Energy Balance					
	Core Practical-I	R25 OF 15	Technical Analysis of Chemical Compounds	4	6	30	70	100
	Core Practical –II	R25 OF 16	Physical Analysis of Oils, Fats and Fatty Acids	4	6	30	70	100
	Audit Course	*R25 OF 17*	*Human Values and Professional Ethics*	*2*	*2*	*50*	--	--
	Sub-Total			**24**				**600**
SEMESTER – II	Mandatory Core	R25 OF 21	Refining of Oils	4	4	30	70	100
		R25 OF 22	Industrial Processes of Speciality Fats	4	4	30	70	100
	Compulsory	R25 OF 23	Oleo chemicals and Surfactants	4	4	30	70	100
	Elective Foundation	R25 OF 24A	Principles of Heat and Mass Transfer	4	4	30	70	100
		R25 OF 24B	Elements in Mechanical Operations					
		R25 OF 24C	Chemical Thermodynamics					
	Core Practical-I	R25 OF 25	Unit Operations Lab	4	6	30	70	100
	Core Practical –II	R25 OF 26	Chemical Analysis of Oils, Fats and Fattyacids Lab	4	6	30	70	100
	Skill Development	*R25 OF 27*	*Communicative English /MOOCS Online*	*2*	*2*	*50*	--	--
	Sub-Total			**24**				**600**
SEMESTER – III	Mandatory Core	R25 OF 31	Production and formulation of Soaps and Detergents	4	4	30	70	100
		R25 OF 32	Extraction of Essential Oils	4	4	30	70	100
	Core Elective-I	R25 OF 33A	Environmental aspects of Oils and Allied Industries	4	4	30	70	100
		R25 OF 33B	Materials Engineering					
		R25 OF 33C	Biochemistry of fats and Other Lipids					
	Open Elective-II	R25 OF 34A	Energy Management for Edible oil Refinery	4	4	30	70	100
		R25 OF 34B	Mass transfer Opertions					
		R25 OF 34C	Applied Mechanics					
	Core Practical-I	R25 OF 35	Soaps and Detergents Lab	4	6	30	70	100
	Core Practical –II	R25 OF 36	Processing of Oils, Fats and Fat based Products Lab	4	6	30	70	100
	Skill Enhancement	*R25 OF 37*	*Basic Computer Applications / MOOCS Online*	*2*	*2*	*50*	--	--
	Sub-Total			**24**				**600**
SEMESTER – IV	Mandatory Core	R25 OF 41	Production and Formulation of Cosmetics	4	4	30	70	100
		R25 OF 42	Packaging of Oils, Fats and Allied Products	4	4	30	70	100
	Core Elective-I	R25 OF 43A	Processing of Petroleum Products	4	4	30	70	100
		R25 OF 43B	Strength of Materials					
		R25 OF 43C	Organic Synthesis Process					
	Open Elective-II	R25 OF 44A	Chemical Process Economics and Industrial Management	4	4	30	70	100
		R25 OF 44B	Biotechnology of oils and fats					
		R25 OF 44C	Industrial Instrumentation					
	Core Practical-I	R25 OF 45	Cosmetic Formulations Lab	4	6	30	70	100
	Core Practical-II	R25 OF 46	Project Work +Seminar + Viva-voce	4	6	--	(50+ 20+ 30) 100	100
	Sub-Total			**24**				**600**
	Grand Total			**96**				**2400**

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SYLLABUS FOR M.Sc. OILS, FATS & PETRO PRODUCTS
(*For the students admitted from the academic year 2025-2026 onwards)*
SEMESTER–I

PAPER–I: CHEMISTRY AND COMPOSITION OF OILS AND FATS (R25OF11)
Max. Marks: 100 (Internal-30M & External-70M)

Learning objectives: -

- To learn the basic chemistry and components of oils & fats
- To study about the non-triglycerides constituents
- To know about the composition and characteristics of individual of oils and fats
- To acquire knowledge about chemical reactions of oils, fats and fatty acids

Unit-1: 10 H

General Introduction to Oils & Fats, their sources structure, Composition and classification of Oils & Fats, constituents of natural Oils & Fats, Glycerides, Fatty acids, their nomenclature, structure and occurrence in Oils & Fats.

Unit- II: 12 H

Non triglyceride constituents like Phospholipids, Free fatty acids, sterols, vitamins, waxes and constituents imparting colour, odour and stability of Oils & Fats. Toxic constituents, Antioxidants and Synergists.

Unit-III: 12H

Composition and characteristics of Individual Oils & Fats-Milk fat group: Ghee, butter, Vegetable fat group: Cocoa butter, Shea butter, Animal fat group: Lard, Tallow, Lauric acid oils: Coconut oils, Palm kernel oils, Marine animals' group: Fish oils, Fish liver oils, shark oils, whale oils.

Unit-IV: 14H

Composition and characteristics of Individual Oils & Fats-Oleic-Linoleic acid oils: Sunflower oil, Palm oil, Rice bran oil, Cotton seed oil, Ground nut oil, Corn oil, Olive oil, Sesame oil, Neem oil, Karanja oil etc., Linolenic acid group: Soy bean oil, Linseed oil, Hydroxy acid group: Castor oil, Erucic acid group: Mustard oil, Rapeseed oil, Conjugated acid group: Tung oil, Oiticica oil.

Unit-V: 12H

Chemical reaction of Oils, fats & Fatty acids, Chemistry of hydrogenation, Dehydrogenation, hydrogenolysis, hydrolysis, Saponification, neutralization, esterification,

transesterification, interesterification, isomeriation, Polymerization, dehydration, pyrolysis, Rancidity in oils, prevention of rancidity.

Reference Books:

1. Bailey's Industrial oil and fat products Volume-1 (4th Edition)
2. Chemistry and Technology of oils & fats by M.M. Chakrabarthy.
3. Treatise on fats, fatty acids and oleo chemicals by O P Narulla

Learning outcomes: -

- Student can have knowledge regarding the basic chemistry of oils & fats
- Student shall able to understand the non-triglyceride constituents and their structures.
- Student can gain the knowledge about composition and characteristics of individual oils and fats
- Student can have knowledge about chemical reactions of oils,fats and fatty acids

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SEMESTER–I

PAPER–II: EXTRACTION TECHNIQUES OF OIL BEARING MATERIALS (R25OF12)
Max. Marks: 100 (Internal-30M & External-70M)

Learning objectives: -

- To understand the harvesting and storage of oils seeds
- To know the machinery employed for oil extraction from different seeds
- To grab the knowledge on solvent extraction
- To learn about desolventization of miscella and meals
- To know the extraction of fat from fatty materials.

Unit-I: 14H

Harvesting conditions of various Oils seeds and their effect on Oil recovery, Drying of Oil seeds, and methods of drying. Shortage of Oil seeds, conditions of shortage Cooking of Oil seed, their effects on Oil Yield and quality. Grading and evaluation of OBM, Crude Oil as per BIS method. Handling and pretreatment of Oilseeds, machinery employed for handling and pretreatment Oil seeds viz. conveyors, elevators, seed cleaning machines, decorticators, disintegrators, reduction rolls and high rolls etc.,

Unit-II: 12H

Machinery employed for production of Oils viz. Ghani, Hydraulic presses, Screw presses, low pressure and high-pressure expellers etc. Filter presses and centrifuges, Preparation of Soya flakes, Rice Bran pellets and cotton seed prior to solvent extraction.

Unit-III: 10H

Solvent extraction theory, selection of solvents, their availability, advantages and limitations. Batch and continuous plants employed for solvent extraction of Low and high oil-bearing materials.

Unit-IV: 12H

Desolventization of miscella and meals: Equipment and plants employed, Effects of operating parameters on the quality of Oil meal after desolventization of miscella and meals. Solvent losses and utilities requirements, Energy conservation, Safety and Environmental consideration of Solvent Extraction plants, Solvent recovery system.

Unit-V: **12H**

Rendering of animal fats: Different methods of rendering, production of tallow, lard, fish oils and Fish liver oils. Spoilage during storage of oils and fats, storage systems for Oils and Fats.

Reference Books:

1. Bailey's Oil and Fat products Volume II (4th Edition)

2. Bailey's Oil and Fat products volume IV (5th Edition)

3. Treatise Volume .I by K.P. Narula.

Learning outcomes: -

- Student can able to learn the harvesting and storage of oils seeds
- Student can know the machinery of oil extraction of different seeds
- Student can grab the knowledge on solvents extraction of different seeds
- Student can able to learn desolventization of miscella and meals
- Student can know the extraction of fat

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SEMESTER–I

PAPER–III: QUALITY CONTROL OF OILS AND ALLIED PRODUCTS (R25OF13)
Max. Marks: 100 (Internal-30M & External-70M)

Learning Objectives:

* To know the elementary methods of analysis of oil seeds, Oils, Fats & Fatty acids

* To know the physico-chemical properties and their evaluation methods

* To get knowledge about the Chromatographic methods.

* To know the principles and uses of modern analytical techniques.

* To learn about the Dilatometric measurement and its significance.

Unit-I: 12H

Elementary methods of analysis of oil seeds, Oils, Fats & Fatty acids, Physical characterization of Oils, fats and fatty acids-oiliness and viscosity, surface and interfacial tension. Density and expansibility, melting point, thermal properties, smoke, fire and flash points, solubility and miscibility, optical properties, refraction, absorption spectra, electrical properties resistance, dielectric constant.

Unit-II: 12H

Chemical characterization of oils, fats and fatty acids- Acid Value, Saponification Value, Iodine Value, Peroxide Value, Ester Value, Reichert Missile Value, Polenske Value, Acetyl Value, BIS methods, Identification of Oils & Fats: Methods for detection of adulteration in Oils & Fats. BIS, FSSAI specifications for Oils and Fats.

Unit-III: 12H

Chromatographic methods: Introduction, Theoretical developments and various techniques-Thin layer chromatography, Column chromatography, Gas – Liquid chromatography, High performance liquid chromatography, super critical chromatography etc.,

Unit-IV: **12H**

Principles and applications of modern spectral analysis techniques such as Ultra Violet, Visible, Infrared, Nuclear Magnetic Resonance spectroscopy, Mass Spectroscopy, high resolution spectra of fats and fatty acids.

Unit-V: **12H**

Special quality control methods -Dilatometric measurement and its significance, Wet bulb temperature& Measurement of humidity, Detection of Nickel in hydrogenated oils, Iron, Sulphur and phosphatide contents of crude and refined vegetable oils.

Reference Books :

1. Analytical methods in Oils & Fats by L.V Cocks

2. Laboratory Hand book for chromatographic methods by O.Milkes.

3. Treatise on Fats, Fatty Acids, Oleo chemicals by O.P.Narula.

4. Instrumentation by D.P Eckmen.

5. Principles of Instrumentation analysis, Edition-III (1985) Edited by Douglas A.Skog

6. BIS/ FSSAI manual of methods of analysis of foods.

Learning outcomes:

* Student can able to understand elementary methods of analysis of oil seeds, Oils

* Student can able to understand the chromatographic techniques.

* Student can able to understand thespectralmethod analysis of oils.

* Student canknow the special analyticaltechniques.

* Student can able to understand the Dilatometric measurement and its significance.

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SEMESTER–I

PAPER–IV: FLUID MECHANICS AND MECHANICAL OPERATIONS (R25OF14[A])

Max. Marks: 100 **(Internal-30M & External-70M)**

Learning Objectives:

* To learn the principles of manometers and types of flows
* To get knowledge about the types of fluids and Boundary layer of flows.
* To get Knowledge about the pump working with Bernoulli's equation.
* To learn about NPSH and centrifugal pumps.
* To get knowledge about the Mechanical separation equipment.

Unit-1: **12H**

U-tube and inclined manometers-Hydrodynamics; potential flow, Laminar flow, turbulent, Velocity gradient and rate of shear, Newtonian and non-Newtonian fluids, Reynolds experiment, Reynolds number, Boundary layer flow, development of turbulent boundary layer on a flat plate

Unit - II: **12H**

Fluid head, Potential head & friction factor definitions, Continuity equations, Bernoulli equations, pump work in Bernoulli equation, Velocity distribution in pipe. Hagen-Poiseuille equation. Flow at sudden enlargement and sudden contraction of cross section.

Unit-III: **12H**

Transportation and metering of fluids: Pipe, fittings and valves, pumps, developed head, power requirement, NPSH, positive displacement pumps and Rotary pumps, Characteristics of a centrifugal pump, steam jet ejector, orifice meter, venturi meter, Pitot tube, rotameter, notches and weirs.

Unit-IV :

12H

Agitation and mixing of liquids: purpose of agitation, flow pattern in vessels, description of equipment for agitation and mixing, size reduction, Particle shape and size, principles of Crushing, Crushing efficiency, Rittenger's law, Bond's law and kicks law. Blake Jaw crusher, Ball Mill, and ultrafine grinders, closed circuit grinding.

12H

Unit-V:

Description of Mechanical separation equipment: Gyratory screens, vibrating screens, centrifugal-sifter, cartridge filter, plate and frame filters, shell and leaf filters continuous rotary vacuum filter, suspended batch centrifugal gravity thickener, cyclones, Tubular centrifuge, Disk centrifuge and nozzle discharge centrifuge.

Reference Books:

1. Unit operation in chemical Engineering by McCabe and Smith McGraw Hill.

2. Introduction to Chemical Engineering by Badger and Bancherc McGraw Hill International Students Edition.

Learning outcomes: -

* Students can able to understand the principles of manometers and types of flows
* Student can get knowledge about the types of fluids and Boundary layer of flows.
* Students are able to get Knowledge about the pump working with Bernoulli's equation.
* Students are able to Understand about NPSH and centrifugal pumps.
*Students can get knowledge about the Mechanical separation equipment.

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SEMESTER–I

PAPER–IV: BASIC UNIT OPERATIONS IN OIL INDUSTRY (R25OF14[B])
Max. Marks: 100 (Internal-30M & External-70M)

Learning Objectives:

- To learn about different liquid extraction techniques
- To understand about different methods of leaching
- To gain knowledge about Adsorption - theory
- To acquire knowledge about Drying
- To know about different crystallization methods

Unit- I **14H**

Liquid Extraction- Definition, principle, introduction about extraction equipment, mixer settler spray and packed extraction towers, perforated plate towers, baffle towers agitated tower extractors, principle of extraction equilibria and phase composition, system of three liquids one pair partially soluble.

Unit- II **12H**

Leaching- leaching principle importance of leaching, decoction, elutriation, introduction to leaching equipment, leaching by percolation and immersion, bollman extractior, hilde brand extractor, rotocel extractor, kennedy extractor, counter current and concurrent leaching.

Unit- III **10H**

Adsorption-Theory and types of adsorption, industrial adsorbents, adsorption equilibria, adsorption hysteresis, differential heat of adsorption, adsorption of solute from dilute solution, fecundities equation, single stage and multi stage adsorption processes

Unit- IV **12H**

Drying equilibria- Definition, principle, importance of drying, In direct and indirect dryers, rate of batch drying, time of drying, the mechanism of batch drying, continuous drying, equipment like tunnel dryers, turbo type dryers, through circulation dryers and rotary dryers.

Unit- V **12H**

Crystallization – Introduction, principle, basic equipment in crystallization, theory of crystallization, crystal size distribution crystal size, purity, equilibrium and yields, basic principles of crystallization equipment, vacuum crystallization, continuous crystallization draft tube crystallization.

Reference Books :

1. Unit operations in chemical engineering by Mcabe Smith

Learning outcomes: -

- Student can Learn about different extraction technique of extraction
- Student can Understand about different methods of leaching - leaching
- Student can gain knowledge about Adsorption - theory and types
- Student have knowledge about Drying equilibria- drying rate curve
- Student can Understand about different crystallization methods

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SEMESTER–I

PAPER–IV: MATERIAL AND ENERGY BALANCE (R25OF14[C])
Max. Marks: 100 (Internal-30M & External-70M)

Learning objectives: -

✓ To get the stoichiometric and composition relations

✓ To know the ideal gas, partial pressures and it's applications

✓ To learn about humidity and saturation

✓ To learn about the material balance and bypass calculations

✓ To know about the energy and heat capacity of gases.

Unit-1: 12H

Stoichiometric and composition relations, Gram mole, pound mole, gram atom concepts, Volume, weight percentage and mole percentages. Excess reactants, conversion and yield. Selectivity, degree of completion.

Unit-II: 12H

Ideal gases, partial pressures, application of ideal gas laws on calculating pressure, volume and temp. Vapor pressure, Vapor pressure of immiscible liquids, Roult's Law for solutions.

Unit-III: 10H

Humidity and Saturation: Relative and percent Saturation, dew point, wet and dry bulb temperatures, Use of humidity charts for Engineering calculations.

Unit-IV: 12H

Material balance without chemical reaction, Recycle, purge and bypass calculations, material balance with chemical reaction.

Unit-V: 14H

Energy, heat capacity of gases, liquids and mixture solutions, latent heats, Energy balance with and without chemical reactions. Classification of coal, Liquid and Gaseous fuels, Proximate and ultimate analysis of coal and the significance of constituents. Calorific values of fuels.

Reference Books:

Chemical process principles, Part-I, Second Edition. By Hougen, Dr. Weston, Ragatz,

Learning outcomes: -

* Students are able to understand the stoichiometric and composition relations

* Students are able to understand the ideal gas, partial pressures and it's applications

* Student can able to understand the about humidity and saturation.

* Student can able to understand the material balance and bypass calculations

* Students are able to understand the about the energy, heat capacity of gases, liquids and mixture solutions.

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SEMESTER–I

PRACTICAL–I: TECHNICAL ANALYSIS OF CHEMICAL COMPOUNDS (R25OF15)

Max. Marks: 100 **(Internal-30M & External-70M)**

(Minimum Five Experiments must be carry out)

1. Percentage purity of sodium hydroxide (NaOH).
2. Percentage purity of Potassium hydroxide (KOH).
3. Percentage purity of sulfuric acid (H_2SO_4).
4. Percentage purity of hydrochloric acid (HCl)
5. Percentage purity of sodium thiosulphate ($Na_2\ S_2O_3$).
6. Percentage purity of Sodium carbonates (Na_2CO_3).
7. Total Hardness of Water.
8. Total Dissolved Solids of Water.
9. Determination of Acidity of Water.
10. Determination of Alkanity of Water.

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SEMESTER–I

PRACTICAL–II: PHYSICAL ANALYSIS OF OILS, FATS AND FATTY ACIDS (R25OF16)

Max. Marks: 100 **(Internal-30M & External-70M)**

(Minimum Five Experiments must be carry out)

1. Determination of Specific gravity of given oil sample
2. Determination of viscosity of given oil sample
3. Determination of refractive index of given sample
4. Determination of color for given oil sample
5. Determination of Titre value
6. Determination of Smoke, Flash and Fire points of given Oil Sample.
7. Determination of Melting Point
8. Determination of Moisture and Volatile matter.
9. Determination of oil content
10. Determination of ash content

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SEMESTER–I

PAPER-VII: HUMAN VALUES AND PROFESSIONAL ETHICS (R25OF17)

Max. Marks: 50(Internal)

Learning Objectives:

- ✓ To know the nature of ethics and goals.
- ✓ To know the basic moral concepts.
- ✓ To know the non-violance of non possession.
- ✓ To know the crime and theories of punishment.
- ✓ To know the Bhagavd Gita, Buddhism, Jainism.

Unit-I: **6H**

Definition and Nature of Ethics – Is relation to Religion, Politics, Business, Law, Medicine and Environment. Need and Importance of Professional Ethics – Goals – Ethical Values in Various Professions.

Unit-II: **6H**

Nature of Values-Good and Bad, Ends and Means, Actual and Potential Values, Objective and Subjective Values, Analysis of Basic Moral Concepts-Right, Ought, Duty, Obligation, Justice, Responsibility and Freedom, Good Behavior and Respect for Elders, Character and Conduct.

Unit-III: **6H**

Individual and Society: Ahimsa (Non-Violence), Satya (Truth), Brahmacharya (Celibacy), Asteya (Non Possession) and Aparigraha (Non-stealing). Purusharthas (Cardinal virtues) - Dharma (Righteousness), Artha (Wealth), Kama (Fulfillment Bodily Desires), Moksha (Liberation).

Unit-IV: **6H**

Crime and Theories of Punishment – (a) Reformative, Retributive and Deterrent, (b) Views on Manu and Yajnavalkya.

Unit-V: **6H**

Bhagavd Gita – (a) Niskama Karma, (b) Buddhism – The Four Nobel Truths – Arya astangamarga, (c) Jainism - Mahavratas and Anuvratas. Values Embedded in Various Religions, Religious Tolerence, Gandhian Ethics.

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SEMESTER–I

PAPER-VII: HUMAN VALUES AND PROFESSIONAL ETHICS (R25OF17)

Max. Marks: 50(Internal)

Reference Books:

1) Johns S Mackenjie: A Manual of ethics
2) "The Ethics of Management" by Larue Tone Hosmer, Richard D. Irwin Inc.
3) Management Ethics – Integrity at work by Joseph A. Petrick and John F. Quinn, Response Books, New Delhi.
4) "Ethics in Management" by S.A. Shelekar, Himalaya Publishing House.
5) Harold H. Titus: Ethics for Today
6) Maitra, S.K: Hindu Ethics
7) William Lilly: Introduction to Ethics
8) Sinha: A Manual of Ethics
9) Manu: Manava Dharma Sastra or the Institute of Manu: Comprising the Indian System of Duties: Religious and Civil (ed) G.C. Haughton.
10) Sasruta Samhita: Tr. KavirajKunjanlal, KunjanlalBrishagratha, Chowkamba Sanskrit Series, Vol I,II and III, Varanasi, Vol I PP, 16-20, 21-32 and 74-77 only.
11) Charaka Samhita: Tr. Dr. Ram Karan Sarma and Vaidya Bhagavan Dash, Chowkambha Sanskrit Series Office. Varanasi I, II, III Vol I PP 183-191.
12) Ethics, Theory and Contemporary Issues. Barbara Mackinnon, Wadsworth/Thomson Learning, 2001.
13) Analyzing Moral Issues, Judith A. Boss, Mayfield Publishing Company, 1999.
14) An Introduction to Applied Ethics (Ed.,) John H. Piet and Ayodya Prasad, Cosmo Publications.
15) Text Book for Intermediate First Year Ethics and Human Values, Board of Intermediate Eduction – Telugu Academy, Hyderabad.
16) I.C. Sharma Ethical Philosophy of India. Nagin& Co Julundhar.

Learning Outcomes:

- ✓ Students are able to understand relation to religion & ethical values.
- ✓ Students are able to understand to character & conduct.
- ✓ Students are able to understand to crime & theories of punishment.
- ✓ Students are able to understand to Gand
- ✓ hian ethics & values embedded in various religions.
- ✓ Studetns are able to understand various individuals of society.

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SEMESTER–II

PAPER–I: REFINING OF OILS (R25OF21)

Max. Marks: 100 **(Internal-30M & External-70M)**

Learning Objectives:

- To know the impurities of crude oils
- To know the removal of gums from the oils.
- To get knowledge about Deacidification of oils.
- To get knowledge about miscella refining
- To get knowledge about Bleaching of oils.
- To get knowledge about the Deodorization of oils.
- To know about the byproducts of oil refining industries.

UNIT-I **10H**

Impurities of Crude oils, Effect of refining due to impurities, Degumming of Oils: Mechanism of degumming, methods of degumming, super degumming, degumming processes for specific oils, recovery of Lecithin from gums. Principle and methods of dewaxing of oils, separation of waxes from oils

Unit-II: **12H**

Deacidification of oils & Fats: Deacidification by Caustic soda and Soda ash, Batch and continuous methods, refining losses. Effect of operating variable on chemical refining, deacidification by steam, Liquid-Liquid extraction, esterification etc., and their limitations. Miscella refining, deacidification by Zenith process. Treatment and disposal of soap stock, batch and continuous methods.

Unit-III: **14H**

Bleaching of Oils and Fats. Theory of adsorption bleaching, components responsible for oil color. Chemical and Physical characteristics of various bleaching agents. Activated carbon, bleaching earth and their manufacturing methods. Batch and continuous methods of bleaching. Effects of operating variable on quality of bleached oil, recovery of Oil from spent bleaching agents. Filtration techniques for removal of spent bleaching agents from bleached Oils.

Unit-IV: **12H**

Deodorization of Oils: Principal components responsible for odor and flavor, their properties, Principle of deodorization, Deodorization types, vertical deodorizer, Horizontal deodorizer, batch and continuous processes, effect of operating variables, deodorization losses, design of commercial deodorizer, thin film deodorization,

Unit-V: **12H**

Physical refining of oils, steps involved in the physical refining, advantages and disadvantages, Miscella refining, merits and demerits, operating variable of different refining processes, energy conservation in oil refining, By-products and their utilization-Gums, Waxes, spent soap stock, spent earth, deodorization distillates, fortification of micro nutrients, vitamins and stabilizing agents.

Reference Books:

1. Bailey's Oil and Fat Products. Volume II (4th Edition)
2. Bailey's Oil and Fat Products. Volume IV (5th Edition)
3. Treatise Volume-I by O.P.Narulla
4. Chemistry and Technology of oils and fats by M.M.Chakrabarthy.

Learning Outcomes:

- Student can understand the impurities of crude oils
- Student can understand the recovery of lecithin.
- Student can understand the Deacidification of oils& fats
- Student can understand the liquid extraction method.
- Student can know the Bleaching process
- Student can have knowledge about all the refining processes.
- Student can have knowledge about the byproduct’s utilization

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SEMESTER–II

PAPER–II: INDUSTRIAL PROCESSES OF SPECIALITY FATS (R25OF22)
Max. Marks: 100 (Internal-30M & External-70M)

Learning Objectives:

* To learn about the Hydrogenation of Oils and its importance.

* To know the Fractionation process.

* To get knowledge about the esterification and transesterification processes.

* To get knowledge about the Interesterification process.

* To acquire knowledge about the Blending process.

UNIT- Il: 14H

Hydrogenation of Oils and Fats, theory and importance of hydrogenation of Oils, reaction kinetics, operating variables and their effect on rate of hydrogenation. Selectivity and isomerization. Catalysts used in hydrogenation of Oils, theory of catalyst structure, Preparation of Nickel catalyst, reclamation and regeneration of Catalyst from spent catalyst. Manufacture of Hydrogen, Commercial plants and processes employed for hydrogenation of oils, design of reactors.

UNIT -II: 10H

Fractionation, introduction, fractionation techniques Bernardini (CMB), De Smet, Fast dry process, solvent fractionation of fats, winterization, deoiling and fractionation of phospholipids by solvent, supercritical extraction, liquid liquid extraction.

Unit III: 12H

Esterification: Introduction, Mechanism, esterification techniques, application of esterified products, Transesterification- Mechanism, transesterification processes, transesterified products, application of transesterified products, characteristics of the esterified and transesterified products, catalysts used in transesterification process, choice of catalyst, recovery of catalyst.

Unit IV: **14H**

Interesterification: Introduction, ester -ester interchange, mechanisms, triglyceride-monoester interchange, analytical methodologies, application of interesterified products, stability and frying, characteristics of interesterified fats, interesterification process, acidolysis, alcoholysis of polyesters with monohydric alcohols, alcoholysis of polyesters with polyhydric alcohols.

Unit- V: **10H**

Blending: Blending of fats and fat fractions, margarine manufacture, shortenings cake and pastry shortenings, general purpose shortenings, puff pastry shortenings, creaming shortenings, pourable shortenings, dry shortenings, spreads, confectionary fats, specialty fats.

Reference Books:

1. Chemistry &Technology of Oils &Fats by M.M. Chakrabarty

2. Treatise Volume I by O.P. Narulla

3. Baileys Industrial oil and fat products Volume-1, 6th Edition

Learning outcomes:

* Student can able to understand Hydrogenation of Oils and its importance.

* Student can able to understand the Fractionation process.

* Student can able to understand the esterification and transesterification routes.

* Student can have a knowledge about the Interesterification process and their products

* Student can able to understand the Blending process.

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SEMESTER–II

PAPER–III: OLEOCHEMICALS AND SURFACTANTS (R25OF23)
Max. Marks: 100 (Internal-30M & External-70M)

Learning objectives:

- To understand the theory of fat splitting and application of fatty acids
- To learn about pretreatment of sweet water and spent soap lye
- To get knowledge about the manufacture of oil derivatives
- To acquire knowledge about surfactants and applications
- To learn about synthesis of different surfactants

Unit-I: 12H

Theory of fat splitting. Fat Splitting curves-Methods of Fat Splitting, Enzymatic fat splitting, Twitchell's fat splitting, Pressure fat splitting- Single tower, Multi tower fat splitting, Distillation and Fractionation of Fatty Acids-Application of fatty acids in Pharmaceuticals, textile, plastic, food, leather, soaps, surfactants and cosmetics industries.

Unit-II: 12H

Glycerin: Pretreatment of sweet water and spent soap lye -continuous glycerin liquor pretreatment plant-continuous glycerin evaporation plant- continuous glycerin refining plant-Synthetic Glycerin-Grades of glycerin-properties and utilization of glycerin.

Unit - III: 12H

Manufacture of Methyl esters, Fatty Alcohols, Fatty amines, Fatty Nitriles, Castor oil derivatives, Sebasic acid-Tri hydroxy Stearic acid - Turkey red oil, perfumery-chemicals, Hydrogenated Castor oil, Polyurethane foams.

Unit-IV: 12H

Fat based surface-active Agents: Introduction, Chemical structure of surfactants, theory of surface action, solubility, properties of surfactants, Hydrophilic Lipophilic Balance (HLB), Types of surfactants and applications of surfactants.

Unit-V: **12H**

Synthesis of Surfactants: Raw materials: Oleo chemical and petrochemical raw materials-contrast or supplement, Chemistry and Technology involved in the synthesis of anionic, cationic, nonionic and amphoteric surfactants, Analysis of surfactants, Bio degradation of surfactants.

Reference Books:

1. Bailey's Industrial Oil and fat products Volume III and V (5th edition)

2. Bailey's Industrial Oil and fat product Volume I (4th edition)

3. Surfactants in consumer products Theory, Technology and application by J. Falbe.

4. Treatise Volume-I and III by O.P. Narulla

Learning outcomes: -

- Student can understand the theory of fat splitting.
- Student can learn about glycerin recovery.
- Student can have a knowledge about manufacture of oleochemical derivatives
- Student can have a knowledge about surfactants and applications
- Student can have a knowledge about synthesis of surfactants.

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SEMESTER–II

PAPER–IV: PRINCIPLES OF HEAT AND MASS TRANSFER (R25OF24[A])
Max. Marks: 100 (Internal-30M & External-70M)

Learning Objectives:

* To learn the principles of Fourier's I Law and thermal conductivity.
* To get knowledge about the industrial heat exchangers.
* To acquire knowledge about Diffusion and Vapour liquid Equilibrium.
* To learn about Principals of heat flow in fluids.
* To get knowledge about Equipment for gas liquid operations.

Unit-1: 10H

Heat transfer by conduction in solids. Fourier's Law, Thermal conductivity, steady and unsteady state conduction, charts, Heat transfer in pipes, heat transfer in tanks, heat transfer in solid surfaces.

Unit-II: 12H

Principles of Heat Flow in Fluids: Heat transfer by convection, Heat transfer by radiation, Examples for convection and radiation, Energy balances, individual and overall heat transfer coefficients, Logarithmic mean temperature difference.

Unit-III: 14H

Industrial heat Exchange equipment: Double pipe heat exchanger shell and tube, Heat exchanger, Plate type heat exchanger, extended surface Heat exchanger, scraped surface heat exchanger, spiral plate heat exchanger, steam heated tubular evaporators, jacketed vessels.

Unit-IV: 12H

Diffusion, Ficks first law of diffusion, Vapor liquid Equilibrium, relative volatility, the boiling point Diagram, Distillation, Flash, differential and steam distillation. Continuous distillation with rectifications, overall material balances for two components system.

Unit -V: 12H

Equipment for Gas liquid operations: Gas dispersed, sparged vessels, mechanically agitated vessels. Tray tower, their general characteristics, Tray efficiency. Liquid dispersed Venturi scrubbers, Wetted Wall towers, Spray towers, packed towers, types of packings.

Reference Books:

1. Unit operations in Chemical Engineering by McCabe and Smith McGraw Hill.
2. Introduction to Chemical Engineering by Badger and Banchero.

LEARNING OUTCOMES

* Students can get knowledge about the industrial heat exchangers.
* Students able to acquire knowledge about Diffusion and Vapour liquid Equilibrium.
* Students able to learn about Principles of heat flow in fluids.
* Students able to get knowledge about equipment for gas liquid operations.
* Students able to learn the principle of Fourier 'Law and thermal conductivity.

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SEMESTER–II

PAPER–IV: ELEMENTS IN MECHANICAL OPERATIONS (R25OF24[B])
Max. Marks: 100 **(Internal-30M & External-70M)**

Learning objectives: -

- To learn about classification of simple vertical boiler
- To understand about Dryness fraction of steam
- To gain knowledge about Reciprocating steam engines
- To acquire knowledge about classification of IC engines
- To learn about working principle of motor

Unit-1: **12H**

Steam Boilers: Classification of simple vertical Boiler, Lancashire boiler, Cochran boiler and water tube boiler, structures and operations.

Unit-II: **12H**

Dryness fraction of steam, Measurement of dryness fraction of steam by throttling and separating Colorimeter, Latent heat, Total heat, Sensible heat and energy.

12H

Unit-III:

Reciprocating steam Engines: Classification of Reciprocating stream engines, cycle of operations and slide valves. Mechanical and Thermal efficiencies.

Unit-IV: **12H**

Internal combustion engines: Classification of IC engines. Indicator diagram for otto and Diesel engines. Mechanical and Thermal efficiencies.

Unit-V: **12H**

General working Principles of motors, generators and transformers, types of motors, working

principles, types of generators, types of transformers, working principles of generators

Reference Books:
Elements of Mechanical Engineering by Roy and Chowdary.

Learning outcomes: -

- Student can learn about classification of simple vertical boiler
- Student can understand about Dryness fraction of steam
- Student can gain knowledge about Reciprocating steam engines
- Student can acquire knowledge about classification of IC engines
- Student can learn about working principle of motor

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SEMESTER–II

PAPER–IV: CHEMICAL THERMODYNAMICS (R25OF24[C])
Max. Marks: 100 **(Internal-30M & External-70M)**

Learning Objectives:

* To learn the basic concepts of about work, energy, equilibrium, head and phase rule.

* To get knowledge about the laws of Thermodynamics.

* To get knowledge on ideal Gas laws.

*To learn about the Carnot cycle.

* To get knowledge on effect of temperature on equilibrium constant and evaluation of equilibrium constant.

Unit-I: **10H**

Basic concepts of about work, energy, Equilibrium, Head, Phase rule. Thermodynamic state and state functions. Thermodynamic properties, thermodynamic equilibrium and Equilibrium state. Zeroth Law of Thermodynamics processes. Maxwell equations.

Unit-II: **12H**

First law of Thermodynamics for closed systems, First law of Thermodynamics for cyclic processes, First law of Thermodynamics for an open system, conservation of mass for an open system, steady state flow process.

Unit-III: **12H**

The ideal Gas law, constant volume process, constant pressure process, constant temperature process, adiabatic process, polytrophic processes, PVT relation of fluids, PVT behavior of pure substances, equation of state for gases, principle of corresponding states.

Unit-IV: **12H**

Statement of Second law of Thermodynamics, Second Law of Thermodynamics for closed and open systems, Heat engine and heat pump. Efficiency of Heat engines. Carnot cycle and deviations

from it. Carnot refrigerator, liquefaction processes. Entropy and quality of energy, entropy change of a work and heat reservoir, Mathematical statement of Second law.

Unit-V: **14H**

Heat capacities of Gases, specific heats of liquids and solids. Internal energy, enthalpy, Joule Thomson coefficient, Clausius, Clapeyron equation. Chemical potential, ideals solutions, fugacity and fugacity coefficient. Excess Gibbs free energy, activity and activity coefficient, VLE, Chemical equilibria, standard Gibbs energy change, equilibrium constant. Effect of temperature on equilibrium constant. Evaluation of equilibrium constant.

Reference Books:

Introduction to Chemical Engineering thermodynamics by J.M. Smith and H.G. van Ness.

Chemical Engineering Thermodynamics by Y.V.C. Rao.

Learning Outcomes:

* Student can able to understand the basic concepts of about work and energy.

* Students can able to understand about the laws of Thermodynamics.

* Student can able to understand Gas laws.

* Student can able to understand the Carnot cycle and deviations.

* Students can able to understand the effect of temperature on equilibrium.

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SEMESTER–II

PRACTICAL–I: UNIT OPERATIONS (R25OF25)

Max. Marks: 100 **(Internal-30M & External-70M)**

(Minimum Five Experiments must be carry out)

1. To verify the law of steam distillation.
2. To verify the Rayleigh's equation for differential distillation.
3. Size reduction by using Jaw crusher.
4. To determine the optimum time of sieving for a given sample.
5. Determine the co-efficient of Discharge of Rota meter
6. Determine the co-efficient of Discharge of Venturi meter.
7. Determine the co-efficient of Discharge of Orifice meter.
8. To determine the equilibrium distribution
9. To find the overall recovery of solute in a single as well as two stage cross current extraction
10. To separate a mixture of coal into two fractions using sink and float method.
11. To determine the minimum thickener area required for continuous thickening

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SEMESTER–II

PRACTICAL–II: CHEMICAL ANALYSIS OF OILS,FATS & FATTY ACIDS (R25OF26)

Max. Marks: 100 **(Internal-30M & External-70M)**

(Minimum Five Experiments must be carry out)

1. Determination of acid value of given oil samples.
2. Determination of saponification value of given oil samples.
3. Determination of iodine value of given oil samples.
4. Determination of peroxide value of given oil samples.
5. Determination of ester value of given oil samples.
6. Determination of unsaponifiable matter of given oil samples.
7. Determination of Hydroxyl value of given oil sample.
8. Detection of adulteration in Oils and Fats

(a) Test for presence of Sesame Oil (Baudouin's Test)

(b) Test for presence of Groundnut Oil (Belier's Turbidity Test)

(c) Test for presence of Linseed Oil (Hexabromide Test)

(d) Test for presence of Mineral Oil (Hold's Test)

(e) Test for presence of Cotton seed Oil (Halpern's Test)

(f) Test for presence of Rancidity (Kries Test)

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SEMESTER–II
PAPER-VII: COMMUNICATIVE ENGLISH (R25OF27)
Max. Marks: 50 (Internal)

Learning Objectives:

- ✓ The course helps to improve easy and fluent communication skill among the students.
- ✓ This English Communication Skill based course mainly focuses on to improve the Linguistic Listening, Communicative Competence and Presentation Skills of the students.
- ✓ Activities in the English Communication Skill based course will simulate actual discourses that students will engage in their interaction with their peers, teachers or strangers in their day-to-day situations.
- ✓ To learn the employability skills and descriptions.
- ✓ To learn the extempore and presentaions.

Unit-I: Communication Skills **6H**

a) Verbal: a) Types of Communication; b) Barriers to Communication.
b) Strategies for effective communication.
Nonverbal Skills - a) Body Language-Voluntary and Involuntary;
b) Kinesics Facial Expressions;
c) Proxemics;
d) Oculesics;
e) Haptics and Chronemics.

Unit-II: Advanced Vocabulary **6H**

a) Synonyms & Antonyms; b) Phrasal verbs; c) Idioms; d) One word Substitutes.

Unit-III: Employability Skills & Descriptions **6H**

Employability Skills:

a) Interview Skills; b) Group Discussion c) Resume Writing.

Descriptions:

a) Process Description; b) Picture Description; c) Narration d) Email etiquette.

Unit-IV: Role Play/Dialogue Writing **6H**

a) Introducing oneself & others;
b) Asking for & giving permissions;
c) Asking for and responding to give directions;
d) Seeking request;
e) Inviting and responding invitations;
f) Apologizing.

Unit-V: Presentation Skills **6H**

Extempore (JAM) Sessions; Paper Presentation.

Learning Outcomes:

- ✓ To realize the importance of communication skills in job arena.
- ✓ To enhance the students ability to communicate.
- ✓ Able to describe procedures and improves analytical thinking.
- ✓ Capable to make the students communicate in Daily life situations.
- ✓ Capable to participate in all recruitment procedures.
- ✓ Able to communicate confidently in oral presentations

Industrial Training

Students are allotted to work as trainee in different oil and allied industries of the field for a period of 6 weeks

The basic objectives are as follows:

To aware with the industrial environment, movement of raw materials finished products, human behavior, industrial relation, manpower management & efficient management of the manpower.

To have a proper knowledge of the manufacturing process of different products, their quality control procedure, utilities and various techniques of quality control in terms of raw material, in process parameters and finished products as per norms of BIS, FSSAI and other statutory bodies.

To gain knowledge of water treatment, effluent treatment and air pollution control devices. Proper analysis of fuel and other utilities.

Students are allotted to work on project assign in those particular industries for controlling the losses, utilities consumption & other inputs for reducing cost of production.

To understand proper maintenance of the equipment in the plants, i. e. regular, preventive and other schedule maintenance.

To understand the stores activities of procurement, storage & issue of spare-parts, packaging materials and various consumables & raw materials.

The students must understand the costing of various inputs on different section basis so as to have knowledge of total cost of production.

To understand the R&D activities being carried out by the industries or intent to carry by the company & share their knowledge.

Seminar- Every student will be required to make a presentation on internship.

Outcomes: -

- This training provides a basic back bone for students for future industrial working environment.
- Gain a proper knowledge of the manufacturing process of different products, their quality control procedures, utilities and various techniques of quality control in terms of raw material, in process parameters and finished products as per norms of BIS, FSSAI and other statutory bodies.
- Students after training can gain knowledge for appearing in campus placement activities.
- Presentation enhances communication skill of the student.

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SEMESTER–III

PAPER–I: PRODUCTION AND FORMULATION OF SOAPS AND DETERGENTS (R25OF31)

Max. Marks: 100 **(Internal-30M & External-70M)**

Course objectives: -

- To learn the basic chemistry of soaps
- To know about recent trends in the manufacturing of soaps
- To acquire knowledge about detergents and detergent duties
- To know about detergent products and their formulations
- To know about testing and evaluation methods

Unit-I: **10H**

Introduction, Raw materials for the soap industry. Classification and selection of Raw Materials. INS Factor, Hardness number and formulation of soaps. Properties of soaps and soap solutions, Chemistry of Soap boiling, various phases in soap boiling.

Unit-II: **14H**

Processes and plants employed in the manufacture of Soaps, Batch process, continuous process, Cold methods, Semi boiled methods, Full boiled methods,Recent trends in the manufacturing of Soaps, Various types of soaps and cleaning preparations.

Unit-III: **12H**

Introduction about Detergents, detergent duties, Components of Detersive systems, How detergent works, Raw materials andtheir functions and roles, in detergents. Mechanisms, oil-soil detergency and measurement of detergency.

Unit-IV: **12H**

Manufacturing processes in Detergents, type of Detergent products and their formulations, plants employed for the manufacturing of detergents, spray drying method, batch methods, continuous methods, soapy detergents, Non soapy detergents.

Unit-V: **12H**

Testing and evaluation methods, for Soaps and detergents. BIS methods for analysis of soaps and detergent products.

Reference Books:-

1. Bailey's Industrial Oil and Fat Products - Vol.I (4th Edition) and Vol.V (5th Edition)

2. The Manufacturing of soaps, Detergents and Glycerin by EDGAR WOOLLATT.

3. Chemistry and Technology of soaps-by J.J. KANE.

4. Chemistry and Technology of Soaps and Detergents by OTAI.

Course outcomes :-

- Student can able to understand basic chemistry of soaps
- Student can get knowledge about recent trends for manufacturing of soaps
- Student can able to understand detergents and detergent duties
- Student know about detergents production and formulations
- Student can get knowledge about testing and evaluation methods

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SEMESTER–III

PAPER–II: EXTRACTION OF ESSENTIAL OILS (R25OF32)
Max. Marks: 100 **(Internal-30M & External-70M)**

Course objectives:-

- To know about the knowledge about chemistry of essential oils
- To know about the manufacturing of essential oils
- To acquire knowledge about the production and properties of Indian essential oils
- To learn about perfumery chemicals and blending of perfumes
- To get the knowledge about testing and evaluation of essential oils

Unit- I: **10H**

Introduction, sources, raw materials, classification and chemistry of essential oil bearing materials, , grading of essential oils, Physico chemical characteristics of essential oils

Unit- II: **12H**

Different methods of manufacturing of essential oils, expelling, water distillation, steam distillation, solvent extraction, newer technologies of essential oils like super critical extraction, Hydro Fluoro Carbon (HFC) extraction, Bio extraction etc.,

Unit- III: **12H**

Production, properties and composition of important Indian essential oils viz., rose, Jasmine, Khusum, Sandal wood, Keora, Palmrosa, lemongrass, peppermint, clove oils, orange oils, eucalyptus Oils,

Unit- IV: **12H**

Important isolates like menthol, camphor, thymol, geraniol, citral, eugenol, terpeniol, vanilline, coumarins, musk, natural synthetic and artificial benzyl acetate, benzyl benzoate synthesis, esters of geraniol, citraniol and terpenols, hydroxyl citronellol, haleotropins, castor oil based perfumery chemicals, blending of perfumes.

Unit- V: **14H**

Testing and evaluation of essential oils, Colour, specific gravity, R.I. solubility, A.V. & Ester values-Analysis of essential Oils for free alcohol, total alcohols, aldehydes &Ketones, Common adultery stand and their detection.

Reference Books:

1. Essential oils by Gunther
2. Manufacture of perfumes and essence by kalicharan
3. The essentiasl oils book edited by Colleen K.Dodt
4. Perfumes, cosmetics and soaps by W.A Poucher

Course outcomes:-

- Student can understand about chemistry of essential oils
- Student can understand about manufacturing of essential oils
- Student can get knowledge about production and properties of Indian essential oils
- Student can able to understand perfumery chemicals and blending perfumes
- Student can able to understand testing and evaluation of essential oils

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SEMESTER–III

PAPER–III: ENVIRONMENTAL ASPECTS OF OIL AND ALLIED INDUSTRIES
(R25OF33A)

Max. Marks: 100 **(Internal-30M & External-70M)**

Course objectives:-

- To know about the industrial pollution and industrial waste
- To know about the environmental management policy and regulations
- To know about the pollution prevention and environment management system
- To know about the liquid effluent treatment plant process
- To know about the solid and gas effluent treatment methods

Unit-I **10H**
Industrial pollution and its impact

Magnitude of industrial waste, Legislative regulations. Recycle and reuse of waste water, recovery of by- products from industrial effluents.

Unit-II **12H**
Environmental Management Policy and Regulations

Environmental policy global and Indian scenario, scope of air and water pollution problems, economic considerations of waste disposal, separation and segregation of wastes, gaseous, liquid and solid waste disposal with special reference to oils and allied product processing CPCB/ state pollution control board guidelines and regulations.

Unit-III **12H**
Waste Management

Pollution prevention and environment Management system ISO 14000. Waste audit, Different regulation means & acts for air, water& solid pollution control.

Unit-IV
Liquid Effluent Treatment Technology **14H**

Pretreatment methods, centrifugation filtration, evaporator and concentrator, extraction and distillation, treatment of dilute waste water. Treatment requirements, neutralization liquid-solid separation, biological oxidation, plant control programme, absorption, liquid phase system, reclamation of waste water effluent andby-productrecovery,ionexchangesystem,acidandalkalipurification,continuousion-exchange,Case studies on vegetable oil processing, soaps anddetergents.

Unit-V
Solid & Gas Effluent treatment **12H**

Waste gas treatment: spent earth, catalyst, fly ash boiler ash, Air pollution control by mechanical method: mechanical collectors, electrostatic precipitator, filters, wet scrubbers, vapour phase system, activated carbon. Typical air purification system.

Reference Books:

1. Air Pollution Engineering, S.K.Garg, Khanna Publishers(2016), DariyaGanj, NewDelhi.
2. Waste Water Engineering, Metcalf Eddy, Tata McGraw-Hill publishing Company Ltd. (1990) 2nd edition, NewDelhi.

3. Waste management for Sustainable Development in India by Nonita T Yap & S.K Awasthi, Tata McGraw-Hill publishing Company Ltd. NewDelhi.
4. Industrial waste management study at Kanpur by S.KAwasthi&R.K.Trivedi (2001), Wisdom PublishingHouse.

Course outcomes:-

- Student can able to understand the industrial pollution and industrial waste
- Student can get the knowledge about environmental management policy and regulations
- Student can able to understand pollution prevention and environment management system
- Student can get knowledge about liquid effluent treatment plant process
- Student can able to understand solid and gas effluent treatment methods

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SEMESTER–III

PAPER–III: MATERIAL ENGINEERING (R25OF33B)
Max. Marks: 100 **(Internal-30M & External-70M)**

Course objectives:-

- To know about the mechanical properties and technological properties of metals
- To know about the fracture of metals and causes of facture
- To get the knowledge about allotropic forms of pure iron
- To get the knowledge about corrosion and prevention of corrosion of metals
- To know about ferrous alloys, Non ferrous alloys and composite materials

Unit-I : **10H**

Mechanicalpropertiesofmetals:Elasticity,Plasticity,Ductility,brittleness,malleability,Weldability,Castability,Hardness,Hardnesstest,
Toughness,Stiffness,Resilience,creep,Endurance,strength,TypesofTechnologicalproperties,weldability,Castability Factors affecting Technologicalproperties,

Unit-II: **12H**

Fractureofmetals-causesoffracture,classificationoffractures.MechanismofBrittle, ductile, creep & fatigue fractures, Non destructivetests-Ultraviolet test, Radiographic tests, Magnetic particle test

Unit-III: **12H**

Allotropic forms of pure Iron, Heating curve for pure Iron. Iron-Iron carbide phasediagrams, Types of steels. Objectives of Heat treatment. Types of Heat treatmentprocesses, Normalizing, Annealing, Hardening, Tempering, and surface hardening.

Unit-IV: **12H**

Corrosion of Metals: Introduction, Electrode potential & Galvanic Series, Dry & WetCorrosion, Passivity, Types of Galvanic cells. Types of corrosions. Prevention andcontrol of corrosion.

Unit-V: **14H**
FerrousAlloys,castiron,effectofimpuritiesonCastiron,typesofcastiron,steeland their applications.
Non Ferrous metals: Aluminum alloys and copper alloys
Polymers, types of polymerization, Plastics, types of plastics, rubber and compositematerials.

Reference Books:

1. Material Science & Processes-R.S.Khurmi. &R.S.Sedha.

Course outcomes:-

- Student can get knowledge about mechanical properties of metals
- Student can get knowledge about fracture of metals and causes of facture
- Student can able get knowledge about allotropic forms of pure iron
- Student can able to understand about corrosion andprevention of corrosion of metals
- Student can able to know about different types of alloys and composite materials

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SEMESTER–III

PAPER–III: BIOCHEMISTRY OF FATS AND OTHER LIPIDS (R25OF33C)
Max. Marks: 100 (Internal-30M & External-70M)

Course objectives:-

- To know about the methods of quantitative and qualitative investigation
- To know about the polymorphism of fats and fatty acids
- To know about the fatty acid distribution of oils and fats
- To know about the knowledge Biosynthesis of fatty acids
- To know about the knowledge of Toxic constituents present in oil seeds

UNIT- I: 12H

Methods of quantitative and qualitative investigation of component triglycerides andfatty acids of natural and processed fats. Crystallization, oxidation, lipase hydrolysisand stereo specific analysis.

UNIT- II: 10H

Polymorphism of fats &fatty acids: Metal salts of fatty acids and other alkali metals,their methods of preparation analysis and applications.

UNIT- III: 12H

Fatty acid distribution in oils &fats: Theories of fatty acid distribution in natural fats.Effect of fatty acid distribution on physical and chemical properties of oils and fat.Synthetic try glycerides.

UNIT- IV:12H

Biosynthesis of fatty acids, phospholipids and tri glycerides in plants, Elongation andde saturation aclchains .Biological utilization of fats, Essential Fatty Acids.

UNIT- V: 14H

Toxicconstituentspresentinoilseeds,oilandfatswithspecialreferencetoaflatoxins,structureoftoxi cconstituentsandeffectonanimals.Methodsofdetoxifications. Urease and its activity in soya meal and cake.

Reference Books:

1. Progressing lipid chemistry by Holman.
2. Lipid chemistry- Gunstane&Hilditch.

Course outcomes:-

- Student can understand the methods of quantitative and qualitative investigation
- Student can understand the polymorphism of fats and fatty acids
- Student can understand the fatty acid distribution of oils and fats
- Student can understand the Biosynthesis of fatty acids
- Student can understand the Biosynthesis of fatty acids

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SEMESTER–III

PAPER–IV: ENERGY MANAGEMENT FOR EDIBLE OIL REFINERY (R25OF34A)
Max. Marks: 100 (Internal-30M & External-70M)

Course objectives:-

- To know about the concepts of Energy Management
- To know about the Energy resources in India
- To acquire knowledge about Principles and Objectives of Energy Management
- To learn about the Energy conservation in boilers
- To know about the Energy conservation in pumps and pumping systems

Unit – I
INTRODUCTION TO ENERGY MANAGEMENT PROGRAMS:
Introduction to Energy conservation act 2001 and its amendments, Necessary steps of energymanagement programmer - Concepts of Energy management - General principles of energymanagement – Energy management in manufacturing and process industries- Qualities andfunctions of Energy manager - Language of Energy manager-Checklist for top management.

Unit – II
ENERGY POLICY, SUPPLY, TRADE &PRICES:
Energy resources in India – level of power generation – transmission &distribution of power.Indian energy policy, Energy trade &its economic impacts – domestic energy production –Energy transformation & distribution &energy self-sufficiency. International & Nationalcrude oil prices – domestic fuel prices – natural gas, LPG, kerosene, and firewood – pricingpolicy.

Unit- III
Principles and Objectives of Energy Management
Design of Energy Management Programmes - Development of energy management systems – Importance - Indian need of Energy Management - Duties of Energy Manager – Preparationand presentation of energy audit reports - Some case study and potential energy savings.

Unit-IV
Thermal Energy Management
Energy conservation in boilers – Energy conservation opportunities in steam systems andIndustrial heating systems - Application of FBC and its types, Cogeneration and waste heatrecovery - Thermal insulation - Heat exchangers and application of heat pumps.

Unit- V
Electrical Energy Management
Introduction to electrical systems, introduction to demand side management, electricalmotors, and energy efficient motors, energy conservation opportunities in HVAC systems,energy conservation in cooling towers, energy conservation in pumps and pumping systems,energy conservation in industrial fan systems, and energy conservation in air compressors.

Reference Books:-

1. Albert Thumann, Handbook of Energy Audits, The Fairmont Press Inc., Atlanta gergia,1979.
2. Murphy W.R and Mckay G, Energy Management, Butterworths, London, 1982.

3. Albert Thumann, Plant Engineer and Management guide to Energy Conservation, VanNost and Reinhold Co., Newyork.
4. Energy Audits, E.E.O.-Book-lets, U.K. 1988.
5. Craig B.Smith, "Energy Management Principles", Pergamon Press.
6. The role of Energy Manager, E.E.O., U.K.
7. The Energy Conservation Design Resource Hand Book-The Royal Architectural Instituteof Canada. 8. Energy Management Hand Book-Ed. By Wayne C. Turner, John Wiley andsons, 1982.
8. Energy Management: W.R.Murphy, G.Mckay 109
9. Energy Management Principles: C.B.Smith
10. Efficient Use of Energy :I.G.C.Dryden
11. Energy Economics A.V.Desai
12. Energy Auditing and Conservation; Methods Measurements, Management and Case
13. study, by Hamies, Hemisphere, Washington, 1980.
14. Guide book for National Certification Examination for Energy Managers and Energy
15. Auditors (Could be downloaded from www.energymanagertraining.com).

Course outcomes:

- Student knows about the concepts of Energy Management
- Student knows about the Energy resources in India
- Student acquire knowledge about Principles and Objectives of Energy Management
- Student learn about the Energy conservation in boilers
- Student knows about the Energy conservation in pumps and pumping systems

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SEMESTER–III

PAPER–IV: MASS TRANSFER OPERATIONS (R25OF34B)
Max. Marks: 100 (Internal-30M & External-70M)

Course Objectives:
To know about the equilibrium and phase compositions
To know about leaching by percolation through stationary beds
To get knowledge about adsorption theory and types of adsorption
To know about the mechanism of batch drying and continuous drying
To get knowledge about crystallization process and crystallizing equipment

Unit I: 12H

Liquid Extraction-Extraction equipment, mixer-settler spray and packed extraction towers, perforated plate towers, baffle towers, agitated tower extractors, principles of extraction, equilibria and phase compositions, system of three liquids one pair partially soluble, two pairs partially soluble, choice of solvent, flow sheets for single stage extraction, cross current and multi stage extractions.

Unit II: 12H

Leaching- Define of leaching and its applications– batch and continuous leaching, leaching equipment, leaching by percolation through stationary solid beds, moving bed leaching, dispersed solid leaching, bollman extractor, Hilde brand extractor , rotocel extractor, kennedy extractor, principles of counter current leaching, constant and variable under flow, material balance for leaching.

Unit III: 12H

Adsorption-Theory and types of adsorption, industrial adsorbents, adsorption equilibria, adsorption hysteresis, differential heat of adsorption, adsorption of solute from dilute solution, fecundities equation, single stage and multi stage adsorption processes

Unit IV: 12H

Drying equilibria- drying rate curve, batch and continuous drying, direct and indirect dryers, rate of batch drying, time of drying, the mechanism of batch drying, continuous drying ,equipments like tunnel dryers, turbo type dryers, circulation dryers and rotary dryers.

Unit V: 12H

Crystallization –magma, crystal size distribution, crystal geometry, crystallographic system invariant crystals, crystal size and shape factors, principles of crystallization, purity, equilibrium and yields, crystallization equipment, vacuum crystallization, continuous crystallizer, draft tube crystallizer.

Referencebooks:-

1. Unit operations in chemical engineering- McCabe & Smith
2. Mass transfer operations- Robert E Treybal

Course outcomes:-

- Student knows about the equilibrium and phase compositions.
- Student knows about the knowledge of leaching by percolation through stationary beds.
- Student can able to get knowledge about adsorption theory and types of adsorption.
- Student can understand themechanism of batch drying and continuous drying.
- Student can able to understand about crystallization process and crystallizing equipment.

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SEMESTER–III

PAPER–IV: APPLIED MECHANICS (R25OF34C)
Max. Marks: 100 **(Internal-30M & External-70M)**

Course Objectives:

- To know about the equilibrium of coplanar forces
- To acquire knowledge about section properties.
- To get knowledge about the Analysis of trusses by the method of joints and sections
- To know about the velocity ratio and efficiency of a screw jack.
- To know about the Simple lifting machines

Unit-I: **12H**

Forces: Composition and Resolution of coplanar forces. Equilibrium of Coplanar forces. Simpleproblems.

Unit-II: **12H**

Section properties: Centre of gravity and movement of inertia of simple and composite

Sections, Simple problems.

Unit-III: **12H**

Trusses - Analysis of trusses by the method of joints and sections. Simple problems.

Unit-IV: **12H**

Friction: Types of friction. Mechanical-Advantage, velocity ratio and efficiency of a screw jack, Simple problems.

Unit-V: **12H**

Simple lifting machines, Wheel & Axle, winches and screw jack, Simple Problems

Reference Books:

1. Applied mechanics R.S.Kurmi

Course outcomes:

- Student can able to understand about equilibrium of coplanar forces
- Student can understand the section properties.
- Student can understand the Analysis of trusses by the method of joints and sections
- Student can get knowledge about the velocity ratio and efficiency of a screw jack.
- Student can get knowledge about the Simple lifting machines

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SEMESTER–III

PRACTICAL–I: SOAPS AND DETERGENTS LAB (R25OF35)

Max. Marks: 100 **(Internal-30M & External-70M)**

(Minimum Five Experiments must be carry out)

1. Preparation of soap by cold method
2. Preparation of soap by semi boiled method
3. Preparation of Metallic soaps
4. Analysis of soaps
   (a) Moisture and Volatile matter
   (b) Free alkali
   (c) Salts
   (d) Alcohol insoluble
   (e) Glycerin
   (f) Active detergent
   (g) Total Fatty Matter
5. Preparation of Detergent Powder
6. Preparation of Detergent cake
7. Preparation of Liquid Detergents.
8. Analysis of Detergents
   (a) Active matter content
   (b) Moisture and volatile matter
   (c) Matter insoluble in water
   (d) Matter insoluble in Alcohol
   (e) Free alkali

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PRACTICAL–II: PROCESSING OF OILS, FATS AND FAT BASED PRODUCTS LAB (R25OF36)

Max. Marks: 100 **(Internal-30M & External-70M)**

(Minimum Five Experiments must be carry out)

1. Extraction of Oils and estimation of Oil content in different oilseeds
2. Degumming of Oils
3. Alkali neutralization of Crude oils.
4. Miscella Refining of Crude oils
5. Bleaching of oils.
6. Preparation of Methyl esters (Bio-Diesel)
7. Fractionation of Oils.
8. Estimation of neutral oil in soap stock.
9. Estimation of neutral oil in acid oil.
10. Preparation of fatty acids by Twitchell's method
11. Removal of micro size dust particles from Effluent water using sedimentation technique.
12. To determine the effect of initial concentration and initial suspension height on the sedimentation rates.

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SEMESTER–III
PAPER-VII: BASIC COMPUTER APPLICATIONS (R25OF37)

Max. Marks: 50 (Internal)

Course Objectives

- To identify computer components and operate the Windows operating system confidently.
- To create, format, and print professional documents using MS Word.
- To create spreadsheets, apply formulas, and analyze data using MS Excel.
- To design and deliver effective presentations using MS PowerPoint tools.
- To understand SAP fundamentals, navigate the SAP system, recognize key functional modules, and gain awareness of SAP career opportunities**.**

Unit 1: Basics of Computers and Operating Systems

- Introduction to Computers - Definition, characteristics, and applications of computers,Types of computers (Desktop, Laptop, Tablet, Smartphone) , Computer Hardware - Input devices (Keyboard, Mouse, Scanner, Webcam) , Output devices (Monitor, Printer, Speakers)CPU, Memory (RAM, ROM), Storage devices (HDD, SSD, Pen Drive) - Computer Software , System software vs Application software , Introduction to Windows OS , Operating System Basics - Booting and shutdown process , Desktop, taskbar, start menu , File and Folder Management - Creating, renaming, copying, moving, and deleting files/folders , File extensions and file types , Use of Recycle Bin , Basic Troubleshooting - Virus basics and antivirus software , Safe handling of computers

Unit 2: MS Word – Document Creation and Formatting

- Introduction to MS Word - Features and uses of Word in offices and careers , Word interface and ribbon tabs , Creating Documents - Creating, opening, saving documents , Page setup and layout , Text Formatting - Fonts, styles, size, color , Paragraph alignment, spacing, indentation , Bullets and numbering , Advanced Formatting - Headers and footers , Page numbers , Columns and section breaks , Working with Objects - Tables (create, format, sort data) , Images, shapes, SmartArt , Proofing Tools - Spelling and grammar check , Find and replace , Mail Merge - Creating letters, labels, and envelopes , Printing and Document Sharing

Unit 3: MS Excel – Spreadsheets and Data Management

Introduction to MS Excel - Uses of Excel in business and jobs - Excel interface (Workbook, Worksheet, Cells) , Data Entry and Formatting - Text, numbers, dates , Cell formatting,

conditional formatting , Formulas and Functions - Basic formulas , Functions: SUM, AVERAGE, COUNT, MIN, MAX , Logical functions: IF , Working with Data - Sorting and filtering data , Data validation , Charts and Graphs - Column, Bar, Pie, Line charts , Chart formatting , Advanced Excel Basics - Pivot Tables (introduction) , What-if analysis (basic) , Practical Applications - Salary sheets, attendance sheets, result sheets

Unit 4: MS PowerPoint – Creating Effective Presentation

- Introduction to PowerPoint - Uses in education, business, and presentations , PowerPoint interface , Creating Presentations - Creating slides , Choosing themes and layouts , Slide Design - Text formatting , Images, icons, shapes , Multimedia - Adding audio and video , Animations and Transitions - Slide transitions , Custom animations , Presentation Skills - Slide show settings , Presenter view , Printing and Sharing Presentations

Unit 5: SAP – Enterprise Resource Planning Fundamenta

Introduction to SAP -Introduction to SAP and ERP concepts , SAP system overview and business process integration , SAP architecture basics (Presentation, Application, Database layers) , SAP GUI overview and system navigation , Transaction codes and menu path , **SAP Organizational Structure and Data** - Company, company code, plant, storage location , Organizational units and enterprise structure , Master data vs transaction data , User roles, profiles, and authorizations , **SAP Functional Modules Overview** - Overview of SAP functional modules , Materials Management (MM) , Production Planning (PP) , Sales and Distribution (SD) , Financial Accounting (FI) , Integration between SAP modules , SAP usage in manufacturing and process industries , **SAP Transactions and Reporting** - SAP transaction processing and data entry , Standard SAP reports , Introduction to SAP tables , Data accuracy, validation, and controls

Reference books:

Fundamentals of Computers – V. Rajaraman
Computer Fundamentals – P. K. Sinha & Priti Sinha
Introduction to Computers – Peter Norton
Microsoft Word Step by Step – Microsoft Press
Office Automation Tools – Ramesh Bangia
Working with Microsoft Word – BPB Publications
Microsoft Excel Step by Step – Microsoft Press
Excel Bible – John Walkenbach
Advanced Excel – Ramesh Bangia
Microsoft PowerPoint Step by Step – Microsoft Press
Office Automation Tools – Ramesh Bangia
Presentation Zen – Garr Reynolds
SAP ERP Fundamentals – Paul Hawking
Discover SAP ERP – Simha R. Magal & Jeffrey Word
SAP Functional Modules Overview – Ravi Shankar

Learning Outcomes:

- Students can able to identify computer components and operate the Windows operating system confidently.
- Students can able to create, format, and print professional documents using MS Word.
- Students can able to create spreadsheets, apply formulas, and analyze data using MS Excel.
- Students can able to design and deliver effective presentations using MS PowerPoint tools.
- Students can able to understand SAP fundamentals, navigate the SAP system, recognize key functional modules, and gain awareness of SAP career opportunities.

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SEMESTER–IV

PAPER–I: PRODUCTION AND FORMULATION OF COSMETICS (R25OF41)
Max. Marks: 100 (Internal-30M & External-70M)

Course objectives: -

- To know about the classification of cosmetics
- To know about the additives of the cosmetics
- To get the knowledge about the cosmetic preparations
- To acquire knowledge about shaving preparations
- To learn the analytical methods for testing of cosmetics

Unit- I:
Introduction, definition, classification of cosmetics- different types of cosmetics for everyday use like face powders, face creams, talcum powders, hair oil, hair creams & dyes, shampoos- baby shampoos, anti dandruff shampoos.

Unit- II:
Cosmetic ingredients viz, antibacterial agents and preservatives, anti irritants for surfactant based products ,anti irritants for sensory irritation, anti oxidants, colorants, hydrating substances ,skin feel agents, ultra violet filters, vitamins, elagic acid etc

Unit- III:
Preparation of different cosmetic products like decorative cosmetics- facial makeup, eye makeup, lip products, manicure & pedicure preparations, nail polishes, nail lacquers,

Unit- IV:
Skin preparations, like basic skin care, cleansing products, skin toners, post cleansing products pressurized dispenses like aerosols, men toiletries like shaving products , dental hygiene – tooth paste , coloring materials, bath and shower products, antiperspirants and deodorants.

Unit- V:
Analytical methods,(Analysis of creams and lotions, analysis of hair treatments, analysis of tooth paste) testing and evaluation of cosmetics and toiletries, safety regulations for cosmetics (The united states, The European Union, Japan)stability testing(Test conditions, Test samples, planning of tests, Recording result, interpretation)

Reference Books:

1. Cosmetic science and technology by Edward Sagarin
2. Hand book of cosmetic science and technology edited by Andrew O Barel, marc paye
3. Perfumes, cosmetics and soaps by W.A Poucher.

Course outcomes:

- Student can know about the classification of cosmetics
- Student can able to learn about the additives of the cosmetics
- Student can get the knowledge about the cosmetic preparations
- Student can acquire knowledge about shaving preparations
- Student can learn the analytical methods for testing of cosmetics

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SEMESTER–IV

PAPER–II: PACKAGING OF OILS, FATS AND ALLIED PRODUCTS (R25OF42)
Max. Marks: 100 (Internal-30M & External-70M)

Course objectives: -

- To study about the different packaging materials
- To know about the different packaging machines
- To get the knowledge about the different polymers for packaging
- To know about the requirements of the printing and laminations
- To acquire knowledge about testing of packaging materials

Unit I

Introduction to Packaging

Elements of packaging & its influence on customers, scopes and functions of a package. Materials used for packaging, paper and paper boards, films and foils, glassware, metals plastics, wood, miscellaneous other materials. Comparison of glass & plastic packaging.

Unit II

Criteria and selection of packing material

Requirements of packaging surfaces for oils and allied products viz. Compatibility with the material to be packed, properties of various packaging materials and their specifications,& essential components for selection of packaging materials, essential criteria for selection of packaging materials, Different packaging and sealing machine for liquid /semisolid packaging. Edible packaging &eco friendly alternative to the plastic

Unit III

Forms of packaging:

Folded cartons/boxes, corrugated board boxes, metal containers bags and envelopes, aerosols. Tubes, cans and different forms of plastics, types of polymers use as packaging materials & useful commercial blend of polymers packaging.

Unit IV

Printing of packaging surfaces

Requirements of Printing and evaluation of printed surfaces, co-extrusion, extrusion Coatings and laminations of the packaging surfaces, types and properties of coatings and limitations, different types of laminating machines, Typical laminates film's constructions and its benefits & application, Coating weight "Neck-in" and drawdown in extrusion Coatings and laminations.

Unit V

Packaging of various products

Oils and fats, soaps and detergents, cosmetics, petro chemicals, wax and wax products, essential oils and perfumes, lubricating oils and greases, by products of oils, soaps and allied industries, Limitation of solid waste management practices, Types of packaging material and environmental issues, advantages and disadvantages. Minimizing environmental impact, Physical & chemical tests of packing materials.

Reference Books:

1. Journal of Applied Packaging Research.
2. Journal of Indian Food Industry.
3. Central Food Technological Research Institute Mysore.
4. Qenos Technical Guides.
5. Journal of Food Science &Technology.
6. Journal of pharmaceutical & Scientific Innovation.
7. Journal of Indian Food Industry.

Course objectives: -

- Student can study about the different packaging materials
- Student can knows about the different packaging machines
- Student can get the knowledge about the different polymers for packaging
- Student can knows about the requirements of the printing and laminations
- Student can acquire knowledge about testing of packaging materials

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SEMESTER–IV

PAPER–III: PROCESSING OF PETROLEUM PRODUCTS (R25OF43A)
Max. Marks: 100 (Internal-30M & External-70M)

Learning objectives: -

- To study the Growth of petrochemical industry in India, petrochemicals and the importance of petrochemical industry, Theories on Origin of petroleum, Transportation of crude oil for refining.
- To study the Fundamental of Cracking-Principle, Reaction and parameters in thermal cracking, pyrolysis, vis-breaking, coking.
- To study the Fundamental of Crude oil distillation system- Operation in Single, Two, Three stages distillation units, Safety, storage and handling of Petrochemical Products. To be acquainted with product from a refinery, temperature range and uses of petroleum products.
- To understand the growth and history of Petrochemical industries globally and in India, petrochemical feed stock-category, composition, sources.
- To understand the manufacturing of Steam reforming of naphtha, cyclohexane, the manufacturing of methanol from synthesis gas, ethanol from synthesis gas, vinyl monomer (vinyl acetate)

UNIT-1: Theories on origin of petroleum inorganic origin of petroleum (theories) theories in support of organic origin of petroleum stages in the formation of petroleum- detection of petroleum pretreatment of oil refining desalting stabilization- composition of petroleum crude oil- petroleum element percent by weight classification of petroleum paraffin's- naphthene's- aromatics- asphaltic- olefins- naphthalene's- organic Sulphur compounds- resins. Transportation of crude oil for refining- trucks- pipelines- ocean- rail.

UNIT-2: Fractionation of crude petroleum oil- cracking- principle, necessity and types of cracking- catalytic cracking fixed bed crackers (houdry process)- moving bed thermos catalytic cracking- thermal cracking process description hydrogenation cracking- necessity for cracking- pyrolysis- process description- vis breaking process description coking- general methods of petroleum coke production are listed below. Hot oven method (kappers) thermal cracking (two coll dubs)- delayed coking- fluid coking- flex coking

UNIT-3: Petroleum refining- product from a petroleum refinery- single stage atmospheric distillation unit- two stage distillation unit- three distillation unit- storage and handling

of petroleum products. Fuel storage tank- storage tank heating exposure regulations on storage of petroleum products. Chemical feed stock.

UNIT-4: Petro chemical feed stock- category, composition and source industrial method of cyclo hexane manufacturing, first generation petro chemicals, second generation of petro chemicals manufacture of methanol from synthesis gas manufacturing of vinyl chloride from ethylene manufacturing of vinyl acetate – manufacturing of acrylanitrile by oxidation of propylene.

UNIT-5: Third generation petro chemicals – manufacturing of formaldehyde manufacturing of acetaldehyde manufacturing of acetic acid – manufacturing of aniline, Manufacturing Of Linear Alkyl Benzene.

Reference books:

1. Nelson N.L., 'Petroleum Refinery Engineering', McGraw Hill Book Co. (1985)
2. B.K. Bhaskara Rao, 'Modern Petroleum Refining Processes', Fifth Edition, Oxford and IBH Publishing Co. Pvt. Ltd.(2007)
3. James G. Speight, 'Handbook of Petroleum Product Analysis', First Edition, John Wiley and Sons, Inc. (2002)
4. Outlines of Chemical Technology C.E Dryden, Third edition Affiliated East-West Press private ltd (1997).

Course Outcomes:

- Student can knows the growth of petrochemical industry in India, petrochemicals and the importance of petrochemical industry, Theories on Origin of petroleum, Transportation of crude oil for refining.
- Student can study the Classify petroleum refining process and fractionation of crude oil
- Student can knows the Importance of 1st, 2nd, 3rd generation petrochemical, refinery products, their properties and uses.

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SEMESTER–IV

PAPER–III: STRENGTH OF MATERIALS (R25OF43B)
Max. Marks: 100 (Internal-30M & External-70M)

Course objectives: -

- To understand how Stress and Strains will acts upon objects.
- To understand the Theory of bending, bending movement when force act on any substance
- To know the Thin and Thick Cylinders when pressure applied on cylinder
- To study the Torque of Circular shafts
- To learn the technological methods riveted and welded connections in detail.

Unit-I:

Types of load, stresses & strains, (Axial and tangential) law, modulus, bulk modulus, modulus of rigidity, ratio, derive the relation between three elastic constants, -Principle of super position, stresses in composite section -Temperature stress, determine the temperature stress in composite bar (single core)-Simple problems on above.

Unit-II:

Theory of bending, Bending Movement and Types of beam and load -Concepts of Shear force and bending Moment-Shear Force and Bending moment diagram and its salient features illustration in cantilever beam, simply supported beam and over hanging beam under point load and uniformly distributed Load-Simple problems on above.

Unit II:

Thin and Thick Cylinders-Definition of hoop and longitudinal stress, Strain-Derivation of hoop stress, longitudinal stress, hoop strain, longitudinal strain and volumetric strain-Computation of the change in length, diameter and volume-Simple problems on above

Unit IV:

Torque of Circular shafts: Theory pure Torsion-Assumption of pure torsion -The torsion equation for solid and hollow circular shaft -Comparison between solid and hollow shaft subjected to pure torsion- Simple problems on above.

Unit V:

JOINTS: Introduction to riveted Types of Rivet -Definitions -Forces Acting on a Riveted- Types of Riveted Joint and welding-introduction- Advantages of Welding –Classification of welding joints. Simple problems on above.

Reference Books:

1. S Ramamrutham ,Strength of Materials Dhanpat Rai (publisher)

2. R K Rajput ,Strength of Materials S.Chand (publisher)

3. R.S khurmi, Strength of Materials S.Chand(publisher)

4. G H Ryder, Strength of Materials Mc millon and co. lmtd(publisher)

5. S Timoshenko and D H Young, Strength of Materials, TMH (publisher)

Course Outcomes:

- Student will learn about Hooks law, factor of safety, lateral strain, modules of rigidity and bulk modulus.
- Student can learn regarding cantilever uniformly distributed load for simply supported beam problems
- Student can learn regarding cylinders subjected to internal and external pressure in oil industries
- Student can knows the Importance of solid and hallow circular shafts and horse power transmission
- Student can knows the Importance of riveted and welded connections

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SEMESTER–IV

PAPER–III: ORGANIC SYNTHESIS PROCESS (R25OF43C)
Max. Marks: 100 (Internal-30M & External-70M)

Course objectives: -

- To study the Halogenation Thermodynamics and Kinetics of halogenations reactions.
- To understand the Manufacture of starch and Dextrin of mono and dibasic acids.
- To know the Sulphonation and Sulphation Kinetics, mechanism and thermodynamics.
- To study Nitrating agents, kinetics and mechanism in detail.
- To study Principles of Polymer chemistry and industrially important polymerization products

Unit-I:

Halgenation Thermodynamics and Kinetics of halogenations reactions, apparatus and materials of construction Technical preparations of ally chloride, DDT, Chloro benzene, BHC, Dichlorodifluro methane, vinyl chloride.

Unit-II:

Sulphonation and Sulphation: Sulphonating and Sulphating agents, Kinetics, mechanism and thermodynamics, Industrial equipment and technical preparation of aliphatic and aromatic sulphonates, Sulphonation of castor oil, coconut oil, naphthalene Sulphation of alpha lauryl alcohol, dimethylether

Unit-III:

Nitration Nitrating agents, kinetics and mechanism of aromatic nitrations, process equipment for nitration, typical industrial nitration process viz preparation of nitrobenzene nitro naphthalene, chloro nitrobenzene and nitroacetamide.

Unit-IV:

Manufacture of starch and Dextrin, Preparation properties and uses of mono and dibasic acids, Aceto acetic acid, malonic acid and their esters. Amines, Mono-di and triethyl amines.

Unit-V:

Principles of Polymer chemistry, industrially important polymerization products, polystyrene, polyvinyl chloride, polyvinyl acetate, epoxy resins, phenolics. caprolactum and isocyanates.

Reference Books:
1. Unit processers in Organic Synthesis by P.H.Groggins.

Course outcomes:-

- Student can learn about Technical preparations of ally chloride, DDT, Chlorobenzene, BHC, Dichlorodifluro methane, vinyl chloride.
- Student can learn regarding technical preparation of aliphatic and aromatic sulphonates, Sulphonation of castor oil, coconut oil e.t.c
- Student can learn regarding typical industrial nitration process viz preparation of nitrobenzene nitro naphthalene, chloronitrobenzene and nitroacetamide e.t.c.
- Student can knows the process and uses of mono and dibasic acids, Aceto acetic acid, malonic acid and their esters. Amines, Mono-di and triethyl amines e.t.c
- Student can understand the process and polystyrene, polyvinyl chloride, polyvinyl acetate, epoxy resins, phenolics. Caprolactum and isocyanides e.t.c

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SEMESTER–IV

PAPER–IV: CHEMICAL PROCESS ECONOMICS AND INDUSTRIAL MANAGEMENT (R25OF44A)

Max. Marks: 100 **(Internal-30M & External-70M)**

Course objectives: -

- To study Basic concepts of demand, supply, market and price
- To understand Cost analysis of equipments, depreciation e.t.c
- To know the Concept of Scientific management in Industry.
- To study Location of industry, material management and many more.
- To study Modern concepts of Marketing, market planning and implementation related concepts.

Unit-I:
Concepts of economics, Basic concepts of demand, supply, market and price, Demand forecasting, Nature and scope of Industrial projects, Requirements for project proposals, Types of production

Unit-II:
Cost analysis of equipments, depreciation, Fixed Capital, working capital, breakeven-analysis, payout period, rate of return, Optimum batches sizes, production Scheduling, Maintenance of equipments, Process of organization

Unit-III:
Industry, Commerce and business, Principles of scientific management- Taylor, principles of management- Henry Fayol , Levels of management, functions of management, decision making, planning, organizing, directing and controling.

Unit-IV:
Location of industry, material management, inventory control, Forms of business ownerships,Types of productions, production planning and control management of human resources, selection, incentives, welfare and safety.

Unit-V:
Modem concepts of Marketing,marketing mix, market planning and implementation. Sales organization and Sales management- Distribution channels,. Public relations, industrial enterprises and Environmental safety.

Reference Books:
1. Business Organization and Management-M.C. Shukla.
2. Handbook of Chemical Engineering. J.H.Perry.
3. Applied Project Management-Ludwig.

Course Outcomes:

- Student can study Basic concepts of demand, supply, market and price
- Student can understand Cost analysis of equipments, depreciation e.t.c
- Student can know the Concept of Scientific management in Industry.
- Student can study Location of industry, material management and many more.
- Student can study Modern concepts of Marketing, market planning and implementation related concepts.

ANDHRA KESARI UNIVERSITY::ONGOLE
DEPARTMENT OF OILS, FATS & PETRO PRODUCTS
SYLLABUS FOR M.Sc. OILS, FATS & PETRO PRODUCTS
(*For the students admitted from the academic year 2025-2026 onwards)*
SEMESTER–IV

PAPER–IV: BIO TECHNOLOGY OF OILS AND FATS (R25OF44B)
Max. Marks: 100 (Internal-30M & External-70M)

Course objectives: -

- To understand the cell structure of micro organisms
- To learn enzymatic fat splitting
- To know the enzymatic conversion of tri-glycerides
- To learn the bio-refining processes
- To know the bio detoxification methods.

Unit -I:

Introduction to Biotechnology-Cell structure of Bacteria, Virus, Algae, fungi, yeast Nucleic acids.

Unit-II:
Immobilized enzyme technology-Enzyme immobilization methods and procedure. Enzymatic fat splitting. Ester Synthesis with immobilized lipase.

Unit-III:
Enzymatic conversion of diglycerides to Triglycerides in palmoils. Production of Dicarboxylic acids by fermentation.

Unit-IV :
Enzymatic extraction of Rice bran oil Enzymatic deguming and bio refining of high FFA oils.

Unit-V:
Biodetoxification of oils & Biosurfactant production and application

BOOKS RECOMMENDED:

1. Proceeding of world conference on Biotechnology for the Oils & Facts industry edition by Thomas H.Apple white.

2. Biotechnology in processing Minor oils by D.K. Bhattacharya.

3. Concepts in biotechnology by Balasubramain

4. Biotechnology for Oils and Fats industry by colin

Learning outcomes:

- Student can understand the cell structure of micro organisms
- Student can learn enzymatic fat splitting
- Student can know the enzymatic conversion of tri-glycerides
- Student can learn the bio-refining processes
- Student can know the bio detoxification methods.

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SEMESTER–IV

PAPER–IV: INDUSTRIAL INSTRUMENTATION (R25OF44C)
Max. Marks: 100 (Internal-30M & External-70M)

Course objectives: -

- To study the characteristics of instruments
- To know about the different types of thermometers
- To understand the principles used in pyrometers
- To acquire the knowledge about measurement of head, pressure and density
- To learn about the working of different controllers

Unit-I:

Elements of Instruments-Static characteristics and Dynamic Characteristics-Cross section of Thermometer bulb, First order type and Second order type instruments.

Unit-II:

Constant volume Gas Thermometer, Mercury in Glass Thermometer, Bimetallic Thermometer and pressure spring thermometer. Thermometer recording mechanism. Vapor - Actuated thermometer, installation and the head effect. Response of thermometers, pneumatic balance pressure thermometer.

Unit-III:

Industrial thermocouples and radiation pyrometers, Principles used in optical, pyrometer. Analysis of moisture in Gases, absolute humidity, Specific humidity, relative humidity, wet bulb and dry bulb thermometer, dew point recorder, Measurement of moisture in paper and textiles.

Unit-IV:

Measurement of head and level: head, density and specific gravity, direct measurement to liquid level, pressure measurement in open vessels, level measurement in pressure vessels, density measurements.

Unit-V:

Automatic process control: Characteristics of Physical systems, Fluid resistance and capacitance, Elements of process dynamics: proportional element capacitance elements, and time constant element mechanism, diagrams of proportional, P.I.Controller and PID controller.

Reference Books:

1. Industrial instrumentation by D.P. Eckman.
2. Automatic process control by D.P.Eckman.

Course outcomes: -

- To study the characteristics of instruments
- To know about the different types of thermometers
- To understand the principles used in pyrometers
- To acquire the knowledge about measurement of head, pressure and density
- To learn about the working of different controllers

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SEMESTER–IV

PRACTICAL–I: COSMETIC FORMULATIONS LAB (R25OF45)

Max. Marks: 100 **(Internal-30M & External-70M)**

(Minimum Five Experiments must be carry out)

1. Cold creams.
2. Vanishing creams.
3. Tooth pastes.
4. Tooth powders.
5. Face powders.
6. Talcum powders.
7. Hair Oils.
8. Shaving creams.
9. Shaving soap.
10. Shampoos.
11. Lip balm.

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SEMESTER–IV

PRACTICAL–II: PROJECT WORK & VIVA-VOCE (R25OF46)
Max. Marks: 80 **(External-50+30=80M)**

Course Objectives

1. Specific topic for project are allotted to students to explore the possibilities of entrepreneurships development right from literature
2. Survey, raw materials availability, plant & machinery suppliers, cost analysis, marketing strategy etc.
3. Students make use of their knowledge and skills in the dissertation, techno-economic feasibilitystudy.Theyimplementtheirentiretechnical&commercialtalentforth eproject.
4. Equipment design enables use of unit operation principles.

Course Outcomes

The students are aware of MSME (Micro Small Medium Enterprises) entrepreneurships.

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SEMESTER–IV

SEMINAR (R25OF46)

Max. Marks: 20 **External-20M**

After completion of the Internship the student will be required to prepare and deliver a seminar as well as submit a written report on the internship done in Vegetable oil/ allied industries / any chemical industries where unit operation & unit process are there. This course will help students begin the process of taking responsibility for their education, career choices, and personal development.

Course Objectives:-

This course will help students develop an informed sense of academic and social belonging or "fit";

1) This course will assist students with identifying and practicing a sense of decidedness, engagement, and self-regulated learning;
2) This course will offer students the opportunity to enhance their ability to think critically about topics including life decisions and career direction; and
3 The course will strengthen students' ability to participate in an inquiry-based learning process.
4) Identify and compare technical and practical issues related to the area of course specialization.
5) Outline annotated bibliography of research demonstrating scholarly skills.
6) Prepare a well-organized report employing elements of technical writing and critical thinking.
7) Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

Course Outcomes:-

1. Students will be able to explicitly engage in ongoing self-reflection and inquiry processes
2. Students will complete an I-Search project that demonstrates critical thinking skills through:
   a. Identifying a personally meaningful and academically relevant question to explore related to the course theme.
   b. Designing a logical search plan to gathering information that addresses the question from multiple, relevant points of view.
   c. Gathering, organizing and interpreting relevant information and revising search plan as necessary.
   d. Reflecting on the process including new insights and knowledge about the topic, their own research question, and themselves as learners.
3. Students will integrate their lived experiences and their intellectual aptitudes through developing an Academic and Personal Plan.