

**TRIBHUVAN UNIVERSITY**  
*Institute of Science and Technology*



**B.Sc. Nutrition & Dietetics**  
**Syllabus**

**Curriculum Development Centre**  
Tribhuvan University  
Kirtipur, Kathmandu  
Nepal

**Publisher:**

Curriculum Development Centre  
Tribhuvan University  
Kirtipur, Kathmandu,  
Nepal.  
Tel No.: 4-330856, 4-334041

© 2010 by CDC, TU All rights reserved

Effective from 2010

**First Edition:**

500 copies  
2067  
Dec. 2010

Price:

**Printers:**

Tribhuvan University Press  
Kirtipur, Kathmandu, Nepal.

## Table of contents

	Page No.
Introduction	i
Subjects, nature of course and their full marks	iii
<b>FIRST YEAR</b>	
BND 101 Mathematics and Statistics	1
BND 102 Principles of Food Science & Nutrition	6
BND 103 Nutritional Physiology	9
BND 104 Biophysics	11
BND 105 Food Chemistry	14
BND 106 Food and Medical Microbiology	17
<b>SECOND YEAR</b>	
BND 201 Food Processing	21
BND 202 Nutritional Biochemistry	23
BND 203 Food Science I	26
BND 204 Food Science II	28
BND 205 Hygiene and Sanitation	30
BND 206 Food Toxicology	32
<b>THIRD YEAR</b>	
BND 301 Human Nutrition	35
BND 302 Catering and Management	38
BND 303 Community Nutrition & Nutrition Education	43
BND 304 Food Quality Control and Analysis	45
BND 305 Research Methodology and Computer Application	48
<b>FOURTH YEAR</b>	
BND 401 Food Habit and Nutritional Assessment	52
BND 402 Clinical Nutrition	55
BND 403 Dietetics	58
BND 404 Dissertation	61
BND 405 Field Based Posting (Internship, 3 months)	62

# **Introduction**

## **Background**

There is prevalence of malnutrition in most of the developing countries, including Nepal. It is the responsibility of the nation to combat it. In this regard, National Planning Commission prioritized a Bachelor of Science in Nutrition & Dietetics (B.Sc.ND) to address this problem in 2006. Central Campus of Technology, Central Department of Food Technology, Dharan therefore prepared the present course of study for Nutrition & Dietetics (B.Sc.ND).

## **Objectives**

The field of nutrition and dietetics is dedicated to protecting health and saving lives by deploying knowledge and expertise in the field. Hence, the course aims to produce graduates with recognized clinical, public health and management skills. The graduates will be qualified to work as nutritionist and dietitian in the hospital setting and other specialized areas such as community and public health, and food industry sector.

## **Eligibility for admission**

Candidates who have passed I.Sc., 10+2 in science, I. Tech. in Food/Lab technology, or equivalent shall be considered eligible to apply for admission to B.Sc.ND.

## **Admission criteria**

An applicant seeking admission to B.Sc.ND must appear in an entrance examination of two hours duration. The selection of the students for admission will be based on their merit in the entrance examination.

## **Course structure**

The entire B.Sc.ND course is of four academic years. The whole course is divided into four parts, each of one year duration and 500 marks. In total, twenty papers are offered. Four theory papers are given 50 marks each while the rest sixteen papers are given 100 marks each. Eleven papers carry practical parts, the marks distribution for theory and practical being 75% and 25%, respectively. In the fourth year, there are

two additional compulsory courses, namely, (i) dissertation, and (ii) field-based posting (3 month internship), each carrying 100 marks. Short field visits will be decided by the Nutrition & Dietetics Instruction Committee.

### **Hours of instruction and attendance**

Working period will be 150 lecture hours (each lecture of 50 min duration) for the paper of 100 marks. One theory paper of 100 marks will have 4 lectures per week. One practical paper of 25 marks will have 4 hours of practical per week. An attendance of 70% in the class is compulsory.

### **Examination**

Students should appear in 3-hour examination for theory paper of 100 as well as 75 full marks; and a 2-hour examination for theory paper of 50 as well as 37.5 full marks. Practical examination for 25 full marks will have a duration of 6 hours.

### **Evaluation system**

Students will have to pass separately in theory and practical examinations. Pass marks in theory and practical will be 35 and 40%, respectively.

Dissertation as well Internship (Field-based posting) will have pass marks of 40%.

A student having passed all the years' examination will be graded as follows:

- a. Distinction – 75% and above
- b. 1<sup>st</sup> division – 60% and above
- c. 2<sup>nd</sup> division – 45% and above

## Subjects, nature of course and their full marks

Details of subjects in each year, nature of course and marks distribution are as follows:

### First Year

<i>Course Code No.</i>	<i>Subject</i>	<i>Nature of course</i>	<i>F.M</i>
BND 101 A	Mathematics & Statistics	Th	75
BND 101 B	Mathematics & Statistics	Pr	25
BND 102 A	Principle of Food Science & Nutrition	Th	100
BND 103 A	Nutritional Physiology	Th	50
BND 104 A	Biophysics	Th	37.5
BND 104 B	Biophysics	Pr	12.5
BND 105 A	Food Chemistry	Th	75
BND 105 B	Food Chemistry	Pr	25
BND 106 A	Food & Medical Microbiology	Th	75
BND 106 B	Food & Medical Microbiology	Pr	25
Total			500

### Second Year

<i>Course Code No.</i>	<i>Subject</i>	<i>Nature of Course</i>	<i>F.M.</i>
BND 201 A	Food Processing	Th	75
BND 201 B	Food Processing	Pr	25
BND 202 A	Nutritional Biochemistry	Th	100
BND 203 A	Food Science I	Th	100
BND 204 A	Food Science II	Th	75
BND 204 B	Food Science II	Pr	25
BND 205 A	Hygiene & Sanitation	Th	50
BND 206 A	Food Toxicology	Th	50
Total			500

### Third Year

<i>Course Code No.</i>	<i>Subject</i>	<i>Nature of Course</i>	<i>F.M</i>
BND 301 A	Human Nutrition	Th	100
BND 302 A	Catering & Management	Th	75
BND 302 B	Catering & Management	Pr	25
BND 303 A	Community Nutrition & Nutrition Education	Th	100
BND 304 A	Food Quality Control & Analysis	Th	75
BND 304 B	Food Quality Control & Analysis	Pr	25
BND 305 A	Research Methodology & Computer Application	Th	100
Total			500

### Fourth Year

<i>Course Code No.</i>	<i>Subject</i>	<i>Nature of Course</i>	<i>F.M</i>
BND 401 A	Food Habit & Nutritional Assessment	Th	75
BND 401 B	Food Habit & Nutritional Assessment	Pr	25
BND 402 A	Clinical Nutrition	Th	75
BND 402 B	Clinical Nutrition	Pr	25
BND 403 A	Dietetics	Th	75
BND 403 B	Dietetics	Pr	25
BND 404 B	Dissertation	Pr	100
BND 405 B	Field Based Posting (Internship, 3 months)	Pr	100
Total			500
Grand total			2000

\*A= Theory (Th)

\*\*B = Practical (Pr)

# Mathematics and Statistics

Full marks: 75 + 25  
Lecture hour: 113 hrs  
Year: I

## Course Code No.: BND 101 A

### Nature of the course

Theory

### Course objectives

The main purpose of this course is to provide theoretical and practical knowledge on using the techniques of differentiation, integration and differential equations to the related problems.

The objective is to provide the knowledge of basic principles and concepts of descriptive statistics, probability, statistical methods, and their applications in simple problems.

### Course Content

#### Mathematics (Part A)

1. Differential calculus: (12 hrs)
  - a. Differential coefficient and derivative
  - b. Successive derivatives
  - c. Indeterminate forms and limits
  - d. Maxima and minima
  - e. Partial differentiation, higher order derivatives
2. Integral calculus: (12 hrs)
  - a. Rules and different standard methods of integration
  - b. Anti-derivatives of some standard forms and rational fractions
  - c. Properties of definite integral, area under plane curves (with reference to under plane curve, ellipse, parabola, circle and between curves and lines)
3. Differential equation: (12 hrs)
  - a. Definition and classification, formulation of differential equations



- b. Solutions of differential equation of first order first degree (by variable separation, homogeneous equation, exact equation and linear equation method)
- c. Linear differential equation with constant coefficients (equation of second order)
- d. Homogeneous linear equation

## **Mathematics (Part B)**

### **Statistics**

- 4. Descriptive statistics:
  - a. Introduction (1 hr)
  - b. Data presentation (5 hrs)
    - Nature and sources of statistical information
    - Frequency distribution
    - Tabular, diagrammatic, and graphic presentation of data
  - c. Fundamental statistical measures: (10 hrs)
    - Measures of location, partition values and dispersion
    - Concepts of moments, measures of skewness and kurtosis
  - d. Correlation, regression and least square fitting: (10hrs)
    - Scatter diagram, correlation, coefficient of correlation and coefficient of determination, Spearman's rank correlation
    - Linear regression, coefficients of regression, multiple and partial correlation coefficient, fitting of multiple regression up to 3 variables
    - Principle of least square fitting of polynomials and exponential curves
- 5. Probability:
  - e. Introduction to probability and random variables: (10 hrs)
    - Random experiment, events, types of events and sample space

- Definitions, axioms, interpretation, properties of probability
  - Additive and multiplicative laws of probability, conditional probability and Bay's theorem
  - Definition of random variable (discrete and continuous); distribution function (discrete and continuous); expectations of r.v., sums, jointly distributed r.v., covariance and correlation
- f. Probability distributions: (12 hrs)
- Discrete probability distributions
  - Binomial distribution: concepts, definitions, distribution function, properties and applications.
  - Poisson's distribution: concepts, definitions, distribution function, properties and applications.
  - Continuous probability distribution
  - Normal distribution: concepts, definition, properties, applications
6. Statistical methods:
- g. Sampling and estimation: (8 hrs)
- Concepts of sample and population, principles of sampling, random and non-random sampling, types of random sampling, methods of sampling, sampling error, standard error, concepts of sampling distribution
  - Theory of estimation, properties of good estimator (definitions only), point and interval estimates, confidence interval for population mean and proportion, determination of sample size
- h. Significance testing: (9 hrs)
- Concepts of null and alternative hypothesis, formulation of hypothesis, hypothesis testing procedure, two types of error in hypothesis testing, one tailed and two tailed tests
  - Z tests: tests the mean of normal population, large sample test for population mean, large sample test for population proportion, tests for difference between two population means

- The t- test: test of significance of single mean for small sample, test of significance of single proportion, t- tests for difference between two population means, paired t-test, testing for difference between population proportions
  - Chi squared tests: test of goodness of fit, test of independence.
- i. Experimental design and analysis (5 hrs)
- General concept of experimental design
  - F- test and analysis of variance (ANOVA) of one way and two way classification
- j. Statistical quality control: (7 hrs)
- Importance of statistical method in industrial research and practices, causes of variations, control limits and tolerance limits
  - Control charts for variables (mean and range chart, mean and S D chart)
  - Control charts for attributes (concepts)
  - Concepts of acceptance sampling plans for attribute and variables

**Course Code No.: BND 101 A**

**Practical (Statistical computations)**

1. Construction of tables, bar diagrams, pie charts and graphs (frequency polygon and curve, histogram and ogive)
2. Computations of mathematical and non-mathematical averages
3. Computations of measures of dispersion (Q. D., M. D., S. D. and C.V.)
4. Computation of moments, coefficients of skewness and kurtosis
5. Computation of regression and correlation coefficients
6. Fitting multiple regression line; finding multiple and partial correlation coefficients
7. Least square fitting of up to 3 degree, fitting exponential curves
8. Computation of probabilities in different conditions
9. Fitting binomial, Poisson's, and normal distribution

10. Finding areas under normal curve in different conditions
11. Finding confidence interval for mean and proportion
12. Test of single mean for large and small sample (variance known /unknown case)
13. Test of equality of two population means for large and small samples (variance known/ unknown case)
14. Test for a proportion and the test for equality of two proportions
15. Test for a population variance and two population variances
16. Test for goodness of fit and test for consistency in  $2 \times 2$  table
17. Carry out one way and two way ANOVA
18. Construction of mean and range chart,
19. Exercises on statistical computation using software packages like Excel, SPSS, Genstat, etc.

### References

1. Das, B.C. & Mukherjee, B.N. *Differential Calculus*, U. N. Dhur & Sons Pvt. Ltd. India (1996)
2. Das, B.C. & Mukherjee, B.N. *Integral Calculus and Differential equation*, U. N. Dhur & Sons Pvt. Ltd. India (1996).
3. Gupta, S. C. *Fundamentals of Statistics*. Himalaya Publishing House, India. (1992)
4. Montgomery, D.C. *Introduction to Quality Control*, John Willey & sons,
5. Pant, G. D. and Shrestha, G. S. *Integral Calculus and Differential equation*, Sunila Prakasan, Kathmandu, Nepal (2003).
6. Saxena, H. C. *Elementary Statistics*, S. Chand and Company, India (2005).
7. Shrestha, H. B. *Statistics and Probability - Concepts and Techniques*, Ekta books Distributors, Nepal
8. Singh, M.B, and Bajracharya, B.C. *Differential Calculus*, Sukunda Pustak Bhawan, Kathmandu, Nepal (2004).
9. Thomas, G. B. and Finney, R.L. *Calculus and Analytical Geometry*, Pearson Education Asia, India.

# Principles of Food Science & Nutrition

Full marks: 100  
Lecture hour: 150 hrs  
Year: I

**Course Code No.: BND 102 A**

## **Nature of the course**

Theory

## **Course objectives**

The main purpose of this course is to provide theoretical knowledge to the students about foods, their functions, components, nutritional aspects, underlying principles to preserve the food and also provide the knowledge on food laws and standards; knowledge of nutrition on food groups, and selection, meal planning, preparation and cooking, nutritional labeling and consumer protection. Therefore, the course includes foods, their components, functions, deterioration and control, quality attributes, principles of food preservation, food products, food packaging, food additives, basic food groups, food selection, food preparation and cooking methods, food law and standards, meal planning and management, food fortification, and food safety.

## **Course Content**

1. Introduction to food science and nutrition: definition, scope, role and responsibilities of food scientists and nutritionists; recent developments in food science and nutrition. (3 hrs)
2. Food and its functions (4 hrs)
3. Constituents of food: (35 hrs)
  - a. Elementary introduction: functions, properties and uses of carbohydrates, proteins and lipids
  - b. Vitamins: types, effect of processing on vitamins.
  - c. Minerals: biochemical functions, types, and principles of determination of calcium, iron and iodine
  - d. Dietary fiber: definition, types, role and functions, determination.
  - e. Organic acids and their roles.
  - f. Natural food toxicants: their effects and methods of their removal from foods.

- g. Natural pigments in foods: definition, types, distribution, roles, uses and preservation.
- h. Water: functions, significance, methods of determination.
- 4. Nutritive aspect of food constituents: (10 hrs)
  - a. Food and energy: calorie and its requirements, determination of energy in foods.
  - b. Nutrient and calorie requirement of various age groups.
  - c. Functions and deficiency diseases associated with vitamins: (i) fat-soluble vitamins, e.g., A, D, E, & K; (ii) water-soluble vitamins, e.g., B-complex and vitamin C.
  - d. Deficiency diseases of minerals: Ca, P, Fe, Cu, Zn, Na, K, I and their prevention.
- 5. Food quality: definitions and attributes. (6 hrs)
- 6. Food deterioration and control: causes and control measures. (6 hrs)
- 7. Food Preservation: principles and methods: (15 hrs)
  - a. Heat preservation
  - b. Cold preservation.
  - c. Drying and dehydration
  - d. Use of acids, salt, sugar, oil and spices.
  - e. Concentration and use of chemicals
  - f. Irradiation, microwave, and ohmic processing of foods.
  - g. Fermentation.
- 8. Food and food products: (20 hrs)
  - a. Cereals and their products, e.g., bread, cake and biscuits.
  - b. Legumes and oilseeds
  - c. Milk, and milk products: milk, market milk, curd, ghee, paneer
  - d. Meat, fish, poultry and eggs.
  - e. Fats & oils and their products
  - f. Vegetables and fruits: green leafy vegetables, succulent roots and tubers, citrus fruits, mango, apple, papaya, banana.
- 9. Food packaging: principle, types, properties and methods of testing. (10 hrs)
- 10. Food additives: definition, classification, functions; properties, uses of antioxidants, emulsifiers and stabilizers, colorings matters, spices and flavorings, non-nutritive sweeteners, mineral and vitamin supplements, curing agents, preservatives. (10 hrs)
- 11. Basic food groups and food selection, factors affecting food acceptance, food guide to aid food selection. (5 hrs)
- 12. Food preparation and cooking methods of foods; effects of preparation and cooking on food components. (5 hrs)

13. Meal planning and management: meal planning for the family and various age groups; meal pattern – vegetarian and non-vegetarian (8 hrs)
14. Food fortification. (2 hrs)
15. Food sanitation and hygiene (2 hrs)
16. Food law and standards. (2 hrs)
17. Food safety and food labeling (2 hrs)
18. Food adulteration and consumer protection. (5 hrs)

### **References**

1. Begum, R.M. *A textbook of Food, Nutrition and Dietetics*. Sterling Publishers Pvt Ltd, New Delhi. (2000).
2. Desrosier, N.W. and Desrosier, J.N. *The Technology of Food Preservation*. 4th ed. AVI Publishing Co., Westport, Conn. (1977)
3. Fennema, O.W. *Principle of Food Science: Part I. Food Chemistry*. Marcel Decker, New York. (1976)
4. Harris, R.S. and Karmas, E. *Nutritional Evaluation of Food Processing*. 2nd ed. AVI Publishing Co. Westport, Conn. (1975).
5. John, M.deMan. *Principle of Food Chemistry*, 3rd Ed, An ASPEN Publishers, Maryland. (1999).
6. Marriott, N.G.(1997). *Essential of Food Sanitation*, Chapman and Hall. International Thomson Publishing.
7. Mudambi, S.R. and Rajagopal, M.V. *Fundamentals of Food and Nutrition*. 3rd ed. Wiley Eastern Limited New Delhi. (1993).
8. Mudambi, S.R. and Rao, S.M. *Food Science*. Wiley Eastern Limited New Delhi. (1990)
9. Norman, N.P. *Food Science*. 3rd ed. AVI Publishing Co., Westport, Conn. (1978).
10. Passmore, R. and Eastwood, M.A. Davidson and Passmore, *Human Nutrition and Dietetics*. Churchill Livingstone, New York. (1975).
11. Potter, N.N. and Hotchkiss, J.H.. *Food Science*. Klumer Academy Plenum Publishers, New York. (1998)
12. WHO. *The Health Aspect of Food and Nutrition*. 3rd ed. Regional Office for the Western Pacific, Manila. (1979).

# Nutritional Physiology

Full marks: 50  
Lecture hour: 75 hrs  
Year: I

**Course Code No.: BND 103 A**

## **Nature of the course**

Theory

## **Course objectives**

The course provides theoretical knowledge on food components, their interaction with the human body, roles of micronutrients, deficiency diseases, and ways to prevent them.

## **Course Content**

1. Introduction: an overview of human physiology - body's composition, the body's cells, the body fluids; the cardiovascular system, the hormonal and nervous system, the digestive system, the excretory system, the storage system and other systems. (18 hrs)
2. The physiology of digestion and absorption: major organs involved in digestion and absorption; hormones and enzymes involved in digestion; digestion of nutrients - carbohydrates, proteins, fats, vitamins and minerals; absorptive cells, types of absorption (16 hrs)
3. Energy balance and weight control: energy requirement for basal metabolism, energy for physical activities, physiological energy value of foods. (5 hrs)
4. Roles and functions of macronutrients: role and functions of carbohydrates and benefits of dietary fibers; regulation of glucose level in blood; Type II diabetes mellitus, glycemic index of foods; role and functions of protein in the body, protein quality, essential amino acids and amino acid balance; role and functions of fats in the body, essential fatty acids, saturated and unsaturated fats, *trans* fats and their relation with cardiovascular diseases. (18 hrs)
5. Role of micronutrients: vitamins - fat-soluble and water-soluble vitamins, functions of various vitamins, storage of vitamins in the



body, toxicity of vitamins; Minerals - functions of various minerals with special emphasis on iron and iodine. (8 hrs)

6. Life cycle approach of nutrition: focus on nutrients and nutrient related issues of infant and children, adolescents, pregnant and lactating women, elderly and nutrients need for sports. (10 hrs)

### **References**

1. Frances Sizer, F. and Whitney, E. *Nutrition: Concepts and Controversies*, 7th edn., Wadsworth Publishing Company, (1997)
2. Swaminathan, M.S. *Advanced Text Book on Food and Nutrition*, Vol. I, The Bangalore Printing and Publishing Company Ltd. (1993)
3. Gordon, M.W. *Perspectives in Nutrition*, 4<sup>th</sup> edn., McGraw-Hill Publication (1999)

# Biophysics

Full marks: 37.5 + 12.5

Lecture hour: 57 hrs

Year: I

**Course Code No.: BND 104 A**

## **Nature of the course**

Theory

## **Course objectives**

The main objective of the course is to impart fundamental concept of physics in relation to nutrition & dietetics. The students will acquire knowledge on properties of matter, thermodynamics, optics, electricity, and electromagnetic radiation.

## **Course Content**

1. Properties of Matter (9 hrs)
  - a. Different types of elastic constants and their relation, coefficient of rigidity of a cylinder, bending moment
  - b. Surface tension and surface energy, pressure difference across a spherical surface, excess pressure inside a liquid drop or an air bubble, excess pressure inside a soap bubble
  - c. Viscosity, coefficient of viscosity, steady flow of liquid through pipe, comparison of viscosities, Oswald Viscometer, Stoke's law, terminal velocity, Poiseuille's method for coefficient of viscosity.
2. Thermodynamics (15 hrs)
  - a. Introduction, thermodynamic equilibrium, Zeroth law of thermodynamics, thermodynamic scale of temperature, principle of thermocouple
  - b. First law of thermodynamics, isothermal & adiabatic changes, second law of thermodynamics, heat & work in engines, Carnot cycle & efficiency.
  - c. Production of low temperature, freezing mixture, cooling by evaporation, refrigeration, vapor compression machine and vapor absorption machine - refrigeration.

- d. Thermal radiation, concept of black body radiation, laws of black body radiation, Wein's displacement law, Planck's theory of radiation, detection of thermal radiation, Stefan-Boltzmann law.
3. Optics (15 hrs)
- a. Wave: introduction, type, superimposition, and properties; production, properties and uses of ultrasonic wave
  - b. Interference, optical path, Young's two slit experiment, Newton's rings, color in thin film due to transmitted and reflected light
  - c. Diffraction: diffraction at single slit, diffraction pattern of images, resolving power.
  - d. Polarization of light, polarized & unpolarized light, Brewster's law, Malus law, Nicol's prism.
4. Electricity (10 hrs)
- a. AC circuits: AC through capacitor, AC through inductor; series circuits - LR in series, CR in series, LCR in series; resonance, AC power
  - b. Electromagnetic waves: production of electric field from moving magnetic field; production of magnetic field from moving electric field; electromagnetic waves, its properties and spectrum, infra-red rays, ultra-violet rays & microwave - their sources, applications & the hazards to the health, microwave oven
  - c. Atomic structure: proton, electron & neutron, mass & atomic numbers, electron shells & energy levels, isotopes, excitation & ionization.
5. Radiation (8 hrs)
- a. High energy radiation and health physics: X-rays and gamma rays – introduction, radio-isotopes and their applications in medical, industrial, agricultural and scientific research; biological effects of radiation, hazards due to external and internal sources, hazards due to radio-isotopes, nuclear weapons
  - b. Radio-sensitivity, high radiation dose, radioactivity units, Geiger Muller tube.

## **Course No.: 104 B**

### **Practical**

1. Determination of surface tension of water by Jaeger's method
2. Determination of coefficient of viscosity of the given liquid by Stoke's method.
3. Determination of wavelength of sodium by measuring the diameters of Newton's rings.
4. Determination of specific rotation of sugar solution by using Laurent's half-shade polarimeter.
5. Study the magnetic field produced by a current carrying solenoid using a search coil and an A.C. source.
6. Study the relationship between current and frequency in a series LCR circuit and (a) find the resonant frequency, (b) the quality factor, (c) the band width of resonant circuit.
7. Draw the plateau curve for a Geiger Mueller counter.

### **References**

1. Alpen, E.L. *Radiation biophysics*, Prentice-Hall, New Jersey
2. Greene, E.S. *Principle of physics*
3. Nelkon and Parker. *Advanced level physics*, 5<sup>th</sup> edn., 1996
4. Sybesma, C. *Introduction to biophysics*, New York

# Food Chemistry

Full marks: 75 + 25  
Lecture hour: 113 hrs  
Year: I

**Course Code No.: 105 A**

## **Nature of the course**

Theory

## **Course objectives**

Food chemistry is fundamental to the study of all aspects of food. This course is designed to provide a very firm background for the understanding of properties, interactions and nutritional significance of various food components. The course also complements subjects like biochemistry, human nutrition, and food analysis.

## **Course Content**

1. Introduction to food chemistry (3 hrs)
2. Physical and chemical properties of food carbohydrates, monosaccharides (chemistry of glucose and fructose only) (4 hrs)
3. Disaccharides: general comparative study of sucrose, maltose, lactose and other related compounds. (5 hrs)
4. Polysaccharides: starch (physical and chemical properties, uses) (4 hrs)
5. General properties of cellulose, hemicellulose and crude fibers (5 hrs)
6. Chemistry of glycogen and its properties (2 hrs)
7. Gums and their uses. (3 hrs)
8. Proteins: occurrence, physical and chemical properties, peptide bond, amino acid, classification of proteins, their properties. (8 hrs)
9. Examples of food protein (comparative study of milk, meat and wheat proteins). (3 hrs)
10. Lipids: definition, occurrence & composition, fatty acids, fats & their physical & chemical properties, identification of natural fats & oils.(7 hrs)
11. Technology of fats and oils, salad oils. (5 hrs)
12. Rancidity: different types of rancidity and antioxidants. (4 hrs)

13. Pectic substances: occurrence, structure, pectolytic enzymes, use of pectin as a jelling agent, theories of gel formation, coagulation & cloud stability, use of pectin in food. (5 hrs)
14. Minerals in food: function, method of their determination (Ca, Fe, K, Na, etc.); importance of minerals. (7 hrs)
15. Vitamins in foods: occurrence, structure and their importance, effect of processing on vitamins. (7 hrs)
16. Natural pigments in foods: brief chemistry of chlorophylls, carotenoids and anthocyanins; effect of processing and cooking on natural pigments. (8 hrs)
17. Chemistry of natural food colorants such as turmeric, caramel, and annatto. (5 hrs)
18. Moisture in foods: types and chemistry, hydrogen bonding, bound and free water, water activity, methods of moisture determination. (10 hrs)
19. Food additives: Definitions and reasons of using food additives, synthetic color, flavor intensifier (monosodium glutamate, MSG), emulsifier, artificial sweeteners (saccharin, cyclamates). (8 hrs)
20. Browning in food: non-enzymatic browning (Maillard's reaction, ascorbic acid oxidation, caramelization), browning mechanisms, methods of preventing browning, enzymatic browning (mechanism, methods of prevention). (10 hrs)

**Course Code No.: BND 105 B**

**Practical**

1. Proximate analyses of food: determination of moisture, carbohydrate, crude protein, ash, crude fiber, and fat.
2. Determination of acidity and pH of food materials.
3. Quantitative test for protein: formol titration, Kjeldahl method.
4. Carbohydrates: estimation of reducing sugar, estimation of starch by hydrolysis.
5. Oil & fats: determination of acid value, saponification value, iodine value, peroxide, value, Reichert Meissl (RM) value, Kirschner value.
6. Determination of ascorbic acid
7. Estimation of minerals: calcium and iron

## References

1. Bahl, B.S. *Organic Chemistry* (2009)
2. Birch, G.G.. *Sugar-Science and Technology* (1978)
3. Brarreman, Z.B.. *Introduction to Biochemistry of food*
4. Jain, J.L. *Fundamentals of Biochemistry*. S. Chand and Co. (2008)
5. K.C. J.B and Rai, B.K. *Essentials of Food Chemistry*, (2007)
6. Lee, F.A. *Basic Food Chemistry*. AVI Publ Co., (1983)
7. Meyer, L.H. *Food Chemistry*, CBS Publishers, (1987)
8. Fennema, O.W. *Principles of Food Science-Food Chemistry*, Marcel and Decker, New York. (1976)

# Food and Medical Microbiology

Full marks: (75+25)  
Lecture hour: 113 hrs  
Year: I

## Course Code No.: BND 106 A

### Nature of the course

Theory

### Course objectives

The main objectives of the course are to impart an insight of the microbial world through the input of theoretical knowledge and practical skills on basics of microbiology. The course includes microbial diversity, nomenclature/classification, morphology, physiology, genetics and ecology with reference to foods; enumeration; microbiological quality control; and food standards.

The main objectives of the course are also to provide the theoretical and practical knowledge about pathogenic microbes and their impact on public health, role of nutrition in building resistance against infectious and non-infectious diseases, the immune system, hypersensitivity to foods, antimicrobial therapy, diagnostic microbiology.

### Course Content

#### PART A: Food Microbiology

#### General Microbiology

1. Microbial world: historical background, microorganisms important in food and medical microbiology; general morphological features of bacteria, fungi *Chlamydia*, *Rickettsia* protozoa, archeabacteria and viruses; classification of bacteria, fungi and viruses.(8 hrs)
2. Nutrition and metabolism: nutrients and nutritional categories; nutrients uptake; role of metabolism in biosynthesis and growth; glycolytic pathways; microbial growth and death kinetics. (8 hrs)
3. Microbial genetics: introduction to gene in prokaryotes and eukaryotes; bacterial DNA structure, replication and expression; genetic recombination of bacteria; gene cloning. (7 hrs)



## **Food Microbiology**

4. Extrinsic and intrinsic parameters of foods affecting microbial growth.(4 hrs)
5. Control of microorganisms by physical and chemical agents. (4 hrs)
6. Contamination of foods and its spoilage: general principles; classification of foods based on their stability; study of the spoilage of baby foods, geriatric foods, milk and milk products, meat, fish, eggs, bakery products, beer, wine, and canned foods (6 hrs)
7. Food fermentation: microorganisms involved, benefits, nutritional values; outline process for the production of: (6 hrs)
  - c. Fermented milk: yoghurt, *Juju dhou*, *misti doi*, acidophilus milk, kefir, and koumiss.
  - d. Fermented vegetables: sauerkraut, kimchi, *gundruk*, and *sinki*.
  - e. Fermented soybean: miso, shoyu, tempeh and natto.
  - f. Alcoholic beverages: distilled and none distilled products
8. Food-borne infection and intoxication: types of food-poisoning bacteria, sign and symptoms of respective food poisoning, methods of preventing food poisoning. (5 hrs)
9. Quality control of foods using microbiological criteria: control at source; codes of Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Point (HACCP) concept; Quality Control Systems ISO 9000 series. (6 hrs)
10. Hospital acquired infections. (3 hrs)

## **PART B: Medical Microbiology**

11. Normal, commensal, and opportunistic bacterial flora of the human body (oral cavity, upper and lower respiratory tract, intestinal tract, urethra, vagina, eye, ear and skin). (7 hrs)
12. Pathogenesis of bacterial infection: concept of health and disease (natural history of disease and determinants of health), types of diseases, reservoir of pathogenesis, portal of entry, transmission, the infection process, host-parasite interactions, bacterial virulence factors.(7 hrs)
13. Resistance to diseases: specific and non-specific resistance, immune system, types of antigens and antibodies, monoclonal antibodies, active and passive immunity, immunization, types of vaccines, schedule of vaccination. (9 hrs)

14. Serology: *in vitro* antigen-antibody reaction, neutralization, agglutination, precipitation, complement fixation, opsonization, flocculation, fluorescent antibody technique, radio immune assay, Western blot technique, Enzyme Linked Immunosorbent Assay (ELISA) (10 hrs.)
15. Hypersensitivity and its types, autoimmune diseases (3 hrs.)
16. Fungi of medical importance; different types of mycoses. (4 hrs)
17. Viral diseases of man: a brief account of measles, mumps, rubella, rabies, polio, HIV, Japanese encephalitis, hepatitis (A, B, C, D, E, and G) (10 hrs.)
18. Antimicrobial chemotherapy: mode of action of clinically used antimicrobial drugs, resistance to antimicrobial drugs, and clinical use of antibiotics. (6 hrs)

### **Course Code No.: BND 106 B**

#### **Practical**

1. Microscopy and micrometry
2. Sterilization methods (physical and chemical)
3. Media preparation: basic media, selective media, enriched media, enrichment media, differential media, transport media.
4. Staining of microbial cell/structure by: simple staining, negative staining, differential staining, Gram's staining, acid-fast staining, spore staining (Shaeffer & Fulton Method)
5. Isolation of pure cultures.
6. Identification of bacteria: general approaches; biochemical tests (O-F Test, starch hydrolysis, gelatin liquefaction, catalase test, oxidase test, IMViC test, fat hydrolysis).
7. Microbiological examination of table wares, kitchen wares, and hand swabs.
8. Microbiological examination of drinking water; enumeration of microorganisms by direct examination, plate count, Miles and Mishra method, Most Probable Number method (MPN method), membrane filter, dye reduction test (Methylene Blue Reduction Time test, MBRT or Resazurin test of milk); microbial count of pasteurized milk, milk powder, meat, spices, flour, processed foods, and street foods.
9. Safety measures in clinical laboratory: contaminant levels.
10. Media for enumeration of pathogens: bacterial, fungal, protozoal and viral.
11. Systematic grouping of pathogenic bacteria: identifying characteristics of common pathogenic bacteria.

12. Laboratory diagnosis of human parasitic infections: collection of specimen, laboratory techniques, processing of specimen, identification of parasites from stool and blood.
13. Laboratory diagnosis of mycotic infections: specimen collection and lab diagnosis of mycotic agents.
14. Sero diagnosis: blood grouping, pregnancy test, Widal test, streptococcal infection, HBsAg, HIV.
15. Laboratory examination of hospital supplies: infusion liquid, powder, syringe, surfaces table, operation theater.
16. Antimicrobial susceptibility test.

## References

1. Adams, M.R. and Moss, M.O. *Food Microbiology*, New Age international (P) Ltd. New Delhi (1995)
2. Ananthanarayan & Paniker: *Textbook of Medical Microbiology*, Orient Longman Ltd. Madras
3. Banson, J.O. Syndey, E., Finegold, M., Bailey and Scott. *Diagnostic Microbiology*. The C.V.A. Mosby Company. USA
4. Cheesbrough, M. *Medical Laboratory Manual for Tropical Country* Vol.II, ELBS, Butterworth-Heinmann (1998).
5. Dubey, R.C. and Maheshwari, D.K. *Practical Microbiology*. S. Chand & Co., New Delhi
6. Frazier, W.C. and Westhoff, D.C. *Food Microbiology*. Tata McGraw-Hill Publ. Co. Ltd, New Delhi. (2008).
7. Greenwood, D., Slack, R. and Pentherer, J. *Medical Microbiology*, ELST Churchhill Livingston. (2007).
8. Gupta S.P. *Laboratory Methods in Food and Dairy Microbiology* Academic Press, London.
9. Harrigan W.F., Margaret, and Mcannce, E. *Laboratory Methods in Food and Dairy Microbiology*. Academic Press, London. (1976).
10. Harry, W., Secley, and Paul, J. V. D. *Microbes in Action: A laboratory Manual of Microbiology*. D.B. Taraporevala & Sons Co., India.
11. James, M. J. *Modern Food Microbiology*, CBS Publisher and Distributors, New Delhi. (1976).
12. Mukharjee and Kanai, L. *Medical Laboratory Technology*, Vol.II, Tata McGraw-Hill Publ. Co., New Delhi (1988)
13. Pelczar, Reid & Chan. *Microbiology*. Tata McGraw- Hill Publishing, New Delhi. (1993).
14. Michael T. Madigan, John M. Martinko, Paul V. Dunlap, David P. Clark. *Brock Biology of Microorganisms*. Benjamin Cummings Publ. (2008).

# Food Processing

Full marks: 75 + 25  
Lecture hour: 113 hrs  
Year: II

## Course Code No.: BND 201 A

### Nature of the course

Theory

### Course objectives

Almost all the foods that we consume come in processed form in one way or the other. This course gives knowledge about the basic principles of food processing and preservation.

### Course Content

1. Introduction, historical development of food preservation. (4 hrs).
2. Post harvest operations: cleaning, sorting and grading, peeling, trimming and blanching. (4 hrs).
3. Hurdles concept of food preservation. (6 hrs).
4. Food preservation by dehydration: principle, moisture content vs water activity, dehydration process, drying equipments. (16 hrs).
5. Food preservation by high temperatures: principle, pasteurization, pH classification of foods, canning, thermobacteriology, aseptic processing, spoilage of canned foods. (20 hrs).
6. Preservation of fresh produce: principle, cellar storage, chilling storage, gas storage (MAS, MAP, CAS), freezing, freezing curves, ice crystal formation, freezing methods, freezing equipment, calculation of ton of refrigeration. (20 hrs)
7. Food preservation by preservatives: introduction, chemical, natural and biopreservatives. (10 hrs).
8. Radiation preservation of foods: introduction, definition of units and terms, dose and dosimetry, mode of action, radiation source, applications, merits and demerits of irradiation. (10 hrs).
9. Principles of food concentrates such as jam, jelly, marmalade, preserves. (4 hrs).

10. Principles of food fermentation: principle, importance, types fermented foods (wine, vinegar, beer, pickle). (6 hrs).
11. Non-conventional methods of food preservation: introduction to high hydrostatic pressure, high intensity pulsed electric field, etc. (6 hrs).
12. Effect of processing on nutrients (2 hrs)
13. Traditional and indigenous methods of food preservation. (5 hrs).

**Course Code No.: BND 201 B**

**Practical**

1. Preparation of brines & syrups and measurement of strength
2. Test of adequacy of blanching.
3. Dehydration of different fruits and vegetables.
4. Canning fruits, vegetables, and meat
5. Preparation of squash.
6. Preparation of jam, jelly, and marmalade.
7. Preparation of wine, brandy, and pickles.
8. Freezing of foods.
9. Calculation of freezing time.
10. Visits to neighboring food processing factories.
11. A survey of traditional and indigenous methods of food preservation.

**References**

1. Desrosier, N.W. and Desrosier, J.N. *The Technology of Food Preservation*, 4th edition CBS Pub. Dist. India, (1987)
2. Fellows, O.J. *Food Processing Technology-Principles and Practice*, Ellice Horwood Ltd. UK (1990)
3. Kharel, G.P. *Principles of Food Preservation* (2004).
4. Lal, G. Siddappa, G.S. and Tondon, G.L. *Preservation of Fruits and Vegetables*, ICAR, New Delhi, India (1998)
5. Potter, N.P. *Food Science*, 3rd edition CBS Publ. & Dist. India.(1987)
6. Rahman, M.S. *Handbook of Food Preservation*, Marcel Dekkar, Inc. NY. (1999)

# Nutritional Biochemistry

Full marks: 100  
Lecture hour: 150 hrs  
Year: II

**Course Code No.: BND 202 A**

## **Nature of the course**

Theory

## **Course objectives**

The course gives knowledge about the biomolecules, cellular metabolism and metabolic regulation, which is a prerequisite for B.Sc. in nutrition & dietetics.

## **Course Content**

1. Introduction to biochemistry: scope and importance of biochemistry. (5 hrs)
2. Biomolecules and the cell: the cell, prokaryotic and eukaryotic cells. (5 hrs).
3. Metabolism: introduction and importance, anabolism, catabolism, free energy, coupled energy, exergonic and endergonic reactions, high and low energy substances, active acetate intermediate metabolism, phosphorylation, dephosphorylation, oxidative phosphorylation, ATP. (10 hrs).
4. Carbohydrates: carbohydrate metabolism, interconversion of glucose, fructose and galactose, Hexose Monophosphate Shunt, glycolysis, TCA cycle, electron transport chain (ETC), glycogen metabolism. (10 hrs).
5. Lipids: Lipid pool, fate of fat, fatty acid oxidation, ketone bodies, biosynthesis of fatty acids, synthesis of triglycerides, metabolism of phospholipids, metabolism of glycolipids, metabolism of cholesterol, lipoproteins, metabolism of HDL. (10 hrs).
6. Protein and amino acids: protein metabolism, amino acid pool, transamination, deamination, keto acid, nitrogen balance; metabolism

- of amino acids: general aspects, metabolism of ammonia, urea cycle. (10 hrs).
7. Interrelationship in metabolism of protein fat and carbohydrate: necessity of glucose for the brain and erythrocytes and continued supply of fuel during starvation, metabolic interrelationship between adipose tissue, the liver and extra-hepatic tissue, summary of the major and unique features of the principal organs. (10 hrs).
  8. Nucleotides: structure, nucleosides and nucleotides, biosynthesis of nucleotides, synthetic derivatives, biosynthesis of pyrimidines and ribonucleotides, clinical aspects. (10 hrs).
  9. Nucleic acids: metabolism of nucleic acids and protein biosynthesis (10 hrs).
  10. Enzymes and co-enzymes: nomenclature, chemical nature and properties, factors affecting enzymic activity, Michaelis-Menten equation, enzyme inhibition, specificity, mechanism of action, regulation of enzymic activity in the living system, non-protein enzymes, diagnostic importance of enzymes, enzyme pattern of disease, enzymes in clinical diagnosis. (10 hrs).
  11. Minerals: biochemical functions of Ca, P, Mg, Na, Cl, S, Fe, Cu, I, Mn, Zn, Mo, Co, F, Se, Cr (10 hrs).
  12. Vitamins: structure and biochemical functions of fat-soluble and water-soluble vitamins. (10 hrs).
  13. Water, electrolytes and acid-base balance: body water, function of water balance and turnover, factors affecting water balance, electrolyte balance, acid-base balance and maintenance of blood pH. (10 hrs).
  14. Integration of metabolism: energy demand and supply, metabolism in starvation, organ specialization and metabolic integration, interrelationship between nutrients. (10 hrs).
  15. Hormones: mechanism of hormonal action, target tissue, hormone receptor, cAMP, phosphatidyl, inositol/calcium system as second messenger; hypothalamic and pituitary, anterior pituitary and posterior pituitary, thyroid; hormones of adrenal cortex; hormones of adrenal medulla, and gonads; gastrointestinal hormones. (10 hrs).

16. Inborn error of metabolism: carbohydrate metabolism, lipid metabolism, protein metabolism, nucleic acid metabolism, hereditary anemia. (10 hrs).

### **References**

1. Deb A.C. *Fundamentals of Biochemistry* New Central Book Agency (P) Ltd, India (1996)
2. Harvey, R.A., Champe C. P. *Lipincott's Illustrated Reviews Biochemistr.* 3rd edition, VP Brothers Medical Publishers, India (1994)
3. J. L. Jain. *Fundamentals of Biochemistry.* S. Chand and Co. (2008)
4. Murray, R.R., Granner, D.K., Mayes, P.A., and Rodwell, V.C. *Harper's Illustrated Biochemistry*, McGraw- Hill Education, India (2000)
5. Nelson, D. L, and Cox, M. M. *Lehninger Principles of Biochemistry* W.H. Freeman (Publ), 2004
6. Satyanarayan, U. *Biochemistry*, Books and Allied (P) Limited, Kolkata, India



# Food Science I

Full marks: 100  
Lecture hour: 150 hrs  
Year: II

**Course Code No.: BND 203 A**

## **Nature of the course**

Theory

## **Course objectives**

The course deals with basic concept of food science that is not covered in other basic subjects but seems to be essential for nutrition and dietetics. The main objective of the course is to provide diverse knowledge about food science. It includes food processing operations, post-harvest physiology, shelf life, food biotechnology, food packaging and storage, and functional properties foods.

## **Course Content**

1. Unit, dimension and unit conversion. (6 hrs)
2. Unit operations in food industries: mass balance and heat balance.(10 hrs)
3. Post harvest physiology of fruits and vegetables (12 hrs)
4. Grain formation, post harvest maturation and physical properties of grain (12 hrs)
5. Shelf life of fresh and processed foods, shelf life determination of fresh, processed and frozen foods, water activity vs shelf life. (16 hrs)
6. Theory and application of membrane technology (6 hrs)
7. Theory and application of microwave, ohmic heating and food thawing (8 hrs)
8. Food biotechnology: introduction, pros and cons of GM foods, single cell protein (SCP), genetic engineering and its scope (16 hrs)
9. Food packaging: types of packaging materials, design, compatibility, aseptic packaging (16 hrs)
10. Food losses and damage during storages. (8 hrs)

11. Uses of pesticides, health hazard and good storage practices. (10 hrs)
12. Organic foods: definition and marketing. (6 hrs)
13. Functional foods. (8 hrs)
14. Fermentation and other uses of microorganism (8 hrs)
15. Food texture, rheology and flavor. (8 hrs)

### **References**

1. Fennema, O.W. *Principle of Food Science: Part I. Food Chemistry*. Marcel Decker, New York. (1976)
2. Hall, D.W. *Handling and Storage of Food Grains in the Tropical and Subtropical Areas*. Oxford and IBHP Publ., FAO Rome (1970).
3. Meyer, L.H. *Food Chemistry*, CBS Publishers, (1987)
4. Mudambi, S.R. and Rajagopal M.V. *Fundamental of Food and Nutrition*. 4th Ed. New Age Int'l Publication. (2001.)
5. Paine, F.A. *A Handbook of Food Packaging*. Leonard Hall. (1983)
6. Potter, N.N. *Food Science*. Avi Publ. Co., Westport, Connecticut. (1978)
7. Singh, B.D. *Biotechnology*. Kalyani Publ. India (1998)

# Food Science II

Full marks: 75 + 25  
Lecture hour: 113 hrs  
Year: II

## Course Code No.: BND 204 A

### Nature of the course

Theory

### Course objectives

This course aims to provide specific insight into preparation, processing and preservation aspects of all categories of foods.

### Course Content

1. Fruits and vegetables – composition, quality factors, preservation; food products: juices, ketchup, sauces, pickles, candy, dried fruits and vegetables. (12 hrs)
2. Dairy products – milk components, physicochemical properties, fresh milk quality, fluid milk processing; food products: paneer, ice cream, milk powder, ghee, butter, yoghurt, cheese, and indigenous milk products. (20 hrs)
3. Meat, poultry, fish and egg – introduction, composition, physical, chemical and microbial qualities, preservation; food products: ham, sausage, bacon, cured meat, canned meat, dry meat, egg powder.(20 hrs)
4. Cereals, legumes and oilseed – introduction, composition, structure, milling, oil extraction; food products: bread, biscuit, cake, pastries, parboiled rice (16 hrs)
5. Fat, oil and related products: sources; products: salad, cooking and frying oils, shortening, margarines. (9 hrs)
6. Beverages: tea, coffee, wine, beer, distilled liquors. (12 hrs)
7. Confectionary and chocolate products: introduction, types. (8 hrs)
8. Spices and condiments – introduction, types, uses in food. (8 hrs)
9. Indigenous food products – *chhurpi, kinema, jand, raksi, gundruk, sinki, pustakari, puffed rice, selroti*, beaten rice, *maseura, bhakka*.

## Course Code No.: BND 204 B

### Practical

1. Physical properties of grain
2. Measurement of browning in foods.
3. Measurement of texture, color and shelf life.
4. Analysis of food products – moisture, °Brix, milk fat, milk protein, total soluble solids (TSS)/TS, solid-not-fat (SNF), specific gravity, refractive index (RI), alcohol content, caffeine content, etc.
5. Food product preparations – sausage, ham, bacon, bread, biscuit, cake, tofu, *kinema*, wine, ice cream, *paneer*, cheese, ketchup, pickle, sauce, toffee, etc.
6. Product development – nutritious food formulations (school tiffin, *sarbottam pitho*, nutro foods)

### References

1. Kent, N.L. *Technology of Cereals*, Pergamon Press, London (1975)
2. Kharel, G.P. *Elementary Food Analysis*. Bharabi Polytechnique Institute, Dharan, Sunsari, Nepal. (1999).
3. Lawrie, R.A. *Meat Science*, 3rd edn. Pergamon Press. (1979)
4. Meyer, L.H. *Food Science*, AVI Publ. Co. Westport, Connecticut (1978)
5. Potter, N.N. *Food Science*. AVI Publ. Co., Westport, Connecticut. (1987)
6. Ranganna, S. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*. Tata McGraw-Hill Publ. Co. Ltd. (2000)
7. Subba, D. *Practical Book of Meat, Poultry, and Fish Technology*, RONAST. (2001)
8. Subba, D. *Textbook of Meat Technology*. (2001).

# Hygiene and Sanitation

Full marks: 50  
Lecture hour: 75 hrs  
Year: II

## Course Code No.: 205 A

### Nature of the course

Theory

### Course objectives

This course deals with the elements of hygiene and sanitation to raise the quality of life of the communities. The aim of the course is to provide knowledge and skill to the students on various components of hygiene and sanitation (H & S) which make them capable to think nutrition & dietetics in a holistic and integrated ways. The overall objective of this course is to enable the students to impart knowledge and skill on hygiene and sanitation in a holistic and integrated manner to raise the quality of life in the community.

### Course Content

1. Concepts: hygiene and sanitation (H & S), Water, Hygiene & Sanitation (WASH) guideline/standards, H & S with respect to food, water, meat, livestock, surroundings, household level and industrial level; H & S with respect to solid and liquid waste management, promotion of H & S (20 hrs).
2. Status : personal hygiene – age specific, safe excreta disposal concept and types, role of H & S in food chain , H & S status in rural and urban areas of Nepal (20 hrs.)
3. Impact: role of H & S in livelihoods, malnutrition due to poor H & S condition, health impact due to poor H & S - demographic (age and sex), seasonal , spatial locations (geographic regions, urban and rural); gender and equity in WASH (20 hrs).
4. Efforts: WASH in schools and communities, WASH during emergency/disaster, participatory management in WASH, Hazard Analysis Critical Control Point (HACCP) in WASH, government policies related to H & S, organizations/ institutions working in H & S

promotion, hygiene behaviors change – programs in different levels. (15hrs).

## References

1. Bryan, F.L *Hazard Analysis Critical Control Point Evaluations: A Guide to Identifying Hazards and Assessing Risks Associated with Food Preservation and Storage*. Geneva: WHO. (1992)
2. Deborah, C. *Water quality Assessment*. Chapman and Hall, London. (1992)
3. ENSIC. *Environmental Systems Reviews: Present Situation of Water Supply and Sanitation and Necessity of Hygiene Education in Developing Countries*. No.44/45. Environmental System Information Centre (ENSIC)/AIT, Bangkok (1998),
4. EPC. Environment Protection Council. Kathmandu: HMG
5. IUCN. *Solid Waste Management in Urban Nepal: A Review*. Kathmandu: NPC/HMG/ IUCN (1992)
6. MOPE/ICIMOD/UNEP *Nepal: Status of Environment Report 2001*. ICIMOD/UNEP, Kathmandu (2001)
7. Park, K. *Preventive and Social Medicine*. Banarsidas Bhanet, India (1997)
8. WHO. *Guideline for Drinking Water Quality Surveillance and Control of Community Supplies*. (1997)
9. WHO. *Guideline for Drinking Water Quality, Health Criteria and Other Supporting information*. 2nd edition Vol.2. WHO. (1995)
10. WHO. *Health Principles of Housing*. WHO, Geneva (1989)
11. WHO/UNICEF. *Global Water Supply and Sanitation Assessment 2000 Report*. WHO/UNICEF, Geneva (2001)

# Food Toxicology

Full marks: 50  
Lecture hour: 75 hrs  
Year: II

**Course Code No.: BND 206 A**

## **Nature of the course**

Theory

## **Course objectives**

The course aims to provide overview of food toxicology and bring awareness on risks of toxic substances associated with food. The course provides the students with basic concepts on food toxicology and builds skill in risk analysis of foods that come from farm to table. The course is a combination of formal lectures, report writing and presentation to understand primary concept and practice on risk analysis of some food substances.

## **Course Content**

1. General Introduction: introduction to general toxicology and food toxicology (3 hrs)
2. Toxins: introduction, definition, occurrence, common types and effect on human health and simple processes of detoxifications with special emphasis on cyanogenic glycosides, glucosinolates, solanine, glycosides, and saponins; natural toxins in foods from animal sources - definitions, occurrence, common types, effect on human health, and simple processes of detoxifications; mycotoxins - introduction, definition, occurrence, common food sources, common types, effect on human health, simple methods of identification and detection, factors responsible for mycotoxins in food materials, prevalence and distribution of mycotoxins in Nepal, remedy measures; anti-nutritional factors found in different foods. (15 hrs)
3. Carcinogenesis: introduction, natural carcinogens in food sources, basic concepts of cancer, modulating factors in the diet, concept of anti-carcinogens in the diet. (3 hrs)

4. Toxicology of chemicals and chemical mixtures: different chemicals used in foods, chemical mixtures and their effect, simple procedures to set standard for chemicals (3 hrs)
5. Toxicological aspects of food additives and food groups: food additives - introduction, common types, their use and limitations in food, effect of preservatives and additives on human health (sulfite, sulfur dioxide, benzoic acid, artificial colors, oxidants, antioxidants); functional and novel foods; concept of hyperactivity in relation to food additives and diet; regulatory mechanism of some commonly used food additives in Nepal; concept of genetically modified foods and their safety assessments, toxicity of vitamin A and D (8 hrs)
6. Basic concepts of nutrigenomics and toxigenomics: functional genomics and safe diet, concept of receptor-mediated gene expression modulation in food toxicology. (3 hrs)
7. Toxicology of metals: lead, mercury and aluminum - introduction, occurrence, metals contaminations in food, factors affecting metal toxicity, chelators, exposure of food to metals, metals toxicity and epidemiology. (3 hrs)
8. Food allergy: concepts, common types and forms of allergy generated by foods, common food allergens, food allergy and food sensitivity, mechanisms of induction of allergic reactions, food sensitivity due to food additives, food sensitivity due to food toxins and poisons, diagnostic test for food hypersensitivity. (4 hrs)
9. Toxicology of drinking water: potable water and its characteristics, water quality, factors influencing the quality of water from different sources, toxic compounds in drinking water, fluorosis, arsenicosis, contaminants (i.e. pesticides and nitrates), methods of treatment of water. (5 hrs)
10. Basic concepts of xenobiotic compounds, biotransformation and kinetics, influence of nutrition, age, gender on kinetics and biotransformation, introduction of combination toxicology. (3 hrs)
11. Persistent organic pollutants (POPs) in human food chain: introduction, types and contamination in foods, distribution and route to human diet and health effect. (3 hrs)



12. Polychlorinated biphenyls (PCB's) and dioxin: introduction, occurrence, types and contamination in foods, distribution and route to human diet and health effect. (3 hrs)
13. Pesticides: introduction, types, their use in agricultural practices and foods, pesticide residue in foods, effects of pesticide residues in human health through food, regulatory provisions of pesticides and pesticide residues in foodstuffs in Nepalese context. (5 hrs)
14. Growth hormones and veterinary drug residues in food products from animal sources: introduction, common practices of use of growth hormones and veterinary drugs, risk associated with growth hormones and veterinary drugs in foods. (4 hrs)
15. Toxicological risk assessment of foods: general concept, importance, field and scope, methods and steps of risk assessment, application of risk assessment technique on the following foods/compounds - solanine, coumarin, methyleugenol, benzo ( $\alpha$ ) pyrene, genistein, quercetin, saccharine, hydroxymethylfurfural, curcumin, DDT (group work on risk assessment: report writing, presentation, defense, submission of the prepared report selecting any one of the foods/compounds) (10 hrs)

### **References**

1. Okoye, Z.S.C. *Bio-chemical Aspects of Nutrition*
2. Vij, K. *A text book of Forensic Medicine and Toxicology: Principles and Practice* 2nd edition
3. Omaye, S.T. *Food and Nutritional Toxicity*, CRC Press Inc. (2004)
4. Helferich, W. and Winter, C.K. *Food Toxicology*, CRC Press Inc. (2000)
5. Shibamoto, T. Bjeldanes, L.F. and Taylor, S. *Introduction to Food Toxicology*, Academic Press. (1993)

# Human Nutrition

Full marks: 100  
Lecture hour: 150 hrs  
Year: III

## Course Code No. BND 301 A

### Nature of the course

Theory

### Course objectives

About two third of the population of the developing countries are suffering from different kinds of nutritional problems. Most of the problems are related to the food intake and its utilization which determines the human's physical and mental development .The good nutritional status of the people depends on consumption of balanced diet and its utilization in the body. For this, people have to have the knowledge about energy and nutritional value of food; energy and nutrients requirement; the effect of the different nutritional disorders and infections. The course provides a thorough knowledge of principles of nutrition, malnutrition problems, nutritional disorders, nutrition and feeding through life cycle, nutrition and infection, the food path, food allergy, etc. Therefore, the course includes the likewise subjects to produce skill manpower in this area.

### Course Content

1. Introduction: definition, scope, history and development of nutrition; historical and geographical perspectives. (5 hrs)
2. Nutrition and human development. (1 hr)
3. Factor affecting human nutrition (1 hr)
4. Human body composition and measurement. (6 hrs)
5. Nutritional physiology: digestive system, absorption, circulation and excretion (2 hrs)
6. Regulation of food intake. (2 hrs).
7. Food, nutrients and their functions (4 hrs)
8. Digestion, absorption and metabolism of foods and nutrients; alcohol metabolism (12 hrs)
9. Energy value of food and energy requirements: (33 hrs)

- a. Energy value of foods, energy units.
  - b. Determination of energy value of foods.
  - c. Gross energy value and physiological value of foods.
  - d. Energy yielding food factors and calorific value of foods.
  - e. Relation between oxygen required and calorific value.
  - f. Direct calorimetry, R.Q.
  - g. Calculation of amount of protein, fats, and carbohydrate oxidized in the body.
  - h. SDA of food.
  - i. Basal metabolism, standard for basal metabolism, basal conditions and factors influencing basal metabolism.
  - j. Determination of energy requirement during work.
  - k. Calculation of daily energy requirement of adult.
  - l. Recommended allowance for calories (ICMR).
  - m. Energy balance and weight management.
10. Nutrient requirement and recommendation (RDA/Dietary standards) (10 hrs)
11. Nutrition and feeding through life cycle: (25 hrs)
- a. Changing nutritional needs.
  - b. Nutrition and ageing.
  - c. Infants, preschooler, school children, and adolescent
  - d. Lactating and pregnant women.
  - e. Old age people.
  - f. Industrial workers.
12. Malnutrition, nutritional deficiencies and disorders: (30 hrs)
- a. Malnutrition and its causes.
  - b. The faces of global malnutrition
  - c. Malnutrition and mental development
  - d. Major malnutrition problem: PEM, Nutritional anemia, IDD, and Vit.A deficiency disorder.
  - e. Nutritional related disorders: beriberi, pellagra, rickets, osteomalacia and osteoporosis, scurvy.
  - f. Nutritional disorder associated with affluence i.e., Obesity.
  - g. Eating disorders (Anorexia Nervosa, Bulimia Nervosa and other conditions).

- h. Nutrition and infection.
  - i. Nutrition and dental health.
13. Supplementary foods and feeding of weaned child. (5 hrs)
  14. The food path: blocks and improvements. (3 hrs)
  15. Food fad and taboos (2 hrs)
  16. Lathyrism (2 hrs)
  17. Roles of the international organization/agencies in nutrition e.g., FAO, WHO, WFP, UNICEF, UNESCO, UNU, World Bank, CARE. (7 hrs)

## References

1. Begum, R.M. *A textbook of Food, Nutrition and Dietetics*. Sterling Publishers Pvt Ltd, New Delhi. (2000).
2. Eleanor, N.W. and Eva, M.N.H. *Understanding Nutrition*. 2nd ed. West Publishing Co. America. (1991).
3. FAO. *Integrating Nutrition into Agricultural and Rural Development Projects. A Manual*. No 1. (1984).
4. Gordon, M., War, D.C. and Margaret, K. *Perspectives in Nutrition*. 1st edn. McGraw-Hill Co. Inc. (2002).
5. Joshi, S.A. *Nutrition and Dietetics*. TATA McGraw-Hill, New Delhi. (1992).
6. King, F.S. and Burgess. *Nutrition for Developing Countries*. Oxford University Press. Walton Street. (1992).
7. Nibe, M. *Human Nutrition*. RTP-FNP UPLB, College Laguna, Philippines. (1987).
8. Nieman, D.C., Butterworth, D.E. and Nieman, C.N. *Nutrition*. Revised 1<sup>st</sup> edn. Wm.C.Brown Publishers. (1991)
9. Passmore, R. and Eastwood, M.A. *Human Nutrition and Dietetics*. Churchill Livingstone, New York. (1896).
10. Paul, I., Turner, R.E. and Ress, D. *Discovering Nutrition*. Jones and Bartlet Publishers. Sudbury, Massachusetts. (2003).
11. Swaminathan, M. *Essential of Food and Nutrition*, Vol. I & II. Bappco, India. (1993).
12. Swaminathan, M. *Human Nutrition and Diet*. Bappco, India. (1993).
13. WHO. *The Health Aspect of Food and Nutrition*. 3<sup>rd</sup> edn. Regional Office for the Western Pacific, Manila. (1979).

# Catering and Management

Full marks: 75 + 25  
Lecture hour: 113 hrs  
Year: III

## Course Code No.: 302 A

### Nature of the course

Theory

### Course objectives

This course is given to assist the students to operate at levels of efficiency which can provide quality food and service. This course also lays a special emphasis on the development of skills needed for the efficient working of the catering management. It also highlights the abilities required to translate these skills into effective management practices for the successful functioning of a modern day hospitality industry. The course is comprehensive and covers all the most important aspects of professional food preparation.

### Course Content

1. Introduction: principles and functions of catering management - principles of management; guidelines to managing catering operations - division of work, authority and responsibility, discipline, unitary command, unitary direction, individuals goals subordinate to establishment goals, payment of remuneration, hierarchy, orderliness, loyalty and devotion, work stability, initiative, unity and control; functions of catering management, planning, organizing, directing, coordinating, controlling and evaluating. (10 hrs)
2. The menu: types of menus, ala carte menu, table-denote menu, function menu, cyclic menu; planning menus, practical aspects, gastronomic aspects, economic aspects, nutritional aspects, planning a simple function menu, presenting a menu. (8 hrs)
3. Food purchasing: Introduction, the main duties of the purchasing manager, the purchasing procedure, the selection of the supplier, aids to purchasing, the purchasing of foods, purchase specifications for food, purchasing of beverages, purchase specification for beverages. (6 hrs)

4. Receiving and storage of food, delivery methods, delivery procedure, receiving procedure, storage, organization of storage, general procedure for storage, store keeping, store records, order form, goods received book. (5 hrs)
5. The kitchen - kitchen layout, food preparation areas, cooking areas, service areas, cleaning and washing areas; kitchen organization - staff organization; kitchen equipment - criteria for choosing equipment, types of equipment, care and maintenance, cook ware, knives and basic cutting tools; kitchen safety - how accidents occur; prevention of cuts, prevention of fires, burns; hygiene - personal hygiene, kitchen and dining room hygiene, food hygiene, contamination by microorganisms, contamination by pests, spoilage by non-bacterial contaminants. (10 hrs)
6. Cooking techniques (methods of cooking food): (15 hrs)
  - Dry heat methods: grilling and barbecuing, methods of grilling - heat source from below, heat source from above, suitable food, advantages and disadvantages of grilling.
  - Roasting: methods of roasting - oven roasting, spit roasting, suitable foods, principles of oven roasting, principles of spit roasting, baking, suitable foods for baking, principles of baking
  - Wet heat methods: boiling, methods of boiling, parboiling, blanching, principles of boiling, advantages and disadvantages
  - Poaching: suitable foods for poaching, methods of poaching, principles of poaching, advantages and disadvantages
  - Steaming: suitable foods, methods of steaming, principles of steaming, pressure cooking, suitable foods, advantages and disadvantages
  - Stewing: principles of stewing, advantages and disadvantages of stewing
  - Frying: methods of frying - dry frying, shallow frying, stir frying, deep frying, coating for fried foods, principles of frying, safety when deep frying
  - Microwave cooking: using a microwave oven, suitable utensils for microwave cooking, utensils not to be used, advantages and disadvantages.

7. Preparing and presenting food: assessing food, reasons for eating, evaluating food, flavoring food - seasoning, herbs and spices, vinegars, sauces, appetizers, hors d'oeuvres, canapes and sandwiches.
- Soups: unthickened soups, thickened soups, principles of making soup.  
Pasta and rice- pasta, types of pasta, storing pasta, cooking pasta, rice, cooking rice, boiling rice, pilaf method
- Eggs: uses in cookery, thickening, binding, glazing, emulsifying, cooking eggs, poaching, boiling, frying eggs, scrambled eggs, storing eggs.
- Fish and shellfish: structure and nutritive value, classification of fish, buying and selecting fish, cooking fish, storage of fish.
- Meat and poultry: meat, marinating meat, cooking meat, roasting, grilling, frying, braising, simmering, types of meat; poultry - chicken, turkey, duck and goose.
- Vegetables: purchasing and storing vegetables, classification of vegetables, preparation, cooking methods - grilling, boiling, steaming
- Salads: Place on the menu, making salads, basic ingredients, garnishing of salad
- Pulses: nutritional value, uses of pulses. (15 hrs)
8. Food controlling: the essentials of a control system, calculation of food cost, methods of food control - weekly/monthly food cost report, a daily food cost report, the advantages of producing basic food report, a detailed daily food cost report, the advantages of type of report, food control checklist, food control procedures. (8 hrs)
9. Food management in industrial catering: introduction, basic policies - financial, marketing and catering, type of customer, type of product/menu, food production style, food service style, control and performance measurement. (8 hrs)
10. Food management in school catering: introduction, the school meals service, basic policies - financial, marketing and catering, type of customer, type of menu, food production styles, food source styles, control and performance measurement. (8 hrs)
11. Food management in hospital catering: introduction, the hospital catering service, basic policies – financial; marketing and catering - type of customers, type of menus, food production styles, food service

- styles, control and performance measurement, contract catering in hospitals. (8 hrs)
12. Food management in geriatric center, children home, college hostel, orphan home, etc. (12 hrs)

### **Course Code No.: BND 302 B**

#### **Practical**

1. Preparation of chicken sweet corn soup
2. Preparation of mixed vegetable soup
3. Preparation of cream of tomato soup
4. Preparation of Chinese fried rice
5. Preparation of spaghetti with chicken and mushroom
6. Preparation of stuffed capsicum
7. Preparation of cauliflower stuffed *paratha*
8. Preparation of vegetable *pakodas*
9. Preparation of vegetable spring rolls
10. Preparation of fried chicken chilly
11. Preparation of chicken *biryani*
12. Preparation of vegetable/chicken cutlet
13. Preparation of meat ball
14. Preparation of sweet and sour fish
15. Preparation of scotch egg
16. Preparation of chocolate cake
17. Preparation of fruit cake
18. Preparation of pizza
19. Preparation of Cheese biscuits
20. Preparation of chilled pudding
21. Food presentation and serving

#### **References**

1. Raina, U., Kashyap, S., Narula, V., Vir, S, and Chopra, S. *Basic Food Preparation, A Complete Manual*, 3<sup>rd</sup> edn. Orient Longman (1986).



2. Cullen, P. *The Food and Beverage Manager*, Hospitality Press, Melbourne.
3. Davis, B. and Stone, S. *Food and Beverage Management*, Butterworth-Heinemann, A division of Reed Education and Professional Publishing Ltd.
4. Humphries, C. *The Best 1000 Quick & Easy Recipes*
5. Joners, P. *Food Service Operations: A Comprehensive Survey of the Catering Industry*, 2nd edition. Redwood Books, Throwbridge, Wiltshire, Great Britain.
6. Kinton, Ceserani, and Foskett, D. *The Theory of Catering*, ELBS with Hodder and Stoughton, Educational Low-priced Books scheme funded by British Government, Printed in Great Britain
7. Lillicrap, D., Cousins, J. and Smith, R. *Food and Beverage Service*, Educational Low-priced sponsored texts (2006).
8. Marzia and McCreery, C. *An Introduction to Food & Beverage Studies*, Hospitality Press, Melbourne (1995).
9. Verghese, B. *Professional Food & Beverage Service Management*, Mcmillan India Limited

# Community Nutrition & Nutrition Education

Full marks: 100  
Lecture hour: 150 hrs  
Year: III

## Course Code No.: BND 303 A

### Nature of the course

Theory

### Course objectives

A graduate in nutrition & dietetics will be able to assess the nutritional situation of a community and design programs for the improvement of community nutrition through nutrition education.

### Course Content

1. Introduction to community nutrition education (2 hrs)
2. Community nutrition survey: methods for qualitative and quantitative nutrition surveys and how to approach a community (20hrs)
3. Data management and analysis, interpretation and dissemination(10 hrs)
4. Factors determining community nutritional status (10 hrs)
5. Examples of successful nutrition programs: What works in Nutrition? (10 hrs)
6. Components of nutrition education: What works in nutrition education? (10 hrs)
7. Tools for nutrition education: growth charts, list of locally available foods, food values, cooking practices and their effect of nutritive values; common food items and their nutritive values; feeding practices and techniques; food beliefs. (20 hrs)
8. Qualities of effective communication, educational tools (10 hrs)
9. Preparation of communication and educational tools. (10 hrs)
10. Methods of providing nutrition education: face-to-face, group counseling or general broadcasts, participation in demonstration, etc. (18 hrs)

11. Monitoring and evaluation of community nutrition education program (5 hrs)
12. Major nutritional problems in Nepal and South-East Asia Region (SEAR) (2 hrs)
13. National nutrition programs in Nepal and SEAR (4 hrs)
14. Food and nutrition program planning and management (8 hrs)
15. School nutrition, breast-feeding, group feeding practice and nutrition rehabilitation (8 hrs)
16. Contamination and adulteration trend of food in Nepal from toxicological aspects, Nepalese standard for contamination and adulteration of food products, regulatory mechanism and bodies to control food adulteration and contamination (3 hrs)

### **References**

1. Adhikari R.K. and Krantz M.E. *Child Nutrition and Health*, HLM Center, Institute of Medicine, Maharajgunj, Kathmandu
2. Adhikari R.K. *Nutrition and Health* (in Nepali), Educational Publishing House
3. Hale, C. *Community Diagnosis Manual*, HLM Center, Institute of Medicine, Kathmandu, Nepal
4. Pradhan H.B. *A Textbook of Health Education*, Educational Publishing House

# Food Quality Control and Analysis

Full marks: 75 +25  
Lecture hour: 113 hrs  
Year: III

## Course Code No.: BND 304 A

### Nature of the course

Theory and Practical

### Course objectives

Every living organism needs food for sustaining life and humans are no exception. However, the same food can be a reason for several diseases and disorders if the quality is compromised. It therefore becomes necessary to introduce the concept of quality in food. This naturally calls for use of certain standard methods to check and be assured that the food is safe, wholesome and of required properties. This course is designed to fulfill all the above requirements.

### Course Content

1. Introduction to the concept of food quality control. (2 hrs)
2. Quality and its function, quality assurance in food industries & functions of quality control organization. (5 hrs)
3. Quality attributes of foods: (a) size and shape (b) color & gloss (c) texture-visual & objective attributes (d) aroma of foods – introductory ideas. (6 hrs)
4. Introduction to sensory evaluation of foods and beverages. (5 hrs)
5. Water standard, water and waste analysis. (5 hrs)
6. Extraneous matters in foods and their methods of detection and removal. (4 hrs)
7. Good Laboratory Practice. (2 hrs)
8. Laboratory layout and design, operation and maintenance of different types of laboratory. (4 hrs)
9. Hazard Analysis Critical Control Points (HACCP). (4 hrs)
10. Food contamination and adulteration, quality control under different stages of food processing; quality assurance and sampling technique. (5 hrs)

11. Food law and food standards formulation, enforcement of food law, inspection, grading, and certification. (4 hrs)
12. Introduction to agricultural practices in Nepal and food control system. (2 hrs)
13. Study of international food regulations, functions of CODEX Alimentarius Commission. (4 hrs)
14. Terminologies and concept of good manufacturing practice (GMP) and generally recognized as safe (GRAS) substances. (4 hrs)
15. Import and export quality control rules and regulations, inspection and sampling at sea port and dry port. (2 hrs)
16. ISO 9000 series. (5 hrs)
17. Introduction to total quality management (TQM). (4 hrs)
18. Statistical quality control: quality control chart, exercises applying inference tests. (5 hrs)
19. Strengthening of QC network in context of world trade organization (WTO). (3 hrs)
20. Errors and accuracy in analysis of food materials, sampling and preparation of samples for analysis. (3 hrs)
21. Proximate analysis of food products, i.e. estimation of moisture, ash, carbohydrate, crude fiber, crude protein, and crude fat. (8 hrs)
22. Study of the methods of determination of additives like sulfur dioxide, benzoic acid, formaldehyde, boric acid, lactic acid, saccharin, cyclamate, dulcin, etc. (7 hrs)
23. Test of radioactivity in foods. (4 hrs)
24. Analytical methods applied in dairy products like milk, milk powder, ice cream, butter, cheese, milk cream, chocolate etc. (8 hrs)
25. Analysis of foodstuffs with reference to the standards of quality fixed for jam, jelly, canned fruits & vegetables, pickles, squash, vinegar, rice, wheat. (8 hrs)

### **Course Code No.: 304 B**

#### **Practical**

1. Proximate analysis of wheat, bran, biscuit, milk.
2. Extraction, separation & identification of water & oil soluble food colors

3. Detection or estimation of trace metals: iron, tin, copper, lead, arsenic
4. Estimation of food additives like sulfur dioxide (SO<sub>2</sub>), benzoic acid, formaldehyde, saccharin.
5. Analysis of foodstuffs with reference to the standard of quality fixed for jam, jelly, canned fruits & vegetable, milk, biscuits, pickles.
6. Checking contamination & extraneous matters in food.
7. Sensory evaluation of foods.
8. Test of adulteration: Baudouin test, Halphen test, Holde test, hexabromide test, metanil yellow, starch in milk, argemone oil test.
9. Chromatographic separation of free amino acids by TLC
10. Complete analysis of table salt.
11. Determination of cholesterol
12. Water analysis: physicochemical and bacteriological.
13. Stability of fats and fatty foods by active oxygen method (AOM).
14. Determination of pesticides and mycotoxins

### References

1. AOAC, *Association of Official Analytical Chemists*. Official Methods of Analysis. Washington, D.C. (2005)
2. Banks, J. *Principles of Quality Control*. Wiley Johan Weley and Son, New York (1989).
3. Egan, H.R.S. Kirk and Sawyer, R. *Pearson's Chemical Analysis of Foods* 8th edition Churchill livingstones, New York. (1981)
4. Herschdoerfer, S.M. *Quality Control in the Food Industry* Vol. 1,2,3 (1968)
5. K.C. J.B and Rai, B.K. *Basic Food Analysis Handbook*. (2007 )
6. Plummer, D.T. *An Introduction to Practical Biochemistry*, 3rd edition. Tata McGraw Hill Pub. India (1987)
7. Ranganna, S. *Handbook of Analysis and Quality Control for Fruit and Vegetable products*. 2nd edition. Tata Mc Graw Hill Pub. New Delhi, (1996)
8. Sadasivam, S. and A. Manikam. *Biochemical Methods in Agricultural Sciences*. India (1992)

# Research Methodology and Computer Application

Full marks: 100  
Lecture hour: 150 hrs  
Year: III

## Course Code No.: 305 A

### Nature of the course

Theory

### Course objectives

The main objective is to provide the students know-how of research methodology. Specifically, it acquaints the students with steps followed in research activities, problem selection, methods of data collection, methods of report writing, presentation, and publication of research articles.

The course aims at providing fundamental concepts, technology and theories of computer application and information technology. The course focuses on using the relational database management system, MS-Access, to create, maintain, and use databases.

### Course content

#### I Research methodology

1. Introduction: (15 hrs)
  - a. Ethics in research (Helsinki declaration)
  - b. Research: definition, purpose, processes (steps), levels, rigor and design
  - c. Research types: descriptive/analytical research, fundamental/applied research, conclusion-oriented/decision-oriented research, quantitative/qualitative, conceptual/ empirical research, diagnostic/hypothesis testing research
  - d. Research problem: definition, criteria of a good problem, guidelines for selecting problems
  - e. Objectives: broad and specific, goals
  - f. Literature review

- g. Hypothesis: sources of hypothesis, qualities of workable hypothesis, types and utilities of hypothesis
2. Data, methods of data collection: (20 hrs)
- a. Nature of data: data required in nutritional study, primary and secondary data, cross section and categorical data, time series, spatial and ordered data
- b. Data collection in social sciences:
- Schedule: purpose of schedule, kinds of schedule, content of schedule, limitations
  - Questionnaire: types, requisites of a good questionnaire, importance of questionnaire method - limitations of questionnaire method; difference in schedule and questionnaire, format of a questionnaire, problems in questionnaire method, technique of getting response, random response technique; questions - types of question, question to be avoided, sequences of questions
  - Interview: field workers - enumerator and supervisor, tasks of interview, obtaining an interview
  - Observation Method: Kinds of observation, controls used in observation method, Documents and their types
- c. Data collection in LAB oriented sciences:
- Introduction, methods of data collection in physical and biological sciences, data measurement and observation methods
  - Recording of data: schedules and observation plan
3. Some research methods: (15 hrs)
- a. Conventional method: scientific methods as conventional methods, characteristic of a scientific method, aspects of scientific method (evolution of scientific studies, steps in scientific methods)
- b. Historical method: nature and steps in historical method, limitations, sources of historical data, importance and fundamentals of historical method
- c. Case study: introduction, types of case studies
- Exploratory and hypothesis testing
  - Steps in case studies
  - Sources of case data, limitation
- d. Experimental method: introduction, types of experiment, problems in experimentation; ex-post facto research - definition and technique,



- e. Survey Method: introduction, and importance of survey method, comparison of survey method with other methods; objectives of social and survey and technical survey, types of social and technical survey, steps in social and technical surveys, pilot survey
- 4. Data analysis and synthesis: (15 hrs)
  - a. Principles of analysis and interpretation, uses of descriptive statistical measures, identifying probabilistic curves and distributions, testing hypothesis and obtaining standard error, variance analysis
  - b. Foundations of measurement and scales, reliability and validity of the tests
  - c. Analysis and synthesis of data: generalization- logical and statistical, types of logical method
- 5. Presentation of research report: (10 hrs)
  - a. Thesis: features of thesis, steps in thesis work, note taking and recording; parts of thesis - reference and bibliography quoting, arranging of the material, approval letters, etc.
  - b. Report: presentation of preliminary general and technical reports, newspaper reporting.
  - c. Publication in research journals: abstract, review and problem specification, objective of the study, data collection, methods of data analysis, results, conclusion
  - d. Appraisal writing and content analysis

## **II Computer Application**

- 6. Introduction to computer system:
  - a. Introduction to computers, types of computers, characteristics of computers (3 hrs)
  - b. Classification of digital computer systems, personal computers, minicomputers, mainframes, supercomputers. (4 hrs)
  - c. Anatomy of digital computer: functions and components of a computer, CPU, memory. (3 hrs)
  - d. Memory Units: RAM, ROM, PROM, EPROM, EEPROM (4 hrs)
  - e. Auxiliary storage devices: magnetic tape, hard disk, floppy disk, optical disk (4 hrs)
- 7. Computer software:
  - a. Introduction to computer software, operating systems, utilities, compilers and interpreters, word processors, spreadsheets, presentations graphics, database management, EpiInfo (statistical software). (6 hrs)

- b. Programming languages: machine language, assembly languages, high-level languages, compilers and interpreters, the compilation process (8 hrs)
- 8. Database management systems:
  - a. Introduction to database management systems, quality of information, definition of database, characteristics of data in a database, definition of DBMS, types of DBMS (6 hrs)
- 9. Telecommunications:
  - a. Introduction to telecommunications, analog and digital signals, modulation, types of modulations, modems (6 hrs)
  - b. Computer networks: communication media, types of networks, network topologies, network, network architecture, peer to peer architecture, client/server. (6 hrs)
- 10. Internet:
  - a. Internet and world-wide web: internet access - dial-up connection, direct connection, internet protocols - HTTP, TCP/IP, Telnet, Internet Addressing (6 hrs)
- 11. Electronic commerce:
  - a. EDC, Virtual Shop (4 hrs)
  - b. Labs with MS-Access: (15 hrs)
    - Data types, creating a database, creating table in design view, assigning primary key, saving the table structure, adding records to the table, saving data, creating a simple query, viewing data in sorted order, creating a delete query, closing a database, opening a database, modifying the structure of a table, hiding fields, changing the order of fields, sorting on the basis of multiple fields, validation: field level validation, table level validation, exiting from access, creating a master table, creating a lookup list, assigning input mask, creating a report from a table, creating a report from query, creating a form from a table, adding records to the table via the form, modifying an existing form, adding button to the form, creating a master-detail form-creating a form with the master table, creating a sub-form with the transaction table, creating buttons to navigate the records, creating a button to close the form, creating a model form, creating a menu.

## References

1. Leon, A. and Leon, M. *Fundamentals of Information Technology*, Leon TECH World
2. Simpson, A. and Robinson, C. *Mastering Access-2000*, BPB Publication

# Food Habit and Nutritional Assessment

Full marks: 100  
Lecture hour: 150 hrs  
Year: IV

**Course Code No.: BDN 401 A**

## **Nature of the course**

Theory and Practical

## **Course objectives**

The main objective of this course is to provide knowledge about food habits of people, factors affecting food habits, nutritional status, and also to give the practical knowledge in assessing food habits, food consumption, and nutritional status of the people in the community. The course includes social functions of foods, factors influencing food habit, dynamism of food habits, different types of nutritional assessment, methodologies, etc. It also includes some issues in the measurement of nutritional status and food security.

## **Course content**

1. Introduction to food habit and nutritional assessment (1 hr)
2. Function of food in the society (2 hrs)
3. Food habit and ecology (2 hrs)
4. Orientation from subsistence farming to cash-crop farming: (a) cash crop and food crop, (b) women and food production and (c) scarcity of fuel for cooking (3 hrs)
5. Influence of town to food habits and urbanization (5 hrs)
6. Food distribution in household and infant feeding (3 hrs)
7. Dynamism of food habits (3 hrs)
8. Food faddism and faulty food habits (2 hrs)
9. Food and nutrition policy (2 hrs)
10. Field study in food habits and food consumption: food habit and food consumption surveys, outline of steps involved, sampling, methods of collecting data, data analysis and interpretation of result (4 hrs)
11. Economic factors affecting food consumption (4 hrs)

12. Social and psychological aspect of food consumption (5 hrs)
13. Nutritional assessment: purposes or objectives (1 hr)
14. Nutritional status: definition, factors influencing nutritional status(3 hrs)
15. Direct nutritional assessment: (a) clinical examination, (b) nutritional anthropometry, (c) biochemical tests and (d) biophysical methods (15 hrs)
16. Indirect nutritional assessment: (a) vital statistics, (b) ecological factors (10 hrs)
17. Methodology for nutritional assessment: introduction, steps, timing, and case studies (3 hrs)
18. Nutrition survey: introduction, purposes, types, planning, field work, sampling, data collection analysis interpretation and action (4 hrs)
19. Food consumption or diet survey: introduction, purposes, types, sampling, field work (data collection), analysis of data, interpretation, and adult consumption unit; growth and development - children's size and growth, development, variation in height and weight; growth chart and its use (8 hrs)
20. Food composition table and RDA: brief introduction and uses (3 hrs)
21. Measurement of the changes in nutritional status: objectives, target population, method, sampling data collection, analysis, interpretation and implication (10 hrs)
22. Indicators for monitoring and evaluation for nutritional status of primary- and middle school age group (6-15 yrs) (1 hr)
23. Some issues in the measurement of nutritional status. (4 hrs)
24. Food security: food security, food and nutrition surveillance, survey of food security (data collection and analysis, interpretation) and measures to improve food security. (5 hrs)

### **Course Code No. BND 401 B**

#### **Practical**

1. Determination of calorific value of foods.
2. Nutrition survey: nutritional assessment.
3. Calculation of energy requirement of various age groups
4. Food consumption survey of household in the community and calculation of adequacy level of food intake.

5. Survey of food habit of consuming snack by school children
6. Anthropometric measurement of preschoolers and school children and obese person
7. Clinical examination of malnourished children
8. Measurement of hemoglobin level, blood sugar level to find out anemia and diabetes mellitus.
9. Rapid ecological visit of a community.

### **References**

1. Anonymous. *Policy Issue on Nutrition and Welfare*. UPLB Agricultural Policy Working Group. UPLB, College Laguna, Philippines.
2. Begum, R.M. *A Textbook of Food, Nutrition and Dietetics*. Sterling Publishers Pvt Ltd, New Delhi. (2000)
3. Gopaldas, T. and Seshadri, S. *Nutrition - Monitoring and Assessment*. Oxford University Press, India. (1987)
4. Hartog, A.P.D. and Staveren, W.A.V. *Manual for Social Survey on Food Habits and Consumption in Developing Countries*. The Netherlands. (1983)
5. Ivan, B., Miriam, C. and Bruno, D. *A Guide to Nutritional Assessment*. WHO, Geneva, Laxman Chand Arya, Krishan Nagar, India. (1988)
6. Jelloffe, D.B. *The Assessment of the Nutritional Status of the Community*. WHO, (1966)
7. King, F.S. and Burgess. *Nutrition for Developing Countries*. Oxford University Pres. Walton Street. (1992)
8. Nube, M. *Human Nutrition*. RTP-FNP UPLB, College Laguna, Philippines. (1987)
9. Swaminathan, M. *Essential of Food and Nutrition*, Vol.I & II. Bappco, India. (1993)
10. WHO. *Measuring Changes in Nutritional Status*. Geneva. (1983).
11. WHO. *The Health Aspect of Food and Nutrition*. 3rd ed. Regional Office for the Western Pacific, Manila. (1979)

# Clinical Nutrition

Full marks: 75 + 25  
Lecture hour: 113 hrs  
Year: IV

## Course Code No.: BND 402 A

### Nature of the course

Theory and Practical

### Course objectives

A graduate in nutrition & dietetics should be able to identify persons suffering from nutritional disorders and advise appropriately for their amelioration. In addition, s/he should also be able to advise persons suffering from chronic illnesses regarding the nutritional component and their management.

### Course content

1. Introduction: explanation of the terms - nutrition, clinical nutrition, nutrients, nutritional status, under nutrition, malnutrition, obesity etc. (6 hrs)
2. Epidemiology of nutritional disorders in Nepal: common nutritional disorders and their prevalence rates and trends over the last ten years, causal factors. (24 hrs)
3. Features of macro and micronutrient deficiency and excess states, problems, assessment and prevention through dietary diversification, modification and fortification (10 hrs)
4. Methods of assessing nutritional status: body mass index, anthropometry, clinical and biochemical methods, growth standard charts: methods, development and interpretations (6 hrs)
5. Clinical classification of nutritional status and features of mild, moderate and severe malnutrition (6 hrs)
6. Approaches in the management of different grades of malnutrition(5 hrs)

7. Physiological and pathological changes with nutritional implications: hypertension, myocardial infarction, diabetes mellitus, obesity, chronic renal failure, chronic liver diseases, pregnant and lactating mothers, neonates, infants and children in health and diseases (15 hrs)
8. Dietary plan for pregnant and lactating mothers, infants and young children, patients suffering from hypertension, myocardial infarction, diabetes mellitus, obesity, chronic renal failure, chronic liver disorders, children suffering from persistent diarrhea, acute respiratory infections including measles; project assignment. (20 hrs)
9. Evidence based practice/guidelines in nutrition: nutrition related internet web pages and their uses (6 hrs)
10. Current issues in clinical nutrition (5 hrs)
11. Nutritional counseling: counseling of mothers and caretakers on breast feeding; infant and young child feeding; pregnant and lactating mothers; feeding of sick children during diarrhea, pneumonia, measles etc. (visit to the maternity ward, antenatal clinic, nutrition clinic in children's hospital and pediatric ward) (10 hrs)

### **Course Code No.: BND 402 B**

#### **Practical**

1. Assessment of nutritional status: anthropometry of infants, children, adults (pregnant and lactating women), clinical assessment, biochemical investigations - hemoglobin, serum proteins and albumin, urinary iodine, serum retinol
2. Observation and demonstration of features of various macro and micronutrient deficiency and excess states: protein energy malnutrition of different grades, anemia, features of IDD, Vitamin A deficiency, deficiency of various B-complex vitamins, Vitamin C, rickets and osteomalacia
3. Metabolic changes in hypertension, gall bladder and renal stones, diabetes, myocardial infarction, chronic renal failure and liver disease - demonstration of the changes in blood, serum and urine
4. Dietary management of diabetes - glycemic load of different food items

5. Observation of the dietary management of persons suffering from chronic illnesses in the hospitals
6. Observation of the management of PEM in the health posts, health centers, pediatric ward and nutrition rehabilitation centers
7. Nutrition advice to patients after gastrointestinal surgery and supplementary feeding of hospitalized adults at risk of malnutrition, including stroke patients
8. Management of special diets from institutional kitchens

### **References**

1. Adhikari, R.K. *Nutrition and Health* (in Nepali). Educational Publishing House, Kathmandu, 2006
2. Adhikari, R.K., Krantz, M. *Child Nutrition and Health*, HLMC, Institute of Medicine
3. Joshi, Y.K. *Basic of Clinical Nutrition*, Medical Publishers, New Delhi, 2003



# Dietetics

Full marks: 75 + 25  
Lecture hour: 113 hrs  
Year: IV

## Course Code No.: BND 403 A

### Nature of the course

Theory and Practical

### Course objectives

This course covers all aspects of human nutrition including nutritional science, therapeutic nutrition and medical nutrition. Students will develop knowledge of food, nutrients, biochemistry and all other aspects of nutrition.

### Course content

1. Introduction to dietetics and its scope (2 hrs)
2. Organizational pattern of dietary department of a hospital; layout of a diet kitchen (2 hrs)
3. Menu planning: dietary guidelines/food pyramid, recommended dietary allowances, planning diets and dietary calculation using the exchange lists (5 hrs)
4. Nutritional and food requirements through out life cycle: infants, pre-school children, school children, adolescence, adults, pregnancy and lactation, old age (8 hrs)
5. Introduction and principles of diet therapy (2 hrs)
6. Routine hospital diet: modification in consistency and texture (clear liquid diet, full fluid, soft diet), modifications of diets in nutrients, modification of diets in different diseases (6 hrs)
7. Nutritional assessment and screening (hospital-based) (2 hrs)
8. Nutritional services for patients: role of doctors, dietitians and nurses in the treatment effects of food acceptance and utilization, patient care and rehabilitation, interpersonal relationship with patient, documentation of nutritional care, feeding the patient, diet counseling. (6 hrs)
9. Influence of drugs on the nutritional status of the patients (2 hrs)

10. Special feeding methods: intravenous feeding, tube feeding. (2 hrs)
11. Nutritional anemia (3 hrs)
12. Diet in obesity and underweight and management (2 hrs)
13. Incidence, etiology, pathophysiology, metabolic aberrations, clinical manifestation, complications, nutritional care and counseling for the following conditions:
  - a. Diseases of oral cavity, the esophagus and the stomach: esophagitis, tonsillectomy, gastric and duodenal ulcer, gastritis (4 hrs)
  - b. Diseases of the intestine and colon: flatulence, diarrhea, constipation, diverticulosis, steatorrhea, celiac disease, ulcerative colitis, irritable bowel syndrome (5 hrs)
  - c. Diseases of the liver, biliary system and pancreas: cirrhosis of liver, infantile biliary, cirrhosis, jaundice and viral hepatitis, hepatic precoma and coma, diseases of gall bladder, acute and chronic pancreatitis (8 hrs)
  - d. Pre-operative and post-operative diet; diet following operations of the mouth, throat or esophagus; gastrectomy, intestinal surgery, other abdominal operations, burns, dumping syndrome (6 hrs)
  - e. Nutritional care in diabetes mellitus: complications, diet exchange lists (4 hrs)
  - f. Various metabolic disorders: gout, joint diseases - rheumatoid arthritis, osteoarthritis, hypo- and hyperthyroidism (4 hrs)
  - g. Diseases of cardiovascular system: atherosclerosis and coronary heart diseases, hyperlipidemias, hypertension, congestive heart failure, myocardial infarction, cardiac surgery (6 hrs)
  - h. Diseases of kidney and urinary tract: acute glomerulonephritis, chronic glomerulonephritis, nephrotic syndrome, nephrosclerosis, renal failure (acute and chronic), dialysis, renal transplantation, urolithiasis, food exchange lists (7 hrs)
  - i. Fever and other infectious diseases: typhoid, tuberculosis (3 hrs)
  - j. Pulmonary diseases (2 hrs)
  - k. Neoplastic diseases (2 hrs)
  - l. Diseases of the nervous system (3 hrs)
14. Diet in food allergy, food intolerance (2 hrs)
15. Malabsorption syndrome: medium chain triglyceride diet, lactose restricted diet, sucrose restricted diet, gluten restricted diet (3 hrs)

- |   |         |
|---|---------|
| 16. Nutritional care in HIV infections and AIDS | (2 hrs) |
| 17. Inborn errors of metabolism                 | (3 hrs) |
| 18. Diet for hospitalized children              | (4 hrs) |
| 19. Sports nutrition and food requirements      | (3 hrs) |

### **Course Code No.: BND 403 B**

#### **Practical**

1. Standardization of portions
2. Planning, preparation and calculation of the following diets: clear liquid diet, liquid diet, soft diet, pureed diet, normal diet, low/high calorie diets, low and high residue diets, low and high protein diets, sodium restricted diets
3. Planning, calculation, preparation, services, evaluation, and dietary counseling for the following diseases: typhoid, tuberculosis, peptic ulcer, diarrhea, constipation, ulcerative colitis, infective hepatitis, diabetes mellitus, heart diseases, kidney diseases, anemia, cirrhosis of liver
4. Combination diets: diabetes mellitus and chronic renal failure, diabetes mellitus and cardiovascular diseases, cirrhosis of liver and GI bleeding

#### **References**

1. Ekvall, S.W. *Pediatric Nutrition in Chronic Diseases and Development of Disorders: Prevention, Assessment and Treatment*. Oxford University Press. (1993)
2. Gibson, R.S. *Principles of Nutritional Assessment*. Oxford University Press. (1990.)
3. Gopalan, C. and Krishnamurthy, K. *Nutrition in Major Metabolic Diseases*. Oxford University Press. (1997)
4. Howard, H.M. *Nutrition and Clinical Dietetics*. Kessinger Publishing. (2007)
5. Njeldanes, L.F. and Shibamoto, T. *Introduction to Food Toxicology*, Elsevier Science and Technology (1993)
6. Watson, R.R. and Preedy V.R. *Review in Food and Nutrition Toxicity*: Taylor & Francis Ltd. (2005)
7. Williams, S.R. *Nutrition and Diet Therapy*. Elsevier Health Sciences (1998)

## **Dissertation**

Full marks: 100

Year: IV

**Course Code No.: BND 404 B**

### **Nature of the course**

Practical

### **Course content**

The students will carry out dissertation work on the approved topic. Topics for the dissertation work will be decided after recommendation from the Nutrition and Dietetics Instruction Committee and approval from the Chairman of Food Technology Subject Committee. The dissertation of the students will be evaluated by a panel of examiners composed of external subject expert, guide teacher, and chairman of Nutrition and Dietetics Instruction Committee. The students will have to present their dissertation before the panel.

## Field Based Posting (Internship, 3 months)

Full marks: 100  
Year: IV

**Course Code No.: BND 405 B**

### **Nature of the course**

Practical

### **Course content**

The students will undergo internship (field-based posting) in order to gain practical experience in the related field. The decision on the posting will be made by Nutrition and Dietetics Instruction Committee.

The possible places for posting will be:

1. Hospitals, NGOs, and INGOs conducting nutritional programs
2. Government bodies related to nutritional programs
3. Other related institutions and organizations

At the end of the field-posting, the intern will have to prepare a report and present it before a panel of experts consisting of Chairman of Nutrition and Dietetics Instruction Committee and teachers related to the subject. The distribution of marks and the system of evaluation will be as follows:

<i>Evaluation</i>	<i>Weightage (marks)</i>
External	50
Internal	20
Presentation	30

*External* means the external expert on relevant topic/field.

*Internal* means the teacher deputed for the inspection of students in the field-posting.

*Presentation* means the presentation of the field report before the panel.

\*\*\*