

Programme Project Report (PPR)
for
Distance Learning Programme under School of Distance Education

DIPLOMA IN FOOD PROCESSING (DFP)

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Academic support by

**Inter University centre for Organic Farming and Sustainable Agriculture
(IUCOFSA)**

Mahatma Gandhi University

Kottayam, Kerala

DIPLOMA IN FOOD PROCESSING

(Distance Learning Programme - Diploma Programme)

Programme Project Report

Mahatma Gandhi University started the School of Distance Education in 1989 with a vision to provide the opportunity of quality education to all realms of society. Since the beginning, thousands of students availed this opportunity for higher education throughout Kerala to a great extent and also outside the state to some extent. But after the new directions of UGC in 2014, University had stopped all its Off-Campus Centres of the School of Distance Education inside and outside the State.

Now it is the new endeavour to revamp the functioning of the school with different types of Diploma and Certificate programmes very relevant to the contemporary society, in addition to the conventional Graduate and Post Graduate programmes with the academic and infrastructural support of the eminent Schools and interdisciplinary interuniversity Centres of the University. All these Schools/ Centres have already conducted similar Programmes or Post Graduate Programmes in the same area. This Diploma Programme has been designed by the Inter University center for Organic Farming and Sustainable Agriculture and to be conducted by the School of Distance Education with the academic support of the School.

Mahatma Gandhi University has established an Inter University Centre for Organic Farming and Sustainable Agriculture (IUCOFS) to encourage and promote development of organic farming and sustainable agriculture in the country.

a) Programme Objective :

The food industry is one of the largest industries in the world and needs highly trained professionals to ensure the sustainable supply, quality and safety of food and food engineering. The objective of this course is to offer in- depth study of various areas related to Food Science and Technology so as to enable the students to understand food composition its nutritional, microbiological and sensory aspects. This program also trains the students in the processing and preservation techniques of food items .They are also taught about the importance of safety, quality, plant sanitation of food, food laws and regulations, and packaging in food industry.

b) Relevance of the programme

Food Scientists: Food Technology students have good career opportunities to work as Food scientists who work on determining the quality of existing methods of food packaging and processing. The Food Corporation of India (FCI) offers jobs to large number of people in the purchase, storage, transport and distribution of food grains. Private enterprises market bread, fruit juices, edible oils and soft drink concentrates. Food processing companies and food research labs hospitality industry are also looking for expert degree holders in food technology. Government is mulling over adding five hundred more Food parks all over the country. This will generate more jobs for Food technologists.

c) Nature of prospective target group of learners:

Students from various streams can join for the programme. Thus the prospective target groups of learners include undergraduates, postgraduates, researchers and the general public who are desirous of studying such a programme.

d) Appropriateness of programme to be conducted in Open and Distance Learning mode to acquire specific skills and competence:

The course provides an outline of theoretical information and practical experience, directly and indirectly related to a better understanding of food processing and also its issues and solutions. The programme is framed for transmission of both knowledge and know-how of local importance and global significance to the students.

e) Instructional design:

The programme is of twelve month durationwith comprising of eight courses with a total of 32 credits. There are adequate contact classes and practicals involve both internal as well as external components. Each student has to submit a report based case studies or project.

Duration of Course – 12 Months

Course Code	Course Name	Contact Session (hrs)	Credits	*Internal Marks	External Marks	Total Marks
DFP 101	Fundamentals of Food Science	12 Hrs	4	20	80	100
DFP 102	Food Preservation	12 Hrs	4	20	80	100
DFP 103	Agro-Processing	12 Hrs	4	20	80	100
DFP 104	Bakery and Confectionary	12 Hrs	4	20	80	100
DFP 105	Milk and Milk Product Processing	12 Hrs	4	20	80	100
DFP 106	Fundamentals of Nutrition	12 Hrs	4	20	80	100
DFP 107	Food Quality Control and Waste Management	12 Hrs	4	20	80	100
DFP 108	Practical and Project Report	60 Hrs	2 +2	20	80	100
	Total	144Hrs	32	160	640	800

f) Procedure for admission, curriculum transaction and evaluation:

Candidates (10+2, undergraduates, graduates, and postgraduates) are eligible for admission irrespective of age.

Admission to the programme will be done by the University through a common procedure for all the programmes under the School of Distance Education. A pass in the Plus Two level is the minimum eligibility for the admission. Fee structure will be decided by the University. The School will prepare an academic calendar/activity planner and will be circulated among all the learners at the time of admission itself. The academic calendar will include all the significant activities, important dates, schedule of submission of assignments, schedule of contact classes, schedule of examinations, etc.

Evaluation of the courses shall be done by the faculty themselves on the basis of internal assessment and end semester examinations. 20% of the marks will be decided by the internal evaluations and the remaining 80% by the end semester examinations which will be done by the University. The performance of a student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points.

Each student shall be required to do one Assignment/Book Review/Debate/Seminar/Presentation of case study for each course. Assignments/Book Review after valuation shall be returned to the students. The teacher shall define the expected quality of the above in terms of structure, content, presentation and the like, and inform the same to the students.

Grading System will be followed for the evaluation on a ten point scale. The details of the grading system are given in the following Table.

Percentage Equivalence of Grade:

Range of % of Marks	Grade Letter	Performance	Grade Point
95 - ≤ 100	O	Outstanding	10
85 - < 95	A plus	Excellent	9

75 - < 85	A only	Very Good	8
65 - < 75	B plus	Good	7
55 - < 65	B only	Above Average	6
45 - < 55	C	Average	5
40 - < 45	P	Pass	4
< 40	F	Fail	0
Absent	Ab	Absent	0

'P' grade is required for a minimum pass in a course. The minimum GPA required for a pass in the Certificate programme is 4.

Calculation of Grade Point Average (GPA) :

Credit Points for the Course = (No. of Credits assigned for the course x Grade Point secured for that course).

GPA indicates the performance of a student in the programme. GPA is based on the total **credit points** earned by a student in all the courses divided by the total number of credits assigned to the courses required in the programme.

Note: GPA is computed only if the candidate passes in all the required courses (gets a minimum required grade for a pass in all the required courses as per the curriculum).

GPA =

$$\frac{\text{Total credit points earned by the student from all the required courses of the programme}}{\text{Total credits of all courses required in the programme}}$$

This formula shall be printed on the Grade Card issued to the student with a note that it could be used to convert the grades into mark-percentages. (The details of the grading system as indicated above shall also be printed on the Grade Card).

Conversion of GPA to Grade

GPA	Grade
10	O
9.0 - < 10	A plus
8.0 - < 9	A only
7.0 - < 8	B plus
6.0 - < 7	B only
5.0 - < 6	C
4.0 - < 5	P
< 4	F
Absent	Ab

Conversion of GPA to percentage

$$\text{Equivalent Percentage} = (\text{GPA obtained}) \times 10$$

g) Requirement of the laboratory support and library resources:

The library and infrastructure support of the Centre and the University will be extended to the learners as per the requirement.

Mahatma Gandhi University Library and Information System consists of University Library, libraries of the Schools and 4 study centre Libraries. The University Library was established in 1989. The University Library which is situated in the main campus occupies purpose-built accommodation, and provides a variety of facilities and has a user-friendly environment. These include individual work spaces, room for group study and teaching, audio-visual access and online information retrieval system. The building of the University Library is 2000 sq.m in area consisting of the cellar, the ground floor and the first floor.

Academic as well as public users are given the facility to use the library. Special category membership is provided to journalists. The library is providing service from 8 am to 8 pm in three shift timings for its staff. The library functions on an average of 345 days in a year. The libraries of teaching departments are open during working hours of the Schools. Reading space is provided in all the three floors housing the various sections of the library. The library provides reading facility to the visually impaired users too. For this, an electronic lab custom made for visually and physically challenged users has been set up during 2016.

The University Library has a Library Advisory Committee. It is an 18 member committee with Vice-Chancellor as Chairman and University Librarian as Convener.

The library has a collection of 59,000 books, 232 journals, 2,135 Ph.D. theses and has access to 15000+ e-journals under E-ShodhSindhu. The activities of the Library are comprehensively automated using open source library management software KOHA. OPAC, Journal Article Index, By monthly Bibliography compilation and Literature Search Service are also available

The library is a member of the INFLIBNET Centre, Ahmedabad as well as DELNET (Developing Library Network). As a member of these networks, the library provides access to the resources of other major libraries in the country. In addition to the access to UGC INFONET consortium, it has access to major online databases, such as EBSCO, ProQuest dissertations and theses, Oxford Scholarship Online, IEEE All Society Periodicals Package etc. Mahatma Gandhi University had won the State IT Award during the year 2009 in the e-learning category for its university online theses digital library. The various department libraries have a good collection of subject specific books and journals.

A. MAHATMA GANDHI UNIVERSITY LIBRARY	
Category	No.
Books	59000
Journals	232
Bound Journals	7500
Ph.D Theses	2135
E-Journals (in UGC-Infonet, renamed as E-ShodhSindhu)	15000
Online databases (in UGC Infonet)	11
Online Archives subscribed	185 Titles
Online databases subscribed	4
E-books	7338
DVDs: Educational Videos	293

h) Cost estimate of the programme and the provisions:

Budget estimate

S.No.	Item	Amount (Rs. in Lakhs)
1.	Manpower	5
2.	Study material	2
3.	Laboratory	3
4.	Books and Periodicals	1
5.	Institutional visit	1
6.	End semester examination	1.5
7.	Project Work	1
	Total	14.5 Lakh

Total Programme fee: Rs. 15000/-

i) Quality assurance mechanism and expected programme outcomes:

The quality of the programme will be ensured through strict monitoring by an executive committee including the Co-ordinator of the programme, the subject experts, Director, School of Distance Education and Head of the Inter University center for Organic Farming and Sustainable Agriculture. The Co-ordinator of the programme shall ensure the regular student feedback of courses, teachers and programme in the prescribed format towards the end of the semester and the same shall be analysed to draw conclusions for effecting improvement. Periodical review meetings on the programme efficacy will be held in which the remarks of teachers on curriculum, syllabi and methods of teaching and evaluation will be given due importance. Moreover, the progress and the quality of the programme will be monitored by the Internal Quality Assurance Cell of the University from the

outcome and feedback of the learners as well as the proper documentation maintained in the Centre.

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Syllabus

DIPLOMA IN FOOD PROCESSING (DFP)

DFP 101: Fundamentals of Food Science

(4+0: Theory Course)

Objectives:

To enable students to

- 1) Understand the basic concept, functions, and classification of food.

Unit 1- Carbohydrates and Proteins

Classification and structure of Carbohydrates: Sources of carbohydrates; Physico-chemical and functional properties; (reaction with phenyl hydrazine, NH_2OH , oxidation, reduction, ring formation); Basic concepts of Starch, cellulose, Glycogen, Pectin, Agar-agar, Gum-Arabic; Reducing and nonreducing sugar: concept and their estimation. Basic idea about Gelatinization, Gel formation, Retrogradation, Crystallization, Caramelization, Maillard reaction.

Classification of amino acid, Sources and physico-chemical and functional properties of proteins; structure of protein; protein denaturation; Common food proteins. protein determination methods, Separation of amino acid by chromatographic method.

Unit II Fats

Fatty acids concepts, classification; essential fatty acids, cis and trans fats; physico chemical and functional properties; Defects (rancidity) and their prevention; Chemical constants of fats (acid value, per-oxide value, Saponification number, Iodine value, Reichert-Meissl number); Basic idea about plasticity, hydrogenation, winterization; fats estimation by solvent extraction method

Unit III -Vitamins & Minerals

Minerals and Vitamins: Sources and physiological functions of minerals & vitamins; deficiency disorder; Effect of processing and storage of vitamins, Pro vitamins A & D; Vitamins as antioxidants.

Unit 4 Pigments& Flavouring Agents

Chlorophyll, xanthophylls, anthocyanin, anthoxanthin, tannin, carotenoids, myoglobin (property, functions, stability), synthetic colour, permitted and non-permitted colour

Food Additives

Definition, examples, use and property of — Preservatives – Emulsifying Agent – Food Additives – Antioxidant

Reference Books

1. Text Book of Biochemistry / Webb, Todd, Mason
2. Principles of Biochemistry / Albert L. Leninger / CBS Publishers & Distributors, New Delhi
3. Biochemistry Laboratory Techniques / Sterling Chaykin / Wiley Eastern Pvt. Ltd.
4. Foods Facts & Principles / N. ShakuntalaManay& M. Shadaksharaswamy / New Age International
4. Food Science / N.N. Potter
5. Food Chemistry / L. H. Meyer

DFP 102: Food Preservation

(4+0: Theory Course)

Objectives:

To enable students –

- 1) to acquire knowledge of food preservation and preservation technique.
- 2) to know the importance and basic principles of food preservation.

Unit I Introduction to food preservation. Rationale and specific aspects of food preservation; the importance of preserving of food in terms of food quality and safety. Characteristics of biochemical, microbiological and physicochemical processes.

Unit – II -
-Preservation by low temperature. Methods involved in preservation of food by low temperature. Principles underlying the above methods. Quick and slow freezing – merits and demerits. Thawing, refrigeration, cold storage, dehydrofreezing, Cryogenic freezing etc

Unit – III - Preservation by use of high temperature. - Concept and importance .- Various methods used – Pasteurization, Boiling, Canning - Effect of high temperature on food. Preservation by drying .Preservation by dehydration .Steps in process of dehydration Merits and demerits of dehydration. Effects on Nutritive value in dehydrated foods.

Unit IV Preservation by Fermentation and Irradiation-

Introduction to fermentation (general view), Different fermented food & their quality aspect

Factors effecting fermentation, Intermediate moisture food.

Preservation by radiation, chemicals and preservatives: Definition, methods of irradiation, direct and indirect effect, measurement of radiation dose, dose distribution, effect on microorganisms. Deterioration of irradiated foods- physical, chemical and biological, effects on quality of foods.

Unit –V

Preservation by preservatives. Objectives, principles, types of preservatives. Chemical preservative used in preservation of food, their Role and function, Different types of chemical preservatives. Safety in use and certification levels etc

Reference books

1. Food Process Engineering / D.R. Heldman & R.P. Singh / AVI
2. Food Processing and Preservation / G. Subbulakshmi & S.A. Uddipi / New Age International
3. The Technology of Food preservation / N.W Desrosier / AVI
4. Laboratory manual for Food Canners & Processors 2 vols. / NCA / AVI
5. Principles of Food Science Vol 2 / Karek & Luno Marcel Delker

DFP 103: Agro-Processing

(4+0: Theory Course)

Objectives:

To enable students –

- 1) To understand the processing techniques of agro products.
- 2) To know the use of agro processing equipments.

Course Content:

- Unit I**
- Agro processing industry.
 - Introduction to Agro processing industry.
 - Scope and importance of Agro processed products.
 - Processing equipments – Floor mill, mini grain mill pulverizers, Hammer mill, Floor separator, Dal mill, Packing and Sealing machine, Balance
- Unit – II**
- Cereal grain Processing
 - Different grains suitable for agro processing.
 - Primary and secondary processing of wheat and corn. Types of corn. Methods of Cleaning, grading, milling. Standards for the wheat flour. Adulteration in flour
- Unit – III**
- Pulses and Legumes processing
 - Classification of pulses. Pre milling treatments of pulses, pulse milling and recent developments. Principle of dal milling. Pulses suitable for milling. Different Methods of dal milling Working and principle of dal mill. By-products utilization. Adulteration in pulse
- Unit IV** Storage and packaging Need and importance of storage and packaging methods, Types of packaging materials e.g. paper, glass, metal, plastic, packaging form. Quality standards for packed processed products. Packaging evaluation WVTR, GTR, Bursting strength, tensile strength, tearing strength, drop

DFP 104: Milk, Meat and Fish processing Technology

(4+0: Theory Course)

Unit – 1 Technology of milk and milk products

Sources, and composition of milk, processing of market milk, standardization, toning of milk, homogenization, pasteurization, sterilization, storage, packaging, transportation and distribution of milk. Milk product processing-cream, butter, ghee, cheese, cheese spread, condensed milk, evaporated milk, whole and skimmed milk powder, ice cream, khoa, channa, chakka, paneer, pedha, fermented milk products - Yoghurt, dahi, shrikhand and similar products. Instantization

of milk and milk products. Judging and grading of milk and its products. In-plant cleaning system.

Unit – II Technology of meat products

Sources and types of meat, meat products in India, its importance in national economy. Chemical composition and microscopic structure of meat. Effect of feed, breed and management on meat production and quality. Slaughtering of animals and poultry, inspection and grading of meat. Factors affecting post-mortem changes, properties and shelf-life of meat. Meat quality evaluation. Mechanical deboning, meat tenderization. Aging, pickling and smoking of meat. Meat plant sanitation and safety, Byproduct utilization. Recent trends in meat processing.

Unit – III Technology of poultry products

Structure, composition, nutritive value and functional properties of eggs and its preservation by different methods. Factor affecting egg quality and measures of egg quality. Recent development in eggs processing.

Unit – IV Fish Processing Technology

Types of fish, composition, structure, post-mortem changes in fish. Handling of fresh water fish. Canning, smoking, freezing and dehydration of fish. Fish sausage and home making. Radiation processing, meat safety.

DFP 105 FRUIT AND VEGETABLE PROCESSING TECHNOLOGY

(4+0: Theory Course)

Unit I Introduction

Scenario of fruits and vegetables in India and World. Post harvest management of fruits and vegetables-control of losses in harvesting, and handling operations. Scope of fruit and vegetable preservation industry in India. Present status, constraints and prospects

Unit II Canning of Fruits and Vegetables

Preparation of fruits and vegetables for canning. – Washing, peeling, grating, slicing dicing, deseeding, blanching - Importance of Blanching operations - Batch and Continuous Blanching.- Hot water and Steam Blanching.- Canning operations – precautions in canning operations, Spoilage of canned foods. Common machinery for operations like Peeling, Slicing/Dicing, Pulping, Grating and canning process.

Unit-III Value addition of fruits and vegetables

Processing technology for manufacturing of fruit juices, pulp, RTS beverage, nectars, squash, syrups, cordials, Carbonated.

Processing of Tomato: paste, ketchup, sauce, puree, soup, chutney etc. Drying and dehydration technology of fruits and vegetables: preparation of raisins, anardana, dried fig, dried leafy vegetables, juice powders, flakes, wafers, chips etc. Fermented fruits and vegetables products like sauerkraut, pickles, wines etc. Utilization of By-products and wastes from fruits and vegetables processing industry

Unit IV Aseptic and other methods of processing

Aseptic processing and Bulk packing of Fruit juice concentrates, Pulps and Puree - Brief information on Asepticity and how it is strictly maintained in the plant - Aseptic heat exchangers for sterilizing and concentrating the product - Aseptic fillers. Different system of filling practiced. Tetra pack for small quantities - Dole system and Scholle system for bulk storage in Bag & Boxes and Bag & Drums. - Storage of Aseptically packed products. Minimal Processing and packaging of vegetables, Brief study of Hurdle technology as applied to Vegetable and Fruit processing

Reference books

1. Post Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetable- E. B. Pantastico, AVI Publishing Company, INC.
2. Post Harvest: An Introduction to the Physiology and Handling of Fruits and Vegetables- R.B. Wills, M.B. Mc Glasson, D. Graham, T.L. Lee and E.G. Hall.
3. Post Harvest Technology of Fruits and Vegetables: Handling, Processing, Fermentation and Waste Management Vol. I and II- Verma L. R. and Joshi V.K.
4. Fruit and Vegetable Preservation Principles and Practices -Srivastava R.P. and Sanjeev Kumar
5. Preservation of Fruits and Vegetables-Khader
6. Fruit and Vegetable Preservation -Bhutani R.C.
7. Principles of Fruit Preservation- Morris, Thomas Norman,.

DFP 106 EMERGING TECHNOLOGIES IN FOOD PROCESSING

(4+0: Theory Course)

Objectives

To enable the student to understand:

1. Emerging / alternative technologies applied to food processing

Unit I High pressure processing of Foods

Principles – applications to food systems – effect on quality – textural, nutritional and microbiological quality – factors affecting the quality – modeling of high pressure processes – High Pressure Freezing, Principles and Applications

Unit II Pulsed electric field processing of Foods

Principles – Mechanism of action – PEF treatment systems – Main processing parameters – PEF Technology – Equipments – Mechanism of microbial and enzyme inactivation- safety aspects– Processing of liquid foods using PEF – Process models – Comparison of High pressure processing and PEF – Enzymatic Inactivation by PEF, Examples – Microbiological and chemical safety of PEF foods

Unit III Osmotic dehydration of Foods

Principle – Mechanism of osmotic dehydration – Effect of process parameters on mass transfer – Methods to increase the rate of mass transfer – Applications – Limitations of osmotic dehydration – Management of osmotic solutions

Unit IV Hurdle technology

Basics of hurdle technology – Mechanism Application to foods - Newer Chemical and Biochemical hurdles- organic acids – Plantderived antimicrobials – Antimicrobial enzymes – bacteriocins – chitin / chitosan (only one representative example for each group of chemical and biochemical hurdle)

Text Books

1. Da-wen Sun: Emerging Technologies for Food Processing, Elsevier Academic PressMarcel Dekker Inc. NY (1995)

DFP 107. Food Legislation, Quality control & Packaging

(4+0: Theory Course)

Unit 1 sensory evaluation

Food Sensory Characteristics, Sensory evaluation of food by subjective method- Difference tests, Sensitivity test, Rating test, Objective method- colour (Theory of spectrophotometer & colorimeter, selection of filter, Colour measurement by CIE system (principle only), Colour specification), viscosity & texture (Fluid behaviour-Newtonian and Non-Newtonian fluid characteristics, Plastic behaviour of liquid food, Brookefield Viscometer (Principle), Rheological properties of fruit juice and concentrate, Different textural attributes of food, Texture measurement instruments and unit of measurement, Instron testing machine).

Unit –II food packaging

Introduction to packaging. Packaging operation, package-functions and design. Principle in the development of protective packaging. Deteriorative changes in foodstuff and packaging methods for prevention, shelf life of packaged foodstuff, methods to extend shelf-life. Food containers-rigid containers, corrosion of containers (Tin plate). Flexible packaging materials and their properties. Food packaging materials and their properties. Food packagesbags, pouches, wrappers, carton and other traditional package. Containerswooden boxes, crates, plywood and wire bound boxes, corrugated and fibre board boxes, textile and paper sacks.

Unit –III Special problems in packaging of food stuff

Consideration in the packaging of perishables and processed foods. Evaluation of packaging, material and package performance, packaging equipment, package standards and regulation. Shrink packaging. Bar coding, aseptic and retortable pouches. Flexible and laminated pouches, aluminium as packaging material. Biodegradable packaging. Active packaging

Unit- IV Food quality control and assurance

Objectives, importance and functions of quality control. Methods of quality assessment, GMP, GLP, assessment of food materials-fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products, sampling and specification of raw materials and finished products, sorting and grading. Food laws and standards, food regulations, grades and standards, Concept of Codex / FPO / FSSAI / HACCP / USFDA / ISO 9000 / AGMARK /MPO/ MMPO /MFPO series

etc. Food adulteration and food safety. Sensory evaluation-introduction, panel screening, selection methods. Interaction and thresholds. Sensory and instrumental analysis in quality control. IPR and patents

Unit- V Marketing and business administration

Principles of marketing and business administration, patents and trademarks, statutory rules, health regulations, Indian and foreign regulations. Export regulations. Trade Act regulations relating to maintaining hygienic conditions. Export and inspection agencies. Nature, objectives and scope of financial management, financial planning and control, capital structure, recent developments in financial management.

DFP 108: Practical and Project Report

- 1)Weights and Measures of raw and cooked food.
- 2)Preparation of product by Gelatinization.
- 3)Introduction to drying equipments
- 4)Processing of food product
 - i)Jack Fruit
- 5)Blanching of vegetables
- 6)Introduction to freezing equipments
- 7)Preservation by using chemical preservatives
 - i)Tomato ketchup
 - ii)Fruit squash
- 8)Introduction to Bakery and Confectionery Equipments
- 9)Preparation of Cake
- 10)Preparation of Cookies
- 11)Preparation of Chocolate
- 12)Physical examination of milk
- 13)Platform tests of milk
- 14)Determination of Fat content of milk
- 15)Preparation of Flavoured milk
- 16)Preparation of Condensed milk
- 17)Preparation of Curds and Shrikhand
- 18)Preparation of Khoa
- 19)Preparation of Gulabjamun
- 20)Preparation of Paneer
- 21)Preparation of Rasgulla
- 22)Preparation of Ice-cream and Kulfi