

ANDHRA KESARI 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 2026-2027 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	R26OF11	Chemistry and Composition of Oils and Fats	4	4	30	70	100
		R26OF12	Extraction Techniques of Oil bearing Materials	4	4	30	70	100
	Compulsory	R26OF13	Quality Control of Oil and Allied Products	4	4	30	70	100
	Elective Foundation	R26OF14A	Fluid Mechanics and Mechanical Operations	4	4	30	70	100
		R26OF14B	Elements in Mechanical Operations					
		R26 OF14C	Material and Energy Balance					
	Core Practical-I	R26OF15	Technical Analysis of Chemical Compounds	4	6	30	70	100
	Core Practical–II	R26OF16	Physical Analysis of Oils, Fats and Fatty Acids	4	6	30	70	100
	Audit Course	*R26OF17*	*Human Values and Professional Ethics*	*2*	*2*	*50*	--	--
	Sub-Total			**24**				**600**
SEMESTER–II	Mandatory Core	R26 OF21	Refining of Oils	4	4	30	70	100
		R26OF22	Oleochemicals and Surfactants	4	4	30	70	100
	Research methodology	R26 OF23	Research Methodology, Ethics & Scientific Writing	4	4	30	70	100
	Elective Foundation	R26OF24A	Principles of Heat and Mass Transfer	4	4	30	70	100
		R26 OF24B	Industrial Processes of Specialty Fats					
		R26OF24C	Chemical Thermodynamics					
	Core Practical-I	R26OF25	Unit Operations Lab	4	6	30	70	100
	Core Practical–II	R26 OF26	Chemical Analysis of Oils ,Fats and Fatty Acids Lab	4	6	30	70	100
	Skill Development	*R26OF27*	*MOOCS Online(https://swayam.gov.in/; https://swayam-plus.swayam2.ac.in/)*	*2*	*2*	*50*	--	--
	Sub-Total			**24**				**600**
SEMESTER–III	Mandatory Core	R26OF31	Production and Formulation of Soaps and Detergents	4	4	30	70	100
		R26 OF32	Extraction of Essential Oils	4	4	30	70	100
	Core Elective-I	R26OF33A	Environmental aspects of Oils and Allied Industries	4	4	30	70	100
		R26 OF33B	Material Engineering					
		R26 OF33C	Biochemistry of Fats and Other Lipids					
	Open Elective-II	R26OF34A	Energy Management for Edible Oil Refinery	4	4	30	70	100
		R26OF34B	Mass transfer Operations					
		R26 OF34C	Applied Mechanics					
	Core Practical-I	R26 OF35	Processing of Oils, Fats and Fat based Products Lab	4	6	30	70	100
	Core Practical–II	R26OF36	Internship (Report submission+ seminar)	4	6	30	70	100
	Skill Enhancement	*R26OF37*	*MOOCS Online(https://swayam.gov.in/; https://swayam-plus.swayam2.ac.in /)/AI in Chemistry*	*2*	*2*	*50*	--	--
	Sub-Total			**24**				**600**
SEMESTER–IV	Mandatory Core	R26OF41	Production and Formulation of Cosmetics	4	4	30	70	100
		R26OF42	Packaging of Oils, Fats and Allied Products	4	4	30	70	100
	Core Elective-I	R26OF43A	Processing of Petroleum Products	4	4	30	70	100
		R26OF43B	Strength of Materials					
		R26 OF43C	Organic Synthesis Process					
	Open Elective-II	R26OF44A	Chemical Process Economics and Industrial Management	4	4	30	70	100
		R26OF44B	Biotechnology of Oils and Fats					
		R26OF44C	Industrial Instrumentation					
	Core Practical-I	R26OF45	Soaps , Detergents and Cosmetic Formulations Lab	4	6	30	70	100
	Core Practical-II	R26OF46	Project work (dissertation+ seminar+vivovoce)	4	6	--	100 (50+ 30+ 20)	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 2026-2027 onwards)*
SEMESTER–III

PAPER–I: PRODUCTION AND FORMULATION OF SOAPS AND DETERGENTS
(R26OF31)

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 Deters ive systems, How detergent works, Raw materials and their 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-byJ.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 (R26OF32)
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 essentia slo ils 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
(R26OF33A)

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 wastewater. Treatment requirements, neutralization liquid-solid separation, biological oxidation, plant control programme, absorption, liquid phase system, reclamation of waste water effluent and by-product recovery, ion exchange system, acid and alkali purification, continuous ion-exchange, Case studies on vegetable oil processing, soaps and detergents.

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),Dariya Ganj, New Delhi.
2. Waste Water Engineering, Metcalf Eddy, Tata McGraw-Hill publishing Company Ltd. (1990) 2nd edition, New Delhi.

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

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 (R26OF33B)
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
- Toget the knowledge about corrosion and prevention of corrosion of metals
- To know about ferrous alloys, Nonferrous alloys and composite materials

Unit-I: **10H**

Mechanical properties of metals: Elasticity, Plasticity, Ductility, brittleness, malleability, Weldabli ty, Castability, Hardness, Hardness test,
Toughness, Stiffness, Resilience, creep, Endurance, strength, Types of Technological properties, w eldability, Castability Factors affecting Technological properties,

Unit-II: **12H**

Fracture of metals-causes of fracture, classification of fractures. Mechanism of Brittle, ductile, creep & fatigue fractures, Nondestructive tests-Ultraviolet test, Radiographic tests, Magnetic particle test

Unit-III: **12H**

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

Unit-IV: **12H**

Corrosion of Metals: Introduction, Electrode potential & Galvanic Series, Dry &Wet Corrosion, Passivity, Types of Galvanic cells. Types of corrosions. Prevention and control of corrosion.

Unit-V: **14H**
Ferrous Alloys, castiron, effect of impurities on Castiron, types of castiron, steel and their applications.
NonFerrous metals: Aluminum alloys and copper alloys
Polymers, types of polymerization, Plastics, types of plastics, rubber and composite materials.

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 and prevention 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 (R26OF33C)
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 oilseeds

UNIT-I: **12H**

Methods of quantitative and qualitative investigation of component triglycerides and fatty acids of natural and processed fats. Crystallization, oxidation, lipase hydrolysis and 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 and de saturation acl chains .Biological utilization of fats, Essential Fatty Acids.

UNIT-V: **14H**

Toxic constituents present in oilseeds, oil and fats with special reference to aflatoxins, structure of toxi cconstituents and effect on animals. Methods of detoxifications. Urease and its activity in soya meal and cake.

Reference Books:

1. Progressing lipid chemistry by Holman.
2. Lipid chemistry-Gun stane&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 (R26OF34A)
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 energy management programmer - Concepts of Energy management - General principles of energy management –Energy management in manufacturing and process industries-Qualities and functions 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 &National crude oil prices – domestic fuel prices – natural gas, LPG, kerosene, and firewood – pricing policy.

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– Preparation and 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 and Industrial heating systems - Application of FBC and its types, Cogeneration and waste heat recovery - Thermal insulation - Heat exchangers and application of heat pumps.

Unit-V
Electrical Energy Management
Introduction to electrical systems, introduction to demand side management, electrical motors, 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 ger gia,1979.
2. Murphy W.Rand MckayG, Energy Management, Butterworths, London,1982.

3. Albert Thumann, Plant Engineer and Management guide to Energy Conservation, Van Nost 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 Institute of Canada. 8.Energy Management Hand Book-Ed. By Wayne C. Turner, John Wiley and sons, 1982.
8. Energy Management:W.R.Murphy, G.Mckay109
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 Ham ies, Hemisphere, Washington, 1980.
14. Guidebook for National Certification Examination for Energy Managers and Energy
15. Auditors(Could be downloaded from www.energy manager training.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 (R26OF34B)
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, Hildebrand extractor, rotocel extractor, kennedy extractor, princ ipl es 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 a dsorption, 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, e quipments 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.

Reference books:-

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 the mechanism 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 (R26OF34C)
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. Simple problems.

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 :PROCESSING OF OILS, FATS AND FAT BASED PRODUCTS LAB (R26OF35)

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 onthe sedimentation rates.



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SEMESTER–III

PRACTICAL–II: INTERNSHIP (R26OF36)

Max. Marks: 100 **(Internal-100M)**

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.

This training provides a basic backbone 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 communications kill of the student.



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SEMESTER–III

Paper-VII: MOOCS (R26OF37)

Max. Marks: 50M

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1) The students can choose a course from Swayam or Swayam plus platform using the below links with not less than 4 weeks course

https://swayam.gov.in/

(or)

https://swayam-plus.swayam2.ac.in/ AI in Chemistry

Note: Finally, the student has to submit the certificate to the University through respective College Principal.



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SEMESTER–IV

PAPER–I: PRODUCTION AND FORMULATION OF COSMETICS (R26OF41)
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, ela gic 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. Handbook 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 (R26OF42)
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. Q enos 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 (R26OF43A)
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 (R26OF43B)
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 acton 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 KRaj put, Strength of Materials S.Chand(publisher)

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

4. GHRyder, Strength of Materials Mcmillon and co.lmtd(publisher)

5. S Timoshenko and DHYoung, 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 (R26OF43C)
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, dimethyl ether

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 nitro acetamide.

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 process ers inOrganic 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, chloro nitrobenzene and nitro acetamide 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 (R26OF44A)

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.



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SEMESTER–IV

PAPER–IV: BIOTECHNOLOGY OF OILS AND FATS (R26OF44B)
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 biodetoxification 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 palm oils. Production of Dicarboxylic acids by fermentation.

Unit-IV:
Enzymatic extraction of Rice bran oil Enzymatic deguming and biorefining 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.Applewhite.

2. Biotechnology in processing Minor oils byD.K.Bhattacharya.

3. Concepts in biotechnology by Bala subra main

4. Biotechnology for Oils and Fats industry by colin

Learning outcomes:

- Student can understand the cell structure of microorganisms
- 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 biodetoxification methods.



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SEMESTER–IV

PAPER–IV: INDUSTRIAL INSTRUMENTATION (R26OF44C)

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 byD.P. Eckman.
2. Automatic process control byD.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: SOAPS ,DETERGENTS &COSMETIC FORMULATIONS LAB

(R26OF45)

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.Analysis of soaps
   i. Moisture and Volatile matter
   ii. Free alkali
   iii. Total Fatty Matter

4.Preparation of Detergent cake
5.Preparation of Liquid Detergents.
6. Analysis of Detergents
   iv. Active matter content
   v. Moisture and volatile matter
   vi. Matter insoluble in water

7. Cold cream
8. Shaving soap.
9. Shampoos.



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SEMESTER–IV

PRACTICAL–II: PROJECT WORK (DISSERTATION ,SEMINAR &VIVA-VOCE)

(R26OF46)

Max. Marks: 100 **(External-50+30+20=100M)**

Course Objectives

1. Specific topic for project are allotted to students to explore the possibilities of entrepreneur ships development right from literature
2. Survey, raw materials availability, plant&machinery suppliers, cost analysis, marketing strategy etc.
3. Students makeuseof their knowledge and skills in the dissertation, techno-economic
   feasibility study. They implement their entire technical&commercial talent forth eproject.
4. Equipment design enables use of unit operation principles.

Course Outcomes

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