I. M.Sc. Home Science (Food and Nutrition) Program Outcomes (POs)

PO No.	Domain	Program Outcome Statement (Aligned to Higher-Order Thinking)
PO 1	Advanced Core Knowledge (Remember, Apply)	Apply advanced principles of human nutrition, food science, and biochemistry to understand metabolic disorders and public health nutrition challenges.
PO 2	Research and Critical Inquiry (Analyze, Create)	Formulate original research questions, design rigorous research methodologies, and analyze complex nutritional data using advanced statistical tools.
PO 3	Problem-Solving & Clinical Application (Apply, Evaluate)	Evaluate nutritional status, and develop evidence-based therapeutic diets and intervention strategies for diverse clinical and community settings.
PO 4	Professional & Enterprise Management (Apply, Create)	Demonstrate leadership and management skills in institutional food service, entrepreneurial ventures, and quality control systems (e.g., HACCP).
PO 5	Technical & Lab Proficiency (Apply, Analyze)	Execute specialized laboratory techniques and instrumentation for the biochemical analysis of food, nutrients, and biological samples.
PO 6	Ethics, Policy & Communication (Evaluate, Apply)	Communicate research findings and complex nutritional information ethically and effectively, adhering to professional standards and public health policies.

II. Course Outcome (CO) to Program Outcome (PO) Mapping (Bloom's Taxonomy)

Semester I Courses (Based on provided M.Sc. F&N Syllabus)

Course Code	Course Title	CO No.	Course Outcome Statement (Action Verb)	PO1	PO2	PO3	PO4	PO5	PO6
CC-1	**Research Methodology and Academic Writing**	1	Analyze the components of the research process and evaluate different research designs (Analyze, Evaluate).	1	3	1	1	1	2
		2	Formulate clear research problems, objectives, and testable hypotheses (Create).	1	3	1	1	1	1
		3	Apply appropriate data collection, statistical analysis, and interpretation techniques (Apply).	1	3	2	1	2	1
		4	Uphold ethical considerations and evaluate literature for plagiarism and bias (Evaluate, Apply).	1	2	1	1	1	3
		5	Develop and structure research reports and academic papers following recognized citation styles (Create).	1	3	1	1	1	3

CC-2	**Advanced Nutritional Biochemistry**	1	Explain the synthesis, breakdown, and detailed regulation of macro-nutrient metabolic pathways (Understand).	3	1	1	1	1	1
		2	Analyze the complex interrelationships between key metabolic pathways and their implications in nutritional disorders (Analyze).	3	2	2	1	1	1
		3	Evaluate the role of hormones, receptors, and signal transduction in maintaining metabolic homeostasis (Evaluate).	3	2	2	1	1	1
		4	Apply the principles of advanced biochemical instrumentation (e.g., Chromatography) for quantitative analysis (Apply).	3	1	1	1	3	1

		5	Relate gene expression and genetic mutations to nutrient requirements and disease susceptibility (Analyze).	3	2	1	1	2	1
CC-3	**Human Physiology**	1	Explain the integrated function and homeostatic mechanisms of the major human organ systems (Understand).	3	1	1	1	1	1
		2	Analyze the structural and functional changes in organ systems related to nutrient deficiency or pathological conditions (Analyze).	3	2	3	1	1	1
		3	Demonstrate proficiency in laboratory techniques for measuring and interpreting vital physiological parameters (Apply).	3	1	1	1	3	1
		4	Correlate basic physiological data (e.g., blood cell	3	3	3	1	1	1

			counts, BT/CT, blood pressure) with clinical health status (Analyze).						
CC-4	**Advances in Food Microbiology**	1	Identify and classify beneficial and detrimental microorganisms in various food systems (Understand).	3	1	1	1	1	1
		2	Analyze the principles of food spoilage, microbial growth kinetics, and foodborne illnesses (Analyze).	3	2	1	2	1	3
		3	Apply physical and chemical control techniques (e.g., preservation methods, sanitation) to enhance food safety and quality (Apply).	3	2	1	3	2	3
		4	Evaluate microbiological quality standards and food safety regulatory systems (e.g., HACCP) (Evaluate).	3	3	1	3	1	3

		5	Design a sampling and testing protocol for assessing the microbial quality of a given food product (Create).	2	3	1	3	3	3

Semester II Courses

Course Code	Course Title	CO No.	Course Outcome Statement (Action Verb)	PO1	PO2	PO3	PO4	PO5	PO6
CC-5	**STATISTICS AND COMPUTER APPLICATION**	1	Explain fundamental concepts of descriptive and inferential statistics relevant to nutritional research (Understand).	1	3	1	1	1	1
		2	Apply appropriate statistical tests (e.g., t-tests, ANOVA) to analyze nutritional and	1	3	2	1	3	1

			health data sets (Apply).						
		3	Utilize statistical and spreadsheet software for data management, computation, and graphical representation (Apply).	1	2	1	1	3	1
		4	Critically evaluate the results of statistical tests for valid interpretation and report generation (Evaluate).	1	3	1	1	1	2
CC-6	**ADVANCE NUTRITION**	1	Explain the physiological functions and detailed metabolism of macro- and micro-nutrients at the molecular	3	1	1	1	1	1

			level (Understand).						
		2	Analyze the concept of Nutrient-Gene interaction and its role in personalized nutrition and disease prevention (Analyze).	3	2	1	1	2	1
		3	Evaluate the nutrient requirements (e.g., RDA, DRI) for different physiological states (e.g., pregnancy, lactation) and life stages (Evaluate).	3	1	3	1	1	1
		4	Develop nutritional strategies to address chronic non-communicable diseases based	3	2	3	1	1	2

			on molecular evidence (Create).						
CC-7	**FOOD SCIENCE**	1	Describe the physiochemical properties and functional roles of major food components (carbohydrates, proteins, fats) (Understand).	3	1	1	1	1	1
		2	Analyze the effect of various processing techniques (e.g., heating, freezing, drying) on food quality and nutrient retention (Analyze).	3	2	1	2	1	2
		3	Apply principles of food chemistry to optimize food product formulation and	3	2	1	3	3	1

			sensory attributes in the lab (Apply).						
CC-8	**FOOD PACKAGING AND SENSORY EVALUATION**	1	Identify and explain the functions and types of various food packaging materials and systems (Understand).	2	1	1	3	1	2
		2	Analyze the interaction between packaging material, food, and the environment (Analyze).	2	2	1	3	1	3
		3	Apply various sensory evaluation methods (discriminative, descriptive, affective) to assess food	1	3	1	3	3	1

			product quality (Apply).						
		4	Design a suitable packaging and sensory evaluation protocol for a new food product (Create).	1	3	1	3	3	1
DEC-1	**CURRENT TRENDS AND ISSUES IN FOOD & NUTRITION**	1	Discuss recent advances and contemporary research topics in the field of Food and Nutrition (Understand).	3	2	1	1	1	1
		2	Analyze the impact of global issues (e.g., food security, climate change) on national and international nutritional health (Analyze).	2	3	2	1	1	3

		3	Evaluate public health policies and initiatives addressing current nutritional challenges (Evaluate).	2	3	3	1	1	3
MEC-1	**NUTRITION FOR HEALTH & FITNESS**	1	Explain the role of nutrition in enhancing physical performance, exercise, and stress management (Understand).	3	1	2	1	1	1
		2	Design personalized diet and fluid plans for athletes and individuals with specific fitness goals (Create).	3	2	3	1	1	2

Semester III Courses

Course Code	Course Title	CO No.	Course Outcome Statement (Action Verb)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CC-9	**NUTRITION IN EMERGENCIES AND DISASTER**	1	Explain the immediate and long-term nutritional consequences of various types of disasters and emergencies (Understand).	3	1	2	1	1	2
		2	Analyze the methods for rapid nutritional assessment and surveillance in affected populations (Analyze).	3	3	3	1	1	2
		3	Design and evaluate effective and culturally sensitive food and nutritional relief programs	2	3	3	2	1	3

			(Create, Evaluate).						
CC-10	**CLINICAL AND THERAPEUTIC NUTRITION**	1	Explain the pathophysiology and metabolic basis of major chronic and acute diseases (Understand).	3	1	1	1	1	1
		2	Analyze clinical data (laboratory tests, medication) and determine patients' nutritional needs (Analyze).	3	2	3	1	2	1
		3	Develop and customize therapeutic diet plans (oral, enteral, parenteral) for specific medical conditions (Create).	3	2	3	1	1	2

		4	Evaluate the efficacy of nutritional intervention strategies and provide follow-up counseling (Evaluate).	3	3	3	1	1	2
CC-11	**INSTITUTIONAL FOOD MANAGEMENT**	1	Describe the principles and systems of institutional food service management (Understand).	1	1	1	3	1	1
		2	Apply management techniques for effective menu planning, purchasing, storage, and inventory control (Apply).	1	1	1	3	1	2
		3	Design efficient workflow	1	2	1	3	2	1

			patterns and kitchen layouts based on principles of work simplification (Create).						
		4	Evaluate and implement critical quality assurance and food safety programs (e.g., HACCP) in mass food production (Evaluate).	2	2	1	3	1	3
CC-12	**ASSESSMENT OF NUTRITIONAL STATUS**	1	Explain the principles and limitations of direct (clinical, biochemical, anthropometric) and indirect (dietary, ecological) assessment	3	1	2	1	1	1

			methods (Understand).						
		2	Apply appropriate field and lab techniques to accurately collect anthropometric and biochemical data (Apply).	3	3	3	1	3	1
		3	Analyze and interpret collected data to diagnose individual and community nutritional problems (Analyze).	3	3	3	1	2	1
		4	Formulate public health recommendations based on comprehensive nutritional	2	3	3	1	1	2

			assessment findings (Create).						
CC-D1	**DISSERTATION (Preliminary Work)**	1	Finalize the research problem, objectives, and detailed methodology for the dissertation (Create).	1	3	1	1	1	2
		2	Complete the comprehensive literature review and develop the theoretical framework (Analyze).	1	3	1	1	1	1

Semester IV Courses

Course Code	**Course Title**	**CO No.**	**Course Outcome Statement (Action Verb)**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**

CC-D 2	**DISSERTATION/PROJECT (Final Submission)**	1	Execute the research methodology, including data collection and statistical analysis (Apply, Analyze).	2	3	2	1	3	1
		2	Analyze and interpret research findings and draw evidence-based conclusions that contribute to the field (Analyze).	2	3	2	1	1	2
		3	Produce a comprehensive, well-structured dissertation report	2	3	1	1	1	3

			adhering to all academic and ethical standards (Create, Evaluate).						
		4	Defend the research orally and communicate findings effectively to an expert committee (Evaluate, Communicate).	1	3	1	1	1	3
CC-I	**INTERNSHIP/FIELD PLACEMENT**	1	Integrate theoretical knowledge into practical, professional challenges in an external organization (Apply).	3	1	3	2	1	2

		2	Demonstrate professional ethics, teamwork, and managerial skills in the practical work setting (Apply).	1	1	2	3	1	3
		3	Evaluate the organizational structure, food/nutrition services, and regulatory compliance of the host institution (Evaluate).	2	2	3	3	1	3
		4	Develop a detailed, reflective report and presentation on the learning experience	1	1	3	2	1	3

			and career readiness (Create, Evaluate).						
EEC-2	**RESEARCH COMMUNICATION AND SCHOLARLY PUBLISHING**	1	Explain the principles of effective scientific writing, manuscript preparation, and journal selection (Understand).	1	3	1	1	1	2
		2	Analyze and evaluate different types of research articles (e.g., review, original research, abstract) and their submission guidelines	1	3	1	1	1	3

			(Analyze, Evaluate).						
		3	Apply techniques for effective oral, poster, and digital presentation of research work (Apply).	1	2	1	1	1	3
		4	Identify and adhere to legal and ethical considerations in scholarly publishing (e.g., copyright, authorship) (Evaluate).	1	2	1	1	1	

1. Target Levels (Benchmarks) of Attainment

Assessment Level	Target	Description
CO Attainment Target	70% of students should score 60% or above in the specific assessment component (e.g., a question or lab exercise) linked to that CO.	A high target is essential for a Master's program.
PO Attainment Target	2.5 (on a scale of 3)	The final calculated attainment score for a PO (after aggregating COs) should be at least 2.5 on the 1–3 mapping scale (Low, Medium, High).

2. Direct Attainment Measurement (80% Weightage)

Direct methods- To use student performance data (marks) from internal and external examinations to quantify CO achievement.

Step 2.1: Mapping Questions to COs

The fundamental step is mapping every question in an exam or assessment tool to one or more specific COs.

Course	CO No.	Assessment Tool	Question Example	Max Marks	Target Mark (60%)
CC-3: Human Physiology	**CO 4**	End-Term Exam (Theory)	"Analyze the correlation between a patient's low RBC count and their clinical health status."	10	6
CC-3: Human Physiology	**CO 3**	Practical Exam	Performance in "Determination of Blood Group and Hemoglobin level"	20	12
CC-1: Research Methodology	**CO 7**	Sessional/Internal Exam	"Draft a complete research proposal using APA 7th Edition citation style."	20	12

Step 2.2: Calculating CO Attainment

The attainment is measured for each CO using the performance data:

CO Attainment Level} =

$$= \frac{\text{Number of Students who Score } \geq \text{ Target Mark on CO-mapped Questions}}{\text{Total Number of Students Assessed}} \times 100$$

If the CO Attainment Level is 70% (Target Met): The CO is deemed attained at a level of **3** (High).

- **If the CO Attainment Level is 60% - 69% (Partial Target):** The CO is deemed attained at a level of **2** (Medium).
- **If the CO Attainment Level is < 60% (Target Not Met):** The CO is deemed attained at a level of **1** (Low).

Step 2.3: Calculating Final PO Attainment (Direct)

This step aggregates the attained CO levels using the CO-PO mapping matrix.

Direct PO Attainment Score=

$$\frac{\sum(\text{CO Attainment Score} \times \text{CO-PO Correlation Value})}{\sum(\text{CO-PO Correlation Value})}$$

Example (for PO 2 in CC-1: Research Methodology):

CO	Correlation to PO 2	Attainment Level (e.g.)	Product (Correlation × Attainment)
CO 1	3	2	6
CO 2	3	3	9
CO 3	3	2	6
CO 4	2	3	6
CO 5	3	2	6
CO 6	2	3	6

CO 7	3	2	6
Total	**19**		**45**

Direct PO 2 Attainment Score = 45}{19} = {2.37}

3. Indirect Attainment Measurement (20% Weightage)

Indirect methods gather feedback from stakeholders to assess the subjective perception of skills and abilities.[2] This typically uses **surveys**.

Step 3.1: Stakeholder Surveys

Surveys are conducted using the PO statements as the primary questions, rated on a Likert scale (1 to 5, where 5 is Excellent).

Stakeholder Group	**Time of Survey**	**POs Measured**
Alumni Survey	6–12 months after graduation.	PO 1 to PO 6
Employer Survey	After internship or employment.	PO 3, PO 4, PO 5, PO 6
Exit Survey	At the end of the final semester.	PO 1, PO 2, PO 3, PO 6

Step 3.2: Calculating Indirect PO Attainment

The average score from the Likert scale is normalized to the 1–3 scale used for mapping.

text{Normalized Indirect PO Attainment Score} = frac{text{Average Survey Score}}{5} times 3

Example: If the average Alumni Survey score for PO 3 is 4.0:

Indirect PO 3 Attainment Score = 4.0{5} times 3 = 2.4

4. Final PO Attainment Calculation

The final attainment score for each Program Outcome combines the direct (80%) and indirect (20%) measurements.

Final PO Attainment Score = (0.80 X Direct PO Attainment Score+ (0.20 X Indirect PO Attainment Score

Example (Continuing from PO 2 and PO 3 examples):

PO	**Direct Score (80%)**	**Indirect Score (20%)**	**Final Attainment Score**	**Target (2.5)**	**Status**
PO 2	(0.80 times 2.37) = 1.896	(0.20 times 2.50) = 0.50	**2.396**	2.5	**Not Met** ❌
PO 3	(0.80 times 2.80) = 2.24	(0.20 times 2.40) = 0.48	**2.72**	2.5	**Met**

5. Continuous Quality Improvement (CQI) Loop

The attainment process is completed with a Continuous Quality Improvement (CQI) cycle:

1. Analyze Attainment: Review all Final PO Attainment Scores (e.g., PO 2 failed to meet the target of 2.5).

2. Identify Gaps: Pinpoint the specific COs (and related course topics/assessments) contributing to the low score. For PO 2 (Research), perhaps the performance on the CC-5: Statistics and Computer Application COs was poor.
3. Action Plan: Develop corrective measures (e.g., increase dedicated lab hours for statistical software, redesign the dissertation methodology section of the CC-1 course, or include more rigorous statistical questions in the final exam).
4. Implement & Reassess: Implement the changes in the next academic cycle and repeat the attainment assessment process to confirm improvement.