

classification - Ingredients used in the preparation - Caramel, toffee and fudge - Processing. Processing of liquorice paste, cream paste and aerated confectionery products - Ingredients- their function - Ingredients and Processing

UNIT V- Confectionery products and Quality Standards

Tablets, Lozenges, Sugar panning tablets, granulated confectionery, medicated confectionery - Ingredients and Processing. Chewing gums, fondants, Marzipan - Ingredients & Processing. Crystallized confectionery - Processing -Ingredients and their functions. Quality and standards/ Regulations to be followed in the Bakery Industry and packaging requirements. Quality and standards/regulations to be followed in the confectionery Industry and packaging requirements

TEXT BOOKS

1. US wheat Associates .Baker's Handbook on Practical Baking
2. John Kingslee .A Professional Text to Bakery and Confectionery. New Age International, NewDelhi. EB Jackson. Sugar Confectionery Manufacture. Aspen Publications

III Year B.Tech. Food Tech. I-Semester

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**FT309 REFRIGERATION ENGINEERING
AND COLD CHAIN
(ELECTIVE - I)**

Course Description & Objectives:

This course will impart basic knowledge of refrigeration process and equipment. By the end of the course students will be able to understand the refrigeration process their application in processing and increasing shelf life of food, also to make students aware of cold chain design and storage.

Course Outcomes:

By the end of the course students will be able understand

1. *Refrigeration and air-conditioning, types, properties and working of refrigerants.*

2. *Vapour compression cycle and different types of evaporators.*
3. *Different types of evaporators and their advantages and disadvantages.*
4. *Processing of fruits and vegetables, meat products etc. by freezing and quality changes during freezing.*

UNIT I- Refrigeration and air conditioning

Definition of refrigeration and air conditioning - Necessity of refrigeration and air conditioning - Factors affecting comfort air conditioning. Definition of Refrigerant - History of refrigerants - Classification of Refrigerants – Primary Refrigerants - Secondary Refrigerants - Halo carbon refrigerants. Azeotrope refrigerants - Inorganic refrigerants - Ammonia - Air - Carbon dioxide – Sulphur dioxide - Water. Hydro carbon refrigerants - Designation system for refrigerants. Desirable properties of an ideal refrigerant - Selection of a refrigerant. Thermodynamic properties of refrigerants.

UNITII- Refrigerators& Refrigerants

Chemical requirements of refrigerants - Physical properties of refrigerants. Secondary refrigerants - Brines. Types of Refrigerators - Air Refrigerator - Vapour refrigerator - Advantages and Disadvantages of Vapour compression refrigeration system over air refrigeration system. Mechanism of a simple Vapour compression refrigeration systems. Evaporators - Capacity of an evaporator - Factors affecting heat transfer capacity of an evaporator - Types of evaporators. Bare tube coil evaporator - Finned evaporator - Plate evaporator - Shell and tube evaporator.

UNIT III- Evaporator

Shell and coil evaporator - Tube in tube evaporator - Flooded evaporator - Dry expansion evaporator. Natural convection evaporator - Forced convection evaporator - Frosting evaporators – Non Frosting evaporators - Defrosting evaporators. Compressors - Classification - Suction pressure, Discharge pressure, Compression ratio, Suction volume, Stroke volume, Clearance factor, Compressor capacity, Volumetric efficiency. Reciprocating compressors - Parts of a reciprocating compressor - Cycle of a reciprocating compressor. Rotary compressor - Centrifugal compressor - Advantages and disadvantages of a centrifugal compressor.

UNITIV- Condensers

Condensers - Working of a condenser - Factors affecting the condenser capacity – Heat rejection factor. Classification of condensers - Air cooled

condensers - Water cooled condensers - Tube in tube condenser - Shell and coil condenser. Fouling factor - Differences between air cooled and water cooled condensers – Evaporative condenser. Expansion Devices - Types of expansion devices - Capillary tube. Hand operated expansion valve - Low side float valve - High side float valve. Ice manufacture - principles of ice production. Applications of refrigeration in different food products.

UNIT V- Freezing

Food Freezing - Freezing systems - Indirect contact systems Plate Freezers - air blast Freezers - Freezers for liquids foods. Direct contact systems - Air blast - Immersion. Frozen food properties - Density – Thermal conductivity - Enthalpy - Apparent specific heat- Apparent thermal diffusivity. Freezing time – Factors influencing freezing time - Freezing rate - Thawing time. Quality changes in foods during frozen storage.

TEXTBOOKS:

1. Adithan, M. and Laroia, S. C. 1991. Practical Refrigeration and Air Conditioning. Wiley Eastern Ltd., New Delhi
2. Arora, C. P. 1993. Refrigeration and Air Conditioning. Tata MC Graw Hill Publishing Co.Ltd.,NewDelhi.

III Year B.Tech. Food Tech. I-Semester

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**FT311 ENGINEERING PROPERTIES
OF FOOD MATERIALS
(ELECTIVE - I)**

Course Description & Objectives:

This course will impart knowledge about the various properties of food and their handling and storage

By the end of the course students will be able to understand physical, chemical and mechanical properties of food and their handling and storage.

Course Outcomes:

By the completion of the course students will be able to understand

1. Engineering properties of food and biomaterials.