

Faculty of Engineering & Technology

**NORTH MAHARASHTRA UNIVERSITY,
JALGAON.**

Syllabus For

M. Tech.

Oleochemicals and Surfactants Tech.

(W.E.F.2009-2010)

**UNIVERSITY DEPARTMENT OF CHEMICAL TECHNOLOGY
NORTH MAHARASHTRA UNIVERSITY, JALGAON
M. Tech. (Oleochemicals and Surfactants Tech.)**

FIRST SEMESTER:

Sub. No.	Paper	Teaching Scheme Hrs. / week	Exam. Scheme Hrs.	Marks Internal	Marks External	Total	Credit Points
OT-1.1	Advances In Technology of Oil & Fat Products	03	03	40	60	100	03
OT-1.2	Processing and Sophisticated Testing of Oleochemicals and Surfactants (P)	06	06	40	60	100	03
OT-1.3	Technology of Fatty Acids & soaps	03	03	40	60	100	03
OT-1.4	Technology of Fatty Alcohols and Nonionic Surfactants	03	03	40	60	100	03
OT-1.5	Technology of Anionic Surfactants & Detergents	03	03	40	60	100	03
OT-1.6	Industrial Edible Products	03	03	40	60	100	03
CT-1.1	Modern Methods of Instrumental Analysis	03	03	40	60	100	03
CT- 1.2	Research Methodology And IPR	03	03	40	60	100	03
Grand Total						500	15

Note:- OT-1.1, OT-1.2, CT-1.1 are compulsory. Select any two papers out of OT-1.3, OT-1.4, OT-1.5 ,OT-1.6 and CT-1.2 . The particular elective course will be offered provided the minimum number of students choosing that Elective is five.

SECOND SEMESTER:

Sub. No.	Paper	Teaching Scheme Hrs. / week	Exam. Scheme Hrs.	Marks Internal	Marks External	Total	Credit Points
OT-2.1	Non Traditional Oils and Non Triglyceride Constituents	03	03	40	60	100	03
OT-2.2	Technology of Oral, Hair and Skin Care Products	03	03	40	60	100	03
OT-2.3	Technology of Cationic and Amphoteric Surfactants	03	03	40	60	100	03
OT-2.4	Tribology	03	03	40	60	100	03
OT-2.5	Utilization of Vegetable Oils and Surface Coating	03	03	40	60	100	03
OT-2.6	Castor Oil Derivatives	03	03	40	60	100	03
OT-2.7	Oil Seed Protein Utilization	03	03	40	60	100	03
CH-2.4	Pollution Control In Chemical Industry	03	03	40	60	100	03
NT 2.5	Applied Colloid and Surface Chemistry	03	03	40	60	100	03
Grand Total						500	15

Note:- OT-2.1, OT-2.2, OT-2.3 are compulsory. Select any two papers out of OT-2.4, OT-2.5, OT-2.6, OT-2.7, CH-2.4 and NT-2.5. The particular elective course will be offered provided the minimum number of students choosing that Elective is five.

THIRD SEMETER :

Sub. No.	Paper	Teaching Scheme, Hrs. / week	Marks		Total Marks	Credit Point
			Internal	External		
OT:3.1	Seminar	10	-	100	100	5
OT:3.2	Project	20	80	120	200	10
Grand Total					300	15

FORTH SEMETER :

Sub. No.	Paper	Teaching Scheme, Hrs. / week	Marks		Total Marks	Credit Point
			Internal	External		
OT:4.1	Project	30	120	180	300	15

**UNIVERSITY DEPARTMENT OF CHEMICAL TECHNOLOGY
NORTH MAHARASHTRA UNIVERSITY, JALGAON**

M.Tech. Oleochemicals and Surfactants Technology

Admission :-

Candidates holding B. Tech. / B.E. degree in Oil Technology or M. Sc. (Chemistry) or equivalent with 55 % marks are eligible for admission. However M. Sc. (Chemistry) will have to qualify additional two UG (B. Tech. Oils, Fats & Waxes Tech.) Courses-OT-303 Post Harvest Technology Of Oleogeneous Materials (Old Course) or OTC- 201 Chemistry & Technology Of Oils & Fats (New Course) or OT – 605 Chemistry Of Surfactants & Oleochemicals (Old Course) or OTC-202 Post Harvest Technology Of Oleogeneous Materials (New Course) or OTC- 302 Technology of Fat Splitting and Soaps (New Course). Those students who have not studied Mathematics course at either undergraduate or post-graduate level, will have to opt and qualify mathematics course-CHE 404 Mathematics-II (Old Course) or BSL201 Mathematics-II (New Course). Preference will be given to candidates holding valid GATE score.

Notes:-

1. The students of M. Tech. Course have to attend 80% of lectures, practical and any other term work as may be prescribed by the university. The conduct and behaviour of the student must satisfy the Head of the Department.
2. The head of the Department certifies that the student has attended the course as prescribed and has conducted himself satisfactorily. In absence of such certificate the student shall not be permitted to the University examination.
3. The University examinations for all the terms shall be conducted at the end of the term.
4. The student shall have to appear personally to all parts of the examination.
5. The Credit structure is based on M. Tech. Credit Guidelines sanctioned by University Academic Council.

**UNIVERSITY DEPARTMENT OF CHEMICAL TECHNOLOGY
NORTH MAHARASHTRA UNIVERSITY, JALGAON**

M.Tech. – Oleochemicals and Surfactants Technology Syllabus

I Semester

OT-1.1, OT-1.2, CT-1.1 are compulsory. Select any two papers out of OT-1.3, OT-1.4, OT-1.5, OT-1.6 and CT-1.2. The particular elective course will be offered provided the minimum number of students choosing that Elective is five.

OT-1.1 : Advances In Technology of Oil & Fat Products (3Hrs/ Week) (Credits 3)

New developments in plants and processes for hydrogenation , oil refining , membrane separation technology , alternative solvents for extraction , newer methods in extraction of oil seeds , biotechnology oil & oilseeds , development of oleochemicals , Eco-friendly and energy efficient processes , Utilization of wastes.

OT-1.2 : Processing and Sophisticated Testing of Oleochemicals and Surfactants (P)
(Practical) (6hrs/ week) (Credits 3)

Minimum 8 Sophisticated Instrumental experiments based on Instruments Studied in CT1.1

“ Modern Instrumental Analysis.” And minimum Eight experiments based on following.

Preparation and Testing of Amphoteric Surfactants.

Use of High Pressure Autoclave for Splitting, Fractional Distillation of Fatty Acids., Manufacture of Vanaspati , Crystallisation of Erucyl Amines.

Speciality Soaps & Detergents, Transparent Soaps; Spray Drying of Detergents,

Synthesis of Alkandamides, Sucrose Polyesters; Friedel Craft Alkylation .

OT-1.3: Technology of Fatty Acids and Soaps (3hrs/ week) (Credits 3)

Manufacturing, chemical properties, applications, Technology of fat splitting, fatty acid separation, Fractional Distillation Technology, Solvent crystallization Technology, Use of fatty acids in Textile, Leather, Pharmaceuticals., Petroleum Processing, Recent advances in soaps: Structural soaps, Super fatty, Transparent, Medicated Soap. Manufacturing Technology, High solids/high TFM Soaps, Advances in Equipments(Centrifuge, Plodder/Roll mill)

OT-1.4 : Technology of Fatty Alcohols and Nonionic Surfactants (3hrs/ week) (Credits 3)

Manufacturing / Properties, Glycerol's ,Fatty alcohols:- Cetyl, Lauryl, Oleyl, Steryl, Ricinoleyl, Ethoxylation: Alcohol ethers, Alkyl phenol ethers, Monoglycerides, Diglycerides, Lecithin, Polyol esters (TWIN, SAN Sucrose PE), Cetyl alcohol sulphonates , Oleyl , Alcohol ethoxylates, Stearyl.

OT-1.5 : Technology of Anionic surfactants & Detergents. (3hrs/ week) (Credits 3)

1) Sulphonates (FAMES , AOS , LABS , Paraffin , Sulphated MG), Sulphates (Alcohol sulpholes , TRO , Sulphated Alkanomadies) , Phosphates , Igepon –A , Igepon –T ,Polymeric Surfactants: Physical Chemistry.

2) Surfactant- Structure Activity related cleaning mechanism (Different theories limitation of DLVO:- 1) Stearic/Entropic 2)Electrical double layer theory.

Different surfactant activity-Foaming, Emulsification, Wetting, Dispersion, detergency

3) Applications/Recent trends/Advances

Technology of Detergents :

Advances in Builders, Formulations, Manufacturers

Recent trends, Detergents Drying-Spray Drying, agglomeration Green Detergents(STPP free Detergent),waterless

Detergents: Dry, Enzyme Detergents, Cleaning system, Compact Detergents.

OT-1.6 : Industrial Edible Products (3hrs/ week) (Credits 3)

Confectionery, Shortening / Bakery, Margarine, Vanaspati, Cooking Salad Oil, Tailor made fats, edible oil Dewaxing, Winterization and Fractionation, Interesterification, Hydrogenation Special on health and Nutritional fats-Related diseases:- (Atherosclerosis, Arthritis, Athlete, Infant, Pregnant lady, wrestlers, Heart Patients.), Design of lipids in relation to nutrition., Nutritional significance of FFA, Prostaglandins, HDL,LDL, VLDL, w-3,w-6.

CT-1.1 : Modern Methods of Instrumental Analysis (3hrs/ week) (Credits 3)

Detail study of following sophisticated instruments with reference to construction, operation principle, applications and merits and demerits:

Gas Liquid Chromatography

High Performance Liquid Chromatography

Infra Red & FTIR Spectroscopy

NMR Spectroscopy

UV Visible Spectroscopy

Mass Spectroscopy

Differential Scanning Calorimeter

Thermo gravimetric Analysis

Scanning Electron Microscope

Transform Electron Microscope & Atomic Force Microscopy

XRD – crystalline phase analysis

Surface area determination by BET- method, Particle size by light scattering method, Zeta potential

Colour Matching and Lovibond Tintometer

References:

- Hari Singh Nalwa - Encyclopedia of Nanotechnology.
- Introduction to Nanotechnology - Charles P. Poole Jr. and Franks. J. Qwens
- Novel Nanocrystalline Alloys and Magnetic Nanomaterials- Brian Cantor
- Nanomaterials Handbook- Yury Gogotsi
- Springer Handbook of Nanotechnology - Bharat Bhusan
- Processing & properties of structural nanomaterials by Leon L. Shaw (editor)
- Chemistry of nanomaterials : Synthesis, properties and applications by CNR Rao et.al.
- Synthesis of Nanostructured Materials –Cao
- Handbook of Nanoscience, Engineering- Goddard et al

CT- 1.2: Research Methodology and IPR(3hrs/ week) (Credits 3)

Research: Meaning, Objective of research, types of research

Selecting a problem and preparing research proposal for different types of research

Literature survey: Use of library, books and journals, use of internet (different useful sites) patent search

Methods and tools in research: Qualitative and quantitative studies enquiry forms, questionnaire, opinionnaire

Data analysis: Parametric and non parametric data, Hypothesis testing

Descriptive and inferential analysis, Statistical analysis of data including standard deviation, student t test, f test, ANOVA, Multiple regression and correlation coefficient

Documentation:

Research paper/ Thesis writing: Different parts of the research paper

Presentation: Oral, poster

Sources of procurement of research grants

Industrial Institution Interaction

Introduction to intellectual property and its relation with regulations

Introduction to patent, patent system in India and worldwide (Paris convention and TRIPS agreement)

II Semester

OT-2.1, OT-2.2, OT-2.3 are compulsory. Select any two papers out of OT-2.4, OT-2.5, OT-2.6, OT-2.7 ,CH-2.4 and NT-2.5. The particular elective course will be offered provided the minimum number of students choosing that Elective is five.

OT-2.1 : Non Traditional Oils and Non Triglyceride Constituents (3hrs/ week) (Credits 3)

Mango kernel fats: Processing as Confectionary fats, Solvent Extraction, F.A./ Glyceride Composition, Characteristics, Lipid Associates. Applications:- Karanja, Neem, Mahwah, Sal, Niger, Kusum, Rubber seed, Palash, Jojoba, Jatropha, Khakan, Kokum.

Fat soluble Vitamins (A,D,E,K), Phosphatides, Pigments, Gossypol. Squalene, Flavanoids, Azardictin ,Oryzanol, Tocofrienols, Carotenes, Sterols, Sesamols

OT-2.2: Technology of Oral, Hair and Skin Care Products (3hrs/ week) (Credits 3)

Toothpaste, shampoo, soap, shaving cream, face/body Formulation and Function, Overview of different cosmetic raw material, Their sources and Chemical nature.

Physiological aspects in usage of cosmetics, Allergy, Skin reaction and Safety aspects. Theory behind physical forms of cosmetics analysis and Product evaluation.

Plant and Machinery used in cosmetic manufacture. Lay out and Hygiene aspect of cosmetic manufacture, Rule governing good manufacturing practices.

OT-2.3 : Technology of Cationic and Amphoteric Surfactants (3hrs/ week) (Credits 3)

Synthesis , Characterization & application of following Cationic and Amphoteric Surfactants Amine oxide, Fatty Amines, Amides, Nitriles, 2-Alkyl imidazoline, Morpholine, Pyridinium derivative, Ester Quacsa, Amide Quacsa, Betains, Sulphobetains, Alanine

OT -2.4 : TRIBOLOGY (3hrs/ week) (Credits 3)

Mechanical Effects, Friction Related Theory, Lubricants, cutting oil, leather softeners / fat liquor, transformer oil, greases, biodiesel, rolling oil, Linoleum.

Chemical modifications –Epoxidation, Pyrolysis, Halogenations, Friedel Craft Alkylation, Hydroxylation Ozonolysis, Metathesis- Reaction, Catalysis, derivatisation and characterization.

OT - 2.5 : Utilization of vegetable oils and surface coating (3hrs/ week) (Credits 3)

Semi non drying oils,

1) Classification of oil on the basis of drying characteristics.

Coconut/Castor oil in short oil alkyds.

Soyabean/ Sunflower/ Safflower in medium oil alkyds.

DCO/ Linseed/ Tung oil in long oil alkyds.

Formulation synthesis, Manufacturing, Set up & Characterization

2) Epoxy resin: Properties

Epoxy esters: Formulation synthesis and Application in industrial and Automotive coating

3) Thermal and oxidation, Polymerization of oils

Dimer acids in reactive and non reactive polyamides, Formulation of paints, Printing inks and Adhesives based on same.

4) Oleoresinous varnishes. Recent advances in manufacturing of varnishes in relation to reactor and heat transfer. Formulation and testing of Furniture, Spark, Insulating varnishes, Role of dryness, Varnishes as binder in decorative paints. Defects in varnishes films, Testing of varnishes.

5) Urethane oils and alkyds:- Use of oils in preparation of urethane products,

OT - 2.6 : Castor Oil Derivatives (3hrs/ week) (Credits 3)

Castor oil Specifications: Lubricants, Medicinal, Cosmetics, Industrial – Processing, Formulation and Testing.

- 1) DCO- Synthesis, role as Drying oil in synthesis of different polymers
- 2) Alkali Fusion : Manufacturing and Purification of Sebacic acid and 2- octanol use as Plasticizer (e.g. DOP)
Influence of Reaction variables (Molar Ratio, Ph, Temp) Polyester Lubricants based on Sebacic acid, undecylenic acid, nylon 11, nylon 6, 10 Manufacturing and Application.
- 3) Pyrolysis: Undecylenic Acid, Heptaldehyde, manufacturing, reactor design, use of solvent and catalysis, Nylon 11, Zn/Cu undecylenic, Metallic soap – skin Ointment, Heptaldehyde: perfumery and flavour derivatives
- 4) Hydrogenated castor oil: use as wax, anti-sagging agent, M.G, use in high temp. greases
- 5) Alkoxylated/ ethoxylated castor oil: as emulsifiers, wetting agents, HLB balance and degree of ethoxylation using lubricants, cutting/ rolling oils.
- 6) Castor oil based urethanes – synthesis and uses in paints/urethanes foam
- 7) Acetylated castor oil: as plasticizers
- 8) Miscellaneous derivatives: (Dimer acids leather softeners.)
HCO, ECO, Sulphated castor oil, , Manufacturing, Derivatisation, Application

OT - 2.7 : Oil Seed Protein and Byproduct Utilization (3hrs/ week) (Credits 3)

Detoxification of oilseed and oil meal

Chemical composition of oilseed, antinutritional factor, utilization of oilseed meal, processing of protein products, minor and non-edible oilseeds as source of proteins.

(Soyabean, Groundnut, Corn, Cottonseed, Rice bran, Corn Starch, Sunflower hulls, Sunflower pectin, Groundnut shell)

CH 2.4 : Pollution Control in Chemical Industry (3hrs/ week) (Credits 3)

Identification, Segregation and Control of solid / liquid/ gases Pollutants from following Chemical Industries:

- Petrochemical and Petroleum refinery
- Vanaspathi Edible oil Refinery and Oleochemical industry
- Fermentation Beverage Dairy and Sugar Industries
- Plastic Processing Industry
- Polymer and Resin Industry
- Control of Volatile Organic Emissions in Paint Industry
- Pharmaceutical and Fine Chemicals

NT 2.5 Applied Colloid and Surface Chemistry (3 hrs/week – 03 Credits)

Introduction to the nature of colloidal solutions
Surface Tension, Wetting, Solubilisation, Dispersion, Detergency
Thermodynamics of Adsorption
Surfactants and Self-assembly
Emulsions and Microemulsions
Charged Colloids
Van der Waals forces and Colloid Stability
Bubble coalescence, Foams and Thin Surfactant Films
Role of surfactants in synthesis of nanoparticles.

Third Semester

OT-3.1 Seminar : Presentation on selected topics in with due emphasis on latest developments.

(10 hrs/week) (5 Credit)

OT 3.2 Project: finalization of particular research problem, thorough literature review, preliminary experimental work, Presentation of Project report and viva - voce based on project work. .(20 hrs/week) (10 Credit)

Semester IV

OT 4.1 Project: (30 hrs/week) (15 Credit)

The entire semester will be devoted for detail experimental work on a research problem selected in III semester. The student will present his/her findings in the form of neatly typed and bound thesis within one month after approval of his synopsis. He/ She will have to appear before panel of experts for defending his Thesis.

=====~~(X)(X)(X)~~=====