Harcourt Butler Technical University, Kanpur-208002

B. Tech. Chemical Technology (Oil Technology)

Course Structure & Evaluation Scheme

(Effective from the session 2013-2014)

Year I Semester I Branch : Common to all branches

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											
1	IMA101	Mathematics I	3	1	0	30	20	50	100	150	4
2	IPH101/ICY101	Physics/Chemistry	3	1	0	30	20	50	100	150	4
3	IEE101/IET101	Electrical Engg./Electronics & **Instrumentation** Engg.	3	1	0	30	20	50	100	150	4
4	IME101/ICS101	Engg. Mechanics/ Concepts of Computer and C programming	3	1	0	30	20	50	100	150	4
5	IHU101/ICE101	Professional communication/ Engineering Graphics	3	1	0	30	20	50	100	150	4
6	IHU102/ICE102	Remedial English/Environment and Ecology	2	0	0				50	50	Audit
Practical/Training/Project											
7	IPH151/ICY151	Physics Lab/Chemistry Lab	0	0	3	10	10	20	30	50	1

8	IHU151/ICS151	Language Lab/Computer Lab	0	0	3	10	10	20	30	50	1
9	IEE151/IWS151	Electrical Engg. Lab/Workshop Practice	0	1	3	30	20	50	50	100	2
10	IGP101	General Proficiency						50		50	

Year I Semester II Branch : Common to all branches

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											
1	IMA201	Mathematics II	3	1	0	30	20	50	100	150	4
2	IPH201/ICY201	Physics/Chemistry	3	1	0	30	20	50	100	150	4
3	IEE201/IET201	Electrical Engg./Electronics & **Instrumentation** Engg.	3	1	0	30	20	50	100	150	4
4	IME201/ICS201	Engg. Mechanics/ Concepts of Computer and C Programming	3	1	0	30	20	50	100	150	4
5	IHU201/ICE201	Professional Communication/ Engineering Graphics	3	1	0	30	20	50	100	150	4
6	IHU202/ICE202	Remedial English/Environment and Ecology	2	0	0				50	50	Audit
Practical/Training/Project											

7	IPH251/ICY251	Physics Lab/Chemistry Lab	0	0	3	10	10	20	30	50	1
8	IHU251/ICS251	Language Lab/Computer Lab	0	0	3	10	10	20	30	50	1
9	IEE251/IWS251	Electrical Engg. Lab /Workshop Practice	0	1	3	30	20	50	50	100	2
10	IGP201	General Proficiency						50		50	

Harcourt Butler Technical University, Kanpur-208002

B. Tech. Chemical Technology (Oil Technology)

Course Structure & Evaluation Scheme

(Effective from the session 2014-2015)

Year-II Semester-III

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											
1	ICY-301	Modern Analytical Techniques	3	1	0	30	20	50	100	150	4
2	IMA-301	Mathematics – III	3	1	0	30	20	50	100	150	4
3	ICH-301	Materials and Energy Balance	3	1	0	30	20	50	100	150	4
4	ICH-304	Fluid Flow and Solid Handling	3	1	0	30	20	50	100	150	4
5	**IOT-301**	**Chemistry of Oils and Allied Products**	3	1	0	30	20	50	100	150	4
6	ICS-301	Cyber Security	2	0	0	-	-	-	50	50	Audit
Practical/Design/Training/Project											
6	ICY-351	Applied Chemistry Lab	0	0	6	30	20	50	50	100	2
7	**IOT-351**	**Oil Characterization Lab**	0	0	6	30	20	50	50	100	2
8	IGP-301	General Proficiency						50		50	--

Year-II Semester-IV

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											
1	IMA-401	Numerical methods & computer programming	3	1	0	30	20	50	100	150	4
2	ICH-401	Heat Transfer Operations	3	1	0	30	20	50	100	150	4
3	ICH-402	Chemical Engg. Thermodynamics	3	1	0	30	20	50	100	150	4
4	**IOT-401**	**Sources, Composition, Characterization of Oils, Fats and Waxes**	3	1	0	30	20	50	100	150	4
5	**IOT-402**	**Expression and Extraction Techniques of Oil Bearing Materials**	3	1	0	30	20	50	100	150	4
Practical/Design/Training/Project											
6	IMA-451	Numerical Methods & Computer Programming Lab	0	0	3	15	10	25	25	50	1
7	ICH-453	Chemical Engg. Unit Operation Lab	0	0	3	15	10	25	25	50	1
8	**IOT-451**	**Oil and Oilseed analysis lab**	0	0	6	30	20	50	50	100	2

9	IGP-401	General Proficiency						50		50	--

Harcourt Butler Technical University, Kanpur-208002

B. Tech. Chemical Technology (Oil Technology)

Course Structure & Evaluation Scheme

(Effective from the session 2015-2016)

Year-III Semester-V

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											
1	IME-506	Elements of Mechanical Engineering	3	1	0	30	20	50	100	150	4
2	ICH-501	Instrumentation and Process Control	3	1	0	30	20	50	100	150	4
3	ICH-506	Mass Transfer Operations	3	1	0	30	20	50	100	150	4
4	**IOT-501**	**Technology of Soaps and Fat Splitting**	3	1	0	30	20	50	100	150	4
5	**IOT-502**	**Commerce and Process Economics; Food Safety and Environmental Aspects of Oil**	3	1	0	30	20	50	100	150	4

		Industry									
Practical/Training/Project											
6	**IOT-551**	**Analysis of Soap Products**	0	0	6	30	20	50	50	100	2
7	**IOT-552**	**Oils and Allied Products Formulation Lab**	0	0	6	30	20	50	50	100	2
8	IGP-501	General Proficiency						50		50	--

Year-III Semester-VI

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											
1	IME-604	Machine Design	3	1	0	30	20	50	100	150	4
2	ICH-606	Chemical Reaction Engineering	3	1	0	30	20	50	100	150	4
3	ICH-607	Transport Phenomenon	3	1	0	30	20	50	100	150	4
4	**IOT-601**	**Refining of Oils**	3	1	0	30	20	50	100	150	4
5	**IOT-602**	**Quality Assurance of Oils and Allied Products**	3	1	0	30	20	50	100	150	4

Practical/Design/Training/Project											
6	ICH-653	Instrumentation and Process Control Lab	0	0	3	15	10	25	25	50	1
7	IOT-651	Detergent Products Preparation and Analysis Lab	0	0	6	30	20	50	50	100	2
8	**IOT-652**	**Seminar**	0	0	3	15	10	25	25	50	1
9	IGP-601	General Profeciency						50		50	--

Harcourt Butler Technical University, Kanpur-208002

B. Tech. Chemical Technology (Oil Technology)

Course Structure & Evaluation Scheme

(Effective from the session 2016-2017)

Year-IV Semester-VII

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											

1	ICH-701	Process Modeling and Simulation	3	1	0	30	20	50	100	150	4
2	**IOT-701**	**Hydrogenation and Modification of Oils**	3	1	0	30	20	50	100	150	4
3	**IOT-702**	**Technology of Surfactants and Synthetic Detergents**	3	1	0	30	20	50	100	150	4
4	**IOT-703**	**Advance Oil Chemistry and Oleochemicals**	3	1	0	30	20	50	100	150	4
5	**IOE-711(Open Elective)**	**Technology of Oils, Oleochemicals and Surfactants**	3	1	0	30	20	50	100	150	4
Practical/Training/Project											
6	**IOT-751**	**Oil Processing Lab -2**	0	0	6	30	20	50	50	100	2
7	**IOT-752**	**Industrial Training and Report Presentation**	0	0	3	-	-	50	-	50	1
8	**IOT-753**	**Project / Dissertation**	0	0	3	-	-	50	-	50	1
9	IGP-701	General Proficiency						50		50	--

Year-IV Semester-VIII

S.No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
Theory											
1	IHU-801	Engineering Economics and Management	3	1	0	30	20	50	100	150	4
2	ICT-801	Process Equipment Design	3	1	0	30	20	50	100	150	4
3	**IOT-801**	**Essential Oils & Cosmetics**	3	1	0	30	20	50	100	150	4
4	**IOT-802**	**Biotechnology of Oilseeds and Oils**	3	1	0	30	20	50	100	150	4
5	**Branch Elective** **IOT-803** **IOT-804** **IOT-805** **IOT-806** **IOT- 807**	**Petroleum Products and Petrochemicals** **Packaging of Oils, Fats and Allied Products** **Technological Advances in Perfumery and Cosmetics** **Environmental Aspects of Oils and Allied Products** **Fuels and Green Lubricants**	3	1	0	30	20	50	100	150	4

Practical/Design/Training/Project											
6	**IOT-851**	**Design and Tehno-economic Feasibility Project**	0	0	12	30	20	50	100	150	3
7	**IOT-852**	**Project On Industrial Assignment**	0	0	3	15	10	25	25	50	1
8	**IOT-853**	Educational Tour Evaluation	0	0	3	15	10	25	25	50	Audit
9	IGP-801	General Proficiency						50		50	--

IOT-301 CHEMISTRY OF OILS & ALLIED PRODUCTS

L : T: P

3 1 0

Unit-I

History and general introduction

Oils, fats, waxes, mineral oils, essential oils, their sources, composition and structures. Constituents of natural fats Glycerides and fatty acids, their nomenclature, classification and principle sources; theories of glyceride structure. Statistics of area under cultivation and oil Production in the Country vis-à-vis world.

06

Unit –II

Non–glyceride components, important minor constituents and contaminants

Phosphatides, sterols, gossypol, carotenoids, hydrocarbons, coloring matter, natural pigments, vitamins, antioxidants, , Fatty Alcohols, Sterols, Tocopherols, Tocotrinols, Oryzanols, Triterpine Alcohols Waxes etc. Gossypol, Sesamol and Sesamoline, Flavoring compounds.

Some minor important constituents of oilseeds: ricin, sinigrin, linamarine, saponin, allyl iso thiocyanate , gossypol, sesamol and sesamoline; environmental contaminants.

08

Unit – III

Physico-chemical characteristics of natural oils, fats and fatty acids

Oiliness and viscosity, cloud point, titre, density and coefficient of expansion, melting point, plasticity of fats & plastic range, smoke, flash and fire points, Boiling point; solubility and miscibility, refractive index,. Acid value, saponification value, Iodine value, thiocyanogen value, diene value, acetyl and hydroxyl value Riechert Miessel and Polensky values, and Kirshner value, Peroxide Value, Anisidine Value, Oxirane Value, TBA value, Krishner Value, Totox value, unsaponifiable matter. BIS methods for testing of oils and fats

08

Unit –IV

Adulteration tests for vegetable and animal fats and oils and their chemistry

Boudiens Test, Holde Test, Halphens test, Hexa Bromide Test, Ammonium Molybdate test, Belliers Turbidity Test, Test for the presence of Argemone, Sal Neem Kusum, Karanja, Animal fat, Allylisothiocyanate test, Detection of ricebran oil in other oils and other relevant test. 08

Unit –V

Brief introduction to chemical reactions of fats and fatty acids

Esterification, interesterification saponification, hydrolysis: reactions involving the carboxyl groups e.g., formation of metal soaps: nitrogen derivatives, acid chlorides, anhydrides etc.: alkoxylation, pyrolysis: reactions in the fatty acid chain; hydrogenation, dehydrogenation, halogenation, addition of sulphur, phenols, cresols , hydrogen sulphide and mercaptans: sulphation and sulphonation and miscellaneous addition to the double bonds, Rancidity and mechanism of chemical and auto oxidation, natural & synthetic antioxidants

10

Reference Books and suggested readings:

1. Bailey's Industrial Oil and Fat Products, Edition 6 Vol-1 (2005), Edited by Feireidoon Shahidi
2. A text book of oil and fat analysis By Cocks & Reid
3. An introduction to chemistry & Biochemistry of Fatty acids & their glyceride By F.D. Gunstone
4. Oils and Fats Manual Vol- I, 1996, Edited by A. Karleskind
5. Chemistry and Technology of Oils and Fats, 2003, Edited by M.M. Chakraborty
6. BIS specifications; IS- 548, part I,II & III
7. Food Lipids; Chemistry Nutrition and Biotechnology By Casimir C. Akoh & David B. Min
8. Lipid Analysis of Oils &Fats, P.J. Hamilton, Liver pool, John Moores Univ., Liver Pool (UK)
9. Modern Technology in Oils and Fats Industry, Vol-II, OTAI (NZ)
10. Handbook of Oil Technology by AOCS

IOT- 351 Oil Characterization Lab

L : T: P

0 : 0 : 6

1. Determination of physical characteristics of oils and fats
   - i) Specific gravity
   - ii) Refractive Index
   - iii) Colour
   - iv) Viscosity by Ford cup and Ostwald Viscometer
   - v) Titre
   - vi) Flash Point, Smoke point and Fire point
   - vii) Slip point of fat
   - viii) Moisture and insoluble in crude oil
   - ix) Unsaponifiable Matter
2. Determination of chemical characteristics of oils and fats
   - i) Acid value
   - ii) Saponification value
   - iii) Iodine Value
   - iv) Hydroxyl and acetyl Value
   - v) Peroxide value

Reference Books and suggested readings:

1. BIS specifications; IS- 548, part I,II & III
2. A text book of oil and fat analysis By Cocks & Reid
3. Food Lipids; Chemistry Nutrition and Biotechnology By Casimir C. Akoh & David B. Min
4. Lipid Analysis of Oils &Fats, P.J. Hamilton, Liver pool, John Moores Univ., Liver Pool (UK)
5. Modern Technology in Oils and Fats Industry, Vol-II, OTAI (NZ)
6. Analysis of Oil & Fats by Bookenhoogen

IOT-401 Sources, Composition, Characterization of Oils, Fats and Waxes

L : T: P

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Unit-I

Natural sources of oils and fats

Global and National production, demand and supply scenario of oilseed and oils, Import and export of oils, oilseeds and oil cake, Past trends and future projections in fluctuations of production and price and their reasons.

08

Unit-II

Handling and Storage of Oils and oilseeds

Handling of oilseeds, oil bearing materials and crude oils. Storage of oilseeds, Grading and evaluation of oilseed and oil bearing material as per BIS/ Codex, Drying of oilseed.

06

Unit –III

Commercial oils, oilseeds, cultivation, characteristics, composition and utilization from plant sources

Coconut, palm, palm kernel, olive, cocoa butter, sunflower, safflower, sesame, groundnut, mustard, rape-seed, canola, soybean, linseed,castor , rice-bran, cottonseed, corn, tung, oiticica, , neem, mahua, kusum, karanja, sal, mango kernel ,tobacco, shea fat, watermelon, maize germ, algae oils, chiaseed oil, jatropha etc. Genetically modified oilseeds 10

Unit -IV

Production, characteristics, composition and utilization of oils from animal sources

Milk fats and butter, Animal fats, lard, tallow, emu oil and greases etc. Fish and marine oils: halibut, herring, shark, menhaden, whale, sardine, fish liver oils, krill oil etc, Different methods of rendering. 08

Unit -V

Natural and synthetic waxes characteristics, composition and utilization

Natural waxes such as bees wax, shellac wax, carnauba wax, sugarcane wax, Montana wax, jojoba wax, sperm-oil , ricebran , sunflower and spermaceti, synthetic waxes, their occurrence, classification , general properties and uses. **08**

Reference Book

1. Bailey's Industrial Oil and Fat, Edition 6 Vol-2 (2005), Edited by Feireidoon Shahidi
2. Oils & fats Technology Edited by E. Bernardini
3. Neem: A wonder tree Edited by R.K. Suri & Mehrotra

4. Non Traditional oilseeds and oils in India, (1987) Edited by N.V. Bringi
5. Rapeseed cultivation, composition, processing and utilization Edited by L.A. Appelquist & R.Ohlson
6. Deep Frying; Chemistry, Nutrition and Practical Application, Michel D.Erickson IInd Edition

IOT-402 EXPRESSION AND EXTRACTION TECHNIQUES OF OIL BEARING MATERIALS

L : T: P
3 : 1: 0

Unit-I

Pre-treatments of oil bearing materials:
Cleaning, dehulling, decortication, size reduction, pre-pressing, flaking, extrusion, pelletization, stabilization (for rice bran), etc. Plants, processes and the machinery used.

08

Unit-II

Production of Oil by mechanical expression:
Machinery employed for expression/ mechanical extraction of oils viz. Ghanis, hydraulic presses, screw presses, low pressure and high pressure expellers, expander- extruder system

08

Unit-III

Production of Oil by solvent extraction:
Principle of solvent extraction, solvents and their availability, selection of solvents, advantages and limitations, properties of different solvents. Solvent extraction techniques: Batch and continuous plants and processes employed for solvent extraction of low and high oil bearing materials. **08**

Unit-IV

De-solventization of meals:
Equipments and plants employed for de- solventization from extracted meal and recovery of solvent from micella, current trends, storage & detoxification of oil cakes, production of Protein products, concentrates and isolates;

06

Unit-V

Alternative extraction processes:
Principle and comparison with conventional solvent extraction processes. Use of super critical fluid and liquefied gases for oilseed extraction and oleoresin preparations, HCF extraction, Aqueous extraction. Enzymatic extraction; Solvent losses and

utility requirements, energy conservation. Safety & hazards, maintenance and environmental consideration of solvent extraction plants & solvent recovery systems. **10**

Reference Book and suggested readings:

1. Bailey's Industrial Oil and Fat, Edition 6 Vol-5 (2005), Edited by Feireidoon Shahidi
2. Oil and Fat Technology Edited by E. Bernardini
3. Solvent extraction of vegetable oil by Parikh
4. Oilseed and Oil Milling in India
5. Proceedings of AOCS
6. Handbook of SEA
7. Oil Extraction &Analysis (critical issue and comparative studies) , D.L. Luthria, US Department of Agriculture Behtsville, Maryland
8. Solvent extraction of Oils, Monogram by Dr. R.K. Trivedi
9. Chemical Process safety by Crowl

.

IOT-451 OIL AND OILSEEDS ANALYSIS LAB

L : T: P

0 : 0 : 6

1 Analysis of individual oils as per FSSIR/ BIS /CODEX methods

2. Identification tests and detection of adulteration in oils and fats.
   Boudiens Test, Holde Test, Halphens test, Hexa Bromide Test, Ammonium Molybdate test, Belliers Turbidity Test, Test for the presence of Argemone, Adulteration of rice bran in mustard oil, Adulteration of palm oils in other oils, Adulteration of other oils in olive oil, Adulteration of Animal fats in vegetable oils.
3. Analysis of oilseeds and cakes as per FSSIR/ BIS methods:
   (a) Moisture Content
   (b) Oil Content
   (c) Nitrogen/ Protein Content

(d) Crude fiber Content
(e) Ash Content
(f) Trace metals, pesticides and naturally occurring toxins

4. Analysis of toxic constituents in oilseed and oilcakes
5. Determination of Allyl Iso-thio cynate in mustard oil as per Agmark
6. Complete analysis of oilcakes from oilseeds
7. Complete analysis of rice bran and its meal
8. Shelf life tests(OSI) , anisidine value

Reference Books and suggested readings:

1. BIS specifications; IS- 548, part I,II & III
2. A text book of oil and fat analysis By Cocks & Reid
3. Food Lipids; Chemistry Nutrition and Biotechnology By Casimir C. Akoh & David B. Min
4. Lipid Analysis of Oils &Fats, P.J. Hamilton, Liver pool, John Moores Univ., Liver Pool (UK)
5. Modern Technology in Oils and Fats Industry, Vol-II, OTAI (NZ)
6. Analysis of Oil & Fats by Bookenhoogen
7. Analysis of Oil & Fats by Malhenbacher
8. Official methods of AOCS
9. Handbook of FSSR

IOT-501: TECHNOLOGY OF SOAPS & FAT-SPLITTING

L : T: P
3 : 1: 0

Unit-I

Fundamentals of soaps:

History and background of soaps, General principles of soap-making, chemistry of cleaning action in soaps. Study of saponification reaction, velocity and temperature. Raw material for soaps and their selection: role of INS factor, solubility ratio and hardness number, quality specifications and soap making properties of oils and fats. Selection and functions of builders, fillers and other auxiliary raw materials, Upgradation of raw materials including fractionation .

10

Unit-II

Manufacture of household soaps:

Machinery employed and quality specifications with emphasis on effect on quality of milling and plodding, Production of soap base by traditional methods in single vessel, saponification in presence of catalysts and/or at high temperature and high pressure and Production of washing and toilet soaps from soap base by cold, semi-boiled and full boiled processes, phase behavior , Manufacture of soaps from fatty acids & methyl esters. **08**

Unit-III

Continuous processes of soap manufacture:

Principles related to the production of extruded soaps-solidification and high shear reaction system, drying, extrusion, solid-solid co-extrusion, homogenization and plastic working. Modern process and plant for the production of household and toilet soaps viz. cascade, mazzoni . Specifications of soaps and fatty acids as per BIS standards.

08

Unit-IV

Manufacture of specialty soaps:

Soft soaps, liquid soaps, transparent and translucent soaps, super fatted soaps, medicated soaps, floating soaps, multicoloured soaps etc. Soap powders like spray-chilled and spray-dried powders. **06**

Unit-V

Fat splitting and fatty acid distillation:

Hydrolysis of oils and fats; composition of partially split fats. Effect of temperature, pressure, catalyst and ratio of reactants in hydrolysis of fats; degree of splitting; Plants and processes employed for fat splitting: Twitchell process, enzymatic fat splitting, low,

medium and high-pressure autoclave processes; semi-continuous and continuous processes of fat splitting, single cut and two cut column for DFA production. Fatty acids, distillation , crystallization , fractionation, high purity fatty acid products blends distillation. Specifications of fatty acids and glycerine as per BIS. Recovery of glycerine from spent soap lye & sweet water.
08

Reference Books and suggested readings

1. Soaps: Their chemistry & Technology by J.G. Kane
2.Soaps & detergent by K.S. Parasuram
3. Bailey's Industrial Oil and Fat, Edition 6 Vol-6 (2005), Edited by Feireidoon Shahidi
4.. Gylcerin Edited Vol -11 (1991)by Eric Jungermann & Norman O.V. Sonntag
5. Surfactants Series vol I- VII
6. Soap Technology By Davidson
7. Soap Technology By Elliot
8. Fatty Acid Series By Markley

IOT-502: Commerce and Process Economics; Food safety and Environmental aspects of Oil Industry

L : T: P
3 : 1: 0

Unit- I

Procurement process for oilseeds and oils:

Different mechanisms, Agencies involved in procurement at national and international level. Tax and import duty structure for oilseeds, oils – crude and refined, edible as well as non edible. Component of transport, labour, insurance and storage involved in cycle of procurement. Present day practices of sale through bulk/ packaged imports, with supply chain management.

08

Unit II

Components of Costing and Human resource development:

Cost and cost analysis of establishing plants e.g. Fixed and variable cost, Break Even Point, Rate of Return, Pay Back Period, Depreciation etc. Human resource Planning: Importance and processes, Job analysis and Engagements, Training need analysis.

08

Unit- III

Utilities & Production planning

Utilities; power, steam, air, water in expression, solvent extraction refining plant, hydrogenation plant, oleochemical unit. Energy conservation in oil processing industry. A working layout and calculation of cost of production for above plants and feasibility studies.

Factory lay out: Principles, general considerations, typical flow diagrams, single & multi storied buildings, different sections of a paint factory and their locations, Instrumentation and automation. 08

Unit-IV

By- products of oil and oilseed processing industry and their utilization;

Phospholipids, production of industrial and edible grade Lecithin, gums. Manufacture of cattle and poultry feed; production of protein concentrates and isolates. Re-esterification of fatty acid with glycerin and its trans-esterification for production of biodiesel. Utilization of deteriorated deep fried oil for industrial utilization. 08

Unit- V

Safety measures, Effluents and their treatment:

Segregation of deodorizer distillate and isolation of value added products by conventional and molecular distillation and other plants and machinery involved. Classification of effluents of oil and allied industries, Safety considerations in storage of hazardous, and inflammable raw materials. Fire Protection and safety: Sources, types, Fire & explosion index, safety measures for protection. Health and Hazards: Resources, competence & regulations, systems & tools, HAZOP guidelines,

Environment: Eco-friendly, waste minimization & waste disposal, Effluent Treatment Plants, system efficiency, respiratory protective equipments. GOI specifications of effluents, eco-friendly processes and green technologies

8

Reference Books and suggested readings:

1. Plant Design & Economics by Peter Timmer House
2. Air & Water by Giringer
3. Efficient use of Steam by Goodall

IOT-551 : ANALYSIS OF SOAP PRODUCTS

L : T: P

0 : 0 : 6

1. Analysis of household washing and toilet soaps as per BIS:
(a) Moisture and volatile matter content
(b) Free alkali
(c) Total alkali
(d) Total fatty matter
(e) Sodium chloride content
(f) Glycerol content
(g) Titre of fatty acids of soaps
(h) Alcohol soluble & Insolubles
(i) Identification of fat base
2. Analysis of P_2O_5 content in STPP
3. Determination of Surface Tension, Interfacial Tension, CMC and Contact angle
4. Determination of Fatty Acid profile of Toilet soaps
5. Analysis of Glycerin as per BIS/AOCS Method
6. Karl-Fischer method for determination of moisture

Reference Books and suggested readings

1. Soaps: Their chemistry & Technology by J.G. Kane
2.Soaps & detergent by K.S. Parasuram
3. Bailey's Industrial Oil and Fat, Edition 6 Vol-6 (2005), Edited by Feireidoon Shahidi
4.. Gylcerin Edited Vol -11 (1991)by Eric Jungermann & Norman O.V. Sonntag
5. Surfactants Series vol I- VII
6. Soap Technology By Davidson
7. Soap Technology By Elliot
8. Fatty Acid Series By Markley
9. BIS- 286

IOT-552: OILS AND ALLIED PRODUCTS FORMULATION LAB

L : T: P
0 : 0 : 6

1. Laboratory preparation for the following:
   (i) Metallic soaps
   (ii) Turkey Red Oil
   (iii) Pilot scale manufacture of Toilet soaps
2. Laboratory preparation for the following:
   1. Cold Creams
   2. Vanishing Creams
   3. Tooth Pastes
   4. Tooth Powders
   5. Face Powders
   6. Talcum Powders
   7. Hair Oils

3. Preparation of Shampoos

Reference Books and suggested readings

1. Soaps: Their chemistry & Technology by J.G. Kane
2.Soaps & detergent by K.S. Parasuram
3. Bailey's Industrial Oil and Fat, Edition 6 Vol-6 (2005), Edited by Feireidoon Shahidi

IOT-601: REFINING OF OILS

L : T: P
3 : 1: 0

Unit-I

Pretreatment of oils:

Impurities of crude oils & micronutrients: Effect of refining and other processing on specific impurities. Washing of crude cotton seed oil, degumming of oils and fats: Mechanism of degumming, various methods employed for degumming, De-waxing of oils: Principle and methods of de-waxing of individual oils,

08

Unit-II

De-acidification of oils and fats:

De-acidification by alkalis e.g. caustic soda and sodium carbonate; batch and continuous methods; seperators, refining losses, effect of operating variables, liquid-liquid extraction, miscella refining; Zenith refining, cold refining, physical refining of oils: Batch, semi-continuous and continuous methods, principle of major types of continuous process, their merits and demerits, esterification, nano-neutralisation etc. and their limitations. Treatment and disposal of gums and soap stock: Batch and continuous methods.

10

Unit-III

Bleaching of oils and fats:

Theory of adsorption bleaching; components responsible for oil color; chemical and physical characteristics of various bleaching agents; activated bleaching earth and activated carbon and their methods of manufacture, extraction of oils from spent earth, determination of bleachability and bleaching efficiency of adsorbents, batch and continuous methods of bleaching by adsorption; DOBI value, filtration techniques for removal of spent bleaching agents from bleached oils viz. Plate & frame filter, polish filter, pressure leaf filter, use of hydro gel & silica gel, chemical bleaching; color fixation in oils and fats.

08

Unit-IV

Deodorization of oils:

Components responsible for odor, flavour reversion, principle of deodorization, batch and continuous methods of deodorization; effect of operating variables; deodorization losses, commercial deodorizer design, thin film deodorization, vacuum systems and their applications, cooling tower, blending of oils, micronutrients present in vegetable oil and effect of processing on micronutrients Nutritional significance, specifications of blended and refined oils. Specifications of oils as per FSSAI, permissible limits of additives.

08

Unit-V

Membrane technology, Biotechnology and other separation processes of crude vegetable oils:

Degumming, de-acidification and bleaching. . Fractionation of Palm Oil and other vegetable and animal oils & fats. Biotechnology: Principle and its application in oil and fat processing, 06

Reference Books and suggested readings:

1. Technology and refining of oil and fats by T.L. Mahatta
2. Bailey's Industrial Oil and Fat, Edition 6 Vol-5 (2005), Edited by Feireidoon Shahidi
3. Bleaching & purifying fats and oils; Theory & Practice Edited by H.B.W. Patterson
4. Practical guide in vegetable oil processing by Manoj K. Gupta
5. Chemistry &Technology of Oils &Fats by M.M. Chakarobarty
6. Fats & Oils Handbook by Michael Bockich
7. Fats & Oils handbook vol. 1 AOCS press
8. Fats & Oils by Richard O' brien

IOT-602: Quality Assurance of Oils and Allied Products

L : T: P

3 : 1: 0

Unit -I

Quality control and Quality Assurance:

Concept of quality assurance and quality control in relation to oil industry; quality management systems - ISO 9000; total quality management (TQM); hazard analysis of critical control points (HACCP); good manufacturing practices (GMP); role of international organisations such as ISO; IDF; CAC; AOAC; WTO and national organisations like BIS; and Agmark; FSSAI and APEDA (Agricultural and Processed Foods Export Development Authority) in oil industry; guidelines for setting up quality control laboratory. Legislation on oils and allied products 10

Unit –II

Chromatographic Techniques:

Theoretical developments of various techniques viz. thin layer chromatography, column chromatography, gas-liquid chromatography, HPLC and Super critical Chromatography; their principles, practices and their applications in the quality control and quality assurance of oils, fats and allied products. 8

Unit –III

Spectroscopic Techniques;

Ultra-Violet, Visible, FTIR, NIR and NMR, Mass spectroscopic techniques: principles, practices and their application in the analysis of oils and allied products; Interpretation of spectra and quantitative applications.

8

Unit –IV

Special quality control methods:

Nickel content of catalyst and hydrogenated oils; iron, sulphur and phosphatide content of crude and refined vegetable oils; wax content of vegetable oils; Vitamin A,D & E(natural & fortified); residual pesticide and solvent analysis, chlorophyll content, amino acid analysis by chemical and instrumental method etc.

8

Unit –V

Hyphenated techniques:

TLC-FID/FPD, GC-MS, SFC-GC, LC-MS, ICP-MS, AAS in analysis of oils and fats.

6

Reference Books and suggested books:

1. Fatty acids; Their chemistry, properties, production and uses Part – III Edited by K.S. Markley
2. Principles of Instrumentation analysis, Edition- III (1985) Edited by Douglas A. Skog
3. CODEX/ BIS
4. PFA
5. Agmark

IOT-651: DETERGENT PRODUCTS PREPARATION AND ANALYSIS LAB

L : T: P

0 : 0 : 6

1. Preparation of Detergent powder

2. Preparation of Liquid detergents

3. Analysis of synthetic detergent powders as per BIS
    1. Active matter content and its type
    2. Moisture and volatile matter content
    3. Matter insoluble in water
    4. Matter insoluble in alcohol
    5. Active alkalinity
    6. Sodium poly phosphate content & Total phosphate content
    7. Other builders
    8. Chloride content
    9. Polymers
    10. Enzymes

4. Analysis of alkyl benzene sulphonic acid as per methods of BIS
    (a) Active matter
    (b) Free LAB
    (c) Sulphuric acid content

5. Determination of performance characteristics of surfactants and detergent products:
    (a) Foaming power
    (b) Dispersing power
    (c) Relative detergency
    (d) Surface tension and Interfacial tension
    (e) Critical miscelle concentration
    (f) Detergency test

Reference Books and suggested readings

1. Soaps: Their chemistry & Technology by J.G. Kane
2.Soaps & detergent by K.S. Parasuram
3. Bailey's Industrial Oil and Fat, Edition 6 Vol-6 (2005), Edited by Feireidoon Shahidi
4, BIS-286

IOT-652: Seminar

L : T: P

0 : 0 : 3

The student will be required to prepare and deliver a seminar as well as submit a written

IOT-653 SEMINAR

L : T: P
0 : 0 : 3

The student will be required to prepare and deliver a seminar as well as submit a written report on the topic assigned to him/her

IOT-701 HYDROGENATION AND MODIFICATION OF OILS

L : T: P
3 : 1: 0

Unit-I

Hydrogenation of oils:

Principle and importance of hydrogenation, kinetics of reaction, operating variables and their effect on rate of hydrogenation, selectivity and isomer formation, trans fat replacement solutions and technology, worldwide trends & regulations.

06

Unit-II

Hydrogenation catalysts and hydrogen production:

Catalyst structure, catalyst poisons and promoters, theory of catalysis, properties of catalysts e.g. porosity, selectivity, activity and other properties, different types of catalysts employed for hydrogenation of oils and fats, methods of catalyst manufacture, regeneration of nickel catalyst, Manufacture of hydrogen: methods of production and purification, storage of hydrogen, distribution through manifold & direct gasification in hydrogenation vessel. Estimation of purity of hydrogen and oxygen gas. Hydrogen gas requirements for hydrogenation of different oils. 10

Unit-III

Commercial plants and processes for hydrogenation of oils:

Different commercial plants for hydrogenation, design of hydrogenation vessels,. chilling equipments for shortening, nitrogen gas based hydrogenation plants. , batch and continuous methods, loop reactors, impellers Manufacture of salad oils and salad dressing, shortening, margarine, butter, bakery and confectionery fats, cocoa butter substitute, hard oils for industrial applications e.g. soaps, lubricating greases etc

10

Unit-IV

High-pressure hydrogenation:

Production of fatty alcohols, Hydrogenation of fatty acids: importance of operating variable and feed stock purity, commercial fatty alcohols and their industrial applications. 06

Unit-V

Modification of oils and their applications:

Analysis of modified fats, dilatometry- theory and practice, Trans unsaturated fatty acids and polyunsaturated fatty acids in nutrition and health,. energy conservation in hydrogenation process, frying & stability characteristics, nutrition & health aspects, Interesterification, fractionation, winterization, diacylglycerols as low calorie fats.

08

Reference Book

1. Bailey's Industrial Oil and Fat, Edition 6 Vol-6 (2005), Edited by Feireidoon Shahidi
2. Hydrogenation of Oil & Fat Edited by H.B.W. Patterson
3. Markley Fatty Acid Vol. II
4. Oils &Fats Analysis by Cocks & Reid
5. Fats and oils formulation and for application by Richard D.O. Brien

IOT-702 TECHNOLOGY OF SURFACTANTS & SYNTHETIC DETERGENTS

L : T: P

3 : 1: 0

Unit-I Surface active agents:

Theory of surface action; effect and behaviour of surface active agents on the interfaces; solid- liquid, gas-liquid, liquid-liquid and interfaces formed by three phases e.g. solid, liquid and gas and two immiscible liquids. Bulk properties of surfactant solutions and methods of their measurements: micelle properties; foaming; wetting, emulsification, dispersion; and detergency; measurement of critical micelle concentration; foaming power and foam stability, wetting power, emulsifying power, stability of dispersion and detergency. 08

Unit-II Classification, synthesis and applications of surfactants:

Anionic surfactants: sulfated and sulfonated surfactants e.g. sulfated oils, alkyl sulfates, alkyl ether sulfates, sulfated mono-glycerides, alkyl glyceryl ether sulfonates, sulfated derivatives alkanolamides, ester and amide sulfonates, sulfonated poly-carboxylic acid surfactants, alkyl aryl sulfonates, olefin sulfonates, methyl ester sulfonates, mahogany and petroleum sulfonates and other miscellaneous anionic surfactants. Cationic surfactants: Non-quaternary nitrogen bases e.g. amines, nitriles and their: quaternary nitrogen bases and miscellaneous cationic surfactants. Nonionic surfactants: Poly-ethoxy ethers and esters and poly-hydroxy nonionic surfactants. Amphoteric surfactants, Biosurfactants, Novel surfactants. 10

Unit-III Plants and manufacturing processes of surfactants:

of anionic surfactants viz. alcohol sulfates, alkyl aryl sulfonates, olefin sulfonates, sulfated and sulfonated oils, alpha methyl esters etc., nonionic surfactants viz. Poly-ethoxy ethers and esters, poly-hydroxy surfactants etc. and cationic surfactant e.g. quaternary ammonium compounds.

10

Unit-IV Builders, fillers and auxillary materials, production of detergent products:

Inorganic and organic builders and fillers, polymers, optical brighteners, enzymes and other performance additives used in the manufacture of synthetic detergents and their functions. Various physical forms of synthetic detergents: Solid, liquid, and non/liquid forms. Manufacture of household synthetic detergents: Plants and processes employed for manufacture of powder, liquid, cake and other forms.

08

Unit-V Evaluation of detergent products:

Analytical techniques employed for analysis of synthetic detergents and surfactants as per BIS Methods. Environmental impact and toxicity of surfactants. Methods for determination of efficacy of surfactants 04

Reference Book

1. The manufacture of soaps other detergents and glycerin Edited by Edgar Woollatt
2. Synthetic detergent Edited by Milwidsky
3. Bailey's Industrial Oil and Fat Products Vol-1 Fourth Edition, Edited by Daniel Swern
4. Soaps & detergent Edited by K.S. Parasuram
5. Synthetic Detergents Edited by Davidson
6. BIS – IS: 4955-1978; Specification for Synthetic Detergent Powders for household use
7. Gemini Surfactants : Synthesis interfacial and Application
8. Handbook of Detergent; Part A,B,C,D

IOT-703 ADVANCE OIL CHEMISTRY AND OLEOCHEMICALS

L : T: P
3 : 1: 0

UNIT-1

Glyceride structure :

Advanced theories of glyceride structure of natural fats, Determination of glyceride structure; Synthesis of glycerides; estimation of mono – di and triglycerides. stereo specific analysis, lipase hydrolysis, polymorphism of fats and fatty acid. chemical synthesis of fatty acid and their derivatives. 08

UNIT-2

Mechanism of important chemical and biochemical reaction of fats and fatty acids:

Esterification,inter-esterification,isomerisation,polymorphism,dehydration,pyrolysis and oxidation of fatty acid esters and other oleo chemicals derived from fats and fatty acids, products and byproducts from castor oil, ,soybean oil, rapeseed oil, neem oil, mahua oil, cotton seed oil etc. 08

UNIT-3

Oil derivatives and their applications:

Production and utilizations of fatty nitriles, amines, sulphited and sulphurised oils; properties, specification, plant and processes employed. Textile chemicals, leather chemicals, polymer additives, paint additives, lubricants additives,

08

UNIT-4

Chemistry and applications of drying oils:

Modification of oils for surface coating industries, thermal and chemical modification methods; properties of modified oils ,changes in drying oils during heat bodying and oxidative polymerization. process and plants employed for their commercial production. Processes for production of malenised oils, epoxidised oils, boiled oils, stand oils blown oils, urethanes oils and alkyds, evaluation of surface coating materials. 10

UNIT-5

Production and applications of methyl ester:

Various methods for production of methyl esters, production of biodiesel, specifications as per ASTM and BIS, sulphated and sulphonated methyl esters and their applications. 06

REFERENCE BOOK

1.Fatty acid Vol.-1-5 by K.S.Markley

2.Bailey's industrial oil and fat,Part -1-5 by bailey

IOE- 711 : TECHNOLOGY OF OILS, OLEOCHEMICALS AND SURFACTANTS

L : T: P

3 : 1: 0

Unit-I

Introduction to oils & fats, types of glycerides, theories of glyceride structure, determination of glyceride structure, non-glyceride components of oils, component fatty acids of oils & fats.

08

Unit-II

Chemical reactions of oils & fats and their industrial importance, physico-chemical characteristics of oils & fats, classification of oils, adulteration of oils. 08

Unit-III

Post harvest technology of oilseeds, handling and storage of oilseeds , different methods for extraction of oils from oil-bearing materials. 08

Unit-IV

Degumming, deacidification, bleaching hydrogenation, deodorization and physical refining. Neutraceuticals derived from oils

08

Unit-V

Saponification of oils, different methods of soap manufacture, selection of raw materials, analysis of soaps. Types of surfactants and fat based surfactants.

08

Reference Book

1. Bailey's Industrial Oil and Fat, Edition 6 Vol-6 (2005), Edited by Feireidoon Shahidi

2. Oil & Fats Technology Edited by E. Bernardini
3. Soaps & detergent Edited by K.S. Parasuram
4. Soaps: Their chemistry & Technology by J.G. Kane
5. Chemistry and Technology of Oils and Fats, 2003, Edited by M.M. Chakraborty

IOT-751: OIL PROCESSING LAB

L : T: P
0 : 0 : 6

1. Laboratory degumming of vegetable oils
2. Laboratory refining(alkali neutralization) of vegetable oils
3. Laboratory bleaching of vegetable oils
4. Analysis of following intermediate and by products:
    A. Acid oil : Moisture & FFA
    B. Neutral oil : Acidity, soap ppm
    C. Soap stock :
        i) FFA
        ii) Neutral oil
        iii) Total fatty matter
5. Analysis of vegetable oils for Phosphatide content, Iron content and Wax content
6. Determination of DOBI value for palm oil
7. Analysis of bleaching earth, activated carbon and nickel catalyst
8. Preparation of methyl esters from crude oils
9. Determination of fatty acid composition and detection of adulteration by Chromatographic techniques.
10. Determination of mono, di and tri glyceride
11. Determination of diene and triene content by UV-Visible

Reference Books and suggested readings:

1. Technology and refining of oil and fats by T.L. Mahatta
2. Bailey's Industrial Oil and Fat, Edition 6 Vol-5 (2005), Edited by Feireidoon Shahidi
3. Bleaching & purifying fats and oils; Theory & Practice Edited by H.B.W. Patterson

4. Practical guide in vegetable oil processing by Manoj K. Gupta
5. Chemistry &Technology of Oils &Fats by M.M. Chakarobarty
6. Fats & Oils Handbook by Michael Bockich

IOT-752 : INDUSTRIAL TRAINING AND REPORT PRESENTATION

L : T: P

0 : 0 : 3

The student(s) will be required to undertake training in the Oil and Allied industries after III B. Tech.VI semester for a specified period and submit its report after completion for evaluation and oral examination in the VII semester of his studies in Final B.Tech.

IOT-753: PROJECT / DISSERTATION

L : T: P

0 : 0 : 3

The student (s) will be required to search literature pertaining to design of an equipment / processing of a Oil and allied product, comprehend it and prepare a report for assessment.

IOT-801: ESSENTIAL OILS & COSMETICS

L : T: P

3 : 1: 0

Unit –I

Sources, classification and chemistry of essential oil bearing materials

Different methods of manufacturing essential oils, Grading and standardization of essential oils 06

Unit -II

Physico-chemical characteristics of essential oils

Specific gravity, refractive index, optical rotation, solubility, acid value, ester value, Analysis of essential oils e.g. free alcohol, total alcohol, aldehyde and ketone content, , phenol content, common adulterants and their detection 08

Unit -III

Production, properties and composition of important Indian essential oils

Rose, jasmine, khus, sandal wood, keora , palmarosa, lemon-grass, peppermint, lemon, spices oils, clove oil, orange oil, eucalyptus oil , natural fats and bi additives compounds etc. 08

Unit -IV

Important isolates, synthetic perfumery materials and fixatives

Menthol, camphor, thymol, geraniol, citral, eugenol, terpeniol, vanillin, coumarins, musk: Natural, Synthetic & Artificial, benzyl acetate, benzyl benzoate etc,Synthesis ;Esters of geraniol, citraniol & terpenols,ionones, Hydroxy citronellol etc. Castor oil based perfumery chemicals, blending of perfumes.

08

Unit -V

Production of cosmetic products

Face creams(cold and vanishing creams), Face powders, Talcum powders, Hair oil, Hair cream & dyes, Shampoos, Tooth pastes & powders, Shaving creams, body gels Lipsticks, Nail polishes, Depilatories, aroma therapeutic products and herbal products etc; related plant and machinery.

10

Reference Book

1. Essential oils –Vol. I –V by Guenther
2. Perfume Cosmetics & Soaps Vol.-I –III by W.A. Poucher
3. Manufacture of perfumes and essence by Kalicharan
4. The essential oils book Edited by Colleen K. Dodt

5. Conditioning agent for hair and skin Edited by Randyschuller and Perry Romanowski
6. Gylcerin Edited Vol -11 (1991)by Eric Jungermann & Norman O.V. Sonntag

IOT-802: BIO-TECHNOLOGY OF OILSEED AND OILS

L : T: P

3 : 1: 0

Unit -I Introduction to GM crops

Genetically modified crops for oil bearing materials, composition, characteristics, composition of GM and non-GM crops, certification of GM crops, global scenario in GM crops.

06

Unit-II Enzymes and their Technology

Types of enzymes, sources and their isolation and their applications, immobilized enzymes, assay of enzymes for oil application

06

Unit –III Bio processing of Oils & Fats

Bio Processing of Oils: Bio degumming , Bio deacidification ,Bio bleaching, Chemistry and technology of bio-interesterification, interesterified fats vis-a-vis bio-interesterified fats/ hydrogenated fats .

10

Unit –IV Speciality fats & Oils

Structured Lipids , Margarine and Shortening ,Production of plastic fats , Cocoa butter substitute ,Food emulsions ,Medicinal applications ,Preparation of diaceyl glycerols, polyol and other oleo chemicals. 10

Unit –V GM Oilseeds

Canola (rapeseed) , Linola (flax) ,High Oleic sunflower ,Low-linloenic soyabean etc.

08

Reference Book

1. Biotechnology for the Oils & fats industry (1983) Edited by Colin Ratledge, Peter Dawson and James Rattray
2. Bioactive Lipids
3. Modifying Lipids for use in Foods
4. Biocatalysts and Biotechnology for Functional Foods

IOT-803: PETROLEUM PRODUCTS AND PETROCHEMICALS

L : T: P
3 : 1: 0

Unit I

Introduction to mineral oils:

Origin and mode of occurrence. Oil resources and refineries in India. Composition of petroleum, Refinery products and their test methods. Evaluation of oil stocks 08

Unit II

Processing of petroleum;

Processing of crude oil distillation, refinery products and their applications, natural gas, gasoline, naphtha kerosene, fuel oils and gas oils, petroleum waxes, lubricating oils, tar and asphalt. 08

Unit III

Petroleum refining processes and operations:

Thermal cracking, catalytic cracking, hydro-forming, catalytic reforming, alkylation, polymerization, isomerisation.
08

Unit IV

Auxiliary processes:

Vis-breaking, de-waxing and de-asphalting operations. Manufacture of paraffin wax and microcrystalline waxes.
08

Unit V

Petrochemicals;

Manufacture of alkyl aryl compounds, ethylene oxide condensation products benzene, toluene, xylene, buta-di-enes, vinyl chloride and styrene etc.
08

Reference Book

1. Petroleum Products Hand Book By V. B. Gutherie
2. Petroleum processing hand book (1967) Edited by Bland & Davidson
3. Petroleum refinery Engineering edited by Nelson
4. Petroleum refining technology Edited By Dr. Ramprasad

IOT-804 PACKAGING OF OILS ,FATS AND ALLIED PRODUCTS

L : T: P
3 : 1: 0

Unit I Introduction to Packaging

Elements of packaging, scopes and functions of a package. Materials used for packaging: paper and paperboards; films and foils; glassware; metals plastics; wood; miscellaneous other materials; 08

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, Different packaging and sealing machine for liquid /semisolid packaging 08

Unit III Forms of packaging:

Folded cartons/boxes; corrugated board boxes, metal containers bags and envelopes, aerosols. Tubes, cans and different forms of plastics etc. 08

Unit IV Printing of packaging surfaces

Requirements of Printing and evaluation of printed surfaces. Coatings and laminations of the packaging surfaces, types and properties of coatings and limitations, different types of laminating machines.
08

Unit V Packaging of various products

Oils and fats, soaps and detergents; cosmetics; petrochemicals, wax and wax products; essential oils and perfumes; lubricating oils and greases; by products of oils, soaps and allied industries. Effect of environmental conditions on packaging materials.
08

IOT-805: TECHNOLOGICAL ADVANCES IN PERFUMERY AND COSMETICS

L : T: P

3 : 1: 0

Unit IFragrance –raw materials.

Plant Oils : Essential Oil , Flower Oil, Resin and gum exudation. Animal secretions. Chemical substance –isolates (Plant , derivatives of plant materials ,synthetic organic substances. 08

Unit II Newer extraction technologies

Raw materials for essential oils , newer extraction technologies of essential oils, Supercritical extraction ,HFC extraction ,Bio extraction etc. Instrumental analytical techniques of analysis of essential oils. 08

Unit III Skin Preperations

Facial makeup : Creams, Cleansing ,emollient , hand and hormones Cream/lotions , foundation makeup , lipstick , sunscreen preparations. 08

Unit IV Hair Preparations

Skin anatomy, raw materials and their selection ,additives etc.for hair dyes ,Bleaches , Hair coloring, hair fixatives ,Hair grooming preparations. Hair Care : Shampoos ,Shaving soaps and creams, pre-shave and aftershave preparation. 08

Unit V Herbal Products

Herbal Cosmetic preparations; Chemical components of herbs & its extraction, Application of herbs & its extracts, Application of herbs in cosmetics application, preservation; Advantages in perfumery: Notes of perfume, compatibility of perfume , fixation and stability of perfume ; analysis of perfumes, Medicinal applications of herbal and other essential oils & perfumes. 08

Reference Books:

a. Perfume Cosmetics & Soaps Vol.-I –III by W.A. Poucher
b. Cosmetics Science & Technology Edition 2 Vol-II (1972 Edited By M.S. Balsam & Edward Sagarin

IOT-806: ENVIRONMENTAL ASPECTS OF OILS AND ALLIED INDUSTRIES

L : T: P

3 : 1: 0

Unit I Industrial pollution and its impact

Magnitude of industrial waste , Legislative regulations. Recycle and reuse of waste water , recovery of by/c0-product from industrial effluents. 08

Unit II 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.

08

Unit III Waste Management

Pollution prevention and environment Management system ISO 14000. Waste audit, Quality management systems, Different regulation means & acts for air , water& solid pollution control. 06

Unit IV Liquid Effluent Treatment Technology

Pretreatment methods, centrifugation filtration, evaporator and concentrator , extraction and distillation, treatment of dilute waste water. Treatment requirements, Neutralisation 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.

10

Unit V Solid & Gas Effluent treatment

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.

08

IOT -807 FUELS AND GREEN LUBRICANTS

L : T: P

3 : 1: 0

Unit I Handling and storage of fuels

Fuels used in industry such as LDO, furnace Oil ,HSD, Gas, thermic fluid, coal, husk, briquets.

06

Unit II Introduction to lubricants

Liquid, Solid and gas lubricants and their applications, Lubricating oils Synthetic lubricants. Physical properties, manufacture of lubricating oils.Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, , classification of lubricating oils such as thermic fluids , gear oils , hydraulic oils etc, viscosity index improver.

10

Unit III Properties of Fuels

Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, distillation, vapour pressure, flash point, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point etc.

08

Unit IV Lubricants

General aspects of lubrication, lubricant characteristics and types ,selection principle ,Lubrication in metal cutting, conditions of use for cutting fluids, coolants, gear oils.

06

Unit V Lubricating Greases

Properties, types, ingredients, additives, analysis of lubricating oils and greases as per BIS test methods. Manufacture of lubricating Greases-Processes and equipments. 10

Reference Books:

1. Internal Combustion Engineering Edited by V. Ganesan. 2003

2. Lubrication and Lubricants, Edited by Eric R. Braithwaite (1967)

3.Lubricating Greases by C.J.Boner

4. .Lubricating Oils by C.J.Boner

IOT-851 DESIGN & TECHNO-ECONOMIC FEASIBILITY PROJECT

L : T: P

0 : 0: 12

Continuation of Term work of IOT-753 with product and/or plant designing with a Techno-economic Feasibility Report of suitable size.

IOT-852 PROJECT ON INDUSTRIAL ASSIGNMENT

L : T: P

0 : 0: 3

Students have to undertake an experimental project on industrial problem assigned to them

IOT-853: EDUCATIONAL TOUR

Students will be taken for the visit of Industrial / Research organization, in their field of specialization, during the vacation period.