Programme Outcomes (POs), Programme Specific Outcomes (PSOs), and Course Outcomes (COs) related to Local, National, Regional, and Global developmental needs

1.1.1 Curricula developed and implemented have relevance to the local, national, regional, and global developmental needs which are reflected in Programme Outcomes (POs), Programme Specific Outcomes (PSOs), and Course Outcomes of the programs offered by the University

Department of Mechanical Engineering

Programme Outcomes(POs)		Graduate Attributes (GAs)
PO1.	Apply the knowledge of mathematics, science, engineering fundamentals, and Engineering concepts for the solution of complex Engineering problems	Engineering Knowledge
PO2.	Identify, formulate, review the literature and analyze complex problems related to mechanical engineering reaching substantiated conclusions using the first principles of mathematics and engineering sciences.	Problem Analysis
PO3.	Design solutions for complex problems in mechanical engineering and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations	Design/Development of solutions
PO4.	Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.	Conduct Investigations of complex problems
PO5.	Create, select, and apply appropriate techniques, resources, and modern engineering tools such as optimization techniques, simulations, including prediction and modeling to complex process Engineering problems with an understanding of their limitations.	Modern Tool Usage
PO6.	Apply contextual knowledge with justification to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering and mechanical engineering professionalpractice	The Engineer & Society
PO7.	Environment and sustainability: An ability to understand the principles, commitment, and practice to improve product sustainable development globally in mechanical engineering with minimal environmental effect.	Environment and Sustainability
PO8.	Apply ethical principles and commit to professional ethics adhering to the norms of the mechanical engineering practice	Ethics

Yellow color represents the text highlighted for Local, National, and Regional Needs

Cyan color represents the text highlighted for Global Needs

PO9.	Function effectively as an individual, and as a member or leader in diverse teams, and multidisciplinary settings	Communication
PO10.	Communicate effectively oncomplex engineering and mechanical engineering activities with the engineering community and with society at large, such asbeing able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	Individual and Teamwork
PO11.	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change	Lifelong Learning
PO12.	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage mechanical engineering projects and in multi disciplinary environments.	Project management & Finance

Department of Mechanical Engineering

Program Specific Outcomes (PSOs)

By the completion of B. Tech. Mechanical Engineering program, the students will achieve the following program specific outcomes:

PSO 1 Identify, formulate and analyze complex engineering problems in thermal engineering, design engineering, manufacturing engineering and allied domains.

PSO 2 An ability to find out, articulate the local industrial problems and solve with the use of mechanical engineering knowledge and skills for realistic outcomes.

PSO 3 An ability of collaborative learning to find out effective and optimal solution for sustainable growth of mechanical systems.

NON-CONVENTIONAL ENERGY RESOURCES & UTILIZATION (EME469)

Type	L	T	P	Credits
PEC	3	0	0	3

Prerequisite: Basic science courses

Course Objectives:

This course considers the background of depleting fossil fuel reserves and lays emphasis on the utilization of alternative energy sources. This course considers the background of depleting fossil fuel reserves and lays emphasis on the utilization of alternative energy sources for meeting varying requirements and ensure sustainable development, while assessing the impact of both conventional and non-conventional sources of energy on civilization.

Course Outcomes:

Student will be able to

CO1	Understand effect of fossil fuels on global warming and their relative impact on the environment.
CO2	Comprehend the energy scenario of world in general and India in particular along with assessment of potential of alternative sources of energy.
CO3	Design, analyze and develop theoretical framework for use of alternative sources of energy for different applications.
CO4	Evaluate the performance of the various non-conventional and renewable energy sources.
CO5	Understand and analyze recent advancements in energy generations like magneto hydro dynamic power generation, fuel cell technology, hydrogen energy etc. and develop energy management skills.

Course Content:

UNIT-1

Energy resources and their utilization:

Indian and global energy sources, Energy exploited, Energy planning, Energy parameters (energy intensity, energy-GDP elasticity), Introduction to various sources of energy, Solar thermal, Photovoltaic, Water power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Fuel cells, Decentralized and dispersed generation.

Solar radiations:

Extra terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle expression for angle between incident beam and the normal to a plane surface (no derivation), Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India.

UNIT-2

Solar energy:

Solar thermal power and it's conversion, Solar collectors, Flat plate, Performance analysis of flat plate collector, Solar concentrating collectors, Types of concentrating collectors, Thermodynamic limits to concentration, Cylindrical collectors, Thermal analysis of solar collectors, Tracking CPC and solar swing

Solar thermal energy storage, Different systems, Solar pond.

Applications, Water heating, Space heating & cooling, Solar distillation, solar pumping, solar cooking,Greenhouses, Solar power plants.

Solar photovoltaic system:

Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photovoltaic system, Standards of solar photovoltaic system, Applications of PV system, PV hybrid system.

UNIT-3

Biogas:

Photosynthesis, Bio gas production Aerobic and anaerobic bio-conversion process, Raw materials, Properties of bio gas, Producer gas, Transportation of bio gas, bio gas plant technology & status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass conversion techniques, Biomass gasification, Energy recovery from urban waste, Power generation from liquid waste, Biomass cogeneration, Energy plantation, Fuel properties, Biomass resource development in India.

Wind energy:

Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals, Types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Selection of a wind mill, Wind energy farms, Economic issues, Recent development.

UNIT-4

Electrochemical effects and fuel cells:

Principle of operation of an acidic fuel cell, Reusable cells, Ideal fuel cells, Other types of fuel cells, Comparison between acidic and alkaline hydrogen-oxygen fuel cells, Efficiency and EMF of fuel cells, Operating characteristics of fuel cells, Advantages of fuel cell power plants, Future potential of fuel cells.

Tidal power:

Tides and waves as sources of energy, Fundamentals of tidal power, Use of tidal energy Limitations of tidal energy conversion systems.

Hydrogen Energy:

Properties of hydrogen in respect of its use as source of renewable energy, Sources of hydrogen, Production of hydrogen, Storage and transportation, Problems with hydrogen as fuel, Development of hydrogen cartridge, Economics of hydrogen fuel and its use.

UNIT-5

Thermoelectric systems:

Kelvin relations, power generation, Properties of thermoelectric materials, Fusion Plasmagenerators.

Geothermal energy:

Structure of earth's interior, Geothermal sites, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station with schematic representation, Site selection for

geothermal power plants. Advanced concepts, Problems associated with geothermal conversion.

Ocean energy:

Principle of ocean thermal energy conversion, Wave energy conversion machines, Power plantsbased on ocean energy, Problems associated with ocean thermal energy conversion systems, Thermoelectric OTEC, Developments of OTEC, and Economics.

Impact of renewable energy generation on environment, Kyoto Protocol, Cost of electricity

Production from different energy sources, Energy options for Indian economy.

Books / Reference:

1. NK Bansal, M Kleemann, M Meliss. Renewable energy sources and conversion technology. TataMcGraw-Hill; 1990.
2. Kothari DP, Singal KC, Ranjan R. Renewable energy sources and emerging technologies. ",Prentice Hall of India Pvt. Ltd. 2011.
3. Rai. G.D. Non-Conventional Energy Sources. Fourth Edition. Khanna Publisher; 2011.
4. AV Desai. Nonconventional energy. vol. 8. Tokyo: New Age International Publishers Ltd; 1990.

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100 YEARS 1921 - 2021

Department of Civil Engineering

Programme Outcomes(POs)		Graduate Attributes (GAs)
PO1.	Apply the knowledge of mathematics, science, engineering fundamentals and Engineering concepts for the solution of complex Engineering problems	Engineering Knowledge
PO2.	Identify, formulate, review literature and analyze complex problems related to civil engineering reaching substantiated conclusions using first principles of mathematics and engineering sciences.	Problem Analysis
PO3.	Design solutions for complex problems in civil engineering and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations	Design/Development of solutions
PO4.	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	Conduct Investigations of complex problems
PO5.	Create, select, and apply appropriate techniques, resources, and modern engineering tools such as optimization techniques, simulations, including prediction and modeling to complex process engineering problems with an understanding of their limitations.	Modern Tool Usage
PO6.	Apply contextual knowledge with justification to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering and civil engineering professionalpractice	The Engineer & Society
PO7.	Environment and sustainability: An ability to understand the principles, commitment and practice to improve product sustainable development globally in civil engineering with minimal environmental effect.	Environment and Sustainability
PO8.	Apply ethical principles and commit to professional ethics adhering to the norms of the civil engineering practice	Ethics
PO9.	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings	Communication

PO10.	Communicate effectively oncomplex engineering and civil engineering activities withthe engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	Individual and Team work
PO11.	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change	Lifelong Learning
PO12.	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage civil engineering projects and in multi disciplinary environments.	Project management & Finance

Department of Civil Engineering

Program Specific Outcomes (PSOs)

PSO-1: Able to apply concepts of Civil Engineering to design simple infrastructure such as Building, water tanks, retaining walls, water supply systems, wastewater treatment plants, hydraulic structures, highways, traffic signals problems, landfills, ash ponds etc.

PSO-2: Able to design and conduct civil engineering experiments, as well as to analyze and interpret data.

PSO-3: Exhibit knowledge of basic and applied sciences (Physics, Chemistry and Maths) and apply the same for solving real life civil engineering field problem.

PSO-4: Exhibit an ability to use the techniques, skills, and modern engineering tools necessary for civil engineering practice.

ENVIRONMENT AND ECOLOGY (ECE-154)

Type	L	T	P	Credits
MC	2	0	0	0

To make students understand and appreciate the unity of life in all its forms, the implication of the life style on the environmental.

Course Objectives:

1. To understand the various causes for environmental degradation.
2. To understand individual contribution in the environmental pollution.
3. To understand the impact of pollution at the global level and also in the local environment.
4. To understand the concept of sustainable development.

Unit-1:

Definition, Scope and importance, Need for Public awareness, Environment definition, Ecosystem, Concept of ecosystem, Structure and function of an ecosystem, Energy flow in ecosystem, Ecological succession, Balanced ecosystem, Human activities, Food shelter, Economic and Social Security.

Effects of Human Activities on Environment: Agriculture, Housing Industry, Mining and Transportation Activities, Basic of Environmental Impact Assessment, Sustainable Development.

Unit-2:

Natural Resources: Water Resources – Availability and Quality Aspects, Conservation of water, Water Borne Diseases, Water induced Diseases, Fluoride problems in Drinking water, Mineral Resources, Forest Wealth, Material Cycles- Carbon, Nitrogen and Sulphur Cycles.

Energy – Different Types of Energy, Electro-magnetic Radiation, Conventional and Non-Conventional Sources, Hydro Electric Fossil Fuel Based, Nuclear, Solar, Biomass, Bio-gas, Hydrogen as an Alternative Future Sources of energy.

Unit-3:

Environmental Pollution: Water Pollution, Land Pollution, Noise Pollution , Public health aspects, AirPollution, Soil pollution, Marine Pollution, Thermal Pollution, Nuclear Hazards.

Solids Waste Management: Cause, effects and control measures of urban and industrial wastes, Role of an Individual in prevention of pollution, Pollution case studies, Disaster management: Floods, earthquake, cyclone and landslides.

Unit-4:

Current Environmental Issue of Importance, Population Growth, Variation among nations, Population explosion , family welfare Programme, Climate Change and Global Warming-Effects, Urbanization, Automobile pollution, Acid Rain, Ozone Layer Depletion.

Environmental Protection –Role of Government, Legal Aspects, Initiatives by Non- Government Organization (NGO), Environmental Education, Value Education, Human Rights, HIV/AIDS, Women and child welfare, Case Studies.

Course Outcomes:

1. Understand the need for eco-balance.
2. Acquire basic knowledge about global climate change with a particular reference to the Indian context.
3. Find ways to protect the environment and play pro-active roles.
4. Involve themselves in activities for environment protection.

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100 YEARS 1921 - 2021

Department of Plastic Technology

Programme Outcomes(POs)		Graduate Attributes (GAs)
PO1.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	Engineering Knowledge
PO2.	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	Problem Analysis
PO3.	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	Design/Development of solutions
PO4.	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	Conduct Investigations of complex problems
PO5.	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations	Modern Tool Usage
PO6.	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	The Engineer & Society
PO7.	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	Environment and Sustainability
PO8.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	Ethics
PO9.	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Communication

PO10.	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	Individual and Team work
PO11.	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	Lifelong Learning
PO12.	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change	Project management &Finance

Department of Plastic Technology

Program Specific Outcomes (PSOs)

PSO1 : to apply practical skills, technical knowledge in major streams such as chemistry, manufacturing, processing, and applications areas of engineering and technology in plastic and allied industries

PSO2 : to take-up career in research organizations or to pursue higher studies in plastic technology and interdisciplinary programs with high regard for ethical values, environmental and social issues.

PROGRAMME ELECTIVE COURSE III

TPL 452 POLYMER PACKAGING AND WASTE MANAGEMENT

L	T	P	C
3	1	0	4

OBJECTIVE: The objective of this course is to enable the students

- To understand concept of packaging and utility of plastics in packaging.
- To analyze properties of polymers for their utility in packaging of variety of products.
- To know various sources of plastics waste generation and its management.
- To understand the recycling techniques used for various plastics.

Course Outcome

CO1	Understand plastic packaging, scope, advantages and disadvantages of plasticpackages, and application of polymer films for packaging.	Understand
CO2	Understand and analyze selection criteria for various household and industrialpolymeric packages, their testing and utility on various fields.	Analyze
CO3	Understand and apply various policies legislation related to plastic waste Management and their effects on environment.	Apply
CO4	Understand recycling technologies for variety of plastics.	Understand and Ethics
CO5	Understand biodegradable polymers and prospects for biodegradable plastics based on renewable resource polymers.	Apply

COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3		2				3					3	3	3
CO2	3	2	2			3	3					3	3	3
CO3	3		2	1		3	3					3	3	3
CO4	3		2			3	3	1				3	3	3
CO5	3		2			3	3				1	3	3	3
Total	**3**	**2**	**2**	**1**		**3**	**3**	**1**			**1**	**3**	**3**	**3**

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) *If there is no correlation, put "-"*

Syllabus

Module-I: Elements of packaging

Concept of plastic packaging, present state of packaging technology, scope of packaging, advantages and disadvantages of polymeric packages over conventional packaging materials. Polymer films for packaging.

Module-II: Polymer Packages and Quality Control

Selection criteria of various household and industrial polymeric packages. Printing on polymeric packages. Testing and quality control. Newer developments in polymer packaging.

Module-III: Plastic waste management

Global policies and regulations. Social and environmental challenges of plastic waste in India. Plastics and environment. Salient features of the plastic waste management (PWM) rules. Waste treatment of various plastic plants, estimation of power requirement and efficiency of size reduction operation of plastics.

Module-IV: Recycling Technology

Recycling and recovery of various plastics items/materials-their effect on environment. Waste collection and recycling methods. Comparative study of conversion of plastic waste into value added products.

Module-V: Biodegradable Polymers

Biodegradable polymers - prospects & utilization, prospects for biodegradable plastics based on renewable resource polymers. Biodegradable polymers for various applications viz. food packaging, agriculture, etc.

Reference Books and Suggested Readings:

1. NP Cheremisinoff, editor. Handbook of Polymer Science and Technology. vol. 4. Taylor & Francis; 1989. 2. G Allen, JC Bevington. Comprehensive polymer science: the synthesis, characterization, reactions & applications of polymers. 1989.
2. CR Oswin. Plastics films and packaging. Applied Science Publishers Ltd.; 1975.
3. Science and Technology of Polymer films, by J.F.Hamlin
4. CR Oswin. Protective Wrapping. London: Cam Publications Ltd.; 1954.
5. DV Rosato, RT Schhwartz. Environmental effects on polymeric materials. 1968.
6. Plastic waste management and environment, by V.P.Malhotra
7. Synthetic Rubber Waste Disposal, by L.D.Dougan & J.C.Bell
8. Plastic waste and its recovery, by M.E.Bocqueye

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100 YEARS 1921 - 2021

Department of Oil Technology

Programme Outcomes(POs)		Graduate Attributes (GAs)
PO1.	Apply the knowledge of mathematics, science, engineering fundamentals and Engineering concepts for the solution of complex Engineering problems	Engineering Knowledge
PO2.	Identify, formulate, review literature and analyze complex problems related to Chemical Technology - Oil Technology reaching substantiated conclusions using first principles of mathematics and engineering sciences.	Problem Analysis
PO3.	Design solutions for complex problems in Chemical Technology - Oil Technology and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations	Design/Development of solutions
PO4.	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	Conduct Investigations ofcomplex problems
PO5.	Create, select, and apply appropriate techniques, resources, and modern engineering tools such as optimization techniques, simulations, including prediction and modeling to complex process Engineering problems with an understanding of their limitations.	Modern Tool Usage
PO6.	Apply contextual knowledge with justification to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering and Chemical Technology - Oil Technology professional practice	The Engineer & Society
PO7.	Understand the impact of the professional engineering and Chemical Technology - Oil Technology solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development	Environment and Sustainability
PO8.	Apply ethical principles and commit to professional ethics adhering to the norms of the engineering and Chemical Technology - Oil Technology practice	Ethics

PO9.	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings	Communication
PO10.	Communicate effectively oncomplex engineering and Chemical Technology - Oil Technology activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and giveand receive clear instructions	Individual and Team work
PO11.	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change	Lifelong Learning
PO12.	Demonstrate knowledge and understanding of the engineeringand management principles and apply these to one's work,as a member and leader in a team, to manage engineering and Chemical Technology - Oil Technology projects andin multidisciplinary environments.	Project management &Finance

Department of Oil Technology

Program Specific Outcomes (PSOs)

PSO1 : to apply practical skills, technical knowledge in major streams such as chemistry, manufacturing, processing, and applications areas of engineering and technology in plastic and allied industries

PSO2 : to take-up career in research organizations or to pursue higher studies in plastic technology and interdisciplinary programs with high regard for ethical values, environmental and social issues.

TOT-252 Sources, Composition, Characterization of Oils, Fats, and Waxes

L	T	P	C
3	1	2	5

OBJECTIVE: The objective of this course is to enable the students

- To understand concept of packaging and utility of plastics in packaging.
- To analyze properties of polymers for their utility in packaging of variety of products.
- To know various sources of plastics waste generation and its management.
- To understand the recycling techniques used for various plastics.

Course Outcome:

On the successful completion of the course, students will be able to.

CO1	This gives exposure to various edible, non-edible, commercial oils, fats, andwaxes from Animal and vegetable sources.	Understand
CO2	Utilization of oils fats, and waxes as well as storage and handling of oils and oil-seeds.	Apply
CO3	This enables the students to come through the specification and physical & chemical characteristic of the oil occurring naturally from vegetable/animal/marine sources	Apply
CO4	Apply their knowledge to analyze the application of individual oils/fats & their nutritional value for edible application direct or after modification.	Analyze
CO5	To analyze the characteristic and composition of various oils, fat and waxes fortheir nonedible & industrial purposes.	Analyze

Syllabus:

Module-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 ofproduction and price and their reasons.

Module-II

Handling and Storage of Oils and oilseeds

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

Module–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, niger seed, linseed, castor , rice-bran, cottonseed, corn, tung, oiticica, neem, mahua, kusum, karanja, sal, mango kernel, tobacco, shea fat, watermelon, wheat germ, algae oils, chiaseed oil, jatropha etc. Genetically modified oilseeds

Module-IV

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

Milk fats and butter, lard, tallow other animal fats and greases etc. Fish and marine oils: halibut, herring, shark, menhaden, whale, sardine, fish liver oils, krill oil etc, Differentmethods of rendering.

Module-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, rice bran, sunflower and spermaceti, synthetic waxes, their occurrence, classification, general properties and uses.

Module- VI

Laboratory work

Analysis of oilseeds and cakes as per FSSAI/ BIS methods- Moisture Content, Oil Content, Nitrogen/Protein Content, Crude fiber Content, Ash Content

Analysis of extracted oils/ de-oiled cake- FFA, MIV, Color, Flash Point, Phosphatides & wax, poptest, protein, sand & silica, urease activity.

Reference Book

1. AE Bailey. Bailey's Industrial Oil and Fat Products, Edible Oil and Fat Products: ProcessingTechnologies. vol. 5. Sixth. United Kingdom: Wiley; 2005.
2. Products: Processing Technologies Edited by Fereidoon Shahidi, A Wiley- Interscience Publication, JOHN WILEY & SONS, New York. Oils & fats TechnologyEdited by E. Bernardini
3. Chemical constitutions of natural fats by T.P. Hilditch and P.N. Williams 4th ed.,Chapman and Hall (1964)
4. Nontraditional oilseeds and oils by N. V. Bringi, Oxford and IBH Co. Pvt. Ltd. (1989)
5. Fatty Acid by K. S. Markely, Interscience publishers (1968)
6. Analysis of fats and oils by Mehlenbacher V. C., Garrardpren (1960)

(Anand Kumar)
Dean of Academic Affairs