POLITEKNIK MALAYSIA
TUN SYED NASIR

PROGRAM HANDBOOK

DIPLOMA IN CHEMICAL TECHNOLOGY [FAT AND OIL]

DEPARTMENT OF CHEMICAL & FOOD TECHNOLOGY

POLITEKNIK
TUN SYED NASIR SYED ISMAIL

DIPLOMA IN CHEMICAL TECHNOLOGY (FATS AND OILS)

PROGRAM INTRODUCTION

The palm oil industry, the fourth largest contributor to the Gross National Income (GNI) is targeted as one of the National Key Economic Areas to propel Malaysia towards achieving high income status in the year 2020. The Entry Point Projects involve downstream expansion directly related to the oleochemical industry. Additionally, under the 11th Malaysian Development Plan Increased investment has also been targeted in downstream palm oil industry in two of the 5 regional economic corridors.

These projects together with the expanding global market in fat and oil end products has made it timely for pursuing a career in the fat and oil technology and particularly in the palm oil industry. A career in oil and fat technology offers excellent job prospects. Therefore, there is a need for graduates with knowledge and skills in chemistry, oil and fat processing and chemical technology to meet industrial manpower requirements in the field. Department of Polytechnic and Community College Education takes the initiative to fulfil this demand by offering Diploma in Chemical Technology (Fat and Oil), to provide career advancement in the fat and oil discipline to meet and equip the needs of the industry now and in the future.

SYNOPSIS

Diploma in Chemical Technology (Fat and Oil) programme is designed to provide the future graduates with knowledge and skills with integrated, rigorous, relevant and real world educational experience in disciplines, areas and sub-areas of fat and oil technology including oleochemistry. Graduates will be nurtured to develop critical thinking, creativity, communication and collaboration skills as well as management knowledge, information technology, entrepreneurship and interpersonal development through the CDIO framework and other student-centered learning approaches.

JOB PROSPECT

The knowledge and skills that the students acquire from the program will enable them to participate in the job market as:

a. Chemical Technologist Assistant
b. Quality Control Assistant
c. Quality assurance assistant
d. Lab Assistant
e. Fat and Oil Product Innovators
f. Project engineering assistant
g. Analytical associate engineering assistant
h. Unit operation and processing technician
i. Pharmacist assistant
j. Medical lab technologist

PROGRAMME AIMS

This programme believes that all individuals have potential to be precise and innovative Assistant Chemical Technologist in supporting government aspiration in increasing number of skilled workforce in chemical industries.

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

Diploma in Chemical Technology (Fat and Oil) should produce Chemical Technologist Assistance who are:

PEO1: apply basic knowledge, understanding and technical skills of chemical technology (fat and oil) in assisting the execution of problem solving for chemical industries issues and challenges

PEO2: integrate values, attitudes, professionalism and social skills in engaging with society and stakeholder

PEO3: alternately adopt the roles of a leader and a team member and communicate effectively in assisting the execution of scientific creative solutions for chemical industries problems

PEO4 : proactively acquire new knowledge and entrepreneurial skills for career advancement and innovatively assist to manage resources and information

PROGRAMME LEARNING OUTCOMES (PLO)

Upon completion of the programme, students should be able to:

PLO1: apply fundamental knowledge and principle of fat and oil, chemistry and technology in related industry to assist in providing solutions to chemical technology issues

PLO2: perform comprehensive technical expertise in chemical technology task based on industrial requirement

PLO3: demonstrate social skills and responsibilities in chemical technology (fat and oil) related industry

PLO4: deliver positive values, ethics and accountability in engaging with society

PLO5: demonstrate effective communication and taking alternate role as a leader and a member of a diverse teams

PLO6: analyse issues in formulating and executing effective solution to situations encountered in chemical technology business and industry by employing appropriate and relevant scientific approaches

PLO7: demonstrate information management and lifelong learning skills in chemical technology (fat and oil) related industry

PLO8: display entrepreneurial and good managerial skills in chemical technology (fat and oil) related industry

PROGRAMME STRUCTURE (SEM 1 - SEM 6)

CLASSIFICATION	COURSE CODE	COURSE NAME	CONTACT HOURS				CREDIT VALUES	PROGRAMME LEARNING OUTCOME (PLO)									PREREQUISITE / CO-REQUISITE
								PLO1	PLO2	PLO3	PLO4	PLO5		PLO6	PLO7	PLO8	
			L	P	T	O		Knowledge	Practical Skills	Social skills & responsibilities	Values, attitudes & proffesionalism	Communication, leadership & team work skills		Problem-solving & scientific skills	Information management & life-long learning skills	Manegerial & Entrepreneural skills	
								CLS1	CLS3a	CLS3d	CLS5	CLS3b	CLS3d	CLS2	CLS3c	CLS4	
SEMESTER 1																	
Compulsory	MPU21032	Penghayatan Etika dan Peradaban	1	0	2	0	2				√					√	
	DUE10012	Communicative English 1	1	0	2	0	2					√				√	
	MPU24XX1	Sukan	0	2	0	0	1						√			√	
	MPU24XX1	Unit Beruniform 1															
Common Core	DBM10133	Mathematics for Technology	2	0	2	0	3	√				√			√		
	DMK10013	Introduction to Chemical Technology	2	2	0	0	3	√	√						√		
Discipline Core	DMK10023	Basic Physical Chemistry	2	2	0	0	3	√	√				√				
	DMK10033	Introduction to Oil and Fat	2	0	2	0	3	√	√		√						
TOTAL			**24**				**17**										
SEMESTER 2																	
Compulsory	MPU23052	Sains, Teknologi Dalam Kejuruteraan Islam *	1	0	2	0	2				√					√	
	MPU23042	Nilai Masyarakat Malaysia **															
	MPU24XX1	Kelab / Persatuan	0	2	0	0	1						√			√	
	MPU24XX1	Unit Beruniform 2															MPU24XX1
Common Core	DUW10012	Occupational, Safety and Health	2	0	0	0	2	√			√	√					
Discipline Core	DMK20042	Organic Chemistry	2	0	1	0	2	√			√						
	DMK20052	Chemistry Laboratory	1	3	0	0	2	√	√				√				
	DMK20062	Standard Analysis of Oil and Fat	1	3	0	0	2	√	√			√					
	DMK20073	Non-edible Oil and Fat Products	2	3	0	0	3	√	√			√					
	DMK20083	Edible Oil and Fat Product	2	3	0	0	3	√	√					√			
TOTAL			**28**				**17**										
SEMESTER 3																	
Compulsory	DUE30022	Communicative English 2	1	0	2	0	2					√				√	DUE10012
	MPU22012	Enterpreneurship	1	0	2	0	2					√				√	
Common Core	DUG30023	Green Technology Compliance	2	0	2	0	3		√			√		√			
Discipline Core	DMK30093	Chemical Instrumentation	2	3	0	0	3	√	√	√							
	DMK30103	Oleochemical Derivatives	2	2	0	0	3	√	√				√				
	DMK30113	Oil and Fat Process Technology	2	0	2	0	3	√	√		√						
	DMK30122	Oil and Fat Processing Laboratory	0	5	0	0	2	√	√		√						
TOTAL			**28**				**18**										

CLASSIFICATION	COURSE CODE	COURSE NAME	CONTACT HOURS				CREDIT VALUES	PROGRAMME LEARNING OUTCOME (PLO)									PREREQUISITE / CO-REQUISITE
								PLO1	PLO2	PLO3	PLO4	PLO5		PLO6	PLO7	PLO8	
								Knowledge	Practical Skills	Social skills & responsibilities	Values, attitudes & proffesionalism	Communication, leadership & team work skills		Problem-solving & scientific skills	Information management & life-long learning skills	Manegerial & Entrepreneural skills	
			L	P	T	O		CLS1	CLS3a	CLS3d	CLS5	CLS3b	CLS3d	CLS2	CLS3c	CLS4	
SEMESTER 4																	
Compulsory	DUE50032	Communicative English 3	1	0	2	0	2					√				√	DUE30022
Discipline Core	DMK40133	Instrumentation in Oil and Fat Analysis	2	3	0	0	3		√				√	√			DMK30093
	DMK40142	Project 1 - Proposal and Research Methodology	2	0	1	0	2						√	√			
	DMK40153	Oil and Fat Product Innovation	2	4	0	0	3		√					√		√	
	DMK40163	Quality Assurances	2	2	0	0	3	√	√		√						
	DMK40173	Sensory and Statistics for Applied Science	2	2	0	0	3		√					√	√		
Electives		Elective 1					2										
		TOTAL	**25**				**18**										
SEMESTER 5																	
Discipline Core	DMK50183	Environmental Impact and Waste Management	2	3	0	0	3	√	√						√		
	DMK50193	Supply Chain Management	2	0	2	0	3	√						√	√		
	DMK50203	Project 2 Implement and Evaluation	0	6	0	0	3		√					√	√		DMK40142
Electives		Elective 2					3										
		TOTAL	**15**				**12**										
SEMESTER 6																	
Industrial Training	DUT60019	Industrial Training	0	0	0	0	9		√	√	√	√	√		√	√	
		TOTAL	**0**				**9**										
		TOTAL CREDIT VALUE					**91**										

ELECTIVES																	
1	DMK50213	Surfactant Chemistry	2	2	0	0	3	√	√		√						
2	DMK50223	Enzyme Technology	2	2	0	0	3	√	√	√							
3	DMT50263	Food Engineering	2	2	0	0	3		√					√		√	
4	DMT20082	Concept of Halal Food	2	0	0	0	2	√		√							
5	DYB40192	Agrobiotechnology	2	0	0	0	2	√			√						

FREE ELECTIVES[a]																	
1	DUD10012	Design Thinking	1	0	0	1	2					√		√			

	Total Credit	%
i. (a) Compulsory	14	15%
(b) Compulsory (Bahasa Kebangsaan A)[b]	2[b]	0%
ii. Common Core	11	12%
iii. Discipline Core	52	57%
iv. Specialization	0	0%
Total Credit	77	
v. (a) Elective	5	5%
(b) Free Electives[a]	2[a]	0%
vi. Industrial Training	9	10%
Grand Total Credit	**91**	**100%**

	Total Hours	%
i. Lecture	32	38%
ii. Practical	44	52%
iii. Tutorial	8	10%
Total Contact Hours	84	100%

SYNOPSIS PROGRAM

SEMESTER	COURSE	CREDIT	PREREQUISITE	SYNOPSIS	CLO
1	DMK10013 INTRODUCTION TO CHEMICAL TECHNOLOGY	3	-	INTRODUCTION TO CHEMICAL TECHNOLOGY aims to foster deeper understanding and appreciation of some major contributions of technology and engineering in the 20th century, development of oil and fat industry, career pathways and the attributes expected of technologist in the 21th century. This module also introduces student to major chemical industries, green technology and initiatives as well as the Conceive-Design-Implement-Operate (CDIO) approach to technology and engineering education. Student is introduced with First Year Industrial Exposure (FYIE) by conducting a mini project and survey to related industry.	1. Explain some major contributions of technology and engineering, development of oil and fat industry, career pathways in chemical industry, green technology and initiatives, and introduction to CDIO. (C2, PLO1). 2. Perfom the practical skills in carrying CDIO mini project which incorporates elements of good teamwork skills and green technology. (P3, PLO2) 3. Apply knowledge to solve a given problem through drawing inferences based on observations and information given incorporating issues of sustainability. (A3, PLO 7)

	DMK10023 BASIC PHYSICAL CHEMISTRY	3	-	BASIC PHYSICAL CHEMISTRY introduces the fundamental concepts of molecular science and uses them to discuss the behavior of atoms and molecules in qualitative and quantitative terms. The fundamental concepts include matter, atomic structure and Periodic Table, redox reactions, acids and bases, kinetic and equilibrium. It will provide the framework for an understanding of the molecular basis of many technologically important processes.	1. Apply the principles of fundamental concepts of molecular science which include matter, atomic structure and Periodic Table, redox reactions, acids and bases. (C3, PLO 1) 2. Display practical skills in carrying out laboratory work. (P3, PLO 2) 3. Follow procedures and proper techniques with emphasis on safety while carrying out practical work and act responsibly as a team member. (A3, PLO 5)

	DMK10033 INTRODUCTION TO OIL AND FAT	3	-	INTRODUCTION TO OIL AND FAT provides basic knowledge of oils and fats, their sources, physical characteristics as well as chemical characteristics. It also covers the structure and nomenclature of fatty acids and lipids.	1. Explain the properties, structure, types, sources of lipid, oil, fat and fatty acids and describe the process in supply chain. (C2, PLO 1) 2. Display the ability to draw the chemical structure and the process related to oil and fat. (P3, PLO 2) 3. Retrieve the knowledge from various sources and present the main points of a given topic related to oil and fat to audience. (A3, PLO 4)
2	DMK20042 ORGANIC CHEMISTRY	2	-	ORGANIC CHEMISTRY covers the structure of organic molecules as well as the IUPAC nomenclature system, chemical and physical properties. These are discussed in terms of the functional group including alkanes, alkenes, alkynes, aromatic, hydroxyl, carbonyl, carboxylic acid and ester with emphasis on common applications of these organic compounds. Subsequently students study the common types of chemical reactions encountered in organic chemistry, followed by concept of isomerism.	1. Explain the functional group in organic, name correctly organic compound using IUPAC nomenclature, the reaction and the isomerism in organic chemistry. (C2, PLO1). 2. Follow guided instructions in the drawing and naming of organic compounds, the reaction and isomers in organic chemistry. (A3, PLO4)

	DMK20052 CHEMISTRY LABORATORY	2	-	CHEMISTRY LABORATORY is an introductory course to the application of laboratory techniques in organic chemistry. These techniques include the purification and quantification of an organic compound, the determination of the physical properties of some common organic compounds and the chemical properties of organic compounds such as aliphatic hydrocarbons, aromatic compound and its derivatives, hydroxyl compounds, carbonyl compounds, carboxylic acids, esters and alkylhalides. Emphasis is placed on analytical techniques that aid the understanding of the differences between the physical and chemical properties of alkanes, alkenes and other organic compounds as well as inculcate the importance of minimizing wastage and pollution to the environment.	1. Explain the procedures used and the results obtained in the determination of the physical and chemical properties of common organic compounds. (C3, PLO1) 2. Perform practical skills in chemical analysis involving organic compounds in the laboratory with efforts to minimize wastage and pollution to the environment. (P3, PLO2) 3. Demonstrate team work in a range of team role situations as a team leader and as a team member. (A3, PLO5)

	DMK20062 STANDARD ANALYSIS OF OIL AND FAT	2	-	STANDARD ANALYSIS OF OIL AND FAT provides students with basic disciplinary knowledge and skills in standard and conventional methods of oil and fat analysis. Physical and chemical properties affect the quality of oils and fats and are important factors for consideration in the production of oil and fat products. Standard analysis used to determine parameters such as refractive index, colour, specific gravity, oil moisture content, iodine value, peroxide value, acidity, saponification value and unsaponifiable matter in the laboratory are introduced. Efforts to minimize wastage and pollution to the environment as green practices are emphasized.	1. Apply the knowledge of oils and fats characteristics, importance of determining quality parameters used in oil and fat analysis, and standard analysis of oil and fat analysis. (C3, PLO1). 2. Perform the laboratory experiment in carrying out standard analysis of oil and fat analysis with efforts to minimize wastage and pollution to the environment. (P4, PLO2) 3. Report writing of experiment by analyzing the result and discussion by collecting the data. (A3, PLO5)

	DMK20073 NON EDIBLE OIL AND FAT PRODUCTS	3	-	NON EDIBLE OIL AND FAT PRODUCTS contains basic knowledge of oils and fats to produce non-food products, soaps and detergents, personal care products, pharmaceuticals, biodiesel, bio-lubricants and production of polymers and plastics. This course also introduces the students to the preparation of products such as liquid, soap, bar soap and lotion.	1. Describe the production of some non-food oil and fat products such as soap and detergent, personal care products, pharmaceuticals, biodiesel, biolubricants and production. (C2, PLO1) 2. Conduct the process of producing non edible oil and fat products such as soaps detergents, personal care products and biodiesel. (P4, PLO2) 3. Present non edible oil and fat product by showing the process, result, and function in team. (A5, PLO5)

	DMK20083 EDIBLE OIL AND FAT PRODUCT	3	-	EDIBLE FAT AND OIL PRODUCT contains basic knowledge of edible oil and fat products such as cooking and frying oil, shortening, vanaspati (vegetable ghee), margarine, butter, ghee, emulsifying agent, and other fat and oil products. This course also introduces the students to the preparation of edible products such as ghee, mayonnaise, ice-cream, margerine and chocolate from oils and fats.	1. Explain edible oil and fat products including cooking oil, shortening, vanaspati (vegetable ghee), margarine, butter, shortening, mayonnaise, salad oils and emulsifying agent and illustrate the production flow process for these products. (C2, PLO1) 2. Perform a laboratory experiment by selecting a suitable edible oil and fat products. (P3, PLO2) 3. Report writing of laboratory practical by analyzing a result and discussion regarding the oil and fat products. (A3, PLO5)

3	DMK30093 CHEMICAL INSTRUMENTATION	3	-	CHEMICAL INSTRUMENTATION introduces the components, function and usage of some analytical instruments in chemical industries. The principles and standard operation procedures of selected instruments such as spectroscopy and separation are covered in this course. Spectroscopic and analytic methods include Visible and Ultraviolet Spectroscopy (UV-VIS), X-ray Fluorescence (XRF) spectroscopy, Infrared Spectroscopy (IR) and Nuclear Magnetic Resonance (NMR) Spectroscopy. Separation and analysis instruments include Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC).	1. Apply the principles of the analytical instruments used in chemical analysis according to appropriate methods. (C3, PLO1) 2. Analyze and discuss the result from chemical instrumentation analysis. (P4, PLO2) 3. Follow procedures with proper techniques emphasizing safety precautions and responsibility while conducting analysis in the laboratory. (A3, PLO3)

	DMK30103 OLEOCHEMICAL DERIVATIVES	3	-	OLEOCHEMICAL DERIVATIVE contains basic knowledge on processes that are involved in the production of selected fatty acid derivative (oleochemicals) as well as the concept of hydrolysis, esterification, oxidation and reduction. This course also provides essential knowledge about production of other oleochemicals and saponification process of fatty acids.	1. Describe the process involved in the production of selected fatty acid derivatives (oleochemicals). (C3, PLO1) 2. Display practical skills in carrying out oleochemical derivatives in the laboratory with effort to minimize wastage and pollution to the environment. (P4, PLO2) 3. Demonstrate responsibility as a team member while carry out practical work. (A3, PL05)

	DMK30113 OIL AND FAT PROCESS TECHNOLOGY	3	-	OIL AND FAT PROCESSING covers the study of several methods used in oil and fat processing. The raw materials for oil and fat products include animal fats, vegetable oils and seed oils. The crude fats and oils from these sources are recovered using a number of methods such as oil extraction, refining, modification and fat splitting. The extent of fat and oil process depends on the source, quality, and nature of the end use. The safety in oil and fat processing plants is also introduced to the students by a safety officer from an oil and fat processing plant.	1. Describe the processes involved in oil and fat processing and sustainable palm oil supply chain. (C3, PLO1) 2. Display the ability to outlines the processes involved in oil and fat processing and sustainable palm oil supply chain by determine the quality parameter analysis involved. (P3, PLO2) 3. Evaluate and present the safety, health and occupational practices used in oil and fat processing industry related to current practice and regulation. (A2, PLO4)

	DMK30122 OIL AND FAT PROCESSING LABORATORY	2	-	OIL AND FAT PROCESSING LABORATORY covers the study of various stages and methods employed in oil and fat processing, beginning from storage, extraction of crude oil from animal and plant sources to refining and modification of extracted oils and fats. Raw materials for oil and fat extraction include animal by-products, fleshy fruits, and oilseeds. Crude oils and fats from these sources can be recovered by methods which include mechanical extraction, thermal extraction, solvent extraction and enzymatic hydrolysis. Some oils, such as virgin olive oil, are ready for consumption after this initial step (pressing), while others require additional processing such as refining and modification. The extent of oil and fat processing depends on the source, quality, and nature of the end use.	1. Explain the various methods and operational procedures for oil and fat processing and briefly discuss green technology in waste management. (C2, PLO1) 2. Display basic proficiency in handling laboratory equipment to carry out laboratory work related to oil and fat processing. (P4, PLO2) 3. Practice safety measures and precautions during oil and fat processing activities by showing the values and attitude in following the procedures. (A5, PLO4)

4	DMK40133 INSTRUMENTATION IN OIL AND FAT ANALYSIS	3	-	INSTRUMENTATION IN OIL AND FAT ANALYSIS covers the study of oil and fat analysis. This study provides essential knowledge about anisidine value, fatty acid analysis, triacylglycerol analysis, melting profile, solid fat content and enzymatic glycerolysis. This study also includes experiments for oil and fat analysis.	1. Explain generally the principles and application of different instruments in oil and fat analysis according to appropriate methods. (C3, PLO1) 2. Perform practical skills in handling instruments in oil and fat analysis. (P4, PLO2) 3. Follow procedures and proper techniques, with emphasis on safety while carrying out practical work and act responsibly as a team member. (A3, PLO5)
	DMK40142 PROJECT 1 – PROPOSAL AND RESEARCH METHODOLOGY	2	-	PROJECT 1 – PROPOSAL AND RESEARCH METHODOLOGY is a theoretical and practical - based study that guides the students to produce a well written research proposal in the field of oil and fat technology. It outlines the basic principles involved in the selection and choice of a research topic, the scope of the research, planning the research and research methodology employing the Conceive-Design-Implement-Operate (CDIO) approach focusing on the Conceive and Design stages. At the end of the study, the project proposal will be presented for evaluation purposes.	1. analyze a problem by providing a solution relating to oil and fat technology field (C4,PLO1) 2. display leadership skills while working in a group during investigation of problems by adopting the CDIO approach focusing on Conceive and Design. (A3,PLO5)

	DMK40153 OIL AND FAT PRODUCT INNOVATION	3	-	OIL AND FAT PRODUCT INNOVATION consists of the method and procedures involved in producing new oil and fat based product, starting from idea generation, screening of ideas, inovation of product, market testing, data collection and analysis, to promotion of a new oil and fat product. This course also consists of advantages of using oils and fats, regulations and marketing of oil and fat products.	1. Solve problem encountered during the product innovation process (C3, PLO2) 2. Develop a new product systematically through the CDIO approach taking into consideration sustainability or green practices. (P4, PLO6) 3. Demonstrate basic entrepreneurial skills through innovation of a selected new product. (A3, PLO8)
	DMK40173 SENSORY AND STATISTIC FOR APPLIED SCIENCE	3	-	SENSORY AND STATISTICS FOR APPLIED SCIENCE contains basic knowledge of sensory method, statistics, descriptive statistics and inferential statistics commonly used in the field of science and technology. This course also introduces the application of computer software for data presentation and analysis. Students will be able to describe and analyze data in science and technology-related situations through application of the knowledge and skills gained.	1. Analyze statistical problems through analysis and application of statistical concepts, basic formulae and inferential statistical tests. (C3, PLO6) 2. Perform practical skills to analyze statistical data using computer software. (P3, PLO2) 3. Demonstrate information skill in data analysis using computer software. (A3, PLO7)

	DMK40163 QUALITY ASSURANCES	3	-	QUALITY ASSURANCE introduces the concept of quality; oil and fat quality control, oil and fat quality parameters and testing methods, oil and fat quality assurance system, and oil and fat quality specification. It also provides exposure to the reporting and recording aspects, the ISO quality system, and current issues in oil and fat quality control.	1. Explain the concepts and procedures of different quality systems in industry as well as current issues in oil and fat quality assurance. (C3, PLO1) 2. Demonstrate oil and fat quality assurance tests in the laboratory to determine common quality assurance parameters. (P5, PLO2). 3. Display professionalism in presenting results of quality assurance measures or activities undertaken. (A3, PLO4)

6	DMK50183 ENVIRONMENTAL AND WASTE MANAGEMENT	3	-	ENVIRONMENTAL AND WASTE MANAGEMENT is designed to provide an overview of the environmental impact resulting from oil and fat industry with particular emphasis on palm oil production beginning from the processing of oil and fat to the production of the final product. It also discusses major processes and facilities as they are related to waste generation and control. This course addresses primarily waste water aspects of oil and fat industry, and briefly, air and solid waste aspects. Other topics include the National Environmental Policy Act and Regulation - its implication and implementation, risk analysis and risk management to overcome problems related to waste management for the purpose of sustainability.	1. Describe the waste generated by oil and fat industries, the various techniques used in waste treatment with emphasis on wastewater treatment and the impact of oil and fat industry on the environment and sustainability. (C3, PLO1) 2. Analysed the result obtained from water quality analysis and apply selected wastewater treatment techniques to treat wastewater from oil and fat processing towards sustainable practices. (P3, PLO2) 3. Express awareness of the responsibilities towards the environmental impact issues resulting from oil and fat industry and waste water treatment to promote green practices. (A3, PLO7)

	DMK50193 SUPPLY CHAIN MANAGEMENT	2	-	SUPPY CHAIN MANAGEMENT covers the supply chain management involved in oil and fat industry. This courses also explain the elements of storage and handling of crude oil, refined and derivatives. Students also learnt how to improve product quality from the related quality parameter. Transportation, shipping and cost management in oil and fat industry also be teaching in this course.	1. Explain the concept of supply chain in storage and handling of oil and fat products, improve product quality as well as cost management in oil and fat - related industry taking into consideration principles of sustainability. (C2, PLO1) 2. Apply procedures to be taken in storage and handling of oil and fat products, improve product quality as well as cost management in oil and fat - related industry taking into consideration principles of sustainability. (C3, PLO6) 3. Practice safety measures and precautions during oil and fat processing activities. (A3, PLO7)

	DMK50203 PROJECT 2- IMPLEMENTATION AND EVALUATION	3	-	PROJECT 2 is a practical-based study that requires the students to carry out a research project in the field of oil and fat technology based on a research proposal completed in Project 1. Students will apply their knowledge and skills on oil and fat technology, the Conceive-Design-Implement-Operate approach as well as research methodology in conducting the research project, collect the data, analyze the data and present the results orally and in written form. The latter comprises Draft 1 and a final report to be submitted for evaluation purposes	1. Apply and transfer the knowledge to solve a problem in achieving the objectives of research regarding to the field of oil and fat technology. (C3, PLO6) 2. Perform the research study based on the reasearch plan (proposal) from commencement to completion. (P4, PLO2) 3. Display and present the findings of the research by achieveng the project objective through project outcome. (A3, PLO7)

ELECTIVE	DMK50213 SURFACTANT CHEMISTRY	2	-	SURFACTANT CHEMISTRY contains basic knowledge on surface and interfacial activity, surfactants, role of surfactants, emulsion and colloids. It additionally emphasizes the applications of surface active materials in non-food and food industries. This course also introduces several classes of surfactants such as anionic, non ionic, cationic, amphoteric.	1. Describe concepts of surface and interfacial activity, surfactants and their roles, emulsion and colloid and explain the application of surfactants in food and non-food industries. (C3, PLO1) 2. Display the abillity to outline the concepts of surfactant chemistry and its applications. (P3, PLO2) 3. Demonstrate lifelong learning and information management skills to identify the application of surfactants used in industry with emphasis on their functions in solving related problems. (A3, PLO4)

	DMK50223 ENZYME TECHNOLOGY	2	-	ENZYME TECHNOLOGY introduces the concept of enzyme, enzyme kinetics,factors affecting enzymatic activity, enzyme preparation and use, enzyme immobilization, and enzyme application in oil and fat industry. It also provides exposure to laboratory experimentation involving enzymes, and factors affecting enzymatic reactions with emphasis on the reporting and recording aspects.	1. Describe enzyme technology in processing with emphasis on its applications in oil and fat industry. (C3, PLO1) 2. Display the ability to outlnes the properties of enzymes, factors affecting enzymatic reactions, and application of enzymes in industry. (P4, PLO2) 3. Demonstrate lifelong learning and information management skIls to identify the application of enzymes used in industry with emphasison their functions in solving relatedproblems. (A3, PLO3)