



BANGLADESH TECHNICAL EDUCATION BOARD

Agargaon, Dhaka-1207

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM
SYLLABUS (PROBIDHAN-2016)

FOOD TECHNOLOGY

TECHNOLOGY CODE: **669**

6th SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

FOOD TECHNOLOGY

6th SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total
						Theory		Practical		
						Cont. assess	Final exam	Cont. assess	Final exam	
1	66961	Food Engineering Operation-1	2	3	3	40	60	25	25	150
2	66962	Food Processing Industries - 1	2	3	3	40	60	25	25	150
3	66963	Food Industrial Instrumentation and Process Control	2	3	3	40	60	25	25	150
4	66363	Industrial Stoichiometry & Thermodynamics	3	3	4	60	90	25	25	200
5	66964	Bakery Products	2	3	3	40	60	25	25	150
6	66965	Food Adulteration and Toxicology	1	3	2	20	30	25	25	100
7	65852	Industrial Management	2	0	2	40	60	0	0	100
Total			14	18	20	280	420	150	150	1000

AIMS:

- To be able to understand the food engineering, unit operation & unit process.
- To be able to understand the flow of fluids.
- To be able to find out the fluid pressure and flow rate of fluid.
- To be able to understand the different types of pumps and compressors.
- To be able to understand the mixing.
- To be able to perform experiment of food engineering operation.

SHORT DESCRIPTION

Basic concept of food engineering; flow of fluids; Energy and momentum relationship in fluid; Bernoulli's equation; measurement of flow and pressure of fluid; pumps; Positive displacement pumps; Rotary pumps; Pumping equipment for gases; Transportation of solids; Mixing and agitation; crystallization; emulsification; irradiation.

DATAIL DESCRIPTION**Theory:****1. Understand the basic concept of food engineering.**

- 1.1 Define food engineering.
- 1.2 Describe engineering units; base units, derived units.
- 1.3 State classification of unit operations.
- 1.4 Explain unit operations and unit process.
- 1.5 Make a list of important unit operations of food engineering.
- 1.6 Explain the importance of unit operations in food process industries.

2. Understand the flow of fluids.

- 2.1 Define fluid and Liquid.
- 2.2 Mention the classification of fluid.
- 2.3 Explain the properties of fluid.
- 2.4 Explain pressure, Density and velocity of fluid.
- 2.5 Describe barometric pressure, gage pressure and absolute pressure.
- 2.6 Define laminar, transition and turbulent flow.
- 2.7 Describe "Reynolds number (Re)".
- 2.8 Density and velocity related problem solving.

3. Understand the continuity equation and Bernoulli's equation.

- 3.1 Define internal energy of the fluid.
- 3.2 Describe the incompressible fluids.
- 3.3 Mention the equation of continuity.
- 3.4 Express the Bernoulli's equation.
- 3.5 Explain the total energy of a fluid in motion.
- 3.6 Describe the pressure and fluid head.
- 3.7 Describe the constant flow of fluid per unit area.
- 3.8 Solve problems on Bernoulli's equation.

4. Understand the friction in pipes and channels.

- 4.1 Describe the friction in pipes and channels.
- 4.2 Explain nature of fluid flow.
- 4.3 Describe shearing characteristics of a fluid.
- 4.4 Explain drop in pressure for flow of fluid through a tube.
- 4.5 Describe pressure drop along a pipe through which fluid is flowing.

5. Understand the measurement of flow and pressure of fluids.

- 5.1 Explain the term "fluid pressure".
- 5.2 Make a list of pressure measuring devices.
- 5.3 Make a list of flow measuring devices.
- 5.4 Describe the measurement of pressure difference by simple manometer.
- 5.5 Describe the measurement of pressure difference by U-tube manometer and inverted manometer.
- 5.6 Describe the methods of measurement of flow through pitot tube.
- 5.7 Describe the methods of measurement of flow of fluid through orificemeter, venturimeter and rotameter.
- 5.8 Solve problem of flow and pressure.

6. Understand the pumping of fluids.

- 6.1 Define pump.
- 6.2 Mention Characteristics of a pump; suction head, impelling head, total head of a pump, net positive suction head: cavitation.
- 6.3 Describe different types of pump.
- 6.4 Describe the operation of a reciprocating piston pumps.
- 6.5 Describe the operation of a centrifugal pump.
- 6.6 Describe the operation of a rotary pump.
- 6.7 Explain the term pump head, priming.
- 6.8 Describe use of pump in food industry.

7. Understand the transportation of solids.

- 7.1 Define conveyors.
- 7.2 Describe gravity conveyors.
- 7.3 Make a list of devices for the transportation of solids.
- 7.4 Describe the followings: (i) Roller conveyors, (ii) Belt conveyors, (iii) Chain conveyors, (iv) Slat conveyors, (v) Vibratory conveyors, (vi) Magnetic conveyors, (vii) Screw conveyors, (viii) Flight conveyors.
- 7.5 Mention elevators.
- 7.6 Describe flight elevators and bucket elevators.
- 7.7 Describe pneumatic conveying systems.

8. Understand the mixing and agitation.

- 8.1 Define mixing.
- 8.2 Mention the reasons for mixing of materials in industries.
- 8.3 Mention the classification of mixing equipment.
- 8.4 Describe the mixing of liquids with propeller/turbines.

8.5 Describe the mixing of solid particles.

8.6 Describe the following equipment: (i) Anchor paddle mixer, (ii) Kneaders, (iii) Pug mill, (iv) Double cone mixer, (v) Propeller agitators, (vi) Turbine agitators.

9. Understand the emulsification.

9.1 Define emulsification.

9.2 Mention emulsifying agents.

9.3 State the methods of emulsification.

9.4 Describe pressure homogenizer.

9.5 Describe the colloid mills.

9.6 Mention using of emulsification of food industry.

9.7 Describe Mayonnaise and Butter making procedure.

10. Understand the crystallization and crystallizer.

10.1 Define crystallization.

10.2 Mention the classification of crystals.

10.3 Explain the terms: crystallization rate (nucleation and crystal growth), crystal habit, caking of crystal.

10.4 Mention the control of caking crystal.

10.5 State the factors for controlling crystal growth.

10.6 Mention the classification of crystallizer.

10.7 Describe growth type crystallizer and its operation.

10.8 Describe the vacuum crystallizer and its operation.

10.9 Describe the crystal crystallizer (i.e oslo crystallizer) and its operation.

11 Understand the dehydration of food and drying equipment. .

11.1 Define equilibrium moisture content, free moisture, relative humidity and equilibrium humidity.

11.2 Describe case hardening, critical moisture content, dehydration ratio and rehydration ratio.

11.3 Explain the following terms of drying cycle:

(i) Setting down period.

(ii) Constant rate period.

(iii) Falling rate period.

11.4 List different types of dryers used in food dehydration.

11.5 Describe a tunnel dryer.

11.6 Describe a spray dryer and its working principle.

11.7 Describe a drum dryer.

11.8 Describe a cabinet tray/shelf dryer.

12 Understand the Evaporation.

12.1 Define evaporation.

12.2 State the mechanism of evaporation system.

12.3 Mention different type of evaporators.

12.4 Describe single effect evaporator.

12.5 Describe multiple effect evaporators.

12.6 Solve problem on material balance in concentrate products using evaporators.

PRACTICAL:

1. Determine the specific gravity of various types of incompressible fluids.
 - 1.1 Select and Collect PPE, tools and equipment.
 - 1.2 Clean tools, equipment and work place.
 - 1.3 Measure specific gravity of solid particles as per SOP.
 - 1.4 Clean and maintain tools, equipment and work place.

2. Determine the viscosity of different liquids.
 - 2.1 Select and Collect PPE, tools and equipment.
 - 2.2 Clean tools, equipment and work area.
 - 2.3 Measure viscosity of sample liquids.
 - 2.4 Clean and maintain tools, equipment and work area.

3. Measure the pressure of an incompressible fluid flowing in a pipe with the help of U-tube manometer.
 - 3.1 Select and Collect PPE, tools and equipment.
 - 3.2 Clean tools, equipment and work area.
 - 3.3 Set up U-tube manometer in pipe line.
 - 3.4 Measure and calculation pressure of an incompressible fluid.
 - 3.5 Clean and maintain tools, equipment and work area.

4. Measure the pressure of an incompressible fluid flowing in a pipe with the help of inclined manometer.
 - 4.1 Select and Collect PPE, tools and equipment.
 - 4.2 Clean tools, equipment and work area.
 - 4.3 Set up inclined manometer in pipe line.
 - 4.4 Measure and calculation pressure of an incompressible fluid.
 - 4.5 Clean and maintain tools, equipment and work area.

5. Measure the flow rate of a pipe with the help of venture meter.
 - 5.1 Select and Collect PPE, tools and equipment.
 - 5.2 Clean tools, equipment and work area.
 - 5.3 Set up venture meter in pipe line.
 - 5.4 Measure and calculation the flow rate of an incompressible fluid.
 - 5.5 Clean and maintain tools, equipment and work area.

6. Measure the flow rate of a pipe with the help of orifice meter.
 - 6.1 Select and Collect PPE, tools and equipment.
 - 6.2 Clean tools, equipment and work area.
 - 6.3 Set up orifice meter in pipe line.
 - 6.4 Measure and calculation pressure of an incompressible fluid.
 - 6.5 Clean and maintain tools, equipment and work area.

7. Verify the Bernoulli`s equation.
 - 7.1 Write the equation.
 - 7.2 Put individual values.
 - 7.3 Calculate the energy for each part.

8. Disassemble, clean all parts and then reassemble a volute type centrifugal pump.
 - 8.1 Select & Collect PPE, tools and equipment.
 - 8.2 Clean tools, equipment and work area.
 - 8.3 Disassemble all parts of centrifugal pump.
 - 8.4 Reassemble all parts of centrifugal pump.
 - 8.5 Clean and maintain tools, equipment and work area.
9. Operate a mixer machine and prepare dough.
 - 9.1 Select & Collect PPE, materials & machine/equipment.
 - 9.2 Clean machine/equipment and work area.
 - 9.3 Set up & pre check mixer machine.
 - 9.4 Operate mixer machine and make dough.
 - 9.5 Shutdown the mixer machine.
 - 9.6 Clean and maintain machine, equipment and production area.
10. Operate a pressure homogenizer for milk homogenization.
 - 10.1 Select & Collect PPE, raw materials, tools and equipment.
 - 10.2 Clean tools, equipment and work area.
 - 10.3 Set up homogenizer and pre check.
 - 10.4 Operate homogenizer and produce homogenized milk.
 - 10.5 Shutdown the homogenizer.
 - 10.6 Clean and maintain machine, tools, equipment and work area.
11. Prepare Mayonnaise.
 - 11.1 Select & Collect PPE, raw materials and equipment.
 - 11.2 Clean machine/equipment and work area.
 - 11.3 Set up blender machine and pre check.
 - 11.4 Operate blender machine and make Mayonnaise.
 - 11.5 Shutdown/Switch off the process.
 - 11.6 Clean and maintain machine, equipment and production area.
12. Separate crystal from liquid by using a basket centrifuge.
 - 12.1 Select & Collect PPE, raw materials and equipment.
 - 12.2 Clean machine/equipment and work area.
 - 12.3 Set up centrifuge and pre check.
 - 12.4 Operate centrifuge and separate crystal from liquid.
 - 12.5 Shutdown/switch off the centrifuge.
 - 12.6 Clean and maintain machine, equipment and work area.
13. Determine the dehydration ratio of potato slices dried by using a shelf drier.
 - 13.1 Select and Collect PPE, tools, equipments & sample.
 - 13.2 Clean tools, equipments and work area.
 - 13.3 Check the electric line and connection.
 - 13.4 Slice & take weight the sample.
 - 13.5 Keep sample in shelf drier.
 - 13.6 Start equipment until certain time.
 - 13.7 Shutdown the machine, Collect, Cool & Take weight dried sample.
 - 13.8 Clean and maintain tools, equipments and work area.
 - 13.9 Calculate the dehydration ratio.

14. Determine the re-hydration ratio of potato slices dried by using a shelf drier.
 - 14.1 Select and Collect PPE, tools, equipments & sample.
 - 14.2 Clean tools, equipments and work area.
 - 14.3 Check the electric line and connection.
 - 14.4 Slice & take weight the sample.
 - 14.5 Keep sample in shelf drier.
 - 14.6 Start equipment until certain time.
 - 14.7 Shutdown the machine & Collect, Cool & Take weight dried sample.
 - 14.8 Rehydrate the dried sample and Take weight wet sample.
 - 14.9 Clean and maintain tools, equipments and work area.
 - 14.10 Calculate the Rehydration ratio.

REFERENCE BOOKS:

1. ফুড ইঞ্জিনিয়ারিং অপারেশন- আবু জাফর মোহাম্মদ হোসাইন খান, বাকাশিবো।
2. Food Engineering Operations- J.G Brennan, J.R Butters.
3. Operation in Food Engineering- Albert Ibarz Ph.D & Gustavo V. Barbosa-Canavas Ph.D.
4. Unit Operations- K.M Sahay & K.K Singh.
5. Introduction to Food Engineering – R. Paul Singh & Dennis R. Heldman.
6. Chemical Engineering- Volume-1 & 2, By- J.M Coulson and J.F Richardson.
7. Unit Operation of Chemical Engineering- W.L Mccabe and J.C Smith.
8. Introduction to Chemical Engineering- Badger and Banchemo.
9. Centrifugal Pumps and Blowers- Austin W. Church and Jagodish Lal.
10. Elementary Chemical Engineering- Peters.
11. Chemical Engineering Handbook- Perry.
12. Chemical Engineering, Volume 4 & 5- J.R Backhust & J.H Harker
13. Chemical Engineering, Volume 3- Richardson and peacock.

AIMS

- To be able to understand the food processing technology.
- To be able to prepare different food products hygienically and economically.
- To impart knowledge of different methods of fruits and vegetable processing.
- To develop the knowledge and skills about food processing industries.

SHORT DESCRIPTION

Water; Fruits and vegetables; Processing operations of fruits and vegetables; Products and by products of fruits and vegetables; Cereals, Pulses and Legumes products; Cereals Processing and milling; Fats and Oils; Corn processing, Spice and spice products; Plantation crops processing; Beverage products; Sugar and Salt.

DETAIL DESCRIPTION**Theory:****1. Understand the concept of water treatment.**

- 1.1 Define water treatment.
- 1.2 List the impurities of water.
- 1.3 Mention the methods of water treatment.
- 1.4 Explain the quality evaluation of raw and processed water.
- 1.5 Explain the softening of water by lime soda process.
- 1.6 Explain the softening of water by organic ion exchanger.
- 1.7 Describe the quality standards of bottled water, mineral water and carbonated water.

2. Understand the basic concept of fruits and vegetables.

- 2.1 Define fruits and vegetables.
- 2.2 Classify the fruits and vegetables with example.
- 2.3 Mention the composition of fruits and vegetables.
- 2.4 Describe the climacteric and no- climacteric fruits.
- 2.5 Describe the principles of fruits and vegetables processing.
- 2.6 Explain the effect of cooking on nutritive value of fruits and vegetables.
- 2.7 Describe the processing methods of fruits and vegetables.

3. Understand the pre-processing operations of fruits and vegetables.

- 3.1 Define pre-processing operations of fruits and vegetables.
- 3.2 Mention the steps of pre- processing operation of fruits and vegetables.
- 3.3 Importance of pre- processing operation of fruits and vegetables.
- 3.4 Briefly describe the blanching of vegetables and fruits.
- 3.5 Describe the objective of adding syrup and brine solution to fruits and vegetables.
- 3.6 Explain the procedure of preservation of fruits and vegetables.
- 3.7 Describe the methods of canning of fruits and vegetables.

4. Understand the manufacture of products and by products from fruits and vegetables.

- 4.1 Define manufacture of products and by products.
- 4.2 List different types of products of fruits and vegetables.
- 4.3 Mention the importance steps involved in processing of fruit juice.

- 4.4 List the different types of by- product of fruits and vegetables.
- 4.5 Describe the procedure of making pickle from mango.
- 4.6 Explain the uses of waste- materials of fruits and vegetables.
- 4.7 Describe the method of disposal of food plant wastes.
- 4.8 Describe the by- products obtained from citrus fruits.
- 4.9 Describe the procedure of potato starch manufacturing.

5. Understand the concept of Fats and oils.

- 5.1 Define fats and oils.
- 5.2 List the different types of fats and oils.
- 5.3 Mention the uses of fats and oils in food processing.
- 5.4 Explain the physical and chemical properties of fats and oils.
- 5.5 Describe the nutritive value of fats and oils.
- 5.6 Describe the process of hydrogenation of fats and oils.
- 5.7 Describe the methods of refining vegetables oils, degumming soya been oil.
- 5.8 Explain the extraction and filtration process of mustered oil from seed.

6. Understand the concept of spices.

- 6.1 Define spices.
- 6.2 Mention the classification of spices.
- 6.3 Explain the characteristics of spices.
- 6.4 Explain the uses of spices.
- 6.5 Explain the adulteration of spices.
- 6.6 Describe the processing of red pepper and cumin.
- 6.7 Describe the processing of Turmeric and Coriander.
- 6.8 Describe the processing of Ginger, Onion and Garlic.

7. Understand the plantation crops processing.

- 7.1 Define plantation crops.
- 7.2 Mentioned the importance of plantation crops.
- 7.3 Explain the chemical composition of plantation crops.
- 7.4 Describe the processing of black tea and green tea.
- 7.5 Describe the processing of coffee by wet and dry method.
- 7.6 Describe the processing of coconut and cashew nut.
- 7.7 Describe the processing of cocoa bean.

8. Understand the processing of Cereals , Pulses and Legumes.

- 8.1 Define cereals, pulses and legumes.
- 8.2 Mention the different types of cereals, pulses and legumes.
- 8.3 Describe the milling process of rice and wheat.
- 8.4 Explain the different types of malts and their food application.
- 8.5 Describe the milling of legumes.
- 8.6 Describe the processing of soya milk.
- 8.7 Describe the boiling effect of rice
- 8.8 Describe the wet and dry milling process of corns.
- 8.9 Describe the milling procedure of maize.

9. Understand the concept of beverage products.

- 9.1 Define beverage products.
- 9.2 Mention the importance and scope of beverage industry in Bangladesh.
- 9.3 List the different types of beverage.

- 9.4 Explain the food value and nutritional status of beverage.
- 9.5 Explain the alcoholic and non- alcoholic beverage
- 9.6 Describe the carbonated and non- carbonated drinks, soft drinks and hard drinks.
- 9.7 Describe the manufacturing process for juice based beverages.

11. Understand the CIP system of process Machineries.

- 11.1 Define CIP
- 11.2 Mention the manual cleaning
- 11.3 Mention different types of CIP
- 11.4 Explain the precaution during CIP.
- 11.5 Describe water CIP, Caustic solution CIP and acid CIP

12. Understand the concept of salt and sugar.

- 12.1 Define salt and sugar.
- 12.2 Classify the salt and sugar.
- 12.3 Mention the different uses of salt and sugar.
- 12.4 State the sources of salt and sugar.
- 12.5 Describe the refining process of evaporated salt and rock salt.
- 12.6 Describe the refining process cane and beet sugar.
- 12.7 Describe the methods of preparation of sugar.
- 12.8 Describe the refining process of iodized salt.

Practical:

1. Identify the Physical properties of cereals and pulses

- 1.1 Collect the raw materials and utensils
- 1.2 Wear PPE and OSH practices
- 1.3 Clean the working area and utensils
- 1.4 Observation and sort based on different properties.
- 1.5 Make a report.
- 3.5 Clean the working area and utensils

2. Study of temperature and time on parboiling of rice.

- 2.1 Wear PPE and OSH practices
- 2.2 Collect the thermometer.
- 2.3 Observation and measured temperature in different stages.
- 2.4 Make a report.
- 2.5 Clean the working area .

3. Determine the temporary and permanent hardness of water.

- 3.1 Collect the raw materials and utensils
- 3.2 Wear PPE and OSH practices
- 3.3 Clean the working area and utensils
- 3.4 Steps the testing procedure and report
- 3.5 Clean the working area and utensils

4. Postharvest of fruits and vegetables (brine solution, sugar syrup, sulphur-dioxide, fermentation /vinegar).

- 4.1 Collect the raw materials and utensils.
- 4.2 Wear of PPE and OSH practices.
- 4.3 Prepare the solution.
- 4.4 Add the vegetables in prepared solution.
- 4.5 Packing and storing.
- 4.6 Clean the working area and utensils.

5. Tomato pulp , mango pulp, papaya pulp processing.

- 5.1 Collect the raw materials and utensils
- 5.2 Wear of PPE and OSH practices
- 5.3 Wash the raw materials
- 5.4 Peeling and slicing
- 5.5 Blending and mixing all ingredients properly
- 5.6 Heat treatment and cooling
- 5.7 Packing and storing
- 5.8 Clean the working area and utensils

6. Juice making from pulp.

- 6.1 Collect the pulp and utensils
- 6.2 Wear of PPE and OSH practices
- 6.3 Mixing all ingredient homogeneously.
- 6.4 Heat Treatment and cooling
- 6.5 Packing and storing
- 6.6 Clean the working area and utensils

7. Pickle processing by (green mango/olive/garlic/ onion/chilli).

- 7.1 Collect the raw materials and utensils.
- 7.2 Wear of PPE and OSH practices
- 7.3 Wash the raw materials
- 7.4 Peeling and slicing
- 7.5 Heat treatment
- 7.6 Cooling and storage

8. Soya milk processing.

- 8.1 Collect the raw materials and utensils
- 8.2 Wear of PPE and OSH practices
- 8.3 Clean the raw material and utensils
- 8.4 Steps the working procedure
- 8.5 Clean the working area and utensils

9. Sugar concentrate products processing (Jam/Jelly/Squash/Candy/Murubba)

- 9.1 Collect the raw materials and utensils
- 9.2 Wash the raw materials and utensils
- 9.3 Peeling and slicing
- 9.4 Heat treatment and cooling
- 9.5 Packing and storing

10. Processing of curry powder (meat curry/ fish curry/chicken curry).

- 10.1 Collect the raw materials and utensils
- 10.2 Wear of PPE and OSH practices
- 10.3 Clean the working area and utensils
- 10.4 Mixing and blending all the ingredients as per required
- 10.5 Packing and storage

11. Prepare spice vinegar.

- 11.1 Collect the raw materials and equipment
- 11.2 Wear of PPE and OSH practices
- 11.3 Clean the working area and equipment
- 11.4 Mixing and blending all ingredients as per required recipe
- 11.5 Packing and storing
- 11.6 Clean the working area and utensils

12. Determination of salt content in canned vegetable products.

- 12.1 Collect the raw materials and utensils
- 12.2 Wear of PPE and OSH practices
- 12.3 Clean the working area and utensils
- 12.4 Wash the vegetables
- 12.5 Count the salt
- 12.6 Blanching the vegetables
- 12.7 Canning the vegetables
- 12.8 Clean the working area and utensils

REFERENCE BOOKS

1. Post harvest Technology of Cereals, Pulses and Oil Seeds by A Chakravarti Oxford Publishing.
2. Shill S. 1978. Food preservation and processing technology. Oxford Univ. Press, New Delhi.
3. Samuel, A.M. (1996) "Principles of cereal Science and Technology" CBS Publisher & Distribution, New Delhi
4. Sivasankar, Food processing and preservation, prentice hall of India Pvt. Ltd, New Delhi.
5. Hui YH, et al 2004 hand book of Food and beverage fermentation technology, marcel Dekker.
6. Manuals on Rice and its processing by CFTRI Mysore and IIT Kharagpur.
7. Ramaswamy, HS & Marcotte, M. 2006. Food processing, principles and applications. Taylor & Francis.

AIMS:

- To be able to understand the modern concepts of industrial instrumentation.
- To be able to understand the concepts of temperature measurement and temperature measuring devices.
- To be able to understand the concepts of control and controller principle.
- To be able to understand the concepts of humidity measurement and humidity measuring devices.
- To be able to calibrate, operate and maintain the different instruments and transducers.
- To be able to understand the basic theory involved in Radiant energy. Spectro photometry, refractometer, P^H measurement and Gas Chromatography.
- To be able to operate and maintain the P^H meter, Spectrophotometer, Refractometer and gas chromatograph.

SHORT DESCRIPTION:

Measurement system; Transducers; Measuring terms; Temperature measurement and temperature measuring devices; Humidity measurement and Humidity measuring devices; Control and controller; Display devices and Recorders; Spectral distribution to radiant energy and its application in instrumental methods of analysis photometry and spectro photometry; refractometer and its application in chemical analysis, Methods of electrometric measurement of P^H; Gas Chromatography.

DETAILED DESCRIPTION:**Theory:****1. Understand the concepts of measurement systems.**

- 1.1 Define meaning of measurement and measurement system.
- 1.2 Define instrument.
- 1.3 Explain the functions of instruments.
- 1.4 Explain the characteristics of instruments.
- 1.5 Draw the block diagram of a generalized measurement system.
- 1.6 Define calibration.
- 1.7 Describe the calibration method of measuring instrument scale by Dead Weight Tester.

2. Understand the Transducers.

- 2.1 Explain the following terms with examples.
 - (i) Transducer.
 - (ii) Signal conditioning
 - (iii) Display.
- 2.2 Make a list of transducers with their uses.
- 2.3 Describe the classification of transducers with examples.
- 2.4 Differentiate between the following terms.
 - (i) Transducers and inverse transducers.
 - (ii) Active and passive transducers.
 - (iii) Primary and secondary transducers.
 - (iv) Analog and digital transducers.
 - (v) Output and input transducers.
- 2.5 Describe the different criteria for selection of transducers of particular applications.

3. Understand the following measuring terms.

Accuracy, Sensitivity, Reproducibility or Repeatability, Drift, Error, Dead zone, Resolution, Percentage error, Zero error, Tolerance, Stability, Constancy, Full scale deflection, Secular changer, Hysteresis, Step input, Range and span, Response time, Capacity, Precision, Linearity, Primary and secondary standard.

4. Understand the temperature measurement and temperature measuring devices.

- 4.1 Make a list of temperature measuring instruments.
- 4.2 Explain the relation between temperature and metal resistance.
- 4.3 Explain the construction and working principle of Resistance Temperature Detectors (RTD).
- 4.4 Explain the principle, constructional detail and operation of Thermistor.
- 4.5 Explain the construction and working principle of a Bimetallic Thermometer.
- 4.6 Make a list of six couple of materials of wire used in making of Thermo couples with range of temperature in each case.
- 4.7 Define pyrometer.
- 4.8 Describe the principle construction and operation of optical pyrometer.
- 4.9 Describe the principle, construction and operation of total radiation pyrometer.

5. Understand the humidity measurement and humidity measuring devices.

- 5.1 Define the terms of absolute humidity, relative humidity, moisture and dew point.
- 5.2 Explain dry and wet bulb temperature.
- 5.3 Explain humidity chart.
- 5.4 Describe the working principle of hygrometer.
- 5.5 Describe the working principle of a sling psychrometer in measuring humidity.
- 5.6 Discuss the method of measurement of dew point by a continuous dew point recorder.
- 5.7 Describe the measurement of moisture by using moisture analyzer
- 5.8 Use psychometric chart.

6. Understand control.

- 6.1 Define automatic control.
- 6.2 Elements of process control system.
- 6.3 Describe automatic control system with block diagram.
- 6.4 Discuss ON-OFF control system (two step and three step)
- 6.5 Describe the automatic temperature control of a reserve.

7. Understand controller principles.

- 7.1 Define the terms: Process load, Process lag, Controller modes.
- 7.2 Describe the essential elements of analog controller.
- 7.3 Describe the working principle of pneumatic controller.
- 7.4 Describe direct digital control system.
- 7.5 Describe the cascade control.

8. Understand Display devices and recorder.

- 8.1 Define display and recorder.
- 8.2 Explain the light emitting diodes (LED) and light crystal diodes (LCD)
- 8.3 Discuss the uses of LED.
- 8.4 Discuss the digital volt meter (DVM)
- 8.5 Describe the digital recorder (magnetic tape recorder)
- 8.6 Describe the pneumatic type recorder.
- 8.7 Describe the X-Y recorder.

9. Understand the measurement of level & weight and their instruments.

- 9.1 Define level and weight.
- 9.2 State Classification of level measuring instrument.
- 9.3 State classification of weight measuring instrument.
- 9.4 Describe weight measurement by load cell.
- 9.5 Describe level measurement by bob and tape slight glass.
- 9.6 Describe level measurement by ultrasonic method.

10. Understand the spectral distribution of radiant energy and its application in the instrumental methods of analysis.

- 10.1 Define radiant energy.
- 10.2 List the source of radiant energy.
- 10.3 Draw the spectral distribution curve of radiant energy sources.
- 10.4 List the special components of filter photometer.
- 10.5 Draw schematic diagram of a spectro photometer and colorimeter/polarimeter.
- 10.6 Describe the working principle of spectro photometry diagrammatically.
- 10.7 Discuss the uses of colorimeters and spectro photometers in food industry.

11. Understand the principle of Refractometer and its application in chemical analysis and the methods of electrometric measurement of P^H value.

- 11.1 Define refractive index or Index of refraction.
- 11.2 Describe the two laws of refraction.
- 11.3 Explain degree Brix and TSS (Total soluble solid).
- 11.4 Define refraction of light.
- 11.5 Define index to refraction of two different medium.
- 11.6 Describe the working principle of the Abbe and the immersion Refractometer diagrammatically.
- 11.7 Describe the working principle of Hand Refractometer diagrammatically.
- 11.8 Discuss the uses of the Refractometer in food industry.
- 11.9 Solve the problems: Specific refraction and molar refraction of Carbon Tetra Chloride & Acetic Acid.
- 11.10 Draw the circuit diagram of a direct reading P^H meter.
- 11.11 Describe the working principle of a direct reading P^H meter diagrammatically.
- 11.12 Describe the method of determination of P^H by color comparison.

12. Understand the principle of gas chromatography.

- 12.1 Define gas chromatography.
- 12.2 Define carrier gas.
- 12.3 Define retention time and retention volume.
- 12.4 Describe the principle of chromatography.
- 12.5 Define TCD and ECD.
- 12.6 Draw a simple schematic diagram of a gas chromatography.
- 12.7 Describe the working principle of paper chromatograph.
- 12.8 Draw a simple schematic diagram of a liquid chromatography.
- 12.9 List the uses of gas chromatograph in the analysis of chemicals

Practical

1. Measure the temperature of a fluid by using a mercury glass thermometer.

- 1.1 Collect materials and instruments.
- 1.2 Heat the sample.
- 1.3 Immersed thermometer bulb.
- 1.4 Take reading of thermometer maintaining eye level.

- 1.5 Note the temperature.
- 1.6 Clean the instruments and workplace.

2. Measure the temperature of steam/ hot water by using a bimetallic thermometer.

- 2.1 Collect materials and instruments.
- 2.2 Heat the sample.
- 2.3 Immersed thermometer bulb.
- 2.4 Take reading of thermometer maintaining eye level.
- 2.5 Note the temperature.
- 2.6 Clean the instruments and workplace.

3. Measure the temperature of a furnace / oven by using a platinum resistance thermometer.

- 3.1 Collect the resistance thermometer.
- 3.2 Extension wire and thermometer.
- 3.3 Put the bulb of resistance in a furnace.
- 3.4 Connect extension wires and ohmmeter properly.
- 3.5 Take reading from the ohmmeter and find out the temperature from the resistance temperature comparative sheet.

4. Determine absolute and relative humidity by using sling psychomotor.

- 4.1 Collect sling psychomotor, breaker, water and psychometric chart.
- 4.2 Immersed thermometer bulb, including wick in a breaker containing water.
- 4.3 Hold the handle of sling psychomotor and rotated for 20 seconds.
- 4.4 Take reading from both the bulb.
- 4.5 Again immersed the wet bulb in water and take reading same way.
- 4.6 Follow the process until lowest temperature attended which is called wet bulb temperature.
- 4.7 Find out the absolute and relative humidity using psychometric chart.

5. Determine moisture in milk powder by using moisture analyzer

- 5.1 Collect the instruments.
- 5.2 Clean the work area and instruments.
- 5.3 Collect sample and test.
- 5.4 Prepared report.
- 5.5 Clean instrument and workplace.

6. Record the temperature of an oven by a circular recorder.

- 6.1 Collect the circular chart.
- 6.2 Put the chart in recorder placed lead in pointer at 6 am.
- 6.3 Close the cover start the plant/Pasteurizer.
- 6.4 Collect the chart in next morning.

7. Measurement level by bob and tape slight glass.

- 7.1 Collect necessary instruments.
- 7.2 Wear PPE and follow OSH practice.
- 7.3 Clean instruments and workplace.

8. Find out the refractive index of the given samples of liquid using Abbe refractometer.

- 8.1 Collect refractometer and clean the prism using distilled water
- 8.2 Collect the sample for measurement of degree brix (sample like as Jam, Jelly, and Juice)
- 8.3 Adjusting the zero of refractometer.

9. Find out the P^H value of unknown solution using a P^H meter.

9.1 Collect pH meter with electrode

9.2 Clean and wash the electrode using distilled water.

9.3 Balance point adjusting the pH meter using by different buffer solution.

9.4 Immersed the electrode in the sample and taken the pH value from pH meter

10. Draw the schematic diagram of a spectro photometer and operate a spectro photometer.

10.1 Select and Collect PPE, tools, equipments & sample.

10.2 Draw the schematic diagram of a spectro photometer.

10.3 Clean tools, equipments and work area.

10.4 Check the electric line and connection.

10.5 Take initial reading.

10.6 Keep sample in shelf drier.

10.7 Start equipment until certain time.

10.8 Shutdown the machine and Take final reading.

10.9 Clean and maintain tools, equipments and work area

11. Draw the schematic diagram of a polarimeter and operate a polarimeter.

11.1 Select and Collect PPE, tools, equipments & sample.

11.2 Draw the schematic diagram of a polarimeter.

11.3 Clean tools, equipments and work area.

11.4 Check the electric line and connection.

11.5 Take initial reading.

11.6 Keep sample in shelf drier.

11.7 Start equipment until certain time.

11.8 Shutdown the machine and Take final reading.

11.9 Clean and maintain tools, equipments and work area

12. Draw the schematic diagram of a gas chromatograph and operate a GC.

12.1 Select and Collect PPE, tools, equipments & sample.

12.2 Draw the schematic diagram of a gas chromatograph.

12.3 Clean tools, equipments and work area.

12.4 Check the electric line and connection.

12.5 Take initial reading.

12.6 Keep sample in shelf drier.

12.7 Start equipment until certain time.

12.8 Shutdown the machine and Take final reading.

12.9 Clean and maintain tools, equipments and work area

AIMS

- To familiarized the students with Industrial Stoichiometry.
- To be able to analyze and solve problems on Material Balance, Energy Balance in Chemical Process.
- To familiarized the students with thermochemistry.
- To be able to understand the principle of thermodynamics.
- To acquire knowledge on thermodynamic process and their application.
- To familiarized the students with thermodynamic cycle and their application.
- To provide the understanding steam table and its uses in problem solving.
- To familiarized the students with heat engines.

SHORT DESCRIPTION

Industrial application of molecular units; Material balance without chemical reaction and Material balance involving chemical reaction; Energy balance of industrial process; Energy conservation in static process; Thermo chemistry; Scope of thermodynamics; Laws of thermodynamics; Thermodynamic process of perfect gases; Constant volume process; Constant pressure process; Isothermal process; Adiabatic process; Reversible process; Polytrophic process; Hyperbolic process; Free expansion process; Enthalpy and entropy; Formation and properties of steam table; Carnot cycle; Otto cycle; Diesel cycle; Formation of steam and its properties; Heat engines; Four stroke cycle engines; Two stroke cycle engines.

DETAIL DESCRIPTION**Theory:****1. Understand the industrial application of molecular unit.**

- 1.1 Define gram atom, kilogram atom, gram mole and kilogram mole.
- 1.2 Explains Avogadro's hypothesis.
- 1.3 Describe Boyle's law & Charles law.
- 1.4 Explain the combination of Boyle's law and Charles's law.
- 1.5 Deduce the formula $PV=mRT$.
- 1.6 Solve the problems related to Boyle's law and Charles's law.

2. Understand the material balance without chemical reaction.

- 2.1 Define material balance.
- 2.2 Mention the law of conservation of material balance.
- 2.3 Describe the overall material balance.
- 2.4 Mention the importance of drawing flow chart of the process.
- 2.5 Describe the individual material balance.
- 2.6 Discuss material Balance without chemical reaction.
- 2.7 Solve the problems of material balance in a process where materials entering and leaving without chemical reaction.

3. Understand the material balance involving chemical reaction in the process.

- 3.1 Define limiting reactants and excess reactants.
- 3.2 Describe the material balance involving chemical reaction.

- 3.3 Define tie-component, excess and % excess.
- 3.4 Find the degree of completion of a reaction.
- 3.5 Solve the stoichiometric problems of material balance involving chemical reactions, molecular units and PVT relations.

4. Understand the energy balance of industrial process.

- 4.1 Define energy balance.
- 4.2 Describe the law of conservation of energy.
- 4.3 Mention the units of energy.
- 4.4 Explain internal and external energy.
- 4.5 Discuss energy balance in flow process.
- 4.6 Solve the problems of energy balance in flow process.

5. Understand the energy conservation in static process and the specific heats.

- 5.1 Mention the energy conservation in static process.
- 5.2 Describe specific heat at constant pressure and specific heat at constant volume.
- 5.3 Explain the relation between specific heat at constant pressure (C_p) and specific heat at constant volume (C_v)
- 5.4 Mention the ratio of specific heats.
- 5.5 Express the deduction of the following formula:
- 5.6 $\Delta E = Q - W$
- 5.7 $\Delta E = Q_v$
- 5.8 $\Delta E = Q_p - P\Delta V$
- 5.9 $Q_p = H_B - H_A = \Delta H = \Delta E + P\Delta V$
- 5.10 Express the deduction of the formula : $\Delta H = Q_p = mc_p(t_2 - t_1)$
- 5.11 Solve stoichiometric problems related to enthalpy, internal energy, specific heat at constant pressure (C_p) and specific heat at constant volume (C_v) and work done.

6. Understand thermo chemistry.

- 6.1 Mention the heat of reaction and standard heat of reaction.
- 6.2 Mention the effect of temperature on heat of reaction.
- 6.3 Describe heat of formation and heat combustion.
- 6.4 Explain heat of neutralization and heat of solution.
- 6.5 Calculate the standard heat of reaction of a given chemical reaction whose heat of formation of the reactants at 25°C and 1 atmospheric pressure are given.
- 6.6 Calculate the standard heat of reaction of a given chemical reaction whose heat of combustion of the reactants at 25°C and 1 atmospheric pressure are given.

7. Understand the scope of thermodynamics.

- 7.1 Define thermodynamics.
- 7.2 Explain application and importance of thermodynamics.
- 7.3 Describe thermodynamic system.
- 7.4 Describe mechanical equivalent of heat.
- 7.5 Define thermal capacity
- 7.6 Describe water equivalent.

8. Understand the law of thermodynamics.

- 8.1 Define Zeroth law of thermodynamics.
- 8.2 State first law of thermodynamics.
- 8.3 Explanation of 1st law of thermodynamics.
- 8.4 State 2nd law of thermodynamics.

8.5 Illustrate second law of thermodynamics.

8.6 Explain third law of thermodynamics.

9. Understand thermodynamic process.

9.1 State thermodynamic process.

9.2 List the various thermodynamic processes.

9.3 Illustrate briefly each of the thermodynamic process.

9.4 Define enthalpy & entropy.

9.5 Explain entropy enthalpy diagram.

9.6 Mention the relation between heat and entropy.

10. Understand the concept of constant volume process and constant pressure process.

10.1 Illustrate with P-V diagram for gas when gas heated at constant volume.

10.2 Explain the work done by the constant volume process.

10.3 Solve the problems at constant volume process.

10.4 Illustrate with P-V diagram for gases when heated at constant pressure process.

10.5 Explain work done by the gas when heated at constant pressure process.

10.6 Solve problems on constant pressure process.

11. Understand the concept of isothermal process and adiabatic process.

11.1 Illustrate with P-V diagram for gases when heated at constant temperature.

11.2 Explain work done by the gas when heated at constant temperature.

11.3 Define adiabatic (isentropic) process.

11.4 Illustrate with P-V diagram the adiabatic expansion process of gas.

11.5 Explain work done by the gas during adiabatic expansion process.

11.6 Define reversible and irreversible process.

11.7 Solve the problems on constant temperature process and adiabatic process.

12. Understand the concept of polytropic process and hyperbolic expansion process.

12.1 State polytropic process.

12.2 Draw P-V diagram during the expansion of a gas on $PV^n = \text{constant}$

12.3 Explain the work done by the gas during the expansion on $PV^n = \text{constant}$.

12.4 State hyperbolic process.

12.5 Draw and explain P-V diagram of hyperbolic expansion process.

12.6 Explain work done by the gas during hyperbolic expansion process.

13. Understand the concept of Carnot cycle.

13.1 Define thermodynamic cycle.

13.2 Explain P-V diagram for Carnot cycle.

13.3 Explain working principle of Carnot cycle.

13.4 Compute the efficiency of Carnot cycle.

13.5 Solve problems on efficiency of Carnot cycle.

14. Understand the concept of Otto cycle and Diesel cycle.

14.1 Describe Otto cycle.

14.2 Draw P-V diagram for Otto cycle.

14.3 Explain working principle of Otto cycle with the help of P-V diagram.

14.4 Describe Diesel cycle.

14.5 Draw P-V diagram of Diesel cycle.

14.6 Explain the working principle of Diesel cycle with P-V diagram.

15. Understand the formation and properties of steam.

15.1 Define steam and vapor.

- 15.2 Explain the term wet steam, dry saturated steam, superheated steam, dryness fraction or quality of wet steam.
- 15.3 Explain the term sensible heat of water, latent heat of evaporation, enthalpy of steam, enthalpy of wet steam, enthalpy of dry saturated steam, enthalpy of superheated steam, specific volume of steam, specific volume of saturated steam, specific heat of superheated steam.
- 15.4 Explain steam table and its uses.
- 15.5 Describe T-S diagram of steam.
- 15.6 Explain Mollier diagram.

16. Understand the concept of heat engine. four stroke and two stroke cycle engines.

- 16.1 Define heat engine.
- 16.2 Describe internal and external combustion engine.
- 16.3 Explain the terms of cylinder, cylinder head, piston, piston ring, crank shaft, connecting rod,
- 16.4 Flywheel, T.D.C, B.D.C, stroke length, stroke volume, clearance volume, full cylinder volume,
- 16.5 Compression ratio etc.
- 16.6 Explain four stroke cycle petrol engines.
- 16.7 Explain four stroke cycle diesel engines.
- 16.8 Explain two stroke cycle petrol engines.
- 16.9 Explain two stroke cycle diesel engines.
- 16.10 Explain advantages and disadvantages of two-stroke over four stroke engines.

PRACTICAL:

- 1. Practice in solving stoichiometric problems on molecular units.**
- 2. Practice in solving stoichiometric problems on material balance.**
 - 2.1 Draw a flow diagram showing input and output according to given information/data.
 - 2.2 Solve the problem of overall material balance and individual material balance.
- 3. Practice in solving stoichiometric problems on energy balance of industrial process.**
 - 3.1 Present the problem through a flow diagram.
 - 3.2 Write the overall energy balance equation.
 - 3.3 Find out individual energy and put the value in overall energy balance equation.
 - 3.4 Calculate the result/unknown quantity.
- 4. Practice in solving stoichiometric problems on specific heat.**
 - 4.1 Collect chart of specific heats.
 - 4.2 Find out necessary data from the chart.
 - 4.3 Note all the information.
 - 4.4 Put the value in proper equation from the information.
 - 4.5 Calculate the result.
- 5. Practice in solving stoichiometric problems on latent heat of fusion and evaporation.**
 - 5.1 Collect steam table.
 - 5.2 Find out the necessary information from the steam table.
 - 5.3 Solve the problem by putting the information in required equation.
- 6. Determine the heat of solution of potassium nitrate in water.**
 - 6.1 Note the equation for determination of Heat of solution.
 - 6.2 Collect necessary materials and equipment.
 - 6.3 Weight the conical flask and glass rod after cleaning and drying.

- 6.4 Pour 200 ml water in the conical flask, put the glass rod in it and placed the whole thing in Calorimeter.
- 6.5 Record the initial temperature and final temperature (after adding potassium nitrate) of calorimeter.
- 6.6 Calculate the Heat of solution using the equation, $\Delta H = \frac{1}{1000} \left[\frac{M}{W} (t_1 - t_2)(m_1 s_1) + m_2 s_2 \right]$
- 6.7 Clean the workplace properly.

7. Determine heat of neutralization of hydrochloric acid with sodium hydroxide.

- 7.1 Note the equation for determination of Heat of Neutralization.
- 7.2 Collect the necessary materials and equipment.
- 7.3 Prepare: a) 500 ml 0.25 N NaOH Soln. b) 100 ml 0.25 $(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$ and 250 ml 2 N HCl soln.
- 7.4 Standardized the NaOH soln. against oxalic acid solution and also find out the amount of 2N 2ml HCl soln. required to neutralized 100 ml of NaOH using titration process.
- 7.5 Collect the calculated amount of NaOH soln. in a conical flask, placed it in a calorimeter, record initial temperature and final temperature (after adding 2N 2ml HCl soln.) of calorimeter.
- 7.6 Calculate the Heat of solution using the equation, $\Delta H = \frac{H \cdot 1000}{100X}$; $H = (m_1 s_1 + m_2 s_2)(t_2 - t_1)$

8. Determine the melting point of organic substance (i.e. wax, oxalic acid, urea etc.)

- 8.1 Collect the necessary materials and equipment.
- 8.2 Block one end of a 10 cm long capillary tube by heating and Pour the substance in it.
- 8.3 Partially immersed the capillary tube including a glass thermometer in a beaker containing paraffin oil or water.
- 8.4 Heat the capillary tube containing organic substance until melting start and record temperature; off the burner and record temperature until freezing started.
- 8.5 Find out the melting point of the substance (average temperature of melting and freezing).

9. Determine the specific heat of a number of materials (i.e. water, kerosene, petrol, glycerin etc.)

- 9.1 Collect necessary materials and equipment and clean and dry glass apparatus.
- 9.2 Heat water in a glass jar and set temperature at 100 °C.
- 9.3 Pour 100 ml water in beaker-1, and 100 ml oil in beaker-2.
- 9.4 Put both the beaker on hot water surface and note raising temperature for every 30 seconds For 5 minutes.
- 9.5 Draw time temperature diagram for both the beaker and find out the time required for raising certain temperature; say for raising 42°C, Kerosene required 2.2 minutes and water required 5.20 minutes.
- 9.6 Calculate the specific heat of kerosene ($2.2 \div 4.6 = 0.48$)

10. Determine the Higher calorific value of fuel oil using Bomb calorimeter.

11. Collect necessary materials and equipment.

- 11.1 Weight 1 gm of fuel oil in a stainless steel crucible and placed the crucible in bomb.
- 11.2 Pour 2500 ml water in calorimeter. Put the bomb in calorimeter and determine the initial temperature of calorimeter (t_1)
- 11.3 Burn the fuel by sparking; record temperature for each 30 second and note the height temperature (t_2)
- 11.4 Calculate Higher Calorific Value using the formula, $\text{HCV} = \frac{(m_w + w) \times (t_2 - t_1)}{m}$

12. Demonstrate the working principle of a 4 stroke Otto and 4 stroke diesel cycle using model.

- 12.1 Collect the Model of a 4-stroke petrol engine.
- 12.2 Show and explain suction stroke.
- 12.3 Show and explain compression stroke.

12.4 Show and explain sparking.

12.5 Explain Power stroke.

12.6 Explain exhaust stroke.

13. Demonstrate the working principle of a 2 stroke Otto and 2 stroke diesel cycle using model.

Reference books:

1. An Introduction to Chemical Engineering
-Little John.
2. Engineering Thermodynamics
-R.S. Khurmi.
2. Principle of Chemical Engineering Thermodynamics.
- Wilson and Rics.
3. Chemical Engineering Thermodynamics
- Doge
4. ইন্ডাস্ট্রিয়াল স্টয়কিউমেট্রি অ্যান্ড থার্মোডাইনামিক্স
- বাংলাদেশ কারিগরি শিক্ষা বোর্ড (সুরেশ চন্দ্র মন্ডল)

AIMS

- To be able to develop the knowledge & skill of manufacturing the bakery products.
- To be able to understand the raw materials needed and its characteristics for the manufacturing of bakery products
- To understand the manufacturing process of different bakery products.
- To be able to develop knowledge & skill on bakery machinery & equipment.

SHORT DESCRIPTION

Basic concept of bakery and bakery products; bakery machinery, equipments & utensils; material requirement for bakery product; wheat and flour; leavening agent; manufacturing process of bread and toast; biscuits and cookies ; cake and pastry; pizza, hard and soft roll.

DETAIL DESCRIPTION**Theory****1. Understand the basic concept of bakery and bakery products.**

- 1.1 Define Bakery & Bakery Products.
- 1.2 List of different types of bakery products.
- 1.3 Describe the scope of bakery in Bangladesh.
- 1.4 Define personal protective equipments (PPE).
- 1.5 Describe hygiene and sanitations in bakery industry.

2. Understand the bakery machinery, equipments & utensils

- 2.1 List the bakery of bakery machinery & equipments.
- 2.2 Describe the weighting equipments.
- 2.3 Mention the different type of mixing equipment.
- 2.4 State the different type of baking (oven) machine.
- 2.5 Describe the functions of different of oven used in a bakery industry.
- 2.6 Briefly discuss the cooling system of bakery products.
- 2.7 Briefly describe the uses of different utensils for bakery industries.
- 2.8 Briefly discuss the packaging machine used in different bakery product.
- 2.9 Explain divider, rounder, intermediate proofer, molder and slicer used in manufacture of bakery products.

3. Understand the concept of raw material required for bakery products.

- 3.1 List the raw materials used in bakery products.
- 3.2 Describe the role of sugar & sweetener, milk & eggs.
- 3.3 Describe the role of shortening agent, emulsifying agent, anti oxidant, preservative & enzyme.
- 3.4 Describe the flavours, colors & other minor ingredients used in bakery products.
- 3.5 Describe the role of fats & oil in bakery products.

4. Understand the concept of Wheat and Flour.

- 4.1 Different types of flours.
- 4.2 Write down the Constituents of flours.
- 4.3 State the pH Value of flour.
- 4.4 Discuss the Water absorption power of flour.
- 4.5 Discuss the Gluten, diastatic activity of flour.
- 4.6 Mention the Grade of flour.

5. Understand the concept of leavening agents

- 5.1 Define leavening agent.
- 5.2 Write down the different types of leavening agent.

- 5.3 State the function of yeast.
- 5.4 Describe the production process of yeast.
- 5.5 Discuss fermentation of dough and conditions influencing by yeast.
- 5.6 Discuss the Effect of over and under fermentation and under proofing of dough and goods.
- 5.7 Define baking powder & write down the types of baking powder.
- 5.8 Differentiate between baking powder & baking soda.

6. Understand bread & toast manufacturing process.

- 6.1 List the raw materials used in manufacturing of bread & toast.
- 6.2 Describe the characteristics of bread flour and yeast.
- 6.3 Explain bread improver.
- 6.4 Describe of preparation of different type of bread dough.
- 6.5 State the advantage and disadvantages of different bread dough methods.
- 6.6 Describe the proofing and baking of bread.
- 6.7 Describe the Tin bread & ban making process with recipes.
- 6.8 Describe the butter toast & plane toast making process.
- 6.9 Describe making process with recipes the following bread
- 6.10 Discuss common defects in bread.
- 6.11 Describe the manufacture of long shelf life bread.
 - a. Milk bread
 - b. Fruit bread
 - c. Cream ban
 - d. France bread

7. Understand the manufacturing of hard dough biscuit.

- 7.1 Define biscuits.
- 7.2 Explain hard dough.
- 7.3 List the raw materials for biscuit manufacturing.
- 7.4 Mention the classifications of biscuits.
- 7.5 Mention the baking temperature effects in biscuits manufacturing
- 7.6 Describe the following hard dough biscuits manufacturing process with recipe.
 - a. Cream cracker
 - b. Marie biscuits
 - c. Saltiest biscuits
 - d. Puffed crackers
 - e. Vegetables crackers
 - f. Sweet & semi sweet hard dough biscuits.

8. Understand the manufacturing of soft dough biscuit & cookies.

- 8.1 Explain soft dough.
- 8.2 Describe the following soft dough biscuits manufacturing process with recipe
 - a. Digestive biscuits
 - b. Fruity orange biscuits
 - c. Pineapple biscuits
 - d. Short cake/bread biscuits
 - e. Nut Biscuits
 - f. Coconut Biscuits
- 8.3 List basic ingredients of cookies.
- 8.4 Differentiate between biscuits and cookies.
- 8.5 Describe the spread of the cookies.
- 8.6 Describe the coating for cookies.
- 8.7 Describe the recipes of coatings for cookies enrobing.

9. Understand the manufacturing of cakes.

- 9.1 Define cakes.
- 9.2 Name the cakes raw materials and their properties.
- 9.3 Describe the single stage mixing used for cake processing.
- 9.4 Describe two stages mixing for cake processing.
- 9.5 Describe the uses of Icing sugar, cream making & cake decoration
- 9.6 Describe blending method for cake processing.
- 9.7 Describe the manufacturing of long shelf life clustered cake.
- 9.8 Describe the manufacture of plain cake, fruit cake, sponge cake, cream cake, with recipe.
- 9.9 Describe the common faults in cakes and its remedies.

10. Understand the manufacturing pizza, hard and soft rolls.

- 10.1 State hard and soft rolls.
- 10.2 Mention recipe for Vienna (Kaiser) rolls.
- 10.3 Describe the process of manufacture of hamburger rolls.
- 10.4 State pizza.
- 10.5 Mention different types of pizza.
- 10.6 State the methods of preparing pizza crust.
- 10.7 Mention recipe for making pizza.

Practical:

1. Gluten test of flour.

- 1.1 Collect utensils and samples materials.
- 1.2 Wear PPE and follow OSH practice.
- 1.3 Clean work area and utensils.
- 1.4 Weight sample and keep inside the oven.
- 1.5 Set temperature and start oven and check sample until weight constant.
- 1.6 Calculate and prepared report.
- 1.7 Clean work area and utensils.

2. Prepare Milk Bread.

2. 1 Collect utensils and samples materials.
2. 2 Wear PPE and follow OSH practice.
2. 3 Clean work area and utensils.
2. 4 Weight raw-materials and make dough.
2. 5 Make bread lop and proof by proofer.
2. 6 Set oven temperature and start oven and bake until bake and brown color.
2. 7 Cooling then test and pack.
2. 8 Clean work area and utensils.

3. Prepare good quality whole wheat bread using standard recipe.

3. 1 Collect utensils and samples materials.
3. 2 Wear PPE and follow OSH practice.
3. 3 Clean work area and utensils.
3. 4 Weight raw-materials and make dough.
3. 5 Make bread lop and proof by proofer.
3. 6 Set oven temperature and start oven and bake until bake and brown color.
3. 7 Cooling then test and pack.
3. 8 Clean work area and utensils

4. Prepare Digestive biscuit.

- 4.1 Collect utensils and samples materials.
- 4.2 Wear PPE and follow OSH practice.
- 4.3 Clean work area and utensils.

- 4.4 Weight raw-materials and make dough.
- 4.5 Mould biscuit piece and keep on tray.
- 4.6 Set oven temperature and start oven and bake until bake and brown color.
- 4.7 Cooling then test and pack.
- 4.8 Clean work area and utensils

5. Prepare Coconut/Nut biscuit.

- 5.1 Collect utensils and samples materials.
- 5.2 Wear PPE and follow OSH practice.
- 5.3 Clean work area and utensils.
- 5.4 Weight raw-materials and make dough.
- 5.5 Mould biscuit piece and keep on tray.
- 5.6 Set oven temperature and start oven and bake until bake and brown color.
- 5.7 Cooling then test and pack.
- 5.8 Clean work area and utensils

6. Prepare Marie biscuit.

- 6.1 Collect utensils and samples materials.
- 6.2 Wear PPE and follow OSH practice.
- 6.3 Clean work area and utensils.
- 6.4 Weight raw-materials and make dough.
- 6.5 Make sheet and cut biscuit pieces.
- 6.6 Keep on tray.
- 6.7 Set oven temperature and start oven and bake until bake and brown color.
- 6.8 Cooling then test and pack.
- 6.9 Clean work area and utensils

7. Prepare Plane cake.

- 7.1 Collect utensils and samples materials.
- 7.2 Wear PPE and follow OSH practice.
- 7.3 Clean work area and utensils.
- 7.4 Weight raw-materials and make better.
- 7.5 Put in tray.
- 7.6 Set oven temperature and start oven and bake until bake and brown color.
- 7.7 Cooling then test and pack.
- 7.8 Clean work area and utensils

8. Prepare Fruit cake.

- 8.1 Collect utensils and samples materials.
- 8.2 Wear PPE and follow OSH practice.
- 8.3 Clean work area and utensils.
- 8.4 Weight raw-materials and make better.
- 8.5 Put in tray.
- 8.6 Set oven temperature and start oven and bake until bake and brown color.
- 8.7 Cooling then test and pack.
- 8.8 Clean work area and utensils

9. Prepare Sponge cake.

- 9.1 Collect utensils and samples materials.
- 9.2 Wear PPE and follow OSH practice.
- 9.3 Clean work area and utensils.
- 9.4 Weight raw-materials and make better.
- 9.5 Put in tray.

- 9.6 Set oven temperature and start oven and bake until bake and brown color.
- 9.7 Cooling then test and pack.
- 9.8 Clean work area and utensils

10. Prepare Pizza.

- 10.1 Collect utensils and samples materials.
- 10.2 Wear PPE and follow OSH practice.
- 10.3 Clean work area and utensils.
- 10.4 Weight raw-materials and make dough.
- 10.5 Make pizza sheet.
- 10.6 Filled by different topping.
- 10.7 Set oven temperature and start oven and bake until bake and brown color.
- 10.8 Cooling then test and pack.
- 10.9 Clean work area and utensils

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1. Hand Book of Bakery Products, by S. M. Arora & Sisir Kumar Nath.
2. Chocolate, Cocoa and Confectionery Science and Technology, by Bernard W. Minifie.
3. Bakery Science and cereal technology by Neelam Khetar Paul, Rajbala Goyal & Sudesh Jood
4. Baking Science & technology by E.J Pyle & L.A Gorton
5. Hand book of bakery products by S.M Arora
6. Bakery and Confectionery by Yogambal Ashokkumar

AIMS

- To be able to develop the knowledge of food adulteration.
- To be able to develop the skill of determine food adulterant.
- To be able to develop the knowledge of toxicology and toxin
- To be able to develop the skill of determine toxin from food.

SHORT DESCRIPTION

Understand the basic concept of food adulteration and contamination, concept of pesticide in food, the concept of food contaminants from industrial wastes and packaging materials, Toxicology and toxin, toxicants, in foods, microbial toxins occurring in food.

DETAIL DESCRIPTION**Theory****1. Understand the basic concept of food adulteration and contaminations.**

- 1.1 Define Food adulteration.
- 1.2 Mention the types of food adulteration.
- 1.3 List of adulterated food with example.
- 1.4 Explain health risks of adulterated food.
- 1.5 State the methods for detecting adulterants.
- 1.6 Explain the controlling method of Food adulteration.
- 1.7 Mention common adulterated foods

2. Understand the concept of pesticide residues in food.

- 2.1 Define pesticide and herbicides.
- 2.2 Discuss about the history of pesticide.
- 2.3 State the pesticides in the food chain.
- 2.4 Explain the regulations pesticides in food.
- 2.5 Describe the following insecticides residue maximum limit for human consumption.
 - DDT
 - Chlorinated cyclodiene
 - Organophosphate
 - Carbonate
 - chlorophenoxy acid esters
- 2.6 Explain the health impact by naturally occurring pesticides.

3. Food Contaminants From Industrial Wastes And Packaging Materials

- 3.1 Define Poly Chlorinated Biphenyls (PCBs)
- 3.2 Explain the environment impact Poly Chlorinated Biphenyls (PCBs) and Poly Chlorinated Dibenzo- p-dioxins (PCDDs)
- 3.3 Describe the determination methods of heavy metals in different food sample (Arsenic, Lead, mercury, Cadmium)
- 3.4 Describe the following heavy metals contamination sources and their maximum limit and over dosage side effects(Arsenic, Lead, Mercury, Cadmium)
- 3.5 List of toxic materials come from packaging materials in food substance.
- 3.6 Determine the toxic materials in sample

4. Understand The Concept Of Toxicology And Toxin.

- 4.1 Define Toxicology.
- 4.2 Explain the history of toxicology.
- 4.3 Define Toxicity.
- 4.4 Differentiate the sub-disciplines of toxicology

- 4.5 Describe the classification of toxic agents
- 4.6 Explain toxic effects.
- 4.7 Describe the field of toxicology and its application.

5. Determination of toxicants in foods.

- 5.1 Define sampling.
- 5.2 Explain qualitative and quantitative analyses of toxicants in foods.
- 5.3 Describe the technique for sample preparation for analysis of toxicants.
- 5.4 Explain the methods of isolation and identification by chromatography.
- 5.5 Describe biological determination of toxicants.
- 5.6 Explain selective Toxicity.

6. Microbial toxins occurring in food.

- 6.1 List of organism's toxin.
- 6.2 Discuss about clostridium botulinum and staphylococcus aureus toxin.
- 6.3 Define foodborne poisoning and infection.
- 6.4 Explain the effects of processing, handling and storage on toxin stability.
- 6.5 Selected cases of food borne mycotoxin poisoning.
- 6.6 Detection, Identification, and determination of mycotoxins in foods.

7. Food allergies and food intolerance.

- 7.1 Define allergy.
- 7.2 Explain the genetic factors which are influence of allergy.
- 7.3 Mention the food allergy symptoms.
- 7.4 Explain the Photo mechanism of food allergy.
- 7.5 Discuss about non –allergic hypersensitivity Reaction.

8. Antibiotic and hormone residues in foods and their significance

- 8.1 List of antibiotic usage in animals.
- 8.2 Explain the antibiotic residues in animal foodstuff.
- 8.3 Explain the antibiotic residues in fish and fish product.
- 8.4 Explain the antibiotic residues in milk and milk product.
- 8.5 Discuss the antibiotic residues in egg and poultry product.

PRACTICAL

1. Determine the % of water present in Raw Milk.

- 1.1 Collect PPE, glass apparatus, Lactometer, and Raw materials according to specification sheet.
- 1.2 Wear PPE and read SOP.
- 1.3 Use lactometer and collect lactometer reading.
- 1.4 Complete your job-repot and submit to your teacher.
- 1.5 Keep PPE, glass apparatus, Lactometer, in designated area.

2. Determine soda in raw milk.

- 2.1 Collect PPE, glass apparatus, Raw materials and chemical according to specification sheet.
- 2.2 Wear PPE read job sheet.
- 2.3 Perform job according to job sheet.
- 2.4 Complete your job-repot and submit to your teacher.
- 2.5 Keep PPE, glass apparatus, and chemical in designated area.

3. Identify salt in market milk.

- 3.1 Collect PPE, glass apparatus, Raw materials and chemical according to specification sheet.
- 3.2 Wear PPE read job sheet.
- 3.3 Perform job according to job sheet.

- 3.4 Complete your job-repot and submit to your teacher.
- 3.5 Keep PPE, glass apparatus, and chemical in designated area.

4. Determine the present of formalin in milk.

- 4.1 Collect PPE, glass apparatus, Raw materials and chemical according to specification sheet.
- 4.2 Wear PPE read job sheet.
- 4.3 Perform job according to job sheet.
- 4.4 Complete your job-repot and submit to your teacher.
- 4.5 Keep PPE, glass apparatus, and chemical in designated area.

5. Determine the present of formalin in fish and fish product.

- 5.1 Collect PPE, glass apparatus, Raw materials and chemical according to specification sheet.
- 5.2 Wear PPE read job sheet.
- 5.3 Perform job according to job sheet.
- 5.4 Complete your job-repot and submit to your teacher.
- 5.5 Keep PPE, glass apparatus, and chemical in designated area.

6. Determine acetylene in mango/any other ripe fruits

- 6.1 Collect PPE, glass apparatus, Raw materials and chemical according to specification sheet.
- 6.2 Wear PPE read job sheet.
- 6.3 Perform job according to job sheet.
- 6.4 Complete your job-repot and submit to your teacher.
- 6.5 Keep PPE, glass apparatus, and chemical in designated area.

7. Determine copper sulphate in ripe banana.

- 7.1 Collect PPE, glass apparatus, Raw materials and chemical according to specification sheet.
- 7.2 Wear PPE read job sheet.
- 7.3 Perform job according to job sheet.
- 7.4 Complete your job-repot and submit to your teacher.
- 7.5 Keep PPE, glass apparatus, and chemical in designated area.

8. Determine the pesticide present in vegetable.

- 8.1 Collect PPE, glass apparatus, Raw materials and chemical according to specification sheet.
- 8.2 Wear PPE read job sheet.
- 8.3 Perform job according to job sheet.
- 8.4 Complete your job-repot and submit to your teacher.
- 8.5 Keep PPE, glass apparatus, and chemical in designated area.

REFERANCE

- 1. Food adulteration and its detection**
Battershall, Jesse P (Jesse Park)
- 2. Textbook of Food Science & Technology**
Avantia Sharma
- 3. Introduction to Toxicology and Food**
By Tomris Altug
- 4. Toxins in food**
Waldemar M. Dabrowski, Zdzislaw E. Sikorski
- 5. Principles of Toxicology**
Takayuki Shibamoto, Leonard Bjedanes
- 6. A Textbook of Modern Toxicology (Fourth edition)**
Ernest Hodgson, PhD

AIMS

- To be able to develop the working condition in the field of industrial or other organization.
- To be able to understand develop the labor management relation in the industrial sector.
- To be able to develop the management techniques in the process of decision making.
- To be able to manage the problems created by trade union.
- To be able to understand Planning
- To be able to perform the marketing.
- To be able to maintain inventory.

Course Outline

Basic concepts of management; Principles of management; Planning, Organization, Scientific management; Span of supervision; Motivation; Personnel management and human relation; Staffing and manpower planning ; Training of staff; Concept of leadership; Concepts and techniques of decision making; Concept of trade union; Inventory control; Economic lot size ; Break even analysis; Trade Union and industrial dispute, Marketing;

1 Basic concepts & principles of management.

- 1.1 Define management and industrial management.
- 1.2 State the objectives of modern management.
- 1.3 Describe the scope and functions of management.
- 1.4 State the principles of management.
- 1.5 State the activity level of industrial management from top personnel to workmen.
- 1.6 Describe the relation among administration, organization & management.

2. Concept of Planning

- 2.1 Define Planning
- 2.2 Discuss the importance of Planning
- 2.3 Discuss the Types of Planning.
- 2.4 Discuss the steps in Planning

3 . Concepts of organization and organization structure.

- 3.1 Define management organization.
- 3.2 State the elements of management organization.
- 3.3 Describe different forms of organization structure.
- 3.4 Distinguish between line organization and line & staff organization.
- 3.5 Distinguish between line organization and functional organization.
- 3.6 Describe the features, advantages and disadvantages of different organization structure.

4. Concept of scientific management.

- 4.1 Define scientific management.
- 4.2 Discuss the basic principles of scientific management.
- 4.3 Explain the different aspects of scientific management.
- 4.4 Discuss the advantages and disadvantages of scientific management.
- 4.5 Describe the difference between scientific management and traditional management..

5. Concept of span of supervision.

- 5.1 Define span of supervision and optimum span of supervision.
- 5.2 Discuss the considering factors of optimum span of supervision.
- 5.3 Discuss advantages and disadvantages of optimum span of supervision.
- 5.4 Define delegation of authority.
- 5.5 Explain the principles of delegation of authority.
- 5.6 Explain the terms: authority, responsibility and duties.

6 . Concept of motivation.

- 6.1 Define motivation.
- 6.2 Discuss the importance of motivation.
- 6.3 Describe financial and non-financial factors of motivation.
- 6.4 Discuss the motivation theory of Maslow and Herzberg.

6.5 Differentiate between theory-X and theory-Y.

7. Concept of leadership.

7.1 Define leadership.

7.2 Discuss the importance and necessity of leadership.

7.3 Discuss the functions of leadership.

7.4 Describe the qualities of a leader.

8. Basic concepts and techniques of decision making.

8.1 Define decision making.

8.2 Discuss the importance and necessity of decision making.

8.3 Discuss different types of decision making .

8.4 Describe the steps in decision making.

9 .Concept of personnel management and human relation.

.9.1 Define personnel management.

.9.2 Discuss the functions of personnel management.

9.3 Define staffing.

9.4 Define recruitment and selection of employees.

9.5 Describe various sources of recruitment of employees.

9.6 Describe the methods of selection of employees.

9.7 Define training and orientation of employee.

9.8 Discuss the importance and necessity of training.

9.9 Discuss the various methods of training of workmen, technicians and executive personnel.

10. Concept of inventory control & Economic lot size

10.1 Define inventory.& inventory control.

10.2 Describe the function of inventory control.

10.3 Define Economic lot size and the Method of determination of economic lot size.

10.4 Discuss the effects of over supply and under supply.

10.5 Explain the following terms :

- Bin card or Bin tag.
- Purchase requisition.
- Store requisition.
- Material transfer note.
- First in first out (FIFO).
- Last in first out(LIFO).
- Safety stock
- Lead time

11. Concept of Break Even Point(BEP)

11.1 Define Break Even Point and Break Even Chart.

11.2 Describe the method of determination of BEP

11.3 Explain the terms :

- Break even analysis.
- Fixed cost.
- Variable cost

12 . Concept of Marketing

12.1 Define marketing.

12.2 Discuss the function of marketing.

12.3 State the objectives of marketing.

12.4 Explain the terms :

- Purchase
- Brand
- Producer
- Consumer

- Customer
- Copyright
- Trade mark

12.5 Discuss product life -cycle and marketing strategies in different stages of a product life-cycle

13. Concept of trade union and industrial dispute

13.1 Define trade union.

13.2 Mention the objectives of trade union.

13.3 Discuss the function of trade union.

13.4 Describe different types of trade union.

13.5 Define industrial dispute

13.6 Discuss different type of industrial dispute

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1. Dr. Md. Mainul Islam and Dr. Abdul Awal Khan-Principles of Management, Bangladesh Open University. 2. Mohammad Mohiuddin-Personnel Management and Industrial Relation, NIDS Publication Co. Dhaka. 3. সুফিয়া বেগম, মো: জাহেদুল হক ও সুপ্রিয়া ভট্টাচার্য্য-ব্যবস্থাপনা এর মৌলিক ধারণা, ব্যতিক্রম প্রকাশনী ঢাকা। Matz Usry-Cost Accounting: Planning & Control.