

DEPARTMENT OF FOOD TECHNOLOGY
HALDIA INSTITUTE OF TECHNOLOGY

COURSE OUTCOMES

Second Year: Third Semester
THEORY

Name of the Course: Chemistry-II

Course Code: BS-FT 301

Course Outcome:

After completion of the course the students will be able to

- CO1:** Understand the fundamentals and application of current chemical and scientific theories and prepare the different solution of definite concentration accurately in the experimental wet lab and industry
- CO2:** Understand the fundamental properties and reactivity of compound and interactions within the molecules and to explain the reaction involved in chemical and biochemical reaction based on the specific ligands.
- CO3:** Identify and to know the classes of polymeric compounds and the importance of structure, scope and function of macromolecules
- CO4:** Understand the importance of different types of solutions use in food engineering and technology
- CO5:** Be skilled in problems solving, critical thinking, and analytical reasoning.
- CO6:** Know the various qualitative and quantitative physical methods available for structure determination and apply the analytical skill and design new experimental techniques to be used in food engineering and technology.

Name of the Course: Engineering Thermodynamics

Course Code: ES-FT 301

Course Outcome:

After completion of the course the students will be able to

- CO1:** Understand the basic concept of thermodynamic system.
- CO2:** Explain the laws of thermodynamics and their applications
- CO3:** Comprehend the properties of pure substances and real gases.
- CO4:** Analyze the different thermodynamic relations and their applications.
- CO5:** Evaluate the fundamentals of Thermodynamics of fluid flow.
- CO6:** Understand the working of different types of boilers and hydraulic power plants.

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Name of the Course: Mechanical Operations in Food Processing

Course Code: ES-FT 302

Course Outcome:

After completion of the course the students will be able to

CO1: Understand different disintegration process in Food Industries.

CO2: Realize different Industrial Mixing process and power consumption in Mixing.

CO3: Make use of design of different type of settling tank by applying the principle of setting.

CO4: Comprehend different type of material and Energy balance in different Food Processing Operations.

CO5: Apply of Material Balance principle in case of Microbial growth.

CO6: Understand different types of crystallization process like candy preparation etc.

Name of the Course: Chemistry of Food

Course Code: PC-FT 301

Course Outcome:

After completion of the course the students will be able to

CO 1: Understand and identify the various food groups; the nutrient components (macro and micro), sources and types of important food constituents.

CO 2: Demonstrate basic structural units, bond formation and estimation process of important food components.

CO 3: Explain the physical, chemical and functional properties of various food constituents.

CO 4: Illustrate the major chemical reactions occurring during handling, processing and storage that limit shelf life of foods.

CO 5: Analyze how the properties of different food components and interactions among these components modulate the specific quality attributes of food systems.

CO 6: Develop solutions to reduce the interference of major chemical reactions during food processing that are likely to impact the overall quality of finished products.

DEPARTMENT OF FOOD TECHNOLOGY
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Name of the Course: Food Microbiology

Course Code: PC-FT 302

Course Outcome:

After completion of the course the students will be able to

CO 1: Identify and note the types of microorganisms inhabiting different categories of food

CO 2: Understand the interactions between microorganisms and the food environment, and factors influencing their growth and survival

CO 3: Describe the characteristics of food-borne, waterborne microorganisms, and methods for their isolation, detection and identification

CO 4: Analyze how beneficial species of microorganisms can be utilized in the food industry.

CO 5: Evaluate how microbial spoilage leads to food-borne illnesses and how they can be controlled.

CO 6: Develop basic microbiological quality control solutions necessary in food production, handling and storage.

Name of the Course: Biology for Engineers

Course Code: BS-FT 302

Course Outcome:

After completion of the course the students will be able to

CO1: Identify and note the different features of microbial cell and plant/animal cell.

CO2: Understand the characteristic life-processes of microbial cell.

CO3: Identify different types and/or forms of microbes.

CO4: Understand and classify different plant/animal/microbial pigments correlating with structure and properties.

CO5: Evaluate and illustrate synthesis of flavor as natural products from natural source.

CO6: Develop basic biological concept to solve basic problems associated with food production, handling and storage.

DEPARTMENT OF FOOD TECHNOLOGY
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Second Year: Third Semester
PRACTICAL

Name of the Course: Chemistry of Food Lab

Course Code: PC-FT 391

Course Outcome:

After completion of the course the students will be able to

CO1: Understand the safety protocols applicable in laboratory.

CO2: Perform different methods of analysis of food components and know operational techniques of various analytical instruments.

CO 3: Compare different methods available for analysis of particular food component.

CO 4: Understand and effectively use appropriate regulatory specifications for analysis of food components.

CO 5: Analyze effectively the data to reach reasonable and valid conclusion.

CO 6: Design appropriate methods for proximate analysis of different food materials in real situation.

Name of the Course: Microbiology of Food Lab

Course Code: PC-FT 392

Course Outcome:

After completion of the course the students will be able to

CO1: Recall and define fundamental principles of biology to recognize and state substantial practical solution of food microbiology problems

CO2: Understand and select appropriate mathematical calculations, review data and express them graphically in relation to the experiment.

CO3: Acquire skills to practice basic lab maintenance protocol, apply appropriate techniques and use theoretical knowledge to handle delicate lab instruments.

CO4: Analyze experiments, examine data, and synthesize information to compare theoretical knowledge with practical experimentation through effective hands on training to reach reasonable and valid conclusions.

CO5: Develop decision making potential, acquire team spirit, manage project, utilize fund, keep good coordination with in realistic constraints such as economic, environmental, ethical, health and microbiological safety, feasibility and sustainability.

CO6: Evaluate effectively all microbial processes which will create lifelong learning by boosting new and original work and thus develop an inquisitive mind and scientific outlook.

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Name of the Course: Chemistry-II Lab

Course Code: BS-FT 391

Course Outcome:

After completion of the course the students will be able to

- CO1:** Use molecular understanding in fields that are based upon chemistry, biological chemistry and engineering.
- CO2:** Know the proper procedures and regulations for safe handling during the use of chemical for safety.
- CO3:** Be skilled in problem solving, critical thinking and analytical reasoning.
- CO4:** Design, carryout, record, analyze the results of chemical experiments and communicate results effectively.
- CO5:** Use a variety of modern instrumentation and to determine different quantitative and qualitative technique and classical technique in course of experimentation.
- CO6:** Collaborate effectively as part of a team to solve problems, interact productivity with diverse group of team members.

DEPARTMENT OF FOOD TECHNOLOGY
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Second Year: Fourth Semester

THEORY

Name of the Course: Transfer Operations in Food Processing

Course Code: ES-FT 401

Course Outcome:

After completion of the course the students will be able to

- CO1:** Understand about nature of fluid flow in a pipe line and correlate shear rate of a fluid and pressure drop in a pipe line.
- CO2:** Design continuous sterilization unit considering the different holding time for different parts of fluid.
- CO3:** Understand the operational principle of different type of heat exchangers.
- CO4:** Understand different diffusion control mass transfer operations and vapor liquid mass transfer phenomenon in a distillation Column.
- CO5:** Realize about importance of reflux ratio and the concept of optimum reflux ratio for minimizing the cost of operation of a distillation column.
- CO6:** Understand about simultaneous mass and heat transfer phenomenon and different types of analogies between mass and heat transfer.

Name of the Course: Biochemistry & Nutrition

Course Code: PC-FT 401

Course Outcome:

After completion of the course the students will be able to

- CO1:** Understand requisite background knowledge in the field of Enzyme chemistry, their basic mode of action and regulation to remember, define, and repeat so that they have access in higher education/ Industry.
- CO2:** Understand how the properties of food components and interactions modulate the specific quality attributes of food systems, and to control the major chemical and biochemical reactions that influence food quality with emphasis on food industry applications.
- CO3:** Understand roles of biochemical reactions in the regulation of human metabolism and nutrition.
- CO4:** Comprehend the importance and role of carbohydrates, lipids, protein, vitamins, minerals in development of novel food product in industry.
- CO5:** Learn the basics of human nutrition and nutritive values of food to exhibit their creative potential in investigating and developing new ideas in food industry based project
- CO6:** Know the various qualitative and quantitative physical methods available for structure determination and apply the analytical skill and design new experimental techniques to be used in food engineering and technology

DEPARTMENT OF FOOD TECHNOLOGY
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Name of the Course: Principles of Food Preservation

Course Code: PC-FT 402

Course Outcome:

After completion of the course the students will be able to

- CO1:** Relate the basic knowledge of food science to understand the need and importance of food preservation.
- CO2:** Recognize and understand the causes of spoilage and how they affect the shelf life of food.
- CO3:** Describe the principles, working mechanism, advantages and disadvantages of different methods and techniques of food preservation
- CO4:** Apply the knowledge of mathematics and graphical derivation in process time calculations to estimate lethality of sterilization processes and spoilage probability of food products.
- CO5:** Demonstrate the appropriate application of different preservation processes in specific foods ensuring maximum retention of nutritional and organoleptical quality of food products.
- CO6:** Evaluate preservation principles in product design and value addition of food products

Name of the Course: Engineering Properties of Food Materials

Course Code: PE-FT 403

Course Outcome:

After completion of the course the students will be able to

- CO1:** Outline physical properties of food which play indispensable role in development of different food processing equipment for generation of various raw materials as well as finished products.
- CO2:** Understand rheological behavior of food materials through analysis of the molecular interplay between basic components of foods like water, oil, proteins and carbohydrates.
- CO3:** Understand the effect of frictional and aerodynamic properties on the perishability and handling properties of food materials.
- CO4:** Understand the different thermal properties of food materials and their effect on the different modes of heat transfer viz., conduction, convection and radiation.
- CO5:** Understand the relationship between the composition and dielectric properties of food materials which has wide application in different food processing techniques such as microwave drying.
- CO6:** Analyze the above-mentioned physical, rheological, frictional, aerodynamic, thermal and electrical properties of various raw materials in order to develop new value-added products or enhance existing products at both industrial and laboratory scale.

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Name of the Course: Numerical Methods & Statistical Techniques

Course Code: BS-FT 401

Course Outcome:

After completion of the course the students will be able to

CO1: Construct the interpolating polynomial for both equispaced and unequispaced arguments.

CO2: Apply numerical techniques to solve food engineering problems.

CO3: Construct graphical displays of science/engineering data and interpret the role of such displays in data analysis.

CO4: Apply basic statistical inference techniques, including confidence intervals, hypothesis testing and analysis of variance, to science/engineering problems.

CO5: Employ appropriate regression models to determine statistical relationships.

CO6: Construct optimal or good designs for a range of practical experiments

Name of the Course: Professional Ethics & IPR

Course Code: HM-FT 401

Course Outcome:

After completion of the course the students will be able to

CO1: Debate interaction of moral and ethics in profession.

CO2: Relate informed critical reflection on the nature of professionalism and ethical challenges inherent in professionalism

CO3: Explain ethical concepts, challenges and dilemmas confronting members in various aspects of food industry

CO4: Explain the significance of various types of IPR with special reference to food industry

CO5: Apply the strategy of acquiring patent and copyright for own innovative works.

CO6: Identify plagiarized contents in written representations and innovations which can be questioned legally in works

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Name of the Course: Environmental Sciences

Course Code: MC-FT 401

Course Outcome:

After completion of the course the students will be able to

CO1: Understand about nature of different pollution and their sources.

CO2: Learn about Environmental law of the country.

CO3: Learn about the nature of industrial waste coming out of different Food Industry.

CO4: Have an idea about removal of different water pollutant

CO5: Understand about different type of air pollutant and their method of removal.

CO6: Have some basic idea of solid waste Management and treatment process.

DEPARTMENT OF FOOD TECHNOLOGY
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Second Year: Fourth Semester
PRACTICAL

Name of the Course: Unit Operation Lab

Course Code: ES-FT 491

Course Outcome:

After the end of the course students shall be able to:

CO1: Learn the different aspect of fluid flow in a pipe line and through packed bed

CO2: Understand the engineering aspect of heat transfer phenomenon.

CO3: Perform different food processing and mechanical operations in Food Industries.

CO4: Apply the knowledge of mathematics, science, engineering fundamentals and engineering specialization to the solution of complex Engineering problem.

CO5: Analyze operation in distillation plant.

CO6: Understand interphase mass transfer operation in absorption column

Name of the Course: Biochemistry Lab

Course Code: PC-FT 491

Course Outcome:

After completion of the course the students will be able to

CO1: Remember and define the fundamental concept of spectroscopy with practical applications (during enzyme assay, chemical estimation of biomolecules).

CO2: Capable of understanding and explaining the calculation and data analysis and graph preparation during experiments.

CO3: Acquire skills being familiar with general lab maintenance protocol, apply various techniques and implement theoretical knowledge to handle delicate instruments.

CO4: Able to compare theoretical knowledge with lab practical testing biomolecules through effective hands on training.

CO5: Develop decision making potential, team spirit, project management, effective utilization of funds, good coordination keeping in mind various environmental facts, ethics and monetary issues.

CO6: Create lifelong learning boosting new and original work and develop an inquisitive mind.

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Name of the Course: Food Preservation Lab

Course Code: PC-FT 492

Course Outcome:

After completion of the course the students will be able to

- CO1:** Recall the basic principles of microbiology to implement and understand real life constraints to practical problems relating to food preservation.
- CO2:** Understand the basic nature of different foods and select appropriate techniques, review experimental data and generate a solution specific to each of them.
- CO3:** Learn the basic chemistry behind food, apply appropriate techniques and use theoretical knowledge to handle sensitive and state of the art lab instruments.
- CO4:** Analyze different experimental conditions, examine data, and synthesize information to compare theoretical knowledge with practical experimentation through effective hands on training to reach a reasonable and valid conclusion.
- CO5:** Develop decision making potential, acquire team spirit, manage project, utilize fund, keep good coordination within realistic constraints such as economic, environmental, ethical, health and microbiological safety, feasibility, and sustainability.
- CO6:** Evaluate effectively all processes in the light of preservation of food which will create lifelong learning by boosting new and original work and thus develop an inquisitive mind and scientific outlook.

Name of the Course: Numerical Methods Lab

Course Code: BS-FT 491

Course Outcome:

After completion of the course the students will be able to

- CO1:** Recall the basic programming tools such as, variable declarations, array in one and two dimensions, for-loop, nested for-loop, if-else and repeated summation & multiplication.
- CO2:** Describe how to write down a program. Explain the logic behind the different numerical tools.
- CO3:** Use different programming language to write the program for interpolation, integration, algebraic equations, system of linear equations and boundary value differential equations for large number of data and complicated functions.
- CO4:** Analyze different real time problems and categorize them during the process of solving, by numerical method using programming language.
- CO5:** Justify and make gradation of above mentioned numerical tools and determine the appropriate program to find the optimal solution for multidisciplinary engineering problems.
- CO6:** Design a working model and build a path by which a new approach can be generated to create a new problem appreciated by academics, research & emerging direction in industry.

DEPARTMENT OF FOOD TECHNOLOGY
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Third Year : Fifth Semester
THEORY

Name of the Course: Technology of Fruits, Vegetables, Spices, Tea, Coffee & Beverages Processing

Course Code: PC-FT 501

Course Outcome:

After completion of the course the students will be able to

CO1: Understand the nutritional and physiological characteristics of fruit and vegetables

CO2: Understand about quality losses of fruit and vegetables during handling and storage and ways to prevent it.

CO3: Develop different value added products from fruits and vegetables.

CO4: Adopt processing of various raw materials used for beverage manufacturing.

CO5: Explain the role of spices in the diet

CO6: Set up new processing flow line for new products with quality standards

Name of the Course: Fish, Meat, Poultry Processing Technology

Course Code: PC-FT 502

Course Outcome:

After completion of the course the students will be able to

CO1: Recall the basic concepts of biology, define the basic structure and biochemical composition of muscle foods and eggs and how these may undergo changes during ante & post mortem handling, processing and storage.

CO2: Understand the spoilage mechanisms in freshly harvested fish, meat and egg and explain how to estimate their quality using apposite qualitative and quantitative biochemical, physical or organoleptic parameters.

CO3: Explain the principle and applicability of different preservation technologies and apply this knowledge to prescribe suitable preservation methods for freshly harvested fish, animal and eggs.

CO4: Analyze ante mortem handling techniques and stunning methods to minimize pain and struggle of animals and frame a hygienic slaughtering process to yield high quality muscle food.

CO5: Evaluate the possibilities of value addition of fish; meat, poultry to design processing and manufacture of value added products and specialty foods

CO6: Identify potential in the by-products originating from fish, meat and poultry industries and propose the manufacture of various food, feed and non-food products

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Name of the Course: Food Process Engineering

Course Code: PC-FT 503

Course Outcome:

After completion of the course the students will be able to

CO1: Understand the basics of various food processing operations.

CO2: Solve different numerical problems on process Engineering.

CO3: Obtain knowledge in application of scientific principles in the processing technologies specific to the materials.

CO4: Understand different line or flow diagrams for different food processing operations.

CO5: Better knowing the changes in the composition of foods with respect to the type of processing technology used

CO6: Develop solutions for practical engineering problems related to industries.

Name of the Course: Nutraceuticals & Functional Foods

Course Code: PE-FT 501A

Type of Course: Professional Elective - I

Course Outcome:

After completion of the course the students will be able to

CO1: Recall the fundamental concept of Nutraceuticals & Functional Foods to understand their origin, presence and functionality.

CO2: Comprehend the disease preventing and health enhancing properties of Nutraceuticals & Functional Foods.

CO3: Apply the basic knowledge to comprehend the manufacturing of various fortified, value-added functional foods and nutraceuticals in different forms for consumption

CO4: Analyze the toxicological aspect, related risks in formulating dosage and defining consumption patterns of Nutraceuticals & Functional Foods.

CO5: Evaluate regulatory and labeling issues related to manufacture, marketing and sale of Nutraceuticals & Functional Foods

CO6: Design value addition of foods incorporating Nutraceuticals & Functional ingredients.

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Name of the Course: Instrumental Methods of Food Analysis

Course Code: PE-FT 501B

Type of Course: Professional Elective - I

Course Outcome:

After completion of the course the students will be able to

CO1: Recall, the structure and working principle of various instruments used in food analysis

CO2: Understand the advantages and shortcomings of the various instruments.

CO3: Apply the various instruments to analyze different components of food matrices.

CO4: Analyze the sensitivity and reproducibility of analytical results produced by the various instruments

CO5: Evaluate the specificity in applications of the various instruments.

CO6: Design and develop methods of food analysis using various instruments.

Name of the Course: Grain Science & Technology

Course Code: PE-FT 501C

Type of Course: Professional Elective - I

Course Outcome:

After the completion of the course, the students will be able to:

CO1: Understand the structure, composition and types of cereals and pulses.

CO2: Adopt various processing methods effectively for paddy, wheat and corn processing

CO3: Deliver ideas regarding different unit operations and its equipments involved in grain processing.

CO4: Manufacture different important products from cereal grains

CO5: Develop value added products from minor millets and pulses

CO6: Utilize the by products effectively.

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Name of the Course: Enzyme Technology

Course Code: OE-FT 501A

Type of Course: Professional Elective - I

Course Outcome:

After completion of the course the students will be able to

- CO1:** Define and relate basic principles of enzyme functioning and its relevance to food processing, biochemical and allied sector
- CO2:** Outline and review research literature in relation to enzyme production and downstream techniques considering techno-economic feasibility
- CO3:** Design and develop processes to find solutions of batch, fed-batch and Continuous reactors (CSTR) based problems to optimize enzyme production technology.
- CO4:** Interpret and validate different modeling and simulation strategies for enzyme upstream and downstream processing through analysis of data, and synthesis of information for final product stability and functionality, scale-up, process economics and sustainability.
- CO5:** Determine modern techniques like immobilizations, recombinant technologies to formulate high value bio-chemicals for food and allied industries in compliance to legal, ethical and environmental guideline.
- CO6:** Design, modify and adopt changes relating nature, structure, function and activity of different food enzymes and proteins in commercial food products for future market meeting the societal and cultural needs through effective communication with the engineering community in multidisciplinary.

Name of the Course: Renewable Energy Technology

Course Code: OE-FT 501B

Type of Course: Open Elective - I

Course Outcome:

After completion of the course the students will be able to

- CO1:** Recognize the need of renewable energy technologies and their role in the world energy demand and describe the major factors affecting the potential contribution to the world's needs of the various sources of energy.
- CO2:** Describe and identify the various renewable energy sources and the possible conversion paths to a useful form of energy.
- CO3:** Distinguish between the sustainable energy sources and fossil energy sources with emphasis on wind and photovoltaic systems.
- CO4:** Describe and introspect how biomass is currently used as source of energy, types of biomass, conversion of biomass to clean fuels and finally its future potential.
- CO5:** Knowledge of security and operational requirements of autonomous and net connected renewable energy system and ability to compare the advantages and disadvantages of various renewable energy technologies.
- CO6:** Review the latest advancement in the materials development applied to renewable energy and develops a personal well-argued and qualified view of a possible energy future.

DEPARTMENT OF FOOD TECHNOLOGY
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Name of the Course: Flavour Technology

Course Code: OE-FT 501C

Type of Course: Open Elective - I

Course Outcome:

After completion of the course the students will be able to

CO1: Relate to the significance and role of flavours in various food products.

CO2: Identify and apply their knowledge in extraction, isolation and identification of different food flavouring components.

CO3: Select suitable flavours in various food matrices.

CO4: Distinguish the changes of flavouring components starting from harvesting of food, food processing operations, storage to consumer and take suitable action to prevent that change.

CO5: Classify flavours in accordance with the food of concern in order to incorporate, minimize, analyze or enhance certain flavour components through the use of sensitive instruments and testing methodologies.

CO6: Recognize and interpret the national and international regulations for food flavours to meet societal, economical and cultural need in the context of human health and safety assessment operations

Name of the Course: Engineering Economics

Course Code: HM-FT 501

Course Outcome:

After completion of the course the students will be able to

CO1: Encounter different problem issues in engineering related to system design, system deployment, project management, etc. and approach towards optimal solution.

CO2: Prepare estimation for short term targets in an industry and compare the actual costs incurred for the same to determine the efficiency of the system.

CO3: Prepare estimation of supply, installation and commissioning in live projects and take necessary measures of cost control.

CO4: Take long term investment decision; select the most profitable project, take decision related to replacement of assets.

CO5: Identify the assets that are subject to depreciation, maintain depreciation account to access the benefit as per tax regulations.

CO6: Can prepare and analyze the financial statements of the company, and determine its financial health.

DEPARTMENT OF FOOD TECHNOLOGY
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Third Year : Fifth Semester
PRACTICAL & SESSIONAL

Name of the Course: Food Processing Lab – I

Course Code: PC-FT 591

Course Outcome:

After completion of the course the students will be able to

- CO1:** Define and describe diverse fields of product technology and unit operations employed in food processing both conceptually and in the pilot plant.
- CO2:** Understand and classify complex biochemical reactions of raw food materials during postharvest storage and their transformation into food products and accordingly outline food processing and preservation techniques.
- CO3:** Construct process flow diagrams along with their combinations and sequences within the context of more advanced ideas, practical applications, economy, laws and regulations.
- CO4:** Analyze the role of various processing aids used and operate equipments with an understanding of the impact of processing conditions on physical, chemical and sensory properties of the food products.
- CO5:** Calculate, evaluate, interpret, and present analytical results obtained during practical experiments in a safe and responsible way.
- CO6:** Design appropriate research methods and techniques to execute targeted experiments in industry like situation.

Name of the Course: Food Analysis & Quality Control Lab-I

Course Code: PC-FT 592

Course Outcome:

After completion of the course the students will be able to

- CO1:** Know the methods of selecting appropriate techniques for analysis of food products.
- CO2:** Apply knowledge in identifying and determining the relative amounts of components in food sample.
- CO3:** Gain knowledge on food standards, regulations and quality control
- CO4:** Obtain knowledge of adulterants in foods.
- CO5:** Appreciate the role of Food Analysis in food standards and regulation for the manufacture and the sale of food products and food quality control in food industries.
- CO6:** Familiarize with the current state of Knowledge in food analysis.

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Name of the Course: Food Engineering Lab

Course Code: PC-FT 593

Course Outcome:

After completion of the course the students will be able to

CO1: Understand the basics of various food processing operations.

CO2: Understand the principles of Process calculations.

CO3: Understand different line or flow diagrams for different food processing operations

CO4: Knowledge in application of scientific principles in the processing technologies specific to the materials.

CO5: Better knowledge about the changes in the composition of foods with respect to the type of processing technology used

CO6: Develop solutions for practical engineering problems related to industries.

Name of the Course: Report & Seminar on Industrial Training

Course Code: SI-FT 581

Course Outcomes:

After completion of the course the students will be able to

CO1: Relate different components of food science and technology, skills and scientific techniques followed in various food business/industry.

CO2: Understand hands on expertise in their relevant fields.

CO3: Bridge the gap between academia and ever-changing demand driven industrial business scenario to develop the need of industry with the polarization paradigm.

CO4: Analyze the skills and knowledge required for a particular job function.

CO5: Get exposure to advanced manufacturing and analytical tools to evaluate complex engineering problem.

CO6: Adopt basic industrial practices with ever changing food regulatory standards, ethics, legislation and food safety issues

DEPARTMENT OF FOOD TECHNOLOGY
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Third Year: Sixth Semester
THEORY

Name of the Course: Milk & Milk Products Processing Technology

Course Code: PC-FT 601

Course Outcome:

After completion of the course the students will be able to

- CO1:** Understand the various properties and composition of milk.
- CO2:** Understand the technology of manufacturing of various milk products.
- CO3:** Appreciate the safety and quality factors that determine the acceptability of the dairy products by consumers.
- CO4:** Select and apply appropriate techniques for solution of practical problems of milk processing lines.
- CO5:** Develop understanding of by-product utilization of dairy industry.
- CO6:** Apprehend the importance of cleaning, sanitation and CIP in dairy industry

Name of the Course: Edible Fats and Oils Processing Technology

Course Code: PC-FT 602

Course Outcome:

After completion of the course the students will be able to

- CO1:** Recall lipid/fat as basic component of food, plant and animal sources of fats, their occurrence, health benefits, physical and chemical properties
- CO2:** Illustrate basic extraction and refining process of crude fat/oil and various processing of true fat (hydrogenation, winterization etc.) and other process-flow for by-products.
- CO3:** Classify fats/oils or fat-based ingredients as per different groups of vegetable oil/ cooking oil/plastic fat/confectionery fat/shortenings etc
- CO4:** Assess quality of fat/oil as raw material/ingredients in the food industries.
- CO5:** Choose different processing techniques of true fat/oil in preparation of fat based raw material for bakery and confectionery industries.
- CO6:** Communicate effectively own idea and activities with the engineering community and the society at large through writing and presentation, to give and receive clear instruction, and to enhance societal awareness on processing and preservation of fats and oils while acquiring capability of adapting with the future advancement of research.

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Name of the Course: Technology of Bakery, Confectionary & Extruded Foods Processing

Course Code: PC-FT 603

Course Outcome:

After completion of the course the students will be able to

- CO1:** Understand the basics of Bakery, confectionary & Extruded Food products.
- CO2:** Understand different raw materials used and their testing methods of Bakery products.
- CO3:** Understand different line or flow diagrams for different bakery, confectionary and extruded products processing operations.
- CO4:** Cope up with modern bakery and confectionary products processing operations as well as modern extruded products (third generation products) and their techniques already implemented.
- CO5:** Understand to maintain bakery hygiene, bakery processing laws & ethics and prevent food processing hazards.
- CO6:** Apply knowledge (hygiene) on laws and regulations related to bakery foods and also ability to function effectively as an individual, and as a member or leader in diverse teams in multi-disciplinary settings, and to develop budding entrepreneurs.

Name of the Course: Fermentation Technology & Biochemical Engineering

Course Code: PE-FT 601A

Type of Course: Professional Elective - II

Course Outcome:

After completion of the course the students will be able to

- CO1:** Define and relate basic principles of industrial microbiology, fermentation techniques and biochemical engineering to food processing sector
- CO2:** Outline and review research literature in relation to production and downstream techniques for ethanol, antibiotics, organic acids and allied biochemicals through fermentation considering techno- economic feasibility
- CO3:** Design and develop processes to address problems and find solutions for various fermentation plants to optimize production of high value biochemicals
- CO4:** Interpret and validate different modeling and simulation strategies for upstream and downstream processing through analysis of data, and synthesis of information for final product stability and functionality, scale-up and sustainability
- CO5:** Determine modern techniques like immobilizations, recombinant technologies to formulate fermentative products for food and allied industries in compliance to legal, ethical and environmental guideline
- CO6:** Design, modify and adopt changes relating nature, structure, function and activity of different commercial biochemicals for future market meeting the societal and cultural needs through effective process economics and communication with in multi-disciplinary setting

DEPARTMENT OF FOOD TECHNOLOGY
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Name of the Course: Management of Food Industry Wastes

Course Code: PE-FT 601B

Type of Course: Professional Elective - II

Course Outcome:

After completion of the course the students will be able to

- CO1: Make the students in understanding about the source and nature of wastes obtained from various food industries.
- CO2: Study the ways to convert the food wastes into valuable products.
- CO3: List the nature of the wastes obtained from different food processing industries.
- CO4: Understand the properties of different food industry wastes.
- CO5: Recognize and communicate common processes which allow the different food processing waste to be converted into valuable products.
- CO6: Communicate effectively on professional activities with the engineering community and with the society at large.

Name of the Course: Food Additives

Course Code: PE-FT 601C

Type of Course: Professional Elective - II

Course Outcome:

After completion of the course the students will be able to

- CO1: Have basic theoretical knowledge about definition, criteria, functional classification and need of food Additives with respect to different food commodities.
- CO2: Assess their significance in the light of current national and international food regulations on additives giving emphasis on safety assessment keeping in mind the acceptable daily intake recommendations.
- CO3: Provide basic concepts about formulation technology in regard to incorporation of food additives in the context the functional ingredient and/or additive-structure-performance relationship for processed food products.
- CO4: Develop the scientific outlook coupled with critical thinking and technology based communication skills required for the assessment of the impacts of food additive applications on health, food safety, and quality, and the current advancements related to food additives.
- CO5: Understand and impart knowledge about the EU regulatory framework, JECFA and EFSA's assessment of consumer safety and exposure on food additives and interpret them in practical real time situations to inculcate societal, economical and cultural development through lifelong learning.
- CO6: Create food technology professionals who are equipped with thorough knowledge of the application based methodologies with respect to food additives that can emerge as entrepreneurs with perseverance and calibre.

DEPARTMENT OF FOOD TECHNOLOGY
HALDIA INSTITUTE OF TECHNOLOGY

Name of the Course: Data Structure & Algorithm

Course Code: OE-FT 601A

Type of Course: Open Elective - II

Course Outcome:

After completion of the course the students will be able to

CO1: Learn the basic types for data structure, implementation and application.

CO2: Know the strength and weakness of different data structures.

CO3: Select basic data structures and algorithms for autonomous realization of simple programs or program parts.

CO4: Determine and demonstrate bugs in program, recognise needed basic operations with data structures.

CO5: Use the appropriate data structure in context of solution of given problem

CO6: Develop programming skills which require to solve given problem.

Name of the Course: Data Base Management System (DBMS)

Course Code: OE-FT 601B

Type of Course: Open Elective - II

Course Outcome:

After completion of the course the students will be able to

CO1: Define and understanding introductory concepts of data structure, time and space analysis of algorithms using different asymptotic notations.

CO2: Understanding linear data structures with its applications and operations on different Linked lists.

CO3: Illustrate the concept and implementation of stack, queue, dequeue, circular queue, and applications of stack using recursion.

CO4: Understanding and build non-linear data structure such as trees, its traversal, insertion, deletion, height-balanced and B-trees.

CO5: Analyze and evaluate various searching and sorting algorithms, problem analysis and representation of graphs such as BFS and DFS.

CO6: Analyze and evaluate the importance of data structure and be able to correlate future programming structure, and its market issues specific to complex engineering problems.

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Name of the Course: Nanoscience in Food Technology

Course Code: OE-FT 602A

Type of Course: Open Elective - III

Course Outcome:

After completion of the course the students will be able to

CO1: Familiarize about the science of nanomaterials and nanoparticles

CO2: Comprehend the importance of nanoparticles and demonstrate the preparation of nanomaterials

CO3: Apply the knowledge acquired for characterization of different nanomaterials/nanoparticles

CO4: Analyze the risk assessment and safety issues of nanoparticles in food and packaging applications

CO5: Evaluate further area of research in food nanotechnology/nano encapsulation/ nano packaging

CO6: Design and develop different process control system of nano technology applied in food industries

Name of the Course: Protein Technology

Course Code: OE-FT 602B

Type of Course: Open Elective - III

Course Outcome:

After completion of the course the students will be able to

CO1: Describe and identify various commercial sources of proteins and its structure, quality and application in food sector

CO2: Understand the importance of protein engineering in improving the nutritional and functional properties of food

CO3: Describe and identify the process of manufacturing protein isolate, concentrate and hydrolysates from different sources to understand and define Factors affecting quality of protein isolate, concentrate and hydrolysates.

CO4: Designing new range of products with improved nutritional characteristics

CO5: Understand and apply knowledge of various techniques to improve nutritional values of food by using protein technology in food industry

CO6: Able to communicate effectively own idea and activities with the engineering community and the society at large through writing and presentation and to give and receive clear instruction and to enhance societal awareness on protein technology

DEPARTMENT OF FOOD TECHNOLOGY
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Name of the Course: New Product Development

Course Code: OE-FT 602C

Type of Course: Open Elective - III

Course Outcome:

After completion of the course the students will be able to

CO1: Apply the specific knowledge for different food product formulations with market prospective.

CO2: Understand the major processing steps applied for food product prototyping and design through scientific approach.

CO3: Apply knowledge of different food processing equipment specific to the product and process development.

CO4: Design products for emerging markets based on opportunity and develop protocol for different category of food products.

CO5: Apply the engineering principles to design consumer centric novel food product.

CO6: Adopt the changing face of consumer demand and develop product with cost optimization and meeting regulatory standards

DEPARTMENT OF FOOD TECHNOLOGY
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Third Year: Sixth Semester
PRACTICAL

Name of the Course: Food Processing Lab – II

Course Code: PC-FT 691

Course Outcome:

After completion of the course the students will be able to

CO1: Learn different methods applied to processing of foods

CO2: Understand and classify changes of raw food materials during transformation into food products

CO3: Understand the significance of food processing on food preservation

CO4: Construct process flow diagrams.

CO5: Operate various equipments.

CO6: Calculate and present analytical results obtained during practical experiments in a safe and responsible way.

Name of the Course: Food Analysis & Quality Control Lab-II

Course Code: PC-FT 692

Course Outcome:

After completion of the course the students will be able to

CO1: Select appropriate techniques for analysis of food products.

CO2: Apply knowledge in identifying and determining the relative amounts of components in food sample.

CO3: Gain knowledge on food standards, regulations and quality control

CO4: Identify and detect adulterants in foods.

CO5: Appreciate the role of Food Analysis in food standards and regulation for the manufacture and the sale of food products and food quality control in food industries.

CO6: Familiarize with the current state of Knowledge in food analysis.

DEPARTMENT OF FOOD TECHNOLOGY
HALDIA INSTITUTE OF TECHNOLOGY

Name of the Course: Fermentation Technology Lab

Course Code: PC-FT 693

Course Outcome:

After completion of the course the students will be able to

- CO1:** Know the methods of selecting appropriate techniques for fermentation.
- CO2:** Apply knowledge in identifying and determining the downstream techniques for allied biochemical through fermentation.
- CO3:** Gain knowledge on design parameters for various fermentation plants to optimize production of high value products.
- CO4:** Obtain knowledge of modeling and simulation for upstream and downstream processing.
- CO5:** Know the modern techniques to formulate fermentative products for food and allied industry.
- CO6:** Familiarize with the current state of knowledge in fermentation process techniques.

Name of the Course: Data Base Management System (DBMS) Lab

Course Code: OE-FT 691

Course Outcome:

After completion of the course the students will be able to

- CO1:** Define different operations on data structure such as insertion, deletion, merging using arrays.
- CO2:** Demonstrate implementation of stacks and queues: insertion, deletion of elements, circular queue: insertion, deletion of elements using array.
- CO3:** Solve expressions operations using multiple stacks & queues.
- CO4:** Construction and implementation of linked lists: inserting, deleting, and inverting a linked list, analyze implementation of stacks & queues using linked lists, polynomial addition, polynomial multiplication, sparse matrices multiplication, addition using linked list.
- CO5:** Evaluate recursive and non-recursive traversal of trees and implementation of recursive binary tree traversal and AVL tree.
- CO6:** Design and implement of different searching and sorting algorithms.

DEPARTMENT OF FOOD TECHNOLOGY
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Fourth Year: Seventh Semester

THEORY

Name of the Course: Food Packaging Technology

Course Code: PC-FT 701

Course Outcome:

After completion of the course the students will be able to:

- CO1:** Define, understand, and relate basic packaging technologies with respect to manufacturing methodologies, potential material development to address substantiated solution to practical food preservation and transportation problems.
- CO2:** Recognize the need, and to have the preparation for independent, life-long learning in the emerging areas of packaging technology in synergy with other technological applications.
- CO3:** Interpret and demonstrate as a professional, who has comprehensive knowledge on regulatory requirements for food packaging and allied areas to meet societal needs within realistic constraints such as economic, environmental, ethical, legal, cultural, health and safety, feasibility, and sustainability.
- CO4:** Examine and analyze problems associated with difficulties related to packaging material, methodologies and food components to be packaged.
- CO5:** Create, develop and formulate appropriate packaging technologies with the aid of various tools with a view to work in real life situations and as independent entrepreneurs.
- CO6:** Communicate to defend effectively on professional activities in order to estimate and support societal awareness and need on packaging technology.

Name of the Course: Food Safety & Quality Management

Course Code: PC-FT 702

Course Outcome:

After completion of the course the students will be able to

- CO1:** Remember and relate principles of natural, biological science, and engineering fundamentals with basics food safety and quality management.
- CO2:** Understand the problems arising in quality control and quality assurance during food processing and interpret the tools and solutions that are being developed to solve such problems
- CO3:** Apply food safety management principles with an understanding of the limitations in application of the same in food quality and safety maintenance in a food industry.
- CO4:** Analyze existing food laws and quality management techniques in relation to follow legal limits and supply safe food to consumers.
- CO5:** Evaluate and interpret data and apply resources to reach a sustainable solution in food safety and quality management system in industries.
- CO6:** Develop system tools to meet specific needs of food safety and maintain the effective quality of food during processing taking into consideration public health and safety, cultural, societal and environmental issues.

DEPARTMENT OF FOOD TECHNOLOGY
HALDIA INSTITUTE OF TECHNOLOGY

Name of the Course: Principles of Management

Course Code: HM-FT 701

Course Outcome:

After completion of the course the students will be able to

CO1: Apply management principles and practices

CO2: Determine the social needs and can define the corporate social responsibilities and corporate governance and their implementation through use of latest technology

CO3: Determine the manpower requirement and device the policies and procedure of recruitment Plan and device appropriate training and development programme in adapting with changed environment and improving performance.

CO4: Conduct market feasibility study to determine the needs of the customer and plan strategies for product development, advertisement, manufacturing and distribution

CO5: Can able to prepare and analyze financial statements to determine the financial health of the company.

CO6: Ability to accomplish desired quality of the deliverables within given budget. Use MIS Software tools for timely and economically managing every aspects of the business.

Name of the Course: Food Laws & Standards

Course Code: PE-FT 701A

Type of Course: Professional Elective - III

CO1: Remember and relate principles of natural, biological science, and engineering fundamentals with elemental food laws and relevant standards.

CO2: Understand the problems arising in food policies during standardization of food laws and interpret the solutions that are being developed to solve such problems

CO3: Apply food laws and relevant regulatory principles with an understanding of the limitations in application of the same in food processing.

CO4: Analyze existing food laws and quality management techniques in relation to follow legal limits and supply safe food to consumers.

CO5: Evaluate and interpret data and apply resources to reach a sustainable solution in food safety and quality management system in industries.

CO6: Develop system tools to meet specific needs of food laws and standards by food business operators taking into consideration public health and safety, cultural, societal and environmental issues.

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Name of the Course: Emerging Trends in Food Processing

Course Code: PE-FT 701B

Type of Course: Professional Elective - III

Course Outcome:

After completion of the course the students will be able to:

CO1: Apply the knowledge of different unit operations in developing a process specific to food

CO 2: Analyze the effect of different process variables on the quality of food product

CO3: Analyze the effect of compositional variables on overall quality and safety attributes of food products

CO4: Design the food process and products optimizing the processing condition subject to product category

CO5: Understand the scale-up opportunities and limitations based on design parameters

CO6: Adopt the technology transfer of emerging food processing over conventional treatments

Name of the Course: Food Toxicology

Course Code: PE-FT 701C

Type of Course: Professional Elective - III

Course Outcome:

After completion of the course the students will be able to

CO1: Recall the nature of food toxicants and the likelihood of their occurrences.

CO2: Understand the mechanisms of action of specific food toxicants.

CO3: Apply the knowledge of mechanism of interaction between toxicants and multiple food compounds to identify the vulnerability of food matrices.

CO4: Analyze the difference between food allergies and food toxicants.

CO5: Evaluate toxicants in food and their associated levels of toxicity with implications on health.

CO6: Devise strategies to eliminate or reduce presence of food toxicants, and create awareness in public and help to strengthen national safety policy of our food supply

DEPARTMENT OF FOOD TECHNOLOGY
HALDIA INSTITUTE OF TECHNOLOGY

Name of the Course: Project Engineering & Food Plant Layout

Course Code: PE-FT 702A

Type of Course: Professional Elective - IV

Course Outcome:

After completion of the course the students will be able to

- CO1:** Learn and solve plant layout problems and ability to produce material flow problems related with food processing industries.
- CO2:** Understand and apply knowledge on laws and regulations related to food and allied areas in plant layout.
- CO3:** Apply mathematical and engineering techniques for project management.
- CO4:** Access and analyze plant layout techniques.
- CO5:** Communicate effectively on professional activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions, and to enhance awareness in relevant fields.
- CO6:** Demonstrate knowledge and understanding of engineering and management principles, and apply these in one's own work taking into consideration the aspects of financial management.

Name of the Course: Modeling and Simulation in Food Processing

Course Code: PE-FT 702B

Type of Course: Professional Elective - IV

Course Outcome:

After completion of the course the students will be able to

- CO1:** To understand about different independent and dependent variable in Food Processing operation.
- CO2:** To evaluate optimum process condition in Food Processing operation.
- CO3:** Understand the problems arising during food processing.
- CO4:** Examine and analyze problems associated with difficulties related to modeling techniques and simulation process.
- CO5:** To develop experimental design for a multivariable process.
- CO6:** Development modeling equation in simultaneous heat and mass transfer process in dryer and absorption column.

DEPARTMENT OF FOOD TECHNOLOGY
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Name of the Course: Plant Maintenance safety and Hygiene

Course Code: PE-FT 702C

Type of Course: Professional Elective - IV

Course Outcome:

After completion of the course the students will be able to

CO1: Understand safety features of different processing operations

CO2: Analyze the plant operation in food processing plant

CO3: Correlate the plant operational hazards with Food Safety

CO4: Identify different types of hazards and establishing control measures

CO5: Understand possible cause of accident in plant and its safety measure

CO6: Realize hygiene and sanitation requirement in food processing and allied industries

Name of the Course: Entrepreneurship Development for Food Technologists

Course Code: OE-FT 701A

Type of Course: Open Elective - IV

Course Outcome:

After completion of the course the students will be able to

CO1: Develop the Entrepreneurial skills for Food Technologists.

CO2: Understanding opportunities to set-up Food processing industries.

CO3: Acquire basic knowledge in Trade license and registration marks, Sources of finance, selection of land and factory sheds.

CO4: Understanding opportunities to set-up Food processing industries.

CO5: Impart knowledge on Preparation of project report, Market feasibility reports, Techno economic feasibility report.

CO6: Develop entrepreneurship knowledge to apply in food processing field.

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Name of the Course: Supply Chain Management and Food Marketing

Course Code: OE-FT 701B

Type of Course: Open Elective - IV

Course Outcome:

After completion of the course the students will be able to

- CO1:** Remember and relate principles of supply chain management principles to find the scope of foodbusinesses
- CO2:** Understand the problems arising in a supply chain during food processing and interpret the tools and solutions that are being developed to solve such problems
- CO3:** Apply sequential strategic planning involved in managing effective production, operation and distribution and limitation of different processed foods
- CO4:** Analyze existing advertising law, regulation and policies in relation to supply of safe food to consumers.
- CO5:** Evaluate and interpret data and apply resources to optimize consumer preference for a category of food product and reach sustainable solution with effective supply chain mapping and traceability systems
- CO6:** Design and develop system tools to meet specific need of Food Product Development and Commercialization

Name of the Course: Food Security & Sustainability

Course Code: OE-FT 701C

Type of Course: Open Elective - IV

Course Outcome:

After completion of the course the students will be able to

- CO1:** Recall the need for food and the nutritional security on global and national level
- CO2:** Comprehend the importance of utilization and preservation of land, water and other natural resources for Food Security and Sustainability.
- CO3:** Apply the basic knowledge and principles to aid in Food Security and Sustainability.
- CO4:** Analyze the different existing and proposed technologies to set up sustainable food eco-systems.
- CO5:** Evaluate food production trends to monitor and explore various avenues to cater to development of sustainable practices
- CO6:** Generate mass awareness and contribute at various levels as individuals or as active members of organizations to uphold the magnitude of Food Security and Sustainability

DEPARTMENT OF FOOD TECHNOLOGY
HALDIA INSTITUTE OF TECHNOLOGY

Fourth Year: Seventh Semester
PRACTICAL & SESSIONAL

Name of the Course: Product Development & Quality Assurance Lab

Course Code: PC-FT 791

Course Outcomes:

After completion of the course the students will be able to

- CO1:** Ability to introduce a basic knowledge about the process for developing food products with market perspective.
- CO2:** Ability to formulate a new product through scientific approach.
- CO3:** Ability to apply advanced techniques for developing new products meeting regulatory standards.
- CO4:** Ability to understand the importance of packaging and nutritional labeling of food products..
- CO5:** Ability to analyze impact of food composition, processing, packaging and storage on the overall food quality attributes.
- CO6:** Interpret and validate data collected through market analysis and practical research

Name of the Course: Report and Seminar on Industrial Training

Course Code: SI-FT 781

Course Outcomes:

After completion of the course the students will be able to

- CO1:** Relate different components of food science and technology, skills and scientific techniques followed in various food business/industry.
- CO2:** Understand hands on expertise in their relevant fields.
- CO3:** Bridge the gap between academia and ever-changing demand driven industrial business scenario to develop the need of industry with the polarization paradigm.
- CO4:** Analyze the skills and knowledge required for a particular job function.
- CO5:** Get exposure to advanced manufacturing and analytical tools to evaluate complex engineering problem.
- CO6:** Adopt basic industrial practices with ever changing food regulatory standards, ethics, legislation and food safety issues

DEPARTMENT OF FOOD TECHNOLOGY
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Name of the Course: Group Discussion & Personality Development

Course Code: HM-FT 781

Course Outcomes:

After completion of the course the students will be able to

- CO1:** Learn how to effectively communicate with appropriate speaking and listening skills by involving students to take part in discussions, annotate group activities and case studies for improvement.
- CO2:** Understand structured attention to specific speaking and listening skills to develop the ability to listen to others
- CO3:** Develop thinking and reaction capabilities on any instant topic.
- CO4:** Use excellent speaking and listening skills to address personal targets to grow individually and assess peers for examining progress
- CO5:** Evaluate their learning journey to demonstrate the skills acquired and reflect it in a professional scenario.
- CO6:** Adopt enhanced general knowledge and public speaking capability to empower communication and soft skills

DEPARTMENT OF FOOD TECHNOLOGY
HALDIA INSTITUTE OF TECHNOLOGY
Fourth Year: Eighth Semester

Name of the Course: Technical Report Writing on Dissertation

Course Code: PC-FT 801

Course Outcomes:

After completion of the course the students will be able to

CO1: Understand how to apply technical information and knowledge in practical documents

CO2: Practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy and honesty

CO3: Understand the current resources (such as search engines and databases) for locating secondary information, and also understand the strategies of effective primary data gathering.

CO4: Understand how to critically analyze data from research; incorporate it into assigned writing clearly, concisely, and logically; and attribute the source with proper citation.

CO 5: Summarize larger texts in clear, direct style for practical applications.

CO6: Develop professional work habits, including those necessary for effective collaboration and cooperation with other students, instructors, and Service

Name of the Course: Internship Project

Course Code: PW-FT 881

Course Outcomes:

After completion of the course the students will be able to

CO1: Grasp on engineering principles in the area of food science, technology, and allied areas.

CO2: Gain knowledge and skills to apply these principles in real-time problem-solving in food technology and relevant fields.

CO3: Communicate verbally with professional organizations and scientific community with reasonable clarity on topics within food science, engineering, technology, and allied areas.

CO4: Familiar with legislative aspects in India for application of problem solving skills and knowledge acquired in the program.

CO5: Correlate the skills and knowledge acquired over the degree program with a particular job function as a professional.

CO6: Understand the challenges with the exposure to professional responsibilities with appropriate level of accountability.