

UNIVERSAL DIET PLANNING USING FOOD TECHNOLOGY AND NUTRITION

ABSTRACT

Nutrition is a key determinant of human health, influencing physical development, metabolic efficiency, and disease prevention. However, designing balanced diets is complex because nutritional requirements vary depending on age, metabolic rate, lifestyle, and cultural dietary patterns.

This project develops a **Universal Diet Planning Framework** that integrates principles of **food technology, nutrition science, metabolism, and dietary guidelines** to design balanced diet models for diverse populations.

The project combines **qualitative understanding of food science** with **quantitative nutritional analysis**, including energy calculations using Basal Metabolic Rate (BMR), Total Daily Energy Expenditure (TDEE), macronutrient distribution ratios, and Recommended Dietary Allowances (RDA).

The final outcome is a conceptual universal diet planning model supported by diet tables for different age groups and metabolic conditions. The framework demonstrates how scientific nutrition principles and food technology concepts can guide effective dietary planning.

1. INTRODUCTION

Food provides energy and nutrients essential for survival, growth, and maintenance of body functions. Nutrition science studies how nutrients interact with the body, while food technology focuses on the processing, preservation, safety, and quality of food products.

Modern dietary patterns have significantly changed due to urbanization, technological development, and increased availability of processed foods. As a result, nutritional imbalances and lifestyle-related diseases have become more prevalent.

A well-designed diet must provide adequate amounts of carbohydrates, proteins, fats, vitamins, and minerals while considering metabolic demands and lifestyle patterns. However, designing individualized diets for large populations can be complex.

The concept of **Universal Diet Planning** aims to develop a systematic framework that provides balanced dietary guidance adaptable to different individuals based on age, metabolic rate, and activity levels.

This project explores the integration of food technology and nutritional science to design a universal diet planning system that promotes health, prevents disease, and ensures nutritional adequacy.

2.OBJECTIVES OF THE PROJECT

The objectives of this project are:

- To study the principles of food technology and nutrition science.
- To understand digestion, metabolism, and energy requirements in humans.
- To analyze macronutrient and micronutrient requirements for balanced diets.
- To study food processing technologies and their effects on nutritional quality.
- To evaluate dietary guidelines provided by global health organizations.
- To develop a Universal Diet Planning framework that integrates qualitative and quantitative nutritional principles.

3.HUMAN DIGESTION AND METABOLISM

The digestive system breaks down food into nutrients that can be absorbed and utilized by the body.

Digestive Process

1. **Ingestion** – food intake through the mouth
2. **Digestion** – mechanical and chemical breakdown of food
3. **Absorption** – nutrients enter the bloodstream
4. **Assimilation** – nutrients are utilized by body cells

Metabolism

Metabolism refers to biochemical processes that convert food into energy.

Two major metabolic processes include:

- **Catabolism** – breakdown of molecules to release energy
- **Anabolism** – synthesis of molecules for growth and repair

4. MACRONUTRIENTS AND MICRONUTRIENTS

Macronutrients

Macronutrients provide energy and structural components for the body.

Nutrient	Energy Value
Carbohydrates	4 kcal/g
Proteins	4 kcal/g
Fats	9 kcal/g

Carbohydrates

Primary energy source for the body.

Examples:

Rice, wheat, fruits, potatoes.

Proteins

Important for tissue repair, enzyme production, and immune function.

Sources:

Eggs, milk, legumes, pulses.

Fats

Provide concentrated energy and support vitamin absorption.

Sources:

Nuts, seeds, vegetable oils.

Micronutrients

Micronutrients are essential vitamins and minerals required in small quantities.

Examples include:

Vitamin A

Vitamin C

Iron

Calcium

Zinc

Deficiency of micronutrients can cause several health problems.

5.RECOMMENDED DIETARY ALLOWANCES (RDA)

Recommended Dietary Allowances represent the average daily intake required to meet the nutritional needs of healthy individuals.

Example RDA values

Nutrient	Adult Male	Adult Female
Energy	2500 kcal	2000 kcal
Protein	60 g	55 g
Calcium	600 mg	600 mg
Iron	17 mg	21 mg
Vitamin C	40 mg	40 mg

These values vary depending on age and physiological conditions such as pregnancy or physical activity.

6.ENERGY REQUIREMENTS AND DIETARY CALCULATIONS

Basal Metabolic Rate (BMR)

BMR represents the minimum energy required by the body at rest.

BMR Formula

For men:

$$\text{BMR} = 10W + 6.25H - 5A + 5$$

For women:

$$\text{BMR} = 10W + 6.25H - 5A - 161$$

Where

W = weight in kg

H = height in cm

A = age in years

Total Daily Energy Expenditure (TDEE)

TDEE accounts for energy used in daily activities.

Sedentary	1.2
Light activity	1.375
Moderate activity	1.55
Very active	1.725

Example 1

BMR = 1400 kcal

Light activity factor = **1.375**

$TDEE = 1400 \times 1.375$

TDEE = 1925 kcal

Example 2

BMR = 1650 kcal

Moderate activity factor = **1.55**

$TDEE = 1650 \times 1.55$

TDEE = 2557.5 kcal

TDEE \approx 2558 kcal

Example 3

BMR = 1800 kcal

Very active factor = **1.725**

$TDEE = 1800 \times 1.725$

TDEE = 3105 kcal

7. FOOD TECHNOLOGY AND FOOD PROCESSING

Food technology plays a vital role in ensuring food quality, safety, and availability.

Thermal Processing

Pasteurization

Sterilization

Blanching

Non-Thermal Processing

High pressure processing

Irradiation

Cold plasma

Food Preservation

Drying

Freezing

Fermentation

Food processing affects shelf life, nutritional value, and safety of food products.

8.FOOD SAFETY AND QUALITY MANAGEMENT

Food safety ensures that food is safe for human consumption.

Important principles include:

- Hazard Analysis Critical Control Point (HACCP)
- Prevention of food contamination
- Shelf life evaluation
- Food labeling and regulation

Food safety guidelines are regulated by organizations such as **FSSAI and WHO**.

9. UNIVERSAL DIET PLANNING MODEL

Universal diet planning must consider multiple variables:

- Age
- Body weight
- Activity level
- Cultural food preferences
- Health conditions

The diet plan distributes calories across meals and ensures adequate nutrient intake.

Macronutrient Distribution

Nutrient	Percentage
Carbohydrates	50–60%
Proteins	15–20%
Fats	20–30%

10. UNIVERSAL DIET PLAN TABLE

Example Diet Plan (2000 kcal)

Meal	Food Items	Calories
Breakfast	Oats, milk, banana, almonds	400 kcal
Mid-morning snack	Fruit and yogurt	150 kcal
Lunch	Rice, dal, vegetables, salad	600 kcal
Evening snack	Nuts and green tea	200 kcal
Dinner	Chapati, paneer/tofu, vegetables	500 kcal
Total		1850–2000 kcal

SAMPLE UNIVERSAL DIET TABLES

Children (1500 kcal)

Meal	Food
Breakfast	Milk, eggs, fruit
Lunch	Rice, dal, vegetables
Snack	Nuts or yogurt
Dinner	Chapati and

	vegetables
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Adults (2000 kcal)

Meal	Food
Breakfast	Oats and milk
Lunch	Rice/chapati, dal, vegetables
Snack	Fruit or nuts
Dinner	Protein source and vegetables

Elderly (1700 kcal)

Meal	Food
Breakfast	Porridge and milk
Lunch	Rice, lentils, vegetables
Snack	Fruit
Dinner	Light chapati and soup

11.DISCUSSION

The Universal Diet Planning model integrates both scientific nutrition principles and food technology concepts. The framework demonstrates that balanced diets require both qualitative knowledge of food groups and quantitative analysis of energy and nutrient requirements.

The model also highlights the importance of adapting diets to individual needs, cultural practices, and metabolic conditions.

CONCLUSION

The project demonstrates how food technology and nutrition science can be combined to develop a Universal Diet Planning framework. By incorporating energy calculations, nutrient requirements, and food safety principles, the model provides a structured approach for designing balanced diets.

Such dietary frameworks can contribute to improved public health by promoting scientifically guided nutrition practices and preventing lifestyle-related diseases.