Name of the Course: Food Process Technology – III (Milk & Milk Products)	
Course Code: PC-FT 601	**Semester: VI**
Duration: 6 months	**Maximum Marks: 100**

Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./ week	Mid Semester Exam.: 15 Marks
Tutorial: Nil	Assignment & Quiz: 10 Marks
Practical: Nil	Attendance: 5 Marks
Credit Points: 3	End Semester Exam: 70 Marks

Objective:	
1	To understand need and importance of processing technologies used for milk and the various products derived from milk
2	To know the compositional and technological aspects of milk
3	To grasp the changes in the composition of milk and milk products with respect to the type of processing technology used
Pre-Requisite:	
1	Chemistry of food and chemical deterioration
2	Principles of food preservation
3	Unit operations
4	Concept of food process engineering

Details of Syllabus:

Unit	Content	Hrs/ Unit	Marks / Unit
1	**Introduction to milk:** PFA & FSSAI definition, Composition of milk; Factors affecting composition of milk; Types of milk as per FSSAI specification; Synthetic milk; Physico-chemical properties and microbiological quality of milk; Checks for purity of milk; Handling, transportation and reception of freshly produced milk	7	
2	**Cleaning and sanitization:** Dairy equipments and plant cleaning and sanitization	2	
3	**Processing of fluid milk:** Pasteurization (LTLT and HTST), sterilization and UHT techniques; Homogenization principle & its application in dairy industry; Packaging of fluid milk; Flavoured milk; Lactose free milk	7	
4	**Fermented milk products:** Dahi, yogurt, acidophilus milk, kefir, kumiss & related products; Probiotics & prebiotics	3	
5	Manufacturing of cream, butter, ghee	6	
6	Manufacturing of Ice-cream	4	
7	Manufacturing of Cheese (classification, manufacturing process of cheddar, cottage cheese, mozzarella cheese, processed cheese)	4	
8	Processing of concentrated (Sweetened condensed milk, evaporated milk)	3	
9	Processing of dried milk products (Milk powder, Infant formulae)	5	
10	Manufacturing process of Chhana, paneer and khoa; Traditional Indian sweets (Rasogolla, Sandesh, Peda, Burfi, Kalakand, Gulabjamun etc.)	1	

11	Dairy industry byproduct utilization (manufacturing of whey beverages, whey cheese, whey powder, lactose, WPC, WPI)	2	
12	Application of advanced technologies in dairy industry (membrane technology, high pressure processing, pulsed electric field etc.)	1	

Text and Reference Books:

TEXT

1. Outlines of Dairy Technology, De S; Oxford.
2. Robinson RK; 1996; Modern Dairy Technology, Vol 1 & 2; Elsevier Applied Science Pub.
3. Indian Dairy Industry KS Rangappa and K L Acharya, Asia publishing house, Mumbai
4. Technology of Milk Processing Khan QA and Padmanabhan ICAR, New Delhi

REFERENCE

1. Dairy Science and Technology by P. Walstra, Jan T.M. Wouters and T.J. Geurts . Second Edn. CRC Press. Taylor and Fransis
2. Milk & Milk Processing; Herrington BL; 1948, McGraw-Hill Book Company.
3. Modern Dairy Products, Lampert LH; 1970, Chemical Publishing Company.
4. Principles of Dairy Processing JN Warner, Wiley Eastern Ltd, New Delhi

Course Outcome:

After the 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

Special Remarks (If any): Nil

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Syllabus for B. Tech in Food Technology

(Applicable from the academic session 2018-2019)

Name of the Course: FOOD PROCESS TECHNOLOGY – IV (Edible Fats and Oils)	
Course Code: PC-FT 602	**Semester: VI**
Duration: 6 months	**Maximum Marks: 100**

Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./ week	Mid Semester Exam.: 15 Marks
Tutorial: Nil	Assignment & Quiz: 10 Marks
Practical: Nil	Attendance: 5 Marks
Credit Points:3	End Semester Exam: 70 Marks

Atleast 45 hrs/Sem

Objective:

1	Understands the basic processing of extraction, purification and quality of refined vegetable oil
2	Build the concept of plastic fat and its possible applications
3	Learn different processing technology for preparation of industrially important fats/oils extruded food items
4	Assess different fat or fat-based foods with respect to quality standards.
5.	Explores possibility of enzyme application in fats/oils.

Pre-Requisite:

1	To have basic concept of chemistry of fats/oils, physical and chemical properties of fats/oils Role of Ingredients in Bakery, confectionary and extruded foods
2	To have idea about true and crude fat

Details of Syllabus:

Unit	**Content**	**Hrs/ Unit**	**Marks / Unit**
1	Importance of fats and oils in foods; Sources, composition and properties of vegetable oils and animal fats (milkfat, lard and tallow); Reversion andrancidity of fats and oils; Extraction of fats and oils – Rendering (only definition), pressing, solvent extraction, supercritical fluid extraction, enzyme-derived oil	9	
2	Processing/refining of oils – Degumming, neutralization, bleaching, deodorization, winterization (continuous operation) for production of RBD oil; characteristics of cooking/frying oil, effect of heat on fats/oils (trans fat, other toxicity)	10	
3	Processing of refined oil – Hydrogenation, Inter-esterification, fractionation, esterification ; Plastic fat – definition, characteristics, common plastic fat – shortenings and margarine ; process flow-sheet of plastic fat (industrial shortenings and margarine); Application of plastic fat inbakery, confectionary (including cocoa butter replacers),	10	
4	By-products of fat/oil processing industries – Lecithin, crude fibre, protein isolate; Quality standards (sensory, physical and chemical) of fats and fat-based products(industrial shortenings, margarine, ghee); Antioxidantsand its mechanism of application.	8	
5	Biotechnology in fats/oils – Enzymatic degumming; enzymatic interesterification ; vegetable fat/oil as functional food; Genetically modified fat/blended oil	8	

Text and Reference Books:

1. Bailey's Industrial Oil and Fat Products, Vol 1 & 2; Swern D; 4th ed, 1982, John Wiley & Sons.
2. The Chemistry & Technology of Edible Oils and Fats; Devine J & Williams PN; 1961, Pergamon Press.
3. Food Oils and their Uses; Weiss TJ; 1983, AVI.
4. Edible Oils & Fats: Developments since 1978 (Food Technology Review # 57); Torrey S; 1983, NDC.

Course Outcome:

After completion of the course the students will be able to

CO1: They are able to recall lipid/fat as basic component of food, plant and animal sources of fats, their occurrence, health benefits, physical and chemical properties

CO2: They are able to 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: They are able to classifyfats/oils or fat-based ingredients as per different groups of vegetable oil/cooking oil/plastic fat/confectionery fat/shortenings etc

CO4: They are able to assess quality of fat/oil as raw material/ingredients in the food industries

CO5: They are able to choose different processing techniques of true fat/oil in preparation of fat-based raw material for bakery and confectionery industries

Special Remarks (If any): Nil

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Syllabus for B. Tech in Food Technology

(Applicable from the academic session 2018-2019)

Name of the Course: Food Process Technology – V (bakery, confectionary and extruded foods)	
Course Code: PC-FT 603	**Semester: VI**
Duration: 6 months	**Maximum Marks: 100**

Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./ week	Mid Semester Exam.: 15 Marks
Tutorial: Nil	Assignment & Quiz: 10 Marks
Practical: Nil	Attendance: 5 Marks
Credit Points:3	End Semester Exam: 70 Marks

Objective:	
1	Understand the operations of different bakery and extrusion process and role of ingredients
2	Build the concept of plant safety sanitation and personal hygiene of the Bakery plant and CIP of extrusion process plant
3	Analyze the different bakery confectionery and extruded food items
4	Apply this knowledge for technological improvement of bakery products
5.	Assess the importance of various operations in extrusion plant
Pre-Requisite:	
1	To have basic concept of Role of Ingredients in Bakery, confectionary and extruded foods
2	Knowledge of wheat flour testing is preferred

Details of Syllabus:

Unit	**Content**	**Hrs/ Unit**	**Marks / Unit**
1	Introduction to baking; Bakery ingredients and their functions; Machines and equipment for batch and continuous processing of bakery products Baking oven: Different types. Functions of different parts present in baking oven. Different zones present in baking oven and their role (s) in baking. Heat transfer inside oven. Thermal conductivity, specific heat of bakery products. Importance of temperature and humidity during baking.	12	
2	Testing of flour; Manufacture of bread, cake and biscuits; Analysis of bakery Products; Cake icing techniques, wafer manufacture, cookies, crackers, dusting or breading. Manufacture of bread rolls, sweet yeast dough products, cake specialties, pies and pastries, doughnuts,); Maintenance, safety and hygiene of bakery plants.	12	
3	Confectionary: Candies: Introduction. Crystalline and non-crystalline candies. Variation of sugar-water ratio at different temperatures to produce crystalline candies. Super-saturation, nucleation, crystal growth dependable factors. The ingredients required for candies.	12	

	Chocolates: Introduction. Different ingredients require for chocolate preparation and their functions. Type of chocolates. Description of chocolate preparation by using definite flow diagram. Problems and solutions for chocolate making.		
4	Importance and applications of extrusion in food processing; Pre and post extrusion treatments; Manufacturing process of extruded products; Change of functional properties of food components during extrusion. Extruder as a Biochemical reactor	9	

Text and Reference Books:

1. Extrusion of Food, Vol 2; Harper JM; 1981, CRC Press.
2. Bakery Technology & Engineering; Matz SA; 1960; AVI Pub.

Course Outcome:

After completion of the course the students will be able to

CO1: Understand the operations of different bakery and extrusion process and role of ingredients

CO2: Build the concept of plant safety sanitation and personal hygiene of the Bakery plant and CIP of extrusion process plant

CO3: Analyze the different bakery confectionery and extruded food items

CO4: Apply this knowledge for technological improvement of bakery products

CO5: Assess the importance of various operations in extrusion plan

Special Remarks (If any):

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Syllabus for B. Tech in Food Technology

(Applicable from the academic session 2018-2019)

Name of the Course: Principles of Management		
Course Code: HM-FT 601	**Semester: VI**	
Duration: 6 months	**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**
Theory: 3 hrs./ week		Mid Semester Exam.: 15 Marks
Tutorial: Nil		Assignment & Quiz: 10 Marks
Practical: Nil		Attendance: 5 Marks
Credit Points:3		End Semester Exam: 70 Marks

Objective:	
1	To develop the knowledge of different functional levels of management
2	To enable the students to learn about the different personal management attributes
	To enable the students to learn about management in technology, operations and in market
Pre-Requisite:	
1	Basic mathematics and ethics

Details of Syllabus:

Unit	Content	Hrs/ Unit	Marks / Unit
1	Basic concepts of management: Definition – Essence, Functions, Roles, Level. Functions of Management : Planning – Concept, Nature, Types, Analysis, Management by objectives; Organisation Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organisational Effectiveness.	8	
2	Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards. People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management, Job Satisfaction. Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes	6	
3	Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship Leadership: Concept, Nature, Theories of Leadership Styles Decision making: Concept, Nature, Process, Tools & techniques. Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making. Communication: Communication Process, Direction of Communication, Barriers to Effective Communication.	10	

4	Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control	8	
5	Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management. Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.	8	
6	Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process.	5	

Text and Reference Books:

1. Principles of Management – Premvir Kapoor, Khanna Publishing House, 2019
2. Management : Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
3. Essentials for Management – Koontz , Revised edition, Tata McGraw Hill(TMH)
4. Management – Stoner, James A. F. (Pearson)
5. Management - Ghuman, Tata McGraw Hill (TMH)

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.

Special Remarks (If any): Nil

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Syllabus for B. Tech in Food Technology

(Applicable from the academic session 2018-2019)

Name of the Course: Enzyme Technology		
Course Code: PE-FT 601A	**Semester: VI**	
Duration: 6 months	**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**
Theory: 3 hrs./ week		Mid Semester Exam.: 15 Marks
Tutorial: Nil		Assignment & Quiz: 10 Marks
Practical: Nil		Attendance: 5 Marks
Credit Points:3		End Semester Exam: 70 Marks
Atleast 45 hrs/Sem		
Objective:		
1	To impart knowledge and understanding on basic principles of enzyme functioning and its relevance to food processing, biochemical and allied sector	
2	To enable students to overview enzyme production and downstream techniques considering techno-economic feasibility	
Pre-Requisite:		
▪ Elementary knowledge of Enzyme and proteins ▪ Basic understanding of Biochemistry and Food Microbiology ▪ Basic understanding of unit operation (specially separation processes) ▪ Basic understanding of reaction kinetics ▪ Primary knowledge of dairy, bakery, beverage and edible oil industrial process line is preferred		

Details of Syllabus:

Unit	Content	Hrs/ Unit	Marks / Unit
1	Introduction to enzyme technology; Industrial enzymes – present status and opportunities with special reference to food industries; Catalytic properties of enzymes; Intracellular and extra-cellular enzymes.	8	
2	Enzyme production technology; Substrate limiting growth: Monod model, Enzyme reactors and process design; Process Scale-up, Application of recombinant DNA technique for enzyme engineering.	12	
3	Cell disintegration by physical, chemical and biological methods; Enzyme purification methods; Insoluble and Soluble product separation processes, Precipitation techniques for enzyme separation: Salting out, Solvent addition, Isoelectric precipitation	10	
4	Application of enzymes in biochemical and food processing industries; Milling and baking, Starch, starch syrups and dextrose, fruit products and wine, Dairy, Meat and Other Proteinaceous Foods, Candy, Cacao, Chocolate, Tea processing, Coffee, Flavors and other applications	8	

5	Introduction to immobilization; its advantages and different types (entrapment, micro-encapsulation, covalent bonding, cross-linking), Diffusional limitation to immobilized cell systems, Damkohler no, Application of immobilized enzymes	4	
6	Basic principles of biosensors and use of enzymes in biosensors, Legal Aspects of the use of Enzymes	3	

Textbooks and

1. Bioprocess Engineering: Basic Concepts, 2nd Edition- Michael L. Shulur and Fikret Kargi
2. Biochemical Engg Fundamentals-Baily, Ollis. MGH
3. Biochemical Engineering: A Textbook for Engineers, Chemists and Biologists- Shigeo Katoh and Fumitake Yoshida
4. Enzyme Kinetics: A Modern Approach – Alejandro G. Marangoni
5. Enzyme Kinetics and Mechanisms- Kenneth B. Taylor

References:

1. Biochemical Engg Fundamentals-Baily, Ollis. MGH
2. Prescott & Dunn's Industrial Microbiology Macmiller
3. Principles of Fermentation Technology- Allan Whitaker, Peter F. Stanbury, and Stephen J. Hall

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 multi-disciplinary

Special Remarks (If any): Nil

Name of the Course: Plant Maintenance safety and Hygiene	
Course Code: PE-FT 601B	**Semester: VI**
Duration: 6 months	**Maximum Marks: 100**

Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./ week	Mid Semester Exam.: 15 Marks
Tutorial: Nil	Assignment & Quiz: 10 Marks
Practical: Nil	Attendance: 5 Marks
Credit Points: 3	End Semester Exam: 70 Marks

Atleast 45hrs/Sem

Objective:

1	Purpose to provide students about the safety measure in the plant to avoid accident
2	Can provide knowledge about the maintenance operation in the plant
3	Safety and hygiene of the operation also on the angle of Food Safety

Pre-Requisite: The following modules (or equivalents) should be preferably completed prior to, this module:

1	Knowing the basic process Technology of different food Processing operations
2	Process flow Flow-sheet and working principle of different Food Processing equipment

Details of Syllabus

Unit	**Content**	**Hrs/ Unit**	**Marks / Unit**
1	Plant maintenance program; Role of maintenance staff and plant operators; Preventive maintenance; Guidelines for GMP & safety precautions; Lubrication & lubricants; Work place improvement through '5S'	10	
2	The objective of safety, health & environment; Cost of safety; Accident investigation report; Safety promotional activity; ISO 45001-Occupational health and safety; Environmental pollution and its control	13	
3	Indian Factories Act on safety; HACCP; Desirable safety features of some food processing equipment; Personal protective equipment; Safety from adulteration of food, Food fraud and Food defense	10	
4	Hygiene and sanitation requirement in food processing and biochemical industries; Cleaning (CIP Systems), sanitizing & pest control in food processing; Safety during receiving- unloading- shifting and storage of food materials and packaging materials ;–General safety facilities in construction sites	12	

Text and Reference Books:

Text and reference books:

1. Basic Concepts of Industrial Hygiene, Ronald M Scott, CRC Press.
2. Safety design criteria for industrial plants. Maurizio Cumo& Antonio Naviglia.CRC Press.
3. Industrial Hygiene & Toxicology by Josef Brozek-1948.
4. Food Hygiene, Microbiology & HACCP. S J Forsythe, P R Hayes. Springer.

Course Outcome:

After completion of the course the students will be able to

CO1: To analyze the plant operation in food processing plant

CO2: To correlate the plant operational hazards with Food Safety

CO3: To identify different types of hazards and establishing control measures

CO4: Understanding of possible cause of accident in plant and its safety measure

CO5: Hygiene and sanitation requirement in food processing and allied industries

Special Remarks (If any): Nil

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Syllabus for B. Tech in Food Technology

(Applicable from the academic session 2018-2019)

Name of the Course: Food additives		
Course Code : PE-FT 601C	**Semester: VI**	
Duration: 6 months	**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**
Theory: 3 hrs./ week		Mid Semester Exam.: 15 Marks
Tutorial: Nil		Assignment & Quiz: 10 Marks
Practical: Nil		Attendance: 5 Marks
Credit Points: 3		End Semester Exam: 70 Marks
Objective:		
1.	Able to define the class, function and uses of additives	
2.	Able to relate the various role of additives	
3.	Able to apply their knowledge in formulation with the uses of different additives.	
4.	Able to select suitable additives in food composition	
5.	Able to categorize uses of additives with regulations and food laws	
Pre-Requisite:		
1.	At least 45 units of undergraduate study in a particular profession	
2.	Basic knowledge of organic, inorganic and physical chemistry	

Details of Syllabus:

Unit	Content	Hrs/ Unit	Marks / Unit
1	Definitions of Food Additives, Basic criterion of additives, Classification and Functions, Legitimate uses of Additives in foods, Intentional & Non Intentional additives, Indirect food additives; Food uses and functions in formulations; Toxicological evaluation of food additives (intake assessments), generally recognized as safe (GRAS),	10	
2	Regulations and food laws on food additives, Joint FAO/WHO Expert Committee (JECFA)/CODEX recommendation for harmonization and control of food additives, GFSA	5	
3	Uses & functions of: Acid, Base, Buffer systems, Salts, acidulants and Chelating/Sequestering agents, Artificial sweeteners and health implications ; Low calorie and non nutritive sweeteners, Polyols.	8	
4	Antioxidants and chelating agents, Emulsifying and stabilizing agents, Anti-caking agents and Humectants, Thickeners, Firming agents. Flour bleaching agents and Bread improvers. Fat mimetics and replacers	9	
5	Anti microbial agents / Class I, Class II and Class III preservatives as per PFA Act. Acceptable Daily Intake (ADI) recommendation by JECFA, Carry-Over of	4	

	Food Additives from ingredients and raw materials into foods, Clarifying agents. Tracers and other additives.		
6	Colours and Flavours (synthetic and natural) Types of flavors, flavor emulsions; essential oils and oleoresins, Flavor enhancer, Method of analysis	8	
7	Risks and benefits of food additives, Food additives and hypersensitivity, Nutritional additives	3	

Text and Reference Books:

1. Gerorge AB. 1996. Encyclopedia of Food and Color Additives. Vol. III.CRC Press.

2. Branen AL, Davidson PM & Salminen S. 2001. Food Additives. 2nd Ed.Marcel Dekker.

3. Fenaroli's Handbook of Flavor Ingredients. 5th Ed.CRC Press.

4. Fennema OR.1996. Food Chemistry. Marcel Dekker

5. Stephen AM. (Ed.). 2006. Food Polysaccharides and Their Applications.Marcel Dekker.

Course Outcome:

After completion of the course the students will be able to

CO1: Able to relate the various roles of additives
CO2: Able to apply their knowledge in formulation with the uses of different additives.
CO3: Make use of different type of food additives in various foods
CO4: Able to select suitable additives in food composition
CO5: Able to categorize uses of additives with regulations and food laws

Special Remarks (If any): Nil

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Syllabus for B. Tech in Food Technology

(Applicable from the academic session 2018-2019)

Name of the Course: Data Base Management System (DBMS)	
Course Code: OE FT-601	**Semester: VI**
Duration: 6 months	**Maximum Marks: 100**

Teaching Scheme	**Examination Scheme**
Theory: 2 hrs./ week	Mid Semester Exam.: 15 Marks
Tutorial: Nil	Assignment & Quiz: 10 Marks
Practical: Nil	Attendance: 5 Marks
Credit Points: 2	End Semester Exam: 70 Marks

Objective:

- To learn about the basics of DBMS
- To provide a general introduction to relational model
- To learn about SQL
- To learn about ER diagrams
- To learn about Transaction Processing

Pre-Requisite: Basic knowledge of mathematics, algorithm, programming

Details of Syllabus

Unit	Content	Hour
1	**Introduction:** Concept & Overview of DBMS, Data model, Database language, Database administrator, Database users, Three Schema architecture of DBMS.	4
2	**Entity-Relationship Model**: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity sets, Extended E-R features.	4
3	**Relational Model:** Structure of relational Databases, Relational Algebra, Relational; calculus, Extended Relational Algebra operations, Views, Modification of the Database.	4
4	**SQL and Integrity Constraints**: Concept of DDL, DML, DCL. Basic structure, Set operations, Aggregate functions, Null values, Domain constraints, Referential integrity, Constraints, assertions, views, Nested sub queries, Data base security application development using SQL, Stored procedures and triggers	5
5	**Relational Database design**: Functional dependency, Different anomalies in designing a Database, Normalization using functional dependencies, Decomposition, Boyce-Codd normal form, 3NF, Normalization using multi-valued dependencies, 4NF, 5 NF.	5
6	**Internal of RDBMS**: Physical data structures, Query optimization: join algorithm, statistics and cost base optimization, Transaction processing, Concurrency control	4

	and recovery management: transaction model properties, state serializability, look base protocols, two phase lockin	
7	**File organization & index** structures File & records concepts, Placing file records on disk, Fixed and variable sized records, Types of single –Level index (primary. Secondary, clustering), Multilevel Indexes, Dynamic multilevel indexes using B tree and B+ tree.	4

Text books:

1. Abraham Silberschatz,Henry F.Korth,S.Sudarshan,2010,McGraw Hill,ISBN 00352332-1
2. Data CJ –An introduction to database, 8th edition, 0321197849
3. Elmasri and Navathe,Fundamentals of Database system Publishing,ISBN,9780136086208
4. Peter rob,CarlosCoronet,Database systems-Disgn,Edition,2009,Thomson Learning,ISBN:978-0538469
5. R.P. Mahapatra, Database Management Systems, Khanna Publishing House, New Delhi

Course Outcomes

CO1: Understand the fundamentals of Database management systems
CO2: Generate proof for good database design after carefully eliminating certain problems inherent in initial database design
CO3: Design logical database schema and mapping it to implementation level schema through database language features
CO4: Understand the practical problems of Concurrency control and gain knowledge about failures and recovery
CO5: Explain the different types of databases and file organization

Name of the Course: Food Processing Lab	
Course Code: PC-FT 691	**Semester: VI**
Duration: 6 months	**Maximum Marks: 100**

Teaching Scheme	**Examination Scheme**
Theory: Nil	Maximum marks: 100 Marks
Tutorial: Nil	Continuous Internal Assessment: 40 Marks
Practical: 3 hrs./ week	External Assessment: 60 Marks
Credit Points: 1.5	Distribution of marks: Experiments - 40 Marks Viva – 20 Marks

Course Outcomes:	
1	Ability to learn different methods applied to processing of foods
2	Ability to understand and classify changes of raw food materials during postharvest storage and transformation into food products
3	Ability to understand the significance of food processing on food preservation
4	Ability to construct process flow diagrams.
5	Ability to operate various equipments
6	Ability to calculate and present analytical results obtained during practical experiments in a safe and responsible way
Pre-Requisite:	
1	Elementary chemistry
2	Plant biology
3	Unit operations
Practical:	
	1) Intellectual skills-
	2) Motor skills- Juicer, Pulper, Crown corking machine, Double jacketed Kettle, Baking Oven/ OTG, Freezer, Incubator, Refractometer

Laboratory Experiments:	
1	Preparation of fruit juice/ squash/ nectar
2	Preparation of jam & jelly using suitable fruits
3	Preparation of tomato ketchup/ sauce
4	Preparation of pickle
5	Preparation of bread/ cake/ cookies/ biscuits
6	Manufacture of ice cream

7	Manufacture of traditional Indian sweetmeats (Rosogolla/ Sandesh)
8	Manufacture of yoghurt
9	Manufacture of alcohol from conventional and/ or non conventional substrates

Text and Reference Books:

1. Sivasankar, B. "Food Processing & Preservation", Prentice Hall of India, 2002.
2. Khetarpaul, Neelam, "Food Processing and Preservation", Daya Publications, 2005.
3. Food Science by Potter
4. Fruit and Vegetable Preservation by Srivastava and Sanjeev Kumar

Special Remarks (If any):

Name of the Course: Food Analysis & Quality Control Lab – I	
Course Code: PC-FT 692	**Semester: VI**
Duration: 6 months	**Maximum Marks: 100**

Teaching Scheme	**Examination Scheme**
Theory: Nil	Maximum marks: 100 Marks
Tutorial: Nil	Continuous Internal Assessment: 40 Marks
Practical: 3 hrs./ week	External Assessment: 60 Marks
Credit Points: 1.5	Distribution of marks: Experiments - 40 Marks Viva – 20 Marks

Course Outcomes:	
1	To know the methods of selecting appropriate techniques for analysis of food products.
2	To apply knowledge in identifying and determining the relative amounts of components in food sample.
3	To gain knowledge on food standards, regulations and quality control
4	To obtain knowledge of adulterants in foods.
5	To 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.
6	To familiarize with the current state of Knowledge in food analysis.
Pre-Requisite:	
1	Basic analytical techniques
2	Handling of glassware, chemicals and equipments
3	Basic knowledge of solution preparation, chemical reactions
4	Spectrophotometric , titrimetric, gravimetric, volumetric and chromatographic principles
5.	Basic knowledge of Food Chemistry, Food Microbiology and Food preservation

Practical:	
	1) Intellectual skills-
	2) Motor skills- Spetrophotometer, pH meter, Hot Air Oven/ Moisture Analyzer, Soxhlet Apparatus, Kjeldhal Unit, Viscometer, Turbidity Meter, Muffle Furnace, Laminar Air Chamber, Autoclave, Incubator, Colony Counter, Reflux Condenser
	Glasswares, chemicals & consumables

Laboratory Experiments:	
1	Determination of adulterants in milk and milk products
2	Analysis of milk, sweetened condensed milk (SCM)
3	Analysis of wheat flour, bread, biscuits & extruded products
4	Estimation of a) Iodine value, (b) Saponification value (c) acid value (d) peroxide value, (e) RM value (f) P value of edible fats and oils
5	Determination of adulterants in fats and oils
6	Analysis of ready – to- eat (RTE) & ready-to-drink (RTD) products

Text and Reference Books:

1. FSSAI Manuals
2. Raghuramulu, N. et al., "A Manual of Laboratory Techniques". 2nd Edition. NIN, 2003.
3. Nielson, S. Suzanne. "Food Analysis" 3rd Edition. Springer, 2003.
4. Pomeranz, Yeshajahu and Clifton E. Meloan "Food Analysis : Theory and Practice". 3rd Edition. Springer, 2000.

Special Remarks (If any):

Name of the Course: Database Management System Lab (DBMS Lab)	
Course Code: OE-FT 691	**Semester: VI**
Duration: 6 months	**Maximum Marks: 100**

Teaching Scheme	**Examination Scheme**
Theory: Nil	Maximum marks: 100 Marks
Tutorial: Nil	Continuous Internal Assessment: 40 Marks
Practical: 2 hrs./ week	External Assessment: 60 Marks
Credit Points: 1	Distribution of marks: Experiments - 40 Marks Viva – 20 Marks

Objectives:

- Lay Foundation knowledge in database concepts, technology and practice to groom students into well -informed database application developers.
- Strong practice in SQL programming through a variety of database problems.
- Develop database applications using front -end tools and back –end DBMS.

Course Outcomes:	
1	Create, Update and query on the database.
2	Demonstrate the working of different concepts of DBMS
3	Implement, analyze and evaluate the project developed for an application
Pre-Requisite:	
1	Basic computing skills
2	Data analysis knowledge
Practical:	
	Intellectual skills-Programming skills

Laboratory Experiments:	
1	**Creating Database:** •Creating a Database, •Creating a table, •Specifying Relational Data Types, •Specifying Constraints, •Creating Indexes.
2	**Table and record Handling:** INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements, DROP, ALTER statements
3	**Retrieving Data from Database:** The SELECT statement, Using the WHERE clause, Using Logical Operators in the WHERE clause, Using IN, BETWEEN, LIKE, ORDER,BY GROUP BY and HAVING
4	**Clause:** Using AGGREGATE function, Combining Tables using JOINS Sub queries

5	**Database Management:** Creating views ,Creating Column Aliases, Creating Database Users, Using GRANT and REVOKE
6	**Cursors** in Oracle PL / SQL :Writing Oracle PL / SQL **Stored Procedures**

Text and Reference Books:

1. Database Systems: A Practical Approach to Design, Implementation and Management" by CONNOLLY
2. Database Management Systems by R.P. Mahapatra, Khanna Publishing House, New Delhi

Special Remarks (If any):