NED University of Engineering and Technology

Department of Food Engineering
Bachelor of Engineering in Food

DEPARTMENTAL OUTCOME BASED EDUCATION (OBE) CATALOGUE

Batch 2021 and Onwards

Contents

1. Vision Statement

a. University Vision

Be a leader in enabling Pakistan's social and economic transformation.

b. Department Vision

To provide high-quality professionals for the food processing and allied industries.

2. Mission Statement

a. University Mission

Acquire education and research excellence in engineering and allied disciplines to produce leadership and enabling application of knowledge and skills for the benefit of the society with integrity and wisdom.

b. Programme Mission

To produce competent Food Engineers capable of applying knowledge and skills for solving complex problems of society in general and food industry in particular by high quality research, education and innovation demonstrating highest professional standard and ethics.

3. Program Educational Objectives (PEOs)

The graduates of Food Engineering programme will:

PEO-1 Demonstrate sound knowledge of food engineering, to attain high level of technical expertise in solving complex engineering problems to achieve professional goals

PEO-2 Demonstrate teamwork and project management skills in a multidisciplinary Environment through effective communication and professional ethics.

PEO-3 Offer sustainable solutions to societal as well as environmental needs and pursue lifelong learning for professional development

4. Mapping of PEOs to University and Departmental Vision and Mission

Vision and Mission		Program Educational Objectives (PEOs)		
		PEO-1	PEO-2	PEO-3
University Vision	Be a leader[2] in enabling Pakistan's social[3] and economic transformation[1,] .	✓	✓	✓
University Mission	Acquire education and research excellence[1] in engineering and allied disciplines to produce leadership[2] and enabling application of knowledge and skills[1] for the benefit of the society[3] with integrity and wisdom.	✓	✓	✓
Department's Vision	To provide high-quality professionals[1] for the food processing[2,3] and allied industries	✓	✓	✓
Programme's Mission	To produce competent Food Engineers capable of applying knowledge and skills for solving complex problems[1] of society[3] in general and food industry in particular by high quality research, education and innovation demonstrating highest professional standard and ethics[2].	✓	✓	✓

5. Program Learning Outcomes (PLOs)

The graduate attributes as defined by PEC, have been adopted as Program Learning Outcomes (PLOs) by the department.

PLO-1 Engineering Knowledge: An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PLO-2 Problem Analysis: An ability to identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PLO-3 Design / Development of Solutions: An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PLO-4 Investigation: An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

PLO-5 Modern Tool Usage: An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.

PLO-6 The Engineer and Society: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.

PLO-7 Environment and Sustainability: An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PLO-8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PLO-9 Individual and Teamwork: An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.

PLO-10 Communication: An ability to communicate effectively, orally as well as in writing, 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.

PLO-11 Project Management: An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

PLO-12 Lifelong Learning: An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

6. Mapping of PLOs to PEOs

Program Learning Outcomes (PLOs)	Program Educational Objectives (PEOs)		
	PEO-1	PEO-2	PEO-3
PLO 1: Engineering Knowledge	✓		
PLO 2: Problem Analysis	✓		
PLO 3: Design / Development of solutions	✓		
PLO 4: Investigation	✓		
PLO 5: Modern Tool Usage	✓		
PLO 6: The Engineer and Society			✓
PLO 7: Environment and Sustainability			✓
PLO 8: Ethics		✓	
PLO 9: Individual and Team Work		✓	
PLO 10: Communication		✓	
PLO 11: Project Management		✓	
PLO 12: Lifelong Learning			✓

7. Scheme of Studies

Food Engineering

First Year

Fall Semester					Spring Semester				
Course Code	Course Title	Credit Hrs			Course Code	Course Title	Credit Hrs		
		Th	Pr	Total			Th	Pr	Total
FD-104	Introduction to Food Engineering	2	0	2	CY-108	Analytical Chemistry	3	1	4
PH-127	Applied Physics for Engineers	2	1	3	EL-232	Electronics	3	1	4
CY-110	Applied Chemistry for Engineers	2	1	3	CS-103	Programming Languages	2	2	4
HS-104	Functional English	3	0	3	HS-105 / HS-127	Pakistan Studies or Pakistan Studies (For foreigners)	2	0	2
BM-108	Computer Aided Engineering Graphics	1	2	3	FD-105	Food Engineering Principles	2	0	2
MT-114	Calculus	3	0	3	HSK-I	Chinese Language	-	-	NC
	Total	**13**	**4**	**17**		**Total**	**12**	**4**	**16**

Second Year

Fall Semester					Spring Semester				
Course Code	Course Title	Credit Hrs			Course Code	Course Title	Credit Hrs		
		Th	Pr	Total			Th	Pr	Total
FD-201	Thermodynamics	3	1	4	FD-208	Food Biochemistry	2	1	3
BM-201	Engineering Mechanics	3	1	4	FD-210	Fluid Mechanics II	2	1	3
MT-223	Differential Equations & Fourier Series	3	0	3	MM-205	Mechanics of Materials	3	1	4
FD-207	Food Chemistry	3	0	3	MT-332	Advanced Calculus & Linear Algebra	3	0	3
FD-209	Fluid Mechanics I	3	1	4	HS-205/ HS-209	Islamic Studies or Ethical Behaviour	2	0	2
HSK-II	Chinese Language	-		NC	HS-200	Community Service	-		NC
	Total	**15**	**3**	**18**		**Total**	**12**	**3**	**15**

Third Year

Fall Semester					Spring Semester				
Course Code	Course Title	Credit Hrs			Course Code	Course Title	Credit Hrs		
		Th	Pr	Total			Th	Pr	Total
FD-301	Unit Operations in Food Engineering-I	3	1	4	FD-304	Food Microbiology	3	1	4
FD-309	Machine Design for Food Engineers	3	0	3	FD-307	Heat & Mass Transfer	3	1	4
FD-306	Instrumentation & Measurement for food Engineers	3	1	4	FD-308	Unit Operations in Food Engineering-II	3	1	4
MT-330	Applied Probability and Statistics	2	1	3	MT-442	Numerical Methods	3	0	3
HS-304	Business Communications & Ethics	3	0	3	CF-303	Applied Economics for Engineers	3	0	3
	Total	**14**	**3**	**17**		**Total**	**15**	**3**	**18**

Final Year

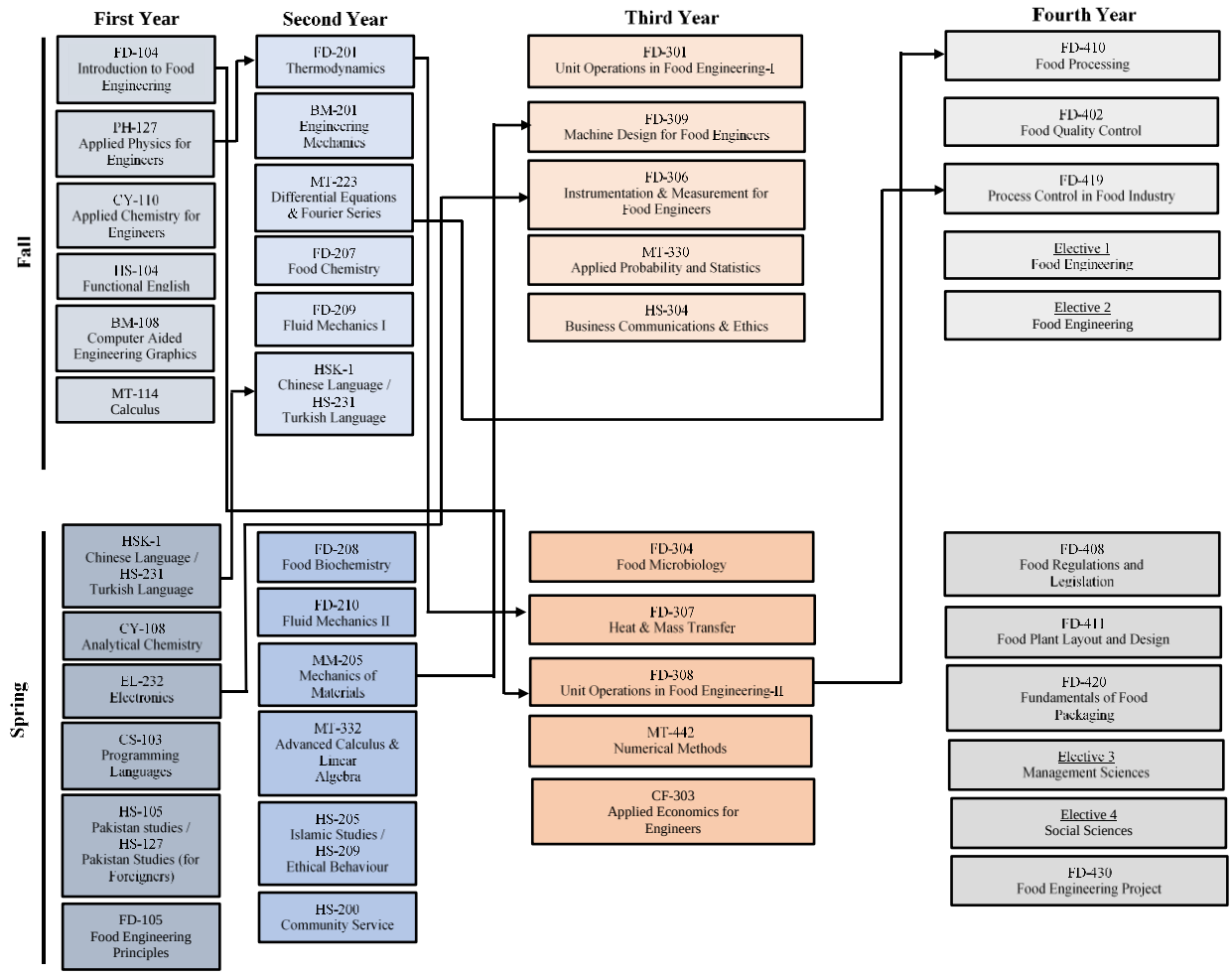
Fall Semester					Spring Semester				
Course Code	Course Title	Credit Hrs			Course Code	Course Title	Credit Hrs		
		Th	Pr	Total			Th	Pr	Total
*FD-430	Food Engineering Project	0	3	3	*FD-430	Food Engineering Project	0	3	3
FD-410	Food Processing	3	0	3	FD-408	Food Regulations and Legislation	2	0	2
FD-402	Food Quality Control	3	0	3	##-###	Elective III (Management Sciences)	3	0	3
FD-419	Process Control in Food Industry	2	1	3	##-###	Elective IV (Social Sciences)	2	0	2

FD-###	Elective I (Food Engineering)	2	1	3	FD-420	Fundamentals of Food Packaging	3	1	4
FD-###	Elective II (Food Engineering)	2	1	3	FD-411	Food Plant Layout and Design	2	1	3
	Total	**12**	**6**	**18**		**Total**	**12**	**5**	**17**
** Duration one academic year: Requires literature survey and preliminary work during this Semester*									

Electives:

Elective I and Elective II Courses (Food Engineering)									
FD-403	Food Biotechnology	2	1	3		FD-414	Beverage Processing	2	1	3
FD-404	Sugar and Confectionery	2	1	3		FD-415	Meat, Poultry and Egg Processing	2	1	3
FD-409	Post-Harvest Processing	2	1	3		FD-416	Food Product Development	2	1	3
FD-412	Dairy Processing	2	1	3		FD-417	Oil and Fats Processing	2	1	3
FD-413	Cereal Processing	2	1	3		FD-418	Food Plant Hygiene and Sanitation	2	1	3
Elective III Courses (Management Sciences)									
CH-407	Industrial Organization and Management	3	0	3		CH-405	Industrial Safety and Maintenance Management	2	1	3
Elective IV Courses (Social Sciences)									
HS-219	Professional Ethics	2	0	2		MG-228	Sociology and Development	2	0	2

Course Dependency Chart



8. Mapping of Curriculum to PLOs

Food Engineering Courses			Program Learning Outcomes (PLOs)											
			PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
First Year	Fall	FD-104 Introduction to Food Engineering	C1 C3 C2											
		PH-127 Applied Physics for Engineers	C2 P3	C3										
		CY-110 Applied Chemistry for Engineers	C2 P3	C3										
		HS-104 Functional English										A3 C2 C6		
		BM-108 Computer Aided Engineering Graphics	C2				C2							
		MT-114 Calculus												
	Spring	CY-108 Analytical Chemistry	C2	C3 C4			P3							
		EL-232 Electronics												
		CS-103 Programming Languages	C2		C3		C3							
		HS-105 Pakistan Studies or HS-127 Pakistan Studies (For foreigners)						C2						C2
		FD-105 Food Engineering Principles	C1 C2											
		HSK-I Chinese Language												
Second Year	Fall	FD-201 Thermodynamics	C2	C3 C4		P3			A3					
		BM-201 Engineering Mechanics	C1	C2	C3	P3								
		MT-223 Differential Equations & Fourier Series												
		FD-207 Food Chemistry	C2									A3		C3
		FD-209 Fluid Mechanics I	C2	C3	C3	P3					A3			
		HSK-II Chinese Language												
	Spring	FD-208 Food Biochemistry	C1 C2			P3								
		FD-210 Fluid Mechanics II	C2	C3	C3	P3					A3			
		MM-205 Mechanics of Materials	C3		C4		C3				P3			
		MT-332 Advanced Calculus & Linear Algebra												
		HS-205 Islamic Studies or HS-209 Ethical Behavior								C2				
		HS-200 Community Service						A3						A2

Food Engineering Courses			Program Learning Outcomes (PLOs)											
			PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
Third Year	Fall	FD-301 Unit Operations in Food Engineering-I	C2		C5	P3								C4
		FD-309 Machine Design for Food Engineers	C2	C2	C4							A3		
		FD-306 Instrumentation & Measurement for Food Engineers	C2		C3		P3						C6	
		MT-330 Applied Probability and Statistics	C2	C4 C3										
		HS-304 Business Communications & Ethics								C3		A3 C6		
	Spring	FD-304 Food Microbiology	C2 C3			P3				A3				
		FD-307 Heat & Mass Transfer	C2		C3	P3							C3	
		FD-308 Unit Operations in Food Engineering-II	C2		C5	P3								
		MT-442 Numerical Methods	C2	C3										
		BF-303 Applied Economics for Engineers		C4				C2						
Fourth Year	Fall	FD-430 Food Engineering Project		C	C				C	A	A	A	A	
		FD-410 Food Processing	C3				C2		C3					
		FD-402 Food Quality Control	C2							C3			C3	
		FD-419 Process Control in Food Industry	C2				C3 P3				A3			
		FD-### Elective I (Food Engineering)	C3			P3			A3					
		FD-### Elective II (Food Engineering)	C3			P3			A3					
	Spring	FD-430 Food Engineering Project		C	C					A	C,A	C,A	C	C
		FD-408 Food Regulations and Legislation						C3	C2					C2
		##-### Elective III (Management Sciences)						C4					C5	
		##-### Elective IV (Social Sciences)												
		FD-420 Fundamentals of Food Packaging			C6	P3		A3	C3					
		FD-411 Food Plant Layout and Design	C2	C3	C5								C3	
		Internship	C	C				A		A	A	A		

List of electives:

		Food Engineering Courses	Program Learning Outcomes (PLOs)											
			PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7	PLO-8	PLO-9	PLO-10	PLO-11	PLO-12
Fourth Year	Fall & Spring	**Elective I and Elective II (Food Engineering)**												
		FD-403 Food Biotechnology	C3			P3			A3					
		FD-404 Sugar and Confectionery	C3			P3			A3					
		FD-409 Post-Harvest Processing	C3			P3			A3					
		FD-412 Dairy Processing	C3			P3			A3					
		FD-413 Cereal Processing	C3			P3			A3					
		FD-414 Beverage Processing	C3			P3			A3					
		FD-415 Meat, Poultry and Egg Processing	C3			P3			A3					
		FD-416 Food Product Development	C3			P3			A3					
		FD-417 Oil and Fats Processing	C3			P3			A3					
		FD-418 Food Plant Hygiene and Sanitation	C3			P3			A3					
		Elective III (Management Sciences)												
		CH-407 Industrial Organization and Management							C4				C5	
		CH-405 Industrial Safety and Maintenance Management												
		Elective IV (Social Sciences)												
		HS-219 Professional Ethics								C2 C3 A3				
		MG-228 Sociology & Development						C2 A3	C5					

9. Key Performance Indicators (KPIs)

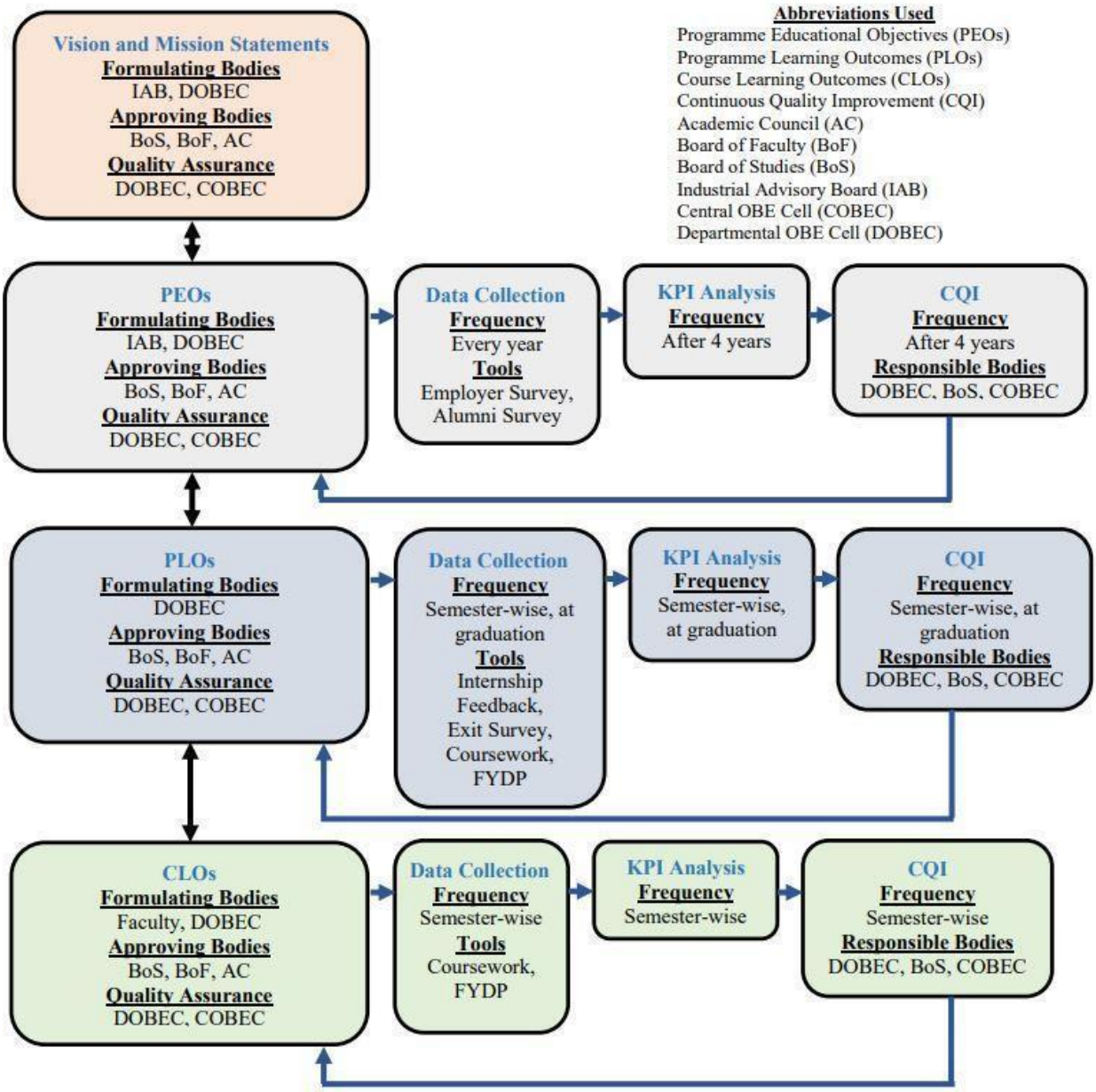
		Evaluation Tool	KPI	Data Collection Frequency	Analysis Frequency
PEO	Programme	▪ Employer Feedback Survey ▪ Alumni Feedback Survey ▪ Employment Statistics	50% of the Survey Form responses must attain a score of 3 or above (on a scale of 1 to 5), and 50% of the graduates must be employed and/or engaged in higher studies.	Every Year	4 years from graduation
PLO	Student	▪ CLO scores of the student in the mapped course(s)	Each PLO must be attained in at least 50% of the respective mapped course(s), with an average score of at least 50%.	Every Semester	Every Semester
	Course	▪ PLO scores of all the students in the mapped course	At least 50% of the students must attain that PLO	Every Semester	Every Semester
	Programme	▪ Final PLO attainment statistics of all the courses including FYDP ▪ Internship Feedback Form ▪ Exit Survey	At least 50% of the mapped courses must attain the PLO and at least 50% of the students/ responses must attain a score of 3 or above on a scale of 1 to 5.	At graduation	At graduation
CLO	Student	▪ Course work	The student must obtain at least 50% average percentage score from all attempts.	Every Semester	Every Semester
	Course	▪ CLO scores of all students in the course	At least 50% of the students must attain that CLO	Every Semester	Every Semester

10. Continuous Quality Improvement (CQI)

The following table shows the post KPI evaluation actions, severity-wise, as outlined in the Manual of Uniform OBE Framework.

	PEO CQI	PLO CQI			CLO CQI	
	Program KPI	**Student KPI**	**Course KPI**	**Programme KPI**	**Student KPI**	**Course KPI**
KPIs Achieved	▪ No Action	▪ No Action	▪ No Action	▪ No Action	▪ No Action	▪ No Action
KPIs Not Achieved	1. Review of curriculum strategies. 2. Review of assessment methods. 3. Review of the relevant KPIs. 4. Review of PEOs. 5. Revisions implemented.	1. Warning through the progressive attainment sheet. 2. Student counselling.	1. Review of teaching and learning process. 2. Review of CLOs assessment methods. 3. Review of CLO-PLO mapping and the relevant KPIs. 4. Review of curriculum design. 5. Revisions implemented.	1. Review of teaching and learning process. 2. Review of PLOs assessment methods. 3. Review of Course-PLO mapping and the relevant KPIs. 4. Review of curriculum design. 5. Revisions implemented.	1. Student provided further chances through direct assessment tools. 2. Student counselling.	1. Review of CLO assessment methods. 2. Review of CLOs and taxonomy levels. 3. Review of students' course feedback. 4. Review of CLO KPIs. 5. Faculty advice by Departmental OBE Cell. 6. Faculty training.

The following figure shows the overall OBE framework for an Engineering Programme as outlined in the Manual of Uniform OBE Framework.



11.Course Profiles

NED University of Engineering and Technology

Department of Food Engineering

Program B.E Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-104 Introduction to Food Engineering**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 13-09-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Historical Background of Food Engineering:
Food engineering and its scope, Importance of chemistry and biological science in food engineering.

Food Processing:
Baked and snack foods, honey, syrups, confectionery, beverages, milk and fish.

Thermal Techniques in Food Processing:
Heat processing of food, Freezing and cold storage, Microwave heating.

Introduction to mass and energy balance:
Mass and energy balance and its application in food processing.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Identify** the major and minor constituents of food and the chemical reactions in which they participate.	**C1**	**Engineering Knowledge**
2	**Apply** the principles of mass and energy balance to food processing systems.	**C3**	**Engineering Knowledge**
3	**Explain** the principles involved in the processing of the major types of food products	**C2**	**Engineering Knowledge**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program B.E Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **PH-127 Applied Physics for Engineers**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 13-09-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction and properties of matter and fluids

Introduction of Engineering Physics, Elasticity and modulus of elasticity, Bending of beams, Cantilever, Steady and turbulent flow, Bernoulli`s theorem and Viscosity, Surface tension, Surface energy and Angle of contact.

Heat and thermodynamics

Heat, temperature and theories of heat, Adiabatic and isothermal processes and The four laws of thermodynamics. Thermodynamic functions, Efficiency of heat engines, Carnot`s cycle, Entropy.
Reversible process and cycles, Thermodynamic equilibrium, Introduction to heat transfer mechanisms.

Waves and optics

Waves and oscillations, Simple harmonic motion, Types of wave motion. Optics of light, Interference, Diffraction, Polarization Double refraction, Dispersion, Types and uses of deviation lasers.

Electricity and magnetism

Electric charges, Electric field, Electric potential, Coulomb`s law, Gauss`s law, Capacitors and dielectrics, Magnetic field, Magnetic force on current, Ampere`s law
Faraday`s law, and Lenz`s law. Electric current, Ohm`s law, Magnetic properties of matter

Sound waves

Speed of sound, Different types of sound waves.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Discuss** principle of physics; and explain the concept of classical physics to solve related problems	C2	Engineering Knowledge
2	**Apply** differential and integral calculus to engineering problems.	C3	Problem Analysis
3	**Discuss** the behavior of sequence and series.	P3	Engineering Knowledge

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE CY-110 Applied Chemistry for Engineers	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ---	DATE OF COURSE CONTENT APPROVAL 13-09-2021	APPLIED FROM BATCH 2021

COURSE CONTENT

Electrochemistry: Laws of electrolysis, E.M.F series, corrosion (Theories, inhibition and protection)

Water and sewage: impurities, hardness, water softening, purification of water for portable and industrial purposes, introduction to environmental pollution, sewage treatment. Fuels: Types of fuels, classification, calorific value

Metals and Alloys: Properties and general composition of metals and alloys such as Iron, Copper, Aluminum, Chromium and Zinc used in engineering field

Engineering Materials: Inorganic engineering materials: cement, glass; organic engineering materials: polymers, rubbers, plastics and paints; semiconductors and dielectric materials

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	Course Learning Outcomes (CLO)	Taxonomy Level	Programme learning outcome (PLO)
1	**Explain** the concepts of physical and engineering chemistry	**C2**	**Engineering Knowledge**
2	**Solve** problems of water, fuels, metallurgy & electrochemistry.	**C3**	**Problem Analysis**
3	**Apply** the concepts of engineering chemistry to industrial processes.	**C3**	**Problem Analysis**
4	**Operate** the equipment with guidance to measure physical & chemical parameters.	**P3**	**Engineering Knowledge**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology, Karachi.

Department Food Engineering
Programme BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **HS-104 Functional English**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 13-09-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Study Skill ; advanced reading skills using variety genre and texts;
listening & speaking skill; oral communication skills development; precise writing; controlled & guided writing; essay writing; writing book & informal reports; informal & formal letters and memos; creating advertisements; applied grammar; sentence correction sentence completion; transformation of sentences; question tages; homonyms/homophones, sentence making, punctuation; extracts; conversations etc.; use of idioms.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Demonstrate** effective presentation skills in academic settings.	**A3**	**Communication**
2	**Comprehend** explicit and implicit information through reading and listening strategies.	**C2**	**Communication**
3	**Compose** drafts of various academic genres using writing processes and strategies.	**C6**	**Communication**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology, Karachi.

Department Food Engineering
Programme BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **BM-108 Computer Aided Engineering Graphics**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ☐2 ■1 ☐0 PR ☐3 ■2 ☐1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 13-09-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction to Computer Aided Drafting:
Introduction to the Engineering design Process, Technical Graphics basics, Orthographic projection and Isometric drawings and basic concepts of Conventional engineering drawings.

Opening a new drawing, paper setting, coordinate systems: User's coordinate system (UCS), Cartesian coordinates and Polar coordinates; saving a drawing.

Creating Elementary Objects:
Apply the Commands: Grid, Ortho, Escape, Erase, Trim, Undo, Draw Lines, Circles, Ellipse, Rectangle And Arcs.

Basic Object Editing:
Apply the following commands: Move, offset, rotate, fillet, chamfer, array and mirror.

Dimensioning:
Show the following dimensioning: Linear, aligned, radial and changing dimensional setting.

Solid Modeling:
Apply the following commands to create 3-D models: Region, extrude, revolve, slice and show plan; elevation and end view of a 3-D model.

Controlling Drawings:
Apply the following commands for a given drawing: Hatching, coloring and rendering.

Text:
Apply the following commands on the given drawing: Creating text, style of text and changing text properties.

Plotting Drawings:
Apply the following commands: Plotting, print preview and printing.

NED University of Engineering and Technology, Karachi.

Department Food Engineering

Programme BE Food

F/QSP 11/17/01

Course Profile

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** basics of engineering drawing and able to draw projections of 3D models	**C2**	**Engineering Knowledge**
2	**Explain** 2D and 3D models by using modern tools and commands	**C2**	**Modern Tool Usage**

REMARKS (if any):

Recommended by : _____
(Chairperson/Date)

Approved by :_____
(Dean/Date)

NED University of Engineering and Technology, Karachi

Department of Food Engineering

Programme BE Food

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE **MT-114 Calculus**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ----	DATE OF COURSE CONTENT APPROVAL 13-09-2021	APPLIED FROM BATCH 2021

COURSE CONTENT

Set and Functions:
Define rational, irrational and real numbers; rounding off a numerical value to specified number of decimal places or significant figures; solving quadratic and rational inequalities in involving modulus with graphical representation. Definition of set, set operations, venn diagrams, DeMorgan's laws, Cartesian product; relations; function and their types; absolute value; greatest integer and combining functions. Graph of some well-known functions, limit of functions, continuous and discontinuous functions with graphical representation.

Propositional Logic:
Definition of proposition; statement and argument; logical operators; simple and compound proposition; various types of connectives; truth table; Tautology; contradiction; contingency & logic equivalence.

Boolean Algebra:
Definition; boolean function; duality; some basic theorems & their proofs. Two values boolean algebra, truth functions, canonical sum of product form, digital logic gates & switching circuit designs.

Complex Number:
Argand diagram; DE Moivres formula root of polynomial equations; curve and regions in the complex plane; standard functions and their inverses (exponential, circular and Hyperbolic functions).

Differential Calculus:
Differential and successive differentiation and its application: Leibnitz theorem. Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange from power series. Taylor and Maclaurin series; L Hopitals rule; extreme values of a function of one variable using first and second derivative test; asymptotes of a function curvature and radous of curvature of a curve; partial differentiation exact differential and its application in computing errors; extreme values of a function of two variables with a without constrains. Solution of non-linear equation using Newton Raphson method.

Integral Calculus:
Indefinite integrals and their computational techniques; reduction formulae, definite integrals and their convergence. Beta and Gamma functions and their identities, applications of integration (centre of pressure and depth of centre of pressure).

Solid Geometry:
Coordinate system in three dimensions; direction cosines and ratios equation of a straight line, plane and sphere; curve tracing of a function of two and three variables; surfaces of revolutions; transformations (Cartesian to polar & cylindrical).

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Identify** functions and sketch their graphs using tools of calculus in relevant engineering problems.	**C1**	**Engineering Knowledge**
2	**Apply** differential and integral calculus to interpret the physical systems and processes.	**C3**	**Problem Analysis**
3	**Identify** real and complex numbers and determine the behavior of sequence and series.	**C1**	**Problem Analysis**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology, Karachi.

Department : Food engineering

Programme : BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **CY-108 Analytical Chemistry**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ---	**DATE OF COUURSE CONTENT APPROVAL** 13-09-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction to Analytical Chemistry:
Review of some basic concepts, statistical analysis; mean, median, mode, standard deviation, relative standard deviation, variance.

Gravimetric and Volumetric Analysis:
Volumetric analysis; neutralization titration, complexation titration, oxidation-reduction titration and precipitation titration; gravimetric analysis; precipitation method, thermo gravimetric method and volatisation method.

Aqueous Solution:
Standard solution, primary and secondary standards, concentration of solutions, chemical equilibrium calculation.

Potentiometric Techniques:
Potential difference and standard electrode potential, potentiometric titrations and use of potentiometry for qualitative analysis, pH meter (pH, buffer solutions, pH of polyfunctional acids).

Chromatography:
Gas chromatography, high-performance liquid chromatography, ionexchange chromatography, paper chromatography, thin layer chromatography, electrophoresis.

Spectroscopic Methods:
Molecular and atomic spectroscopy.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** analytical techniques used in Food Engineering.	**C2**	**Engineering Knowledge**
2	**Apply** appropriate analytical methods for the calculation of experimental data.	**C3**	**Problem Analysis**
3	**Analyze** the analytical data in term of statistics.	**C4**	**Problem Analysis**
4	**Operate** the equipment with guidance to measure physical and chemical parameters.	**P3**	**Modern Tool Usage**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

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Course Profile

COURSE CODE& TITLE **EL-232 Electronics**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ---	**DATE OF COURSE CONTENT APPROVAL** 13-09-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Conduction in Solids

Introduction, Mechanics of conduction, Mobility, Bohr's model for the elements, Energy level diagrams for solids, Conductors, Intrinsic and extrinsic semiconductors, Electron-hole pairs in an intrinsic semiconductor, Distribution of electron and hole in conduction and valence bands, Recombination and lifetime.

Semiconductors and Diodes

Donor and acceptor impurities, Zero biased, Forward biased and reverse biased junction diodes, Junction diode current equation, Depletion barrier width and junction capacitance, Diffusion capacitance, Zero and Avalanche break down, Hall effect, Fabrication of pn junction, Diodes.

Electron Emission Devices

Types of electron emissions, Thermionic diode, Volt ampere characteristics, Child Langmuin power Law, Gas filled diode, Thermionic triode, Parameters and characteristics, Tetrode, Pentode, and beam power tubes, Parameters and characteristics.

Simple Diode Circuits and Applications

Mathematical and graphical analysis of diode circuits, The ideal and non-ideal diodes, Piecewise linear models, Analysis of piecewise linear models of vacuum tube and junction diodes, The half wave rectifier, The inductance filter, The inductance capacitance filter circuits, Zener and gas diode, Voltage regulator circuits, Clamping and DC restorer circuits, Voltage double circuits, Clipping and limiting circuits.

Bipolar and Field Effect Transistors

Transistor biasing and thermal stabilization, The operating point, Bias stability, Collector to base bias, Fixed bias, Emitter feedback bias, Stabilization for the self-biased circuits, Field effect transistors, Basic principles and theory, Types, FET characteristics, Different configurations-common gate, Common source and common drain, The FET, small signal model, Parameters, Biasing of the FET.

Amplifier Circuits

Introduction "h" parameters, Hybrid model for transistor, Elementary treatment, Low frequency transistor amplifier circuits, Stage cascaded LF.

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** fundamental concepts and characteristic of diodes, FETs and amplifiers.	**C2**	**Engineering Knowledge**
2	**Analyze** fundamental circuits of diodes, FETs and amplifiers.	**C3**	**Problem Analysis**
3	**Design and Investigate** application circuits of diode, amplifiers and FETs.	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE **CS-103 Programming Languages**	SEMESTER ■SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ■2 ☐1 ☐0
PREREQUISITE COURSE(S) ---	**DATE OF COURSE CONTENT APPROVAL** 13-09-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

The Turbo C Programming Environment:
Setting up the integrated development environment; file used in C program development; use of integrated development environment; the basic structure of C program; explaining the printf( ) function.

C Building Blocks:
Variables; input/output; operators; comments.

Loops:
The for loop; the while loop; the do while loop.

Decisions:
The if statement, the if-else statement; the else-if construct; the switch statement; the conditional operator.
Functions: Simple functions; functions that return a value, using arguments to pass data to a function; using more than one functions; external variables; prototype versus classical K and R; preprocessor directives.

Arrays and Strings:
Arrays; referring to individual elements of the array; string; string functions; multidimensional arrays.

Pointers:
Pointer overview; returning data from functions; pointers and arrays; pointers and strings; double indirection; pointers to pointers. Structures, unions and ROM BIOS.

Turbo C Graphics Functions:
Text-mode functions graphics - mode functions. Text with graphics.

Files:
Types of disk I/O, standard, input/output binary mode and text mode; record, input/output; random access; error conditions; system level input/output; redirection.

Advanced Variables:
Storage classes, enumerated data type, renaming data type with typedef; identifiers and naming classes; type conversion and casting; labels and goto statement.

c++ and Object Oriented Programming:
Object oriented programming, some useful c++ features, classes and objects; constructors and memory allocations; inheritance; function overloading; operator overloading.

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** fundamentals and semantics of computer programming.	**C2**	**Engineering Knowledge**
2	**Apply** basic programming language structures.	**C3**	**Design/Development of Solutions**
3	**Practice** computer programming using constructs of a high level language (Lab work only).	**C3**	**Modern Tool Usage**

REMARKS (if any):

Recommended by: _____
(Chairperson/Date)

Approved by: _____
(Dean/Date)

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Course Profile

COURSE CODE & TITLE **HS-105 Pakistan Studies**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) -------	DATE OF COUSE CONTENT APPROVAL 13-09-2021	APPLIED FROM BATCH 2021

COURSE CONTENTS

Historical and Ideological Perspective of Pakistan Movement:
Two nation theory; definition; significance; creation of Pakistan; factors leading to the creation of Pakistan; Quaid-e-Azam and the demand of Pakistan.

Land of Pakistan:
Geo-physical conditions; geo-political and strategic importance of Pakistan; natural resources-mineral; water and power.

Constitutional Process:
Early efforts to make a constitution - problems and issues; constitution of 1956 and its abrogation; constitution of 1962 and its abrogation; constitutional and political crisis of 1971; constitution of 1973; recent constitutional developments.

Contemporary Issues in Pakistan:
A brief survey of Pakistan economy; agricultural and industrial development in Pakistan; internal and external trade; economic planning and prospects; social issues; literacy & education in Pakistan; state of science & technology with special reference to IT education; Pakistan society and culture; environmental issues; hazards of atmospheric pollution; other forms of environmental degradation & their causes & solution; Pakistan's role in preservation of nature. Through international conventions/efforts.

Foreign Policy:
Relations of Pakistan with neighbors; super powers; Muslim world.

Human Rights:
Conceptual foundations of human rights; what are human rights? Definition; significance and importance; comparative analysis of Islamic and western perspectives of human rights; UN system for protection of human rights; an overview; UN charter; international bill of human rights; implementation mechanism; other important international treaties and conventions; the convention on the elimination of all forms of discrimination against woman; international convention on the right; of child (CRC); convention against torture (CAT); refugee convention; Pakistan's response to human rights; at national and international level; constitutional provisions; Pakistan's obligations to international treaties and documents; minority rights in Pakistan; Pakistan's stand on violation of human rights in the international perspective.

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Understand** the historical and ideological perspectives of Pakistan and their implications for individuals and professionals in societal contexts	**C2**	**The Engineer and Society**
2	**Explain** the strategic implications of international conventions and treaties applicable to Pakistan at the national and international level	**C2**	**Lifelong Learning**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE **FD-105 Food Engineering Principles**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 13-09-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction to fundamental of food engineering:
Physical attributes, Size and size distribution, Shape, volume, density, porosity.

Rheological properties:
Flow of materials; Newton's law of viscosity, Viscous fluids, Plastic fluids, Measurement of viscosity.

Deformation of materials;
Viscoelastic behavior, Stress relaxation test, Creep test, Dynamic oscillatory test.

Textural properties:
Texture profile analysis, Compression, snapping-bending, Cutting shear, puncture, penetration.

Water activity and sorption properties:
Prediction and measurement of water activity, Effect of temperature and pressure on water, Activity, preparation of sorption isotherms.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Acquire** the knowledge of engineering properties of food materials	**C1**	**Engineering Knowledge**
2	**Explain** the relationship between food composition and physical properties	**C2**	**Engineering Knowledge**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE **FD – 201 Thermodynamics**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) PH-127	**DATE OF COURSE CONTENT APPROVAL** 21-12-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Thermodynamics:
Thermodynamics and energy; dimensions and units; systems and control volume; properties.

Energy and Energy Transfer:

Forms of energy; energy transfer by heat and work; mechanical work; first law of thermodynamics. Pure substances; phases of pure substance; property diagrams and tables; ideal gas equations; compressibility factor. Mass and energy analysis for closed systems and control volumes; examples.

Second Law of Thermodynamics & Entropy:
Second law concepts; reversible and irreversible process; Carnot cycle; entropy; isentropic processes; increase of entropy principle. Power and Refrigeration cycles; Essential equipment.

Thermodynamics Properties for Mixture:
Maxwell relations; Clapeyron equation; Joule Thomson Coefficient; Gibbs free energy and fugacity for pure substance; criteria for phase equilibria in multi-component system; vapor-liquid equilibrium.

Chemical & Phase Equilibria:
Chemical equilibrium in single phase system; chemical reactions; combined chemical and phase equilibrium. pH as criteria for ionization of biochemical.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Explain** basic concepts, fundamental laws of thermodynamics and phase equilibria for single and multicomponent systems.	**C2**	**Engineering Knowledge**
2	**Apply** concepts of thermodynamics laws to engineering applications and using such relationship to solve engineering problems.	**C3**	**Problem Analysis**
3	**Analyze** performing efficiency calculations on different Ideal thermodynamic cycles.	**C4**	**Problem Analysis**

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4	**Express** thermodynamics principle and applications in food industry.	**A3**	**Environment and Sustainability**
5	**Imitate** and practice the thermodynamic principles by various measuring devices.	**P3**	**Investigation**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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COURSE CODE& TITLE **BM-201 Engineering Mechanics**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ____	**DATE OF COURSE CONTENT APPROVAL** 21-12-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction:
General principles; units of measurement

Force Vectors:
Addition of vectors; Cartesian vectors; free vector; position vectors; force directed along a line.

Equilibrium of a Particle:
Conditions for the equilibrium; free body diagram; 3D force systems; force system resultants; moment of force; Virognon's theorem; cross product; moment of a couple; equivalent systems.

Equilibrium of a Rigid Body:
Equilibrium in 2D and 3D; constrains for a rigid body; redundant and improper constraints.

Friction:
Types of friction; angle of repose; application of friction.

Kinematics of a Particle:
Rectilinear motion; curvilinear motion; motion of projectile; absolute dependent motion of two particles.

Kinetics of a Particle:
Equation of motion for a system of particle; equation of motion in rectangular, cylindrical, normal and tangential coordinates; principles of work and energy for a system of particles; linear momentum; conservation of momentum; impact; angular momentum; kinematics of a rigid body; translation; rotation.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Define** different theoretical concepts related to engineering mechanics	**C1**	**Engineering Knowledge**
2	**Explain** concepts related to motion of a particle or a system of particles acted upon forces or a rigid body acted upon by forces and moments.	**C2**	**Problem Analysis**

3	**Apply** the method of work and energy, impulse and momentum to problem model as a single particle, system of particles and a rigid body	**C3**	**Design/Development of Solutions**
4	**Imitate** and practice experiment under guidance / supervision	**P3**	**Investigation**

REMARKS (if any):

Recommended by: _____
(Chairperson/Date)

Approved by: _____
(Dean/Date)

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Course Profile

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COURSE CODE& TITLE **MT-223 Differential Equation and Fourier Series**	SEMESTER ☐ SPRING ■FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) —	**DATE OF COURSE CONTENT APPROVAL** 21-12-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

1st Order Differential Equations

Basic concept; Formation of differential equations and solution of differential equations by direct integration and by separating the variables; Homogeneous equations and equations reducible to homogeneous from; Linear differential equations of the order and equations reducible to the linear form; Bernoulli's equations and orthogonal trajectories; Application in relevant Engineering.

2nd and Higher Orders Equations

Special types of IInd order differential equations with constant coefficients and their solutions; The operator D; Inverse operator l/D; Solution of differential by operator D methods; Special cases, Cauchy's differential equations; Simultaneous differential equations; simple application of differential equations in relevant Engineering.

Partial Differential Equation

Basic concepts and formation of partial differential equations; Linear homogeneous partial differential equations and relations to ordinary differential equations; Solution of first order linear and special types of second and higher order differential equations; D' Alembert's solution of the wave equation and two dimensional wave equations; Lagrange's solution: Various standard forms.

Lap lace Integral & Transformation

Definition, Laplace transforms of some elementary functions, first translation or shifting theorem, second translation or shifting theorem, change of scale property, Laplace transform of the nth order derivative, initial and final value theorem Laplace transform of integrals. Laplace transform of functions tn F(t) and F(t)/ t, Laplace transform of periodic function, evaluation of integrals, definition of inverse Laplace transform and inverse transforms, convolution theorem, solutions of ordinary differential using Laplace transform.

Fourier series

Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients; Expansion of function with arbitrary periods. Odd and even functions and their Fourier series; Half range expansions of Fourier series, "DFT and FFT, Fourier Spectrum".

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	Describe formation of differential equations to explain physical situations	**C2**	**Engineering Knowledge**
2	Apply appropriate methods to solve differential equations of relevant engineering problems.	**C3**	**Problem Analysis**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

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Course Profile

COURSE CODE& TITLE **FD-207 Food Chemistry**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 21-12-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Chemical Composition of Foods:
Carbohydrates, proteins, lipids, water, vitamins, minerals, enzymes, phenolic compounds and pigments.

Food Additives:
Preservatives, colorants, antioxidants, sweeteners, emulsifiers.

Toxicological concepts:
Contaminants and evaluation of metals, radionucleides, pesticides, hormones, antibiotics mycotoxins, polycyclic aromatic hydrocarbons and toxic compounds naturally found in foods.

Nutritional value of food:
Calorific value and pH of food.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Explain** properties and chemical structure of food components, including macro and micronutrients, and their role and interaction in raw food systems and food processing.	**C2**	**Engineering Knowledge**
2	**Describe** basics of food additives and its application in food system.	**C2**	**Engineering Knowledge**
3	**Demonstrate** the classes and risk associated with food toxins and their control.	**C3**	**Lifelong Learning**
4	**Present** the application of Food Additives in different Food Industries	**A3**	**Communication**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

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Course Profile

COURSE CODE& TITLE **FD-209 Fluid Mechanics-I**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) —	**DATE OF COURSE CONTENT APPROVAL** 21-12-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Fluid Properties:
Definition of fluid, Classification of fluids, Concept of continuum, Viscosity, Vapor pressure, Surface tension, Variation of fluid properties with temperature.

Fluid Statics:
Concept of pressure and basic equation for compressible and incompressible. Pressure measurements and devices, Hydrostatic forces on plane and curved surfaces. Buoyancy and stability, Pressure variation in fluid with rigid body motion.

Fluid Kinematics:
Flow characterization, Description of velocity and acceleration field (Streamlines, streak-lines and path-lines), Control volume and control mass, Deriving Reynold transport theorem (RTT).

Fluid Dynamics:
Application of Newton's 2nd law in fluids. Total, stagnation and dynamic pressures. Deriving Bernoulli equation and its applications.

Integral Analysis of Fluid Flow:
Deriving continuity, linear momentum and moment of momentum equations using RTT. Solving problems related to continuity, linear and angular momentum.

Flow in Pipes:
Characteristics of pipe flow laminar and turbulent, calculating friction factor and wall shear stresses, and Solving pipe flow network problems.

Dimensional Analysis:
Dimensional analysis, similitude and modeling. Buckingham Pi theorem and determination of Pi group terms.

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Discuss** fluid mechanics properties and characteristics of different types of flow.	**C2**	**Engineering Knowledge**
2	**Solve** static and dynamic systems with fluid as the working medium using fundamental principles and relations of fluid mechanics	**C3**	**Design/Development of Solutions**
3	**Apply** dimensional analysis that helps in scale-up and scale-down of fluid flow systems.	**C3**	**Problem Analysis**
4	**Use resources to** solve the case of a food industry fluid system.	**A3**	**Individual and Team Work**
5	**Imitate** and practice the fluid properties by various measuring devices.	**P3**	**Investigation**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE **FD-208 Food Biochemistry**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 21-12-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Basic Concept of Biochemistry:
Overview of cellular structure and process, Lipid and membranes. Acid, base and buffers.

Carbohydrates and its Metabolism:
Structure. Classification, Dietary fibre, Digestion of carbohydrates, Oxidation of glucose (Glycolysis), Citric acid cycle and production of energy.

Lipids:
Structure. Classification, Fatty acids and triacylglycerides, Digestion of lipid, Fatty acid oxidation.

Amino Acids and Protiens:
Classification of amino-acids, Protein structure and functions, Protein digestion and amino acid absorption.

Micronutrients:
Vitamins, Minerals elements.

Enzymes:
Structure, Classification, Mechanism of enzymes, application.

Biochemistry of Food:
Biochemistry of fruits, vegetables, meat and poultry.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Acquire** knowledge of the biochemical processes at molecular level, structure, classification and function of biomolecules.	**C1**	**Engineering Knowledge**
2	**Explain** process of digestion and metabolic pathways of various biomolecules.	**C2**	**Engineering Knowledge**
3	**Imitate** experiments for detection of biomolecules through chemical reaction and with the help of digital and electronic devices	**P3**	**Investigation**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

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Course Profile

COURSE CODE& TITLE **FD-210 Fluid Mechanics-II**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE ----	**DATE OF COURSE CONTENT APPROVAL** 21-12-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Differential Analysis of Fluid Flow:
Deriving continuity equation by applying principle of conservation of mass, calculating velocity and acceleration field using material derivative. Deriving Navier – Stokes equation, solving Navier – Stokes equation for simple geometries.

Potential Flow Theory:
Concept of Vorticity, Circulation, Inviscid and Irrotational flow fields, Basic velocity potential functions and their superposition, Prediction of Lift and Drag using potential flow theory.

Flow Over Immersed Bodies:
Boundary layer theory and its thicknesses, Concept of local and average drag coefficient, Calculating drag and lift forces due to pressure and velocity field.

Turbomachinery
Classification of fluid Machines, Fans, Pumps, turbines and other flow devices Deriving Euler's equation of Turbo-machine, Solving turbo-machine problems using velocity triangle. Turbo machine performance characteristic curves, Series and Parallel combination of pumps, affinity laws.

Introduction to Compressible Flows:
Mach number and speed of sound, Isentropic flow of an ideal gas, Convergent and divergent nozzle.

Introduction to Open Channel Flow:
Steady, 1 dimensional open channel flow analysis, Froude Number, uniform flow channels and critical depth.

Introduction to Computational Fluid Dynamics:
Finite difference formulations, Concept of discretization, Solving simple fluid flow problems using available CFD code.

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Course Profile

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Apply** differential fluid mechanics for theoretical solution of various fluid flow systems	**C3**	**Design/Development of Solutions**
2	**Describe** the characteristics of flow over immersed bodies, Compressible and open channel flow	**C2**	**Engineering Knowledge**
3	**Apply** principles of fluid mechanics to the operation, design, and selection of fluid machinery such as pumps, blowers, fans, and compressors	**C3**	**Problem Analysis**
4	**Use resources** to solve simple fluid flow problems using available CFD code.	**A3**	**Individual and Team Work**
5	**Practice** fundamental concepts of fluid through laboratory experiments.	**P3**	**Investigation**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE **MM-205 Mechanics of Materials**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 21-12-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Review mechanics of materials. Deformation; strain; elastic stress-strain behavior of materials; Introduction to stress-strain diagram, working stresses, unit design, Introduction to elastic and nonlinear continua. Poisson's ratio; Determination of forces in frames; Simple bending theory; general case of bending; Shear force and bending moment diagrams; Relationship between loading, shear force and bending moment. Stress; Skew (antisymmetric) bending Direct, shear, hydrostatic and complementary shear stresses; Bar and strut or column; Theory of buckling instability, Thin ring, Elementary thermal stress and strain; General stress-method. Theory of elasticity, Analytical solution of elasticity problems brittle fracture strain energy in tension and compression.

Analysis of bi-axial stresses, principal planes, principal stress-strain, stresses in thin walled pressure vessels. Mohr's circles of bi-axial stress. Torsion of circular shafts, coiled helical spring, strain energy in shear and torsion of thin walled tubes, torsion of non-circular sections. Shear centre and shear flow for open sections, General case of plane stresses, principal stress in shear stresses due to combined bending and torsion plane strain. Composite materials, Volume dilatation, Theories of Yielding, Thin Plates and Shells Stress Concentration.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Calculate** internal loads, based on different support reaction.	**C3**	**Engineering Knowledge**
2	**Correlate** the internal stresses with different external loading conditions.	**C4**	**Design/Development of Solutions**
3	**Construct** Mohr circle to find stresses in materials at different angles.	**C3**	**Modern Tool Usage**
4	**Operate** under supervision different equipments and techniques to determine mechanical properties.	**P3**	**Individual and Team Work**

REMARKS (if any):

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Course Profile

COURSE CODE& TITLE **MT-332 Advanced Calculus and Linear Algebra**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

1st Order Differential Equations

Basic concept; Formation of differential equations and solution of differential equations by direct integration and by separating the variables; Homogeneous equations and equations reducible to homogeneous from; Linear differential equations of the order and equations reducible to the linear form; Bernoulli's equations and orthogonal trajectories; Application in relevant Engineering.

2nd and Higher Orders Equations

Special types of IInd order differential equations with constant coefficients and their solutions; The operator D; Inverse operator l/D; Solution of differential by operator D methods; Special cases, Cauchy's differential equations; Simultaneous differential equations; simple application of differential equations in relevant Engineering.

Partial Differential Equation

Basic concepts and formation of partial differential equations; Linear homogeneous partial differential equations and relations to ordinary differential equations; Solution of first order linear and special types of second and higher order differential equations; D' Alembert's solution of the wave equation and two dimensional wave equations; Lagrange's solution: Various standard forms.

Lap lace Integral & Transformation

Definition, Laplace transforms of some elementary functions, first translation or shifting theorem, second translation or shifting theorem, change of scale property, Laplace transform of the nth order derivative, initial and final value theorem Laplace transform of integrals. Laplace transform of functions tn F(t) and F(t)/ t, Laplace transform of periodic function, evaluation of integrals, definition of inverse Laplace transform and inverse transforms, convolution theorem, solutions of ordinary differential using Laplace transform.

Fourier series

Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients; Expansion of function with arbitrary periods. Odd and even functions and their Fourier series; Half range expansions of Fourier series, "DFT and FFT, Fourier Spectrum".

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Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** formation of system of linear equations and vector calculus to explain physical situations	**C2**	**Engineering Knowledge**
2	**Apply** appropriate methods to solve system of linear equations in relevant engineering problems.	**C3**	**Problem Analysis**
3	**Use** of vector calculus in relevant engineering problems.	**C3**	**Problem Analysis**

REMARKS (if any):

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(Chairperson/Date)

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(Dean/Date)

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Course Profile

COURSE CODE& TITLE **HS-205 Islamic Studies**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ___	**DATE OF COURSE CONTENT APPROVAL** 21-12-2021	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Thematic Study of Holy Quran:
Basic Islamic believes, Topics, Tauheed, AlAmbiya-22, Al-Baqarah-163-164, Prophet hood, A-Imran-79, AI-Hashr-7, Al- Madah-3, Here-After, AI-Hajj-5, AI-Baqarah-48, Two Hadith, Basic Islamic Practices, Al-Mu'minun-I-II, Amre-Bil-MA' Roof WA-Nahi Anil Munkar, The concept of Good & Evil, Importance & necessity of DA'Wat-e-Deen Al-Imran-110, Method of DA'Wat-e-Deen, An-Nehl-125, Al-Imran-04, Two Hadith, Unity of the Ummah,Al-Imran-103, Al-Hujurat-10, Al-Imran-64, Al-An'am-08, Kasb-e-Halal, Taha-81,AI-A'raf-32-33, AI-Baqarah-188, Two Hadith, Huquq-ul-Ibad, Right to Property, AI-Maidah-32, Right to Property, An-Nisa-29,Right of Respect & Dignity, Al-Hujurat-11-12, Freedom of Expression, Al-Baqarah-256, Right of Equality, Al-Hujurat-13, Economic Security, Al-Ma'arij24-25, Employment Opportunity on Merit, An-Nisa-58, Excession Right to Justice, An-Nisa-135, Women Rights, An-Nehl-97, Al-Ahzab-35,An-Nisa-07, Relations With Non-Muslims, Al-Mumtahanah-8-9, Al-Anfa-6, last sermon of Hajj at Arafat on 10thZil-Hajj, Translation & the important points of the sermon.

Serat Life of theHoly Prophet:
Birth, life at Makkah, declaration of Prophet hood, preaching & its difficulties, migration to Madina, brotherhood (Mawakhat) &Madina charter, the Hoy war of the prophet (Ghazwat-e-Nabawi), Hujjatu-Wida.

Islamic Civilization:
Impacts of Islamic civilization on the sub-continent, the civilization of sub-content before Islam, the political, social & moral impacts of Islamic civilization on sub-continent, academic, intellectual, social & cultural impacts of Islam on the world.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Explain** the given Quranic verses and Hadiths to their tangible meaning and message.	**C2**	**Ethics**
2	**Describe** the basic concepts of Shariah, the features of Seerat-un-Nabi (SAW), and the impact of Islam on our society.	**C2**	**Ethics**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

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Course Profile

COURSE CODE& TITLE FD-301 Unit Operation in Food Engineering-I	SEMESTER ☐ SPRING ■FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	DATE OF COURSE CONTENT APPROVAL 25-05-2022	APPLIED FROM BATCH 2021

COURSE CONTENTS

Preliminary preparative operation:

Cleaning, sorting, grading methods; Size reduction: Particle size distribution, classification, screening and sieving, mechanism of size reduction, machinery for crushing and grinding, disintegration of fibrous materials, energy requirements for communication of solids.

Pneumatic and Hydraulic Conveying:

Screw, vibrating, belt conveyors and elevators; Fluidization, mixing and agitation, Flow pattern and baffles, rate of mixing and power consumption, Centrifugation theory and applications.

Agglomeration Phenomena and its application:

Granulation, pelletization, tabling and storage. Filtration: Mechanism of filtration. Filter media. Flow through filter cake and/or cloth. Cake resistance and relation between thickness of cake and volume of filtrate.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** the engineering principles required to design preliminary preparative operations and material handling in food processing.	C2	Engineering Knowledge
2	**Design** of unit operations involved in food industry.	C5	Design/Development of Solutions
3	**Compare** the performance of preliminary processes and material handling equipment used in food industries.	C4	Lifelong Learning
4	**Practice** engineering principles of each unit operation.	P3	Investigation

REMARKS (if any):

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Course Profile

COURSE CODE& TITLE **FD-309 Machine Design for Food Engineers**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) MM-205	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction to Food Machine Design:
Food Machinery designs, Design Tools and Resources, The Design Engineer's Professional Responsibilities, Safety and Product Liability

Machine Dynamics:
Kinematics of Motion, kinetics of Motion, Simple Crank and Cam Mechanisms, Linkages, Types of Links, Structure, Kinematic Pair, Degree of freedoms, Mechanism, Cams, Kutzbach and Grubler's criteria for planar mechanisms.

Types of Mechanisms:
Slider Crank Mechanisms and its Inversions, Kinematic Analysis of Cams, Single Slider Crank Mechanism and its Inversions, Double Slider Crank Mechanism and its Inversions, Four Bar Mechanisms and its Inversions.

Failure Prevention:
Failures resulting from Static Loading:
Static Strength, Failure Theories for Ductile Materials and Brittle Materials. Maximum-Shear-Stress Theory for Ductile Materials, Distortion-Energy Theory for Ductile Materials, Coulomb-Mohr Theory for Ductile Materials, Failure of Ductile Materials Summary , Maximum-Normal-Stress Theory for Brittle Materials
Failures resulting from Variable Loading
Introduction to Fatigue loadings, Approach to Fatigue Failure in Analysis and Design. Fatigue-Life Methods, The Stress-Life Method The Linear-Elastic Fracture Mechanics Method, The Endurance Limit, Fatigue Strength, Endurance Limit Modifying Factors, Stress Concentration and Notch Sensitivity, Characterizing Fluctuating Stresses, Fatigue Failure Criteria for Fluctuating Stress.

Design of Simple Machine Elements of Food Machinery:
Design of Mechanical Springs
Pipe and Pipe joints:
Flexible Mechanical Elements: Belts, Flat and Round Belt drives, V Belts, Timing Belts, Design of a Belt Conveyor

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Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Discuss** machine dynamics and the basic knowledge, tools and resources involved in designing food machinery elements.	**C2**	**Engineering Knowledge**
2	**Calculate** the stress under static and variable loading and identify failure modes for machine elements.	**C2**	**Problem Analysis**
3	**Design** the simple machine elements of food machinery.	**C4**	**Design/Development of Solutions**
4	**Present** the design aspects effectively through oral presentation.	**A3**	**Communication**

REMARKS (if any):

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(Chairperson/Date)

Approved by :_____
(Dean/Date)

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Course Profile

COURSE CODE& TITLE **FD-306 Instrumentation and Measurement for Food Engineers**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) EL-232	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Principles of Colour Measurement for Food, Colour Measurement of Foods by Colour Reflectance, Food Compositional Analysis Using Near Infra-red Absorption Technology, Infra-red Remote Thermometry, In-line and Off-line FTIR Measurements, Microwave Measurements of Product Variables, Pressure and Temperature Measurement in Food Process Control, Level and Flow Measurement in Food Process, Ultrasound Propagation in Foods and Ambient Gases: Principles and Applications; Ultrasonic sensors for Food Industry, Rheological Measurements of Foods, Conductance/Impedance Techniques for Microbial, Chemosensors, Biosensors, Immunosensors, Electronic Noses and Tongues.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Explain** the basics of measurement systems in food processing.	**C2**	**Engineering Knowledge**
2	**Demonstrate** operations of various devices used to measure temperature, pressure, flow and level.	**C3**	**Design/Development of Solutions**
3	**Select** the instruments and measuring variables necessary to the control of food processing operations	**C6**	**Project Management**
4	**Practice** experiments using different instruments and programming with Arduino.	**P3**	**Modern Tool Usage**

REMARKS (if any):

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Approved by : _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE **MT-330 Applied Probability & Statistics**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■ 2 ☐1 ☐0 PR ☐3 ☐2 ■ 1 ☐0
PREREQUISITE COURSE(S) ---	DATE OF COURSE CONTENT APPROVAL 25-05-2022	APPLIED FROM BATCH 2021

COURSE CONTENTS

Statistics

Introduction, Types of data & variables, presentation to data, object, classifications, Tabulation, Frequency distribution, Graphical representation, Simple & Multiple Bar diagrams, Sartorial & Pie-Diagram, Histogram, Frequency Polygon, Frequency Curves & their types.

Measure of Central Tendency and Dispersion

Statistics Averages, Median Mode, Quartiles, Range, Moments, Skewness& Kurtosis, Quartile Deviation, Mean Deviation, Standard Deviation, Variance & its coefficient, Practical Significance in related problems.

Curve Fitting

Introduction, fitting of a first and second degree curve, fitting of exponential and logarithmic curves related problems, Principle of least squares, Second order Statistics & Time series not in bit detail.

Simple Regression & Correlation

Introduction, Scatter diagrams, Correlation & its Coefficient, Regression lines, Rank Correlation & its Coefficient, Probable Error (P.E), Related problems.

Sampling and Sampling Distributions

Introduction, Population, Parameter & Statistics, Objects of sampling, Sampling distribution of Mean, Standard errors, Sampling & Non-Sampling Errors, Random Sampling, Sampling with & without replacement, Sequential Sampling, Central limit theorem with practical significance in related problems.

Statistical Inference and Testing of Hypothesis

Introduction, Estimation, Types of Estimates, Confidence interval, Tests of Hypothesis, Chi-Square distribution/test, one tails & two tails tests. Application in related problems.

Probability

Basic concepts, Permutation & Combination, Definitions of probability, Laws of probability, Conditional probability, Baye's rule. Related problems in practical significance.

Random Variables

Introduction, Discrete & Continuous random variables, Random Sequences and transformations, Probability distribution, Probability density function, Distribution function, Mathematical expectations, Moment Generating Function (M.G.F.), Markoverandom walks chain/Related problems.

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Probability Distributions

Introduction, Discrete probability distributions, Binomial, Poisson, Hyper geometric & Negative binomial distributions. Continuous probability distribution, Uniform, Exponential & Normal distributions & their practical significance.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Discuss** the fundamental concepts in Probability and Statistics	**C2**	**Engineering Knowledge**
2	**Analyze** data to produce mathematical or probabilistic models in relevant engineering problems.	**C4**	**Problem Analysis**
3	**Perform** statistical analysis on data through computer software.	**P3**	**Problem Analysis**

REMARKS (if any):

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(Chairperson/Date)

Approved by :_____
(Dean/Date)

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Course Profile

COURSE CODE& TITLE **HS-304 Business Communication and Ethics**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) -----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

- **Communication Skills (oral):**
- Definitions and Conditions,
- Modes: verbal, non-verbal, vocal, non-vocal, sender, Receiver, en-coding, decoding, noise, context, emotional maturity, relationships, etc.
- Language, perception,
- Non-verbal, body language, physical appearance, cultural differences etc.
- Personal and interpersonal skills / perceptions.
- Communication dilemmas and problems
- Public Speaking – speaking situation, persuasion,
- Making presentations,
- Interviews

- **Business Writing:**
  - Formal / Business letters, e-mails: a) job applications and resumes/ cv, b) enquiries, c) complaints / adjustments, d) orders, e) quotations, f) banking etc.
  - Memos: layout, language, style
  - Meeting management: notice, agenda, conducting / participating, writing minutes.
  - Contracts and agreements (basic theoretical knowledge and comprehension),
  - Research / scientific reports: types, structure, layout / presentation, writing process etc.
  - Tenders (basic theoretical knowledge and comprehension)

- **Engineering / Business Ethics:**
- Need and objectives for code of ethics and its importance
- Type of ethics, involvement and impact in daily life
- Problems / conflicts / dilemmas in application (case studies)
- Sexual Harassment / discrimination in the workplace
  - why it occurs,
  - myths regarding sexual harassment,
  - how to deal with it,
  - gender equality,
  - respect etc.

Codes of conduct:

- Pakistan Engineering Council
- Code for Gender Justice,
- Brief study of other codes of conduct.
- Lesikar & Pettit, *Report writing for Business,* McGraw Hill

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Demonstrate** effective oral communication and interpersonal skills in simulated professional and business situations.	**A3**	**Communication**
2	**Compose** effective business messages for various purposes and audiences.	**C6**	**Communication**
3	**Apply** principles, theories, and codes of ethics in situations related to professional practice.	**C3**	**Ethics**

REMARKS (if any):

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(Chairperson/Date)

Approved by: _____
(Dean/Date)

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Course Profile

COURSE CODE& TITLE **FD-304 Food Microbiology**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	DATE OF COURSE CONTENT APPROVAL 25-05-2022	APPLIED FROM BATCH 2021

COURSE CONTENTS

The scope and development of food microbiology:
Microorganisms in food, food spoilage/preservation, food safety. Micro-organism in atmosphere, soil, air, water, equipments, plants and animal, raw meat, raw and pasteurized milk, vegetables fruits and nuts, canned foods, sugars and confectionaries, soft drinks etc.

Microbial Metabolism of Food Components:
Metabolism of food carbohydrates, fermentation, anaerobic aerobic respiration, metabolism of food proteins, metabolism of food lipids.

Factors affecting the Growth and Survival of Micro-organism:
Intrinsic factors: pH, moisture contents, oxidation reduction potential, nutrient content. Extrinsic factors: temperature of storage, concentration of gases, humidity.

Microbial Spoilage and Examination of Food:
Spoilage: Spoilage of various foods causes of spoilage, types of spoilage. Examination: Sampling, microbial test procedures, indicator organisms, food poisoning organisms, food spoilage organisms.

Bacterial and Non-bacterial Agents of Food Borne Illness:
Aeromonashydrophilia, Bacillus cereus and other species, Brucella, Compylobecter, Clostridium botulinum, Clostridium perfringens, Listeria monocytogenesis, Mycobacterium species, PlesiomonasShigelloids, Samonella, Shigella, Vibrio, Yersinia, Enterocolitica, Scombrotoric fish poisoning. Helminths and Nematodes, Protozoa, Toxigenic algae and fungi, food borne viruses, Spongiform encephalopathies.

Beneficial activities of microbes in food:
Fermented and microbial food; yeast, lactic acid bacteria, fermented milks, cheese, fermented vegetable and meats.

Controlling the Microbiological Quality of Food:
Food preservation, microbial control.

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Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** the basics of microbiology with emphasis on characteristics, sources, and growth requirements of food associated micro-organisms.	**C2**	**Engineering Knowledge**
2	**Demonstrate** procedures/ methods/ principles for microbial enumeration.	**C3**	**Engineering Knowledge**
3	**Demonstrate** the advantages and disadvantages of microbial association with food and their control measures.	**C3**	**Engineering Knowledge**
4	**Express** HACCP plan for different food products	**A3**	**Ethics**
5	**Practice** identification or enumeration of different micro-organisms.	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____
(Chairperson/Date)

Approved by :_____
(Dean/Date)

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Course Profile

COURSE CODE& TITLE **FD-307 Heat & Mass Transfer**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) FD-201	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction

Overview, Energy transfer and energy balance for closed & for steady-flow systems, surface energy balance, heat transfer mechanisms, 1-dheat conduction and its cases, general heat conduction equation, boundary and initial conditions, solution of one dimensional heat conduction problems, heat generation in solids.

Steady Heat Conduction

Steady heat conduction in plane walls, thermal contact resistance, generalize thermal resistance networks, heat conduction in cylinders and spheres, critical radius of insulation, finned surfaces, heat transfer in common configurations.

Transient Conduction

Lumped system analysis, transient heat conduction with spatial effects in large plane walls, long cylinders and in spheres.

Numerical Methods in Heat Conduction

Need for numerical techniques, finite difference formulations for differential equations.

Fundamentals of Heat Convection

Physical mechanisms of convection, velocity and thermal boundary layer, derivation of differential convection equation.

External Forced Convection

Drag force & heat transfer in external flow, flow over flat plates, flow across cylinders, spheres& tube banks.

Fundamentals of thermal radiation

Thermal radiation, blackbody radiation, atmospheric and solar radiation.

Radiation Heat transfer

The view factor and its relations, black and diffused grey surfaces.

Heat Exchangers

Types of heat exchangers, heat transfer coefficient, analysis of heat exchangers, log mean temperature difference.

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Course Profile

Introduction to mass transfer

Analogy b/w heat & mass transfer, mass diffusion, boundary conditions, steady mass diffusion through wall, mass convection.

Boiling and condensation

Boiling heat transfer, pool boiling, flow boiling and condensation heat transfer.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Discuss** the concept of heat and mass transfer in food engineering applications.	C2	Engineering Knowledge
2	**Apply** different types of mathematical relations to solve the heat and mass transfer problems.	C3	Design/Development of Solutions
3	**Describe** working procedures of different types of heat exchanging equipment.	C3	Project Management
4	**Practice** experiments to analyze heat transfer characteristics of different materials.	P3	Investigation

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

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Course Profile

COURSE CODE& TITLE **FD-308 Unit Operations in Food Engineering-II**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) FD-104	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Humidification and Cooling Towers:
Wet-bulb and adiabatic saturation temperature; Cooling Towers types, features, outline design.

Drying:
General principles, Rate of drying, Diffusion and Capillary drying, Classification and selection of dryers.

Distillation:
The fractionating column. Calculation of number of plates required for binary separations. Lewis-Sorel, McCabe-Thiele methods. Column Design diameter and height.

Absorption:
Extension of design techniques. Wetted wall columns and determination of transfer coefficients. Equipments for gas absorption.

Liquid-Liquid Extraction:
Introduction, Extraction Processes, Extraction equipment.

Leaching:
General principles, Factors influencing the rate of extraction.

Adsorption:
The nature of adsorbents, Adsorption equilibria. Adsorption equipments and regeneration of spent adsorbents.

Crystallization:
Growth and properties of crystals, saturation and nucleation, crystallization rate, impurities, effect of temperature on solubility.

Membrane separation:
General theory of separations based upon equilibrium and rate processes. Theory, design and analyses of ion exchange processes along with industrial applications.

Evaporation:
Single effect and multiple effect evaporators.

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Course Profile

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** the engineering principles required to design unit operations used in food processing.	**C2**	**Engineering Knowledge**
2	**Design** of unit operations involved in food industry where mass transfer and simultaneous heat and mass transfer are applied.	**C5**	**Design/Development of Solutions**
3	**Discuss** the application of unit operations used in food engineering.	**C2**	**Engineering Knowledge**
4	**Practice** engineering principles of each unit operation.	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____
(Chairperson/Date)

Approved by :_____
(Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **MT-442 Numerical Methods**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS **TH ■3 ☐2 ☐1 ☐0** **PR ☐3 ☐2 ☐1 ■0**
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Error Analysis
Types of errors (relative, Absolute, inherent, round off, truncation), significant digits and numerical instability, flow chart. Use any Computational tools to Analysis the Numerical Solutions.

Linear Operators
Functions of operators, difference operators and the derivative operators, identities.

Difference Equations
Linear homogeneous and non homogeneous difference equations.

Solution of Non-linear Equations
Numerical methods for finding the roots of transcendental and polynomial equations (Secant, Newton – Raphson Chebyshev and Graeffe's root squaring methods), rate of convergence and stability of an iterative method.

Solution of Linear Equations
Numerical methods for finding the solutions of system of linear equations (Gauss-Elimination, Gauss-Jordan Elimination, triangularization, Cholesky, Jacobi and Gauss – Seidel).

Interpolation &- Curve Fitting
Lagrange's, Newton, Hermit, Spline, least squares approximation. (Linear and non-linear curves).

Numerical Integration & Differentiation
Computation of integrals using simple Trapezoidal rule, 1/3th Simpson's rule, 3/8th Simpson's rule, Composite Simpson's and Trapezoidal rules, computation of solutions of differential equations using (Euler method, Euler modified method, RungeKutta method of order 4). Numerical Solutions of Partial differential Equations, Optimization problem (Simplex Method). Steepest Ascent and Steepest Descent Methods.

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COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Explain** numerical method to solve system of linear equations and non-linear equation.	**C2**	**Engineering Knowledge**
2	**Apply** numerical method to solve system of linear equation and non-linear equations in relevant engineering problems.	**C3**	**Problem Analysis**
3	**Apply** numerical differentiation and numerical integration in relevant engineering problems.	**C3**	**Problem Analysis**

REMARKS (if any):

Recommended by : _____
(Chairperson/Date)

Approved by :_____
(Dean/Date)

NED University of Engineering and Technology

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Program BE Food

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE CF-303 Applied Economics for Engineers	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ------	DATE OF COURSE CONTENT APPROVAL 25-05-2022	APPLIED FROM BATCH 2021

COURSE CONTENTS

Introduction:
Basic concepts and principles of economics, micro & macro economic theory, the problem of scarcity, basic concepts of engineering economy, financial effectiveness and non monetary factors.

Economic Environment:
Consumer and producer goods; goods and services, demand and supply concept, market equilibrium, elasticity of demand and supply, measure of economic worth, price supply-demand relationship, revenue, cost and profit function.

Basic Cost Concept and Break Even Analysis:
Types of cost and cost curves (fixed cost, variable cost, average cost, marginal cost, total cost….) determination of costs/ revenue, numerical and graphical presentation, practical application, BEA as a management tool for achieving financial / operational efficiency.

Elementary Financial Analysis:
Basic accounting equation, development and interpretation of financial statements (income statement, balance sheet).

Cash flow, working capital management, financial ratio analysis

a) Time value of money and financial returns:
   Concept of simple, compound and effective interest rate, less often then compounding period and more often than once year, present value, future value and annuities concepts, uniform gradient and geometric sequence of cash flow.

b) Project selection and comparing Alternatives Techniques:
   Net present value, annual worth analysis, internal rate of return, benefit cost ratio analysis, payback period.

Depreciation and Taxes:
Depreciation concept, economic life, methods of depreciations (straight line, SYD approach, declining balance, etc), gain (loss) on the disposal of asset, depreciation as tax shield.

Business Organizations and Financial Institutions:
Types of ownership, single ownership, partnership corporation, types of stock, joint stock companies, banking and specialized credit institution.

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Introduction to Production Management to Production Concept):
Basic production function, stages of production, returns to scale, production lead time, production rate, capacity, operations, planning and control, order processing, scheduling, material requisitions planning, line of balance.

Linear Programming:
Mathematical statement of LP problem, graphical solution, simplex method, duality problem.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Discuss** significance of economic analysis in engineering profession	**C2**	**The Engineer and Society**
2	**Analyze** alternatives using economic analysis techniques to accomplish given objective	**C4**	**Problem Analysis**

REMARKS (if any):

Recommended by : _____
(Chairperson/Date)

Approved by :_____
(Dean/Date)

NED University of Engineering and Technology

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Program BE Food

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Course Profile

COURSE CODE& TITLE **FD-410 Food Processing**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) FD-308	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Processing/Preservation Technologies:
Blanching, Fermentation, Canning, Dehydration, Extrusion, Chilling, Freezing, Aseptic processing, Sterilization, Pasteurization, Ohmic heating.

Preservation concerns in Food Processing:
Food packaging fundamentals, Food Toxicology, Environmental hazards.

Sanitation and Quality:
Food Plant Sanitation Requirement: Sanitation, need for a sanitation program, Sanitizers, Pest Control, Quality Assurance.

Product Development:
Product development basics, sensory evaluation of foods.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** the basics of food processing and preservation techniques.	**C2**	**Modern Tool Usage**
2	**Demonstrate** the construction and operations of food processing equipment and their impact on food quality.	**C3**	**Engineering Knowledge**
3	**Demonstrate** emerging trends related to food processing, packaging and preservation, along with their environmental impacts.	**C3**	**Environment and Sustainability**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-402 Food Quality Control**	SEMESTER ☐ SPRING ■FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Definition of Quality:
Quality assurance, total quality concepts; evolution of quality activities in the history.

Principles of total Quality Management:
Quality Management System and ISO-9000 standards; functions of Quality Assurance Department and its relations with other departments.

Description of Critical Control Points:
HACCP, GMP systems; classification of food quality attributes; definition and objective evaluation of sensory food attributes, sensory test techniques.

Nutritional Quality Control:
Approximate analysis of foods; statistical quality control tools.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** the basics of Quality and control techniques applied in food industries.	**C2**	**Engineering Knowledge**
2	**Apply** Food quality management standard in food manufacturing unit	**C3**	**Project Management**
3	**Demonstrate** an effective HACCP system implementation in food production area.	**C3**	**Ethics**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-419 Process Control in Food Industry**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) MT-223	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction to Process control:
Importance of Process Control in the Food industry: Importance; introduction to process control principles; definition of control objectives. Feedback and Feed forward Control systems. Types of control scheme, (Proportional, Integral, Derivative and PID) Controllers.

Mathematical Modeling:
Basics of mathematical modelling; process control elements; definition of open and closed loop systems; transfer functions and block diagrams.

Process control arrangement in different food processes:
Bioreactors, pasteurization and sterilization, drying, freezing, evaporation.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** the fundamental principles of process control apply in food processing.	**C3**	**Engineering Knowledge**
2	**Use resources** to solve process control problems by applying mathematical model.	**A3**	**Individual and Team Work**
3	**Apply** the knowledge of mathematics [Linearization, Laplace Transforms and Frequency Response] to solve it describing dynamics of Food processing.	**C3**	**Modern Tool Usage**
4	**Practice** experiments to control parameters used in food industries.	**P3**	**Modern Tool Usage**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-408 Food Regulations and Legislation**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Pakistan Standards:
Standards and Quality Control Authority: functions, authorities.

Pure Food Rules:
Background, definitions, significant features, enforcement, amendments; Food inspector and public analyst: qualifications, duties, powers.

Food Adulteration:
Adulterants, health hazards, methods of detection.

Food Labelling:
Perspectives on nutrition labeling; Islamic food laws and regulations: sources, principles, lawful foods, unlawful foods; Consumer laws in Pakistan.

International Food Laws:
Introduction; The World Trade Organization (WTO) - the agreement on the application of sanitary and phytosanitary measures; GATT; Codex Alimentarius: general, procedural manual, standards, codes, legal force.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Demonstrate** Pakistan standards (Food) and Halal FSMS along with their implementation in food industry	**C3**	**The Engineer and Society**
2	**Describe** the ISO 22000 FSMS and Codex Alimentarius with some examples related to their application in food processing facility.	**C2**	**Lifelong Learning**
3	**Explain** major food regulatory agencies both local and international which deals with food regulations and Legislation.	**C2**	**Environment and Sustainability**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE **FD-420 Fundamentals of Food Packaging**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction of food packaging:
Introduction to conventional and modern food packaging, importance and functions of packaging, elements of successful packaging

Packaging materials and their processing
Introduction to packaging materials: polymers (plastics), paper, glass and metals. Selection criteria of packaging materials for different food products, processing of packaging materials for food applications, Industrially preferred manufacturing processes of food packaging products such as injection moulding, extrusion, blow moulding, sheet and film extrusion, paper and paperboard calendaring, lamination, steel drawn cans processes. Fresh and frozen food packaging systems (meat, poultry, sea food, fruits and vegetables, dairy products).

Recent trends in food packaging:
Active, Controlled atmosphere (CA), Modified atmosphere (MA), Anti-microbial, Edible, Aseptic and biodegradable packaging

Packaging equipment and machinery:
Vacuum, Seal and shrink packaging machine. Form & fill sealing machine, Aseptic packaging systems, Retort pouches, Bottling machines, Carton making machines, Package printing machines.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Evaluate** different packaging materials, their properties and processing steps as used for the safety, quality and shelf life of various types of food products	**C6**	**Design/Development of Solutions**
2	**Use resources** to identify problems associated with different processing steps used in food packaging industries.	**A3**	**The Engineer and Society**
3	**Apply** modern food packaging guidelines in accordance with sustainability and eco-friendly environment	**C3**	**Environment and Sustainability**
4	**Imitate** the characterization of packaging materials.	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology, Karachi.

Department of Food Engineering

Programme BE Food

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE **FD-411 Food Plant Layout & Design**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Plant design and layout: Objectives and functions, financial requirements, plant location, site selection, space requirement, building design and construction, floors, drains, walls, doors, windows, ceiling, ventilation, lighting, auxiliary facilities. Food plant equipment, layout of equipment, requirements, design, construction, choice of material.

Selection of novel products from food industry through market survey, food product development. Selection of the local preparation of the plant layout, material and energy balances. Design of the major units and sizing, auxiliary equipment including services, health and safety considerations, plant and product cost estimation.

Use of computer for layout, environmental impact, material handling and equipment process flow chart.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Program learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Describe** the strategic importance of a plant layout and its Location selection	**C2**	**Engineering Knowledge**
2	**Demonstrate** the major elements of plant design and its cost estimation.	**C3**	**Problem Analysis**
3	**Develop** the flow sheet synthesis and process equipment design concepts with the principles of engineering.	**C5**	**Design/Development of Solutions**
4	**Demonstrate** related software that help in food process design, analysis and flow sheeting**.**	**C3**	**Project Management**

REMARKS (if any):

Recommended by: _____ (Chairperson/Date)

Approved by: _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE **FD-404 Sugar and Confectionery**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ---	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** **2021**

COURSE CONTENTS

Sugar Industry in Pakistan:
Composition and properties of Molasses Sugarcane and sugar beet and honey: production, quality; Indigenous technology for small scale sugar production: *gur*, *khund*, *shaker*; Raw sugar manufacturing: unit operations, Bagging, storage; Factors affecting sugar processing; Quality criteria: raw and refined sugar; Specialty sugar products: brown or soft sugar, liquid sugar; Sugar industry by products and their uses.

Nutrition Value:
Caloric and non-caloric sweeteners; Nutritional Value, Sweetening Power, Processing, Toxicology and Safety. Packaging, By-products and their Utilization. Quality Control. Non- Nutritive Sweeteners.

Confectionery:
Significance, classification, industries in Pakistan. Ingredients, manufacturing - high boiled sweets, caramel, toffee, fudge, gums.

Sugar free Confectionery:
Need, ingredients, manufacture; Chewing gum technology; Chocolate confectionery.

Snack Foods:
History, manufacture - potato, nuts, cereal, meat and fish based; Puffed and baked snacks.

Seasonings:
Ingredients, formulations, applications; Quality control; Packaging.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Discuss** processing of sugar and its properties	**C3**	**Engineering Knowledge**
2	**Describe** processing of confectionery products.	**C3**	**Engineering Knowledge**
3	**Use resources** to identify problems associated with confectionery products.	**A3**	**Environment and Sustainability**
4	**Imitate** experiments to understand confectionery processing	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-412 Dairy Processing**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Milk:
Production statistics, importance, standards, major constituents; Factors influencing raw milk quality.

Milk Handling:
Manual and machine milking, farm cooling, collection, reception, analyses at different levels, transportation.

Unit Operations in Milk Processing:
Cream separation, bactofugation, filtration, thermization, standardization, homogenization, pasteurization, sterilization, UHT, aseptic packaging, storage, distribution, effect on milk constituents.

Technology:
Chemistry, microbiology of industrial products and quality control: evaporated, condensed and powder milks, butter, yogurt, cheese, ice cream, *khoa*, *gulabjamun*, *burfi*, *rabri*, *paneer*, *dahi*, *lassi*, *kheer*, *desi ghee*; Milk by-products: dried whey, casein.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Explain** the steps related to raw milk handling and technologies employed for milk preservation and storage	**C3**	**Engineering Knowledge**
2	**Describe** different processing steps of byproduct of milk and their quality assessment tools	**C3**	**Engineering Knowledge**
3	**Respond** different processing steps involved in raw milk handling/by product of milk in dairy industries.	**A3**	**Environment and Sustainability**
4	**Imitate** experiments followed by data analysis and interpretation.	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by :_____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-417 Oil and Fats Processing**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Physical and Chemical Characteristics:

Oils and fats: importance, sources, production, uses; Characteristics of oils and fats. Oil bearing materials: pre-treatment, storage.

Extraction Methods:

Rendering, expression, solvent extraction; Processing: degumming, refining, bleaching, deodorization, fractionation, winterization, hydrogenation, interesterification, esterification, emulsification, stabilization; Spoilage: oxidative and hydrolytic rancidity – chemistry, prevention - use of antioxidants; Manufacture of frying oils, margarine, mayonnaise; Byproducts of fats and oils industry and their uses.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Illustrate** the process of extraction and refining of edible oils and fats from different natural sources	**C3**	**Engineering Knowledge**
2	**Demonstrate** the processing techniques and technology used to produce a range of edible fats and oils products and their quality assessment.	**C3**	**Engineering Knowledge**
3	**Use resources** to identify problems associated with oil processing.	**A3**	**Environment and Sustainability**
4	**Imitate** experiments to characterize different oil seed and edible oil samples	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-403 Food Biotechnology**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Biotechnology:
Introduction, history.

Microbial Metabolism:
Developments in metabolic and biochemical engineering: metabolites, range of fermentation processes, components of fermentation processes; Isolation and preservation of industrially important microorganisms.

Industrial Fermentations:
Media, design and types of fermentors, process variables in fermentation, recovery, purification of fermentation products; Production of organic acids, enzymes, amino acids, single cell proteins, carotenoids and fermented food products.

Microbial Genetics:
Conjugation, transduction, transformation; Legal and social aspects of food biotechnology.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Illustrate** the microbial metabolism and fermentation processes	**C3**	**Engineering Knowledge**
2	**Demonstrate** the use of microbial genetics in food processing.	**C3**	**Engineering Knowledge**
3	**Use resources** to identify problems associated with microbial processing.	**A3**	**Environment and Sustainability**
4	**Imitate** experiments to characterize different microbial processess	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-409 Post Harvest Processing**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction:
Production, losses, causes, trade.

Fruit Ripening:
Changes during ripening, recommended conditions, commercial practices, water loss, respiration activity; Harvesting and handling methods; Maturity assessment of different fruits and vegetables.

Ripening Process:
Respiration, climacteric and non-climacteric patterns, pectic substances, ripening conditions; Postharvest physiology of fruits and vegetables; Postharvest treatments: coatings, curing, vapor heat treatment, hot water treatment, degreening; Storage: refrigerated, CA, hypobaric, MAS.

Packaging:
Types, design, modified atmospheric packaging, recycling.

Cold Chain:
Packing house operations, transportation; Safety and quality of fruits and vegetables;

Postharvest Technology of Cereals:
Harvesting, threshing, drying, storage and handling; New developments in postharvest technology.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Illustrate** the post harvest processing of fruits and vegetables	**C3**	**Engineering Knowledge**
2	**Demonstrate** the use of storage techniques for post harvest processing	**C3**	**Engineering Knowledge**
3	**Use resources** to identify problems associated with post harvest processing	**A3**	**Environment and Sustainability**
4	**Imitate** experiments to characterize post harvest processing steps	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-413 Cereal Processing**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Cereal Grains:
Importance, production, structure, composition, nutrition: Grain grades and grading; Storage: methods, types, role of temperature and moisture, safe storage methods; Dry milling process: cleaning, tempering, conditioning;.

Grinding and Sieving:
Types of grinding machines; Sieving process: principles, types of sifters; Flour treatment and quality assessment; Rheology of doughs and batters. Maize - wet milling: production of starch, oil, protein. Rice: Drying, milling, parboiling; Processing of rice and oats; Malting and brewing; Production of breakfast cereals and snack foods; Feed and industrial uses of cereals.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Illustrate** the cereal processing	**C3**	**Engineering Knowledge**
2	**Demonstrate** the processing techniques and technology used to produce a range of cereal products	**C3**	**Engineering Knowledge**
3	**Use resources** to identify problems associated with cereal processing.	**A3**	**Environment and Sustainability**
4	**Imitate** experiments to characterize cereal products	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-414 Beverage Processing**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Beverage industry in Pakistan:
Beverages: classification – still, carbonated, alcoholic; Beverage ingredients: water, fruit components, sweeteners, flavorings, colorings, preservatives; Manufacture of soft drinks and fruit juices: mixing, pasteurization, homogenization, filling, packing and storage.

Carbonation:
History, CO2, gas volume; Soft drinks and fruit juices: ingredient specifications, manufacturing problems, changes in color, appearance, flavor;

Packaging Types:
Interactions; Shelf life Issues: microbiological problems; Bottled water: legislation, water treatment, filling, quality issues; Fermented beverages: introduction, types, role of microorganisms.

Regulations and Standards:
Statuary requirement: labeling, nutrition claims

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Illustrate** the beverage processing	**C3**	**Engineering Knowledge**
2	**Demonstrate** the processing techniques and technology used to produce a range of beverage products	**C3**	**Engineering Knowledge**
3	**Use resources** to identify problems associated with beverage processing.	**A3**	**Environment and Sustainability**
4	**Imitate** experiments to characterize beverage products	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by :_____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-415 Meat, Poultry and Egg Processing**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Poultry industry in Pakistan:
Factors affecting poultry quality: breed, age, sex, genotype, rearing conditions and practices; Bird selection: weight, quality; Primary poultry processing: live-bird, stunning, slaughtering, scalding, plucking, evisceration, giblet harvesting, whole-carcass and cuts packaging; Portioning and deboning operations; Preservation: freezing, canning, drying, chemical treatments, irradiation.

Packaging:
Materials, selection; Quality assurance: parameters, drug and feed residues.

Eggs:
Identification, grading, composition, quality characteristics, handling, storage; Egg processing: drying, freezing - whole, white, yolk; Functional properties and applications in food processing; Quality control during processing.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Illustrate** the poultry processing	**C3**	**Engineering Knowledge**
2	**Demonstrate** the processing techniques and technology used to produce a range of poultry products	**C3**	**Engineering Knowledge**
3	**Use resources** to identify problems associated with pourltry processing.	**A3**	**Environment and Sustainability**
4	**Imitate** experiments to characterize poultry products	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

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NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-416 Food Product Development**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Process:
Food product development: strategy, design, development, commercialization, evaluation; Key to new product success and failure.

Consumer Tends:
Food product development: consumer behavior, food choices, sensory needs, consumer role; Preference mapping and food product development: conducting trials, analyzing, recent developments; Case study of consumer-oriented food product development: reduced-calorie foods - healthy eating, marketing and technological challenges, success factors; Case study: reduced -calorie on-the-go beverages; The ethics of food production and consumption. Genemitically Modified food.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Illustrate** the steps in food product development cycle	**C3**	**Engineering Knowledge**
2	**Demonstrate** the processing techniques and technology used for food product development	**C3**	**Engineering Knowledge**
3	**Use resources** to identify problems/ risks associated with product development	**A3**	**Environment and Sustainability**
4	**Imitate** experiments to develop food products	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by :_____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **FD-418 Food Plant Hygiene and Sanitation**	SEMESTER ☐ SPRING ■ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Food Sanitation:
Importance of sanitation in food industry; Introduction to Hazard Analysis and Critical Control Points (HACCP).

Practices:
Food processing systems; sanitation standard operating procedures (SSOP); cleaning compounds; sanitizers; pest control; waste product handling

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Illustrate** the standards used for hygiene improvement	**C3**	**Engineering Knowledge**
2	**Demonstrate** the procedures used for hygiene improvement in food industries	**C3**	**Engineering Knowledge**
3	**Use resources** to identify issues in hygiene and sanitation	**A3**	**Environment and Sustainability**
4	**Imitate** experiments to improve hygiene and sanitation in food processing	**P3**	**Investigation**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

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F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **CH-405 Industrial Safety and Maintenance Management**	**SEMESTER** ■ SPRING ☐ FALL	**CREDIT HOURS** TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ■1 ☐0
PREREQUISITE COURSE(S) ----	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction: Accident and loss statistics, public perception of chemical industry, the accident process, some significant disasters as case studies; Toxicology: how toxicants enter and are eliminated from biological organisms, effects of toxicants, dose versus response models, threshold limit values.

Industrial Hygiene: Government regulations, identification and evaluation and control of various exposures in chemical industry. Fires and explosions: fire triangle, flammability characteristics of liquids and vapors. Design to prevent fires and explosions. Hazard identification and risk assessment. Accident investigations and case histories.

Forms of maintenance, scheduling of maintenance. Computerized Maintenance. Non destructive testing techniques. Forms of corrosion, prevention and inhibition,; Preparation for startup and shutdown. Preventive and predictive maintenance.

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Commit** to observe safe working practices in any workplace.	**A4**	**Environment and Sustainability**
2	**Manage** changes by advancing health and safety principles within management systems, cultures, practices, and priorities.	**C4**	**Project Management**
3	**Evaluate,** design, and support health and safety programs and implement procedures appropriate to the task.	**C6**	**The Engineer and Society**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by : _____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **CH-407 Industrial Organization and Management**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ■3 ☐2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ---	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction and History, Company and Organization, Facility Location and Layout Planning, Operation Planning and Control, Marketing and Distribution, Total Quality Management, Project Management, Maintenance Management, Financial Management, Human Resources, Other Topics and Recent Trends in Management

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Discuss** the industry standards, and best practices in a variety of workplaces.	**C2**	**Ethics**
2	**Compare** the leadership styles to anticipate the consequences of each leadership style.	**C4**	**The Engineer and Society**
3	**Manages** projects effectively including the management of scope, time, costs, and quality, ensuring satisfying the needs for which the project was undertaken.	**C5**	**Project Management**
4	**Distinguish** various quality tools in total quality management.	**C6**	**Lifelong Learning**

REMARKS (if any):

Recommended by : _____
(Chairperson/Date)

Approved by :_____
(Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

Course Profile

F/QSP 11/17/01

COURSE CODE& TITLE **HS-219 Professional Ethics**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) ___	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction to Professional & Engineering Ethics:

- Definitions: Ethics, professional Ethics, Engineering Ethics, Business Ethics
- Ethics & Professionalism Need and scope of Engineering and professional Ethics through Case Studies
- Development of Engineering Ethics & Major issues in Engineering & Professional Ethics

Moral Reasoning & Ethical Frameworks Ethical Dilemma:

- Resolving Ethical dilemmas and making Moral Choices Codes of Ethics (of local and international professional bodies)
- Moral Theories: Utilitarianism, Rights Ethics and Duty Ethics, Virtue Ethics Self- Realization & Self Interest
- Ethical Problem Solving Techniques: Line drawing, flow Charting, Conflict Problems. Case Studies and applications

Contemporary Professional Ethics:

- Professional Responsibilities
- Risk and Safety as an Ethical Concern for Engineers
- Workplace Responsibilities and Ethics: Teamwork, confidentiality and conflicts of interest, Whistleblowing, Bribe and gift, risk and cost-benefit analyses, gender discrimination and sexual harassment
- Environmental Ethics Computer Ethics & the Internet Honesty: Truthfulness, trustworthiness, academic and research integrity

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	Discuss the contemporary frameworks of professional and engineering ethics in the light of ethical theories and dilemmas.	**C2**	**Ethics**
2	**Apply** principles, theories, and codes of ethics in situations related to professional practice.	**C3**	**Ethics**
3	**Value** professional, aspirational, and collective ethics for continual professional development	**A3**	**Ethics**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by :_____ (Dean/Date)

NED University of Engineering and Technology

Department of Food Engineering

Program BE Food

F/QSP 11/17/01

Course Profile

COURSE CODE& TITLE **MG-228 Sociology & Development**	SEMESTER ■ SPRING ☐ FALL	CREDIT HOURS TH ☐3 ■2 ☐1 ☐0 PR ☐3 ☐2 ☐1 ■0
PREREQUISITE COURSE(S) _____	**DATE OF COURSE CONTENT APPROVAL** 25-05-2022	**APPLIED FROM BATCH** 2021

COURSE CONTENTS

Introduction to Sociology

- Foundations of OB: Management functions, roles, and skills
- Definition, nature, scope, and importance of Sociology
- Study of social life; exploring the global village
- Sociology as a science; relationship with other social sciences
- The sociological imagination; development of Sociology, pioneers of Sociology
- The sociological imagination; development of Sociology, pioneers of Sociology
- Brief historical development of Sociology
- Society and community, Social interaction processes

Social groups & Social Institutions

- Definition, functions and types of social groups
- Structure and function of social institutions
- Inter-relationships among various social institutions

Culture and Related Concepts

- Definition, types and elements of culture
- Role of culture in organization
- Socialization and personality

Social Stratification

- Factors of Social Stratification
- Approach to study social stratification
- Power, Prestige, and Authority
- Social Mobility; Migration

Social and cultural change

- Definition of social change
- Dynamics of social change
- Impact of globalization on society and culture
- Resistance to change

Sociology & Development

- Significant sociological questions
- Measures of inequality and development
- Modernisation theory and explanation of underdevelopment
- Education, industrialization & development

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Course Profile

F/QSP 11/17/01

COURSE LEARNING OUTCOME AND ITS MAPPING WITH PROGRAMME LEARNING OUTCOME

Sr. No.	CLOs	Taxonomy level	Programme learning outcome (PLO)
At the end of the course, the student will be able to:			
1	**Discuss** key concepts and theoretical perspectives of sociology**.**	**C2**	**The Engineer and Society**
2	**Evaluate** contemporary social and developmental issues in purview of sustainable practices	**C5**	**Environment and Sustainability**
3	**Express** ideas and Plans for socio-economic changes in society.	**A3**	**The Engineer and Society**

REMARKS (if any):

Recommended by : _____ (Chairperson/Date)

Approved by :_____ (Dean/Date)