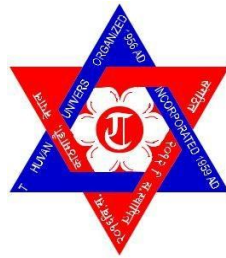


TRIBHUVAN UNIVERSITY

Institute of Science and Technology



B.Sc. Nutrition & Dietetics

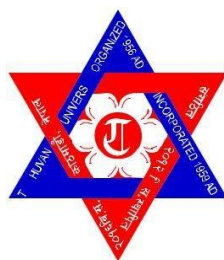
Syllabus

TRIBHUVAN UNIVERSITY

Institute of Science and Technology

Syllabus for

B.Sc. Nutrition & Dietetics



Academic Committee

Central Campus of Technology, Dharan, Nepal

2018

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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 connection, National Planning Commission prioritized a Bachelor of Science in Nutrition & Dietetics (B.Sc. ND) program in 2006 to address this problem. Central Campus of Technology, therefore, can be an appropriate place to run the course. The existing courses of B. Tech. (Food) and B.Sc. (Microbiology) will be helpful and play a complementary role for successful running of B.Sc. ND program.

Objectives

The curriculum is aimed at protecting health and saving lives by deploying knowledge and expertise in the field of nutrition and dietetics. Hence, the course is intended to produce graduates with recognized clinical, public health and diet 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 other food and nutrition related sectors.

Eligibility for admission

Candidates who have passed I.Sc., 10+2 in Science, I. Tech. in Food/Lab Technology, or equivalent securing at least second division or equivalent shall be considered eligible to apply for admission to B.Sc.ND.

Admission criteria

A student who seeks admission to B.Sc. ND program:

- Must appear in an entrance examination of two hours duration conducted by Central Campus of Technology, Institute of Science and Technology (IOST), TU.
- Candidates securing at least 50% marks in the entrance examination are eligible to admit in the program.
- The selection of the students for admission will be based as per the merit of the entrance examination.
- Candidate must comply with all the application procedures.

Course structure

The entire B.Sc. ND course is of eight semesters (four academic years) constituting in total of 127 credit hours. Each semester consists of 16 to 18 credit hr (equivalent to 400 to 450 marks) except semesters VII and VIII.

In total, thirty two papers are offered. Among them, eight papers consist of theory only; two theory papers consist of 3 credit hours (75 marks) and remaining six theory papers are given 2 credit hours (50 marks) each. Twenty four papers consist of both theory and practical part. Thirteen papers are given 3 credits hours (2 credit hour theory and 1 credit hour for practical), while the rest eleven papers are given 4 credit hour (3 credit hour for theory and 1 credit hour for practical) each. One credit hour has given 25 marks for both theory and practical parts, respectively. For theoretical part, 1 credit hour has 16 teaching hours and for practical part, 1 credit hour has 12 to 16 practicals (36 to



48-16 teaching hours) depending upon the nature of the course. Each practical has 3 hours of duration.

In the seventh semester, there are two compulsory courses, namely, (i) Community based posting (2 months) of 6 credit hour and (ii) hospital based posting (3 months) of 8 credit hours. In the eighth semester students should carry out dissertation work of 12 credit hours as mentioned in the curriculum.

Notes:

- Dissertation topics will be finalized by the Department of Nutrition & Dietetics and approved by the Nutrition and Dietetics Subject Committee.
- Short field visits will be decided by the Department.

Courses distribution

The entire syllables of B.Sc. ND is divided into Basic courses, Allied courses and Core courses with their contribution of 15%, 35% and 50% respectively (Table 1)

Table 1: Distribution of the courses by nature as Basic, Allied and Core subjects

Types of Courses	Subject Code	Name of Subjects	Nature of course	Credit hrs	Sub-Total	% Distribution
Basic Courses	BND 101	Biophysics	Th+Pr	3+1= 4	19	15
	BND 102	General Chemistry and ITA	Th+Pr	3+1= 4		
	BND104	Mathematics	Th	2		
	BND 103	Basic & Food Microbiology	Th+Pr	2+1=3		
	BND152	Medical Microbiology	Th+Pr	2+1= 3		
	BND 206	Computer Applications	Th+Pr	2+1= 3		
Allied Courses	BND 105	Principle of Food Science & Processing I	Th+Pr	3+1= 4	44	35
	BND 151	Principle of Food Science & Processing II	Th+Pr	3+1= 4		
	BND153	Food Chemistry	Th+Pr	3+1=4		
	BND 154	Human Physiology I	Th+Pr	2+1=3		
	BND 155	Hygiene & Sanitation	Th	2		
	BND 201	Nutritional Biochemistry I	Th+Pr	2+1= 3		
	BND203	Human Physiology II	Th+Pr	2+1= 3		
	BND205	Pharmacology	Th	2		
	BND 251	Nutritional Biochemistry II	Th+Pr	2+1= 3		
	BND 253	Food Toxicology	Th+Pr	3+1= 4		
	BND 254	Catering & Food Service management	Th+Pr	3+1= 4		
	BND 255	Food Quality Control & Management	Th	2		
	BND 303	Applied Statistics in Health & Nutritional Research	Th+Pr	3+1=4		
	BND 356	Research Methodology	Th	2		
Core Courses	BND 202 A	Health & Nutritional Aspects of Food	Th	3	64	50
	BND204	Human Nutrition I	Th+Pr	2+1=3		
	BND 252	Human Nutrition II (Life cycle nutrition)	Th+Pr	2+1=3		
	BND 301	Clinical Nutrition I	Th+Pr	2+1=3		
	BND 302	Dietetics I	Th+Pr	2+1=3		
	BND304	Basic and Nutritional Epidemiology	Th+Pr	3+1= 4		
	BND 305	Nutrition Education and Behaviour Change Communication	Th+Pr	3+1= 4		
	BND 352	Clinical Nutrition II	Th+Pr	2+1=3		
	BND 352	Dietetics II	Th+Pr	2+1=3		
	BND 353	Food & Nutrition Security	Th+Pr	3+1=4		
	BND 354	Public Health Nutrition	Th	3		
	BND 355	Nutrition for Athletics and Sport Persons	Th	2		
	BND 401	Community Based Posting (2 months)	Pr	6		
	BND 402	Hospital Based Posting (3 months)	Pr	8		
	BND 451	Dissertation (6 months)	Pr	12		
Total				127	127	100

Hours of instruction and attendance

One semester will constitute 120 working days. For a paper of 4 credit hours, there will be 64 lectures of 50 min each. One theory paper of 4 credit hours will have 4 lectures per week. One practical paper of 1 credit hour will have 3 hours of practical per week. An attendance of 70% is compulsory in both theory and practical classes.

Evaluation Criteria

All the theory courses will have an internal assessment of 20% weightage and a final examination of 80% weightage of the full marks. A student must secure a minimum of 50% marks in both internal assessment and final examination to pass the theory courses.

All the practical course will have an internal assessment of 50% weightage and a final examination of 50% weightage of the full marks. A student must secure a minimum of 50% marks in both internal assessment and final examination to pass the practical courses.

The marks distribution for internal assessment of theory paper will be as given in Table

2. Table 2: Marks distribution for internal assessment of theory paper

Credit hour (Cr)	Full marks	Marks distribution			
		Attendance	Seminar/Assignment	Class test	Pre-board examination
4	20	5	2.5	2.5	10
3	15	3.5	2.0	2.0	7.5
2	10	2.5	1.5	1.5	4.5

The marks distribution for internal assessment and final examination of practical papers will be as given in Table 3.

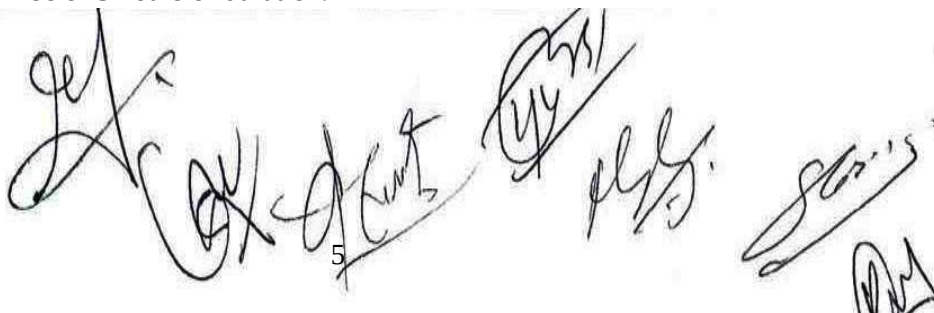
Table 3: Marks distribution for internal assessment of practical paper

Credit hr (Cr)	Full marks	Internal Assessment			Total	Final Examination			Total
		Attendance	Practical Records	Performance		Written Exam	Practical	Viva	
1	25	3.5	6	3	12.5	2.5	4	6	12.5

The internship (community based posting and hospital based posting) and dissertation are evaluated by a team of different evaluators (internal, supervisor, HOD and external) assigned by the Department and students should secure at least 50% of marks in each evaluator evaluation. The final score will be the sum of all evaluator's marks.

Final (Semester end) Examination:

The campus will conduct the final examination at the end of each semester. Students should appear in a 3-hour examination for theory paper of 3 credits hours (60 marks) papers and a 2-hour examination for theory paper of 2 credits hours (40 marks). Practical examination for 1 credit hour (12.5 marks) will be of 3 hours of duration.



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The Grading System:

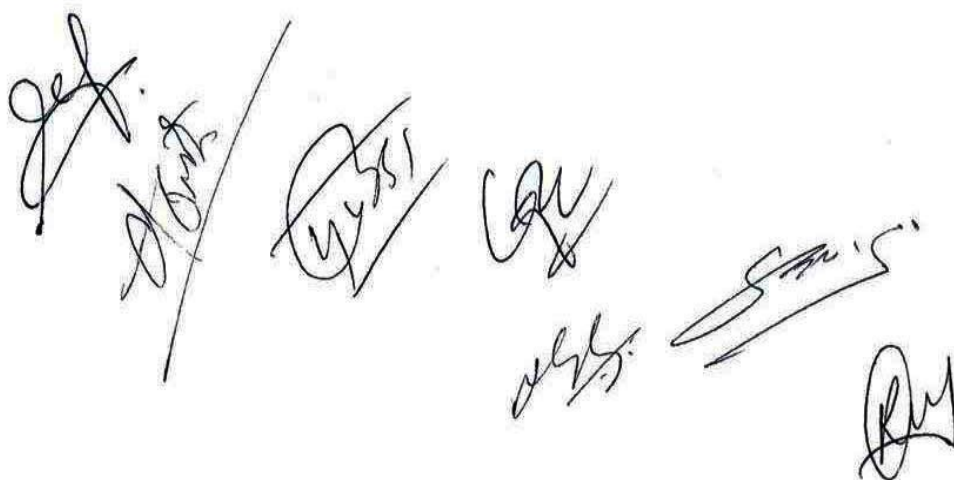
A student having passed his/her 8 semesters (4 years) of study will be graded as follows:

Distinction: 80% and above (8 semester's Average)

First Division: 70% and above (8 semester's Average)

Second Division: 60% and above (8 semester's Average)

Pass Division: 50% and above (8 semester's Average)

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Semester wise Course Distribution

The details of semester wise courses distribution of B.Sc. ND is as follows:

Semester I

Course Code	Subject	Nature of Course	Credit hours	FM	Total Credit hours
BND 101 A	Biophysics	Th	3	75	17
BND101B	Biophysics	Pr	1	25	
BND 102A	General Chemistry and Instrumental Technique of Analysis	Th	3	75	
BND 102B	General Chemistry and Instrumental Technique of Analysis	Pr	1	25	
BND 103A	Basic and Food Microbiology	Th	2	50	
BND 103 B	Basic and Food Microbiology	Pr	1	25	
BND 104 A	Mathematics	Th	2	50	
BND 105A	Principles of Food Science and Processing I	Th	3	75	
BND 105B	Principles of Food Science and Processing I	Pr	1	25	
Total	Theoretical course	5	13	325	
	Practical Course	4	4	100	

Semester II

Course Code	Subject	Nature of Course	Credit hours	FM	Total Credit hours
BND 151 A	Principles of Food Science and processing II	Th	3	75	16
BND151B	Principle of Food Science and processing II	Pr	1	25	
BND 152A	Medical Microbiology	Th	2	50	
BND 152B	Medical Microbiology	Pr	1	25	
BND 153A	Food Chemistry	Th	3	75	
BND 153 B	Food Chemistry	Pr	1	25	
BND 154A	Human Physiology I	Th	2	50	
BND 154 B	Human Physiology I	Pr	1	25	
BND 155A	Food Hygiene and Sanitation	Th	2	50	
Total	Theoretical Courses	5	12	300	
	Practical Courses	4	4	100	

Semester III

Course Code	Subject	Nature of Course	Credit hours	FM	Total Credit hours
BND 201 A	Nutritional Biochemistry I	Th	2	50	17
BND201B	Nutritional Biochemistry I	Pr	1	25	
BND 202A	Health & Nutritional Aspects of Food	Th	3	75	
BND 203A	Human Physiology II	Th	2	50	
BND 203 B	Human Physiology II	Pr	1	25	

BND 204A	Human Nutrition I	Th	2	50	
BND 204B	Human Nutrition I	Pr	1	25	
BND205A	Pharmacology	Th	2	50	
BND 206A	Computer Applications	Th	2	50	
BND 206B	Computer Applications	Pr	1	25	
Total	Theoretical Courses	6	13	325	
	Practical Courses	4	4	100	

Semester IV

Course Code	Subject	Nature of Course	Credit hours	FM	Teaching hours
BND 251 A	Nutritional Biochemistry II	Th	2	50	16
BND251B	Nutritional Biochemistry II	Pr	1	25	
BND 252A	Human Nutrition II (Life cycle Nutrition)	Th	2	50	
BND 252B	Human Nutrition II (Life cycle Nutrition)	Pr	1	25	
BND 253A	Food Toxicology	Th	3	75	
BND 253 B	Food Toxicology	Pr	1	25	
BND 254A	Catering & Food Service Management	Th	3	75	
BND 254 B	Catering & Food service management	Pr	1	25	
BND 255A	Food Quality Control & Management	Th	2	50	
Total	Theoretical Courses	5	12	300	
	Practical Courses	4	4	100	

Semester V

Course Code	Subject	Nature of Course	Credit hours	FM	Total Credit hours
BND 301A	Clinical Nutrition I	Th	2	50	18
BND301B	Clinical Nutrition I	Pr	1	25	
BND 302A	Dietetics I	Th	2	50	
BND 302 B	Dietetics I	Pr	1	25	
BND 303A	Applied Statistics in Health & Nutritional Research	Th	3	75	
BND 303 B	Applied Statistics in Health & Nutritional Research	Pr	1	25	
BND 304A	Basic and Nutritional Epidemiology	Th	3	75	
BND 304B	Basic and Nutritional Epidemiology	Pr	1	25	
BND 305A	Nutrition Education & Behavior Change Communication	Th	3	75	
BND 305 B	Nutrition Education & Behavior Change communication	Pr	1	25	
Total	Theoretical Course	5	13	325	
	Practical Courses	5	5	125	

Semester VI

Course Code	Subject	Nature of Course	Credit hours	FM	Teaching hours
BND 351 A	Clinical Nutrition II	Th	2	50	17
BND351B	Clinical Nutrition II	Pr	1	25	
BND 352A	Dietetics II	Th	2	50	
BND 352B	Dietetics II	Pr	1	25	
BND 353A	Food & Nutrition Security	Th	3	75	
BND 353 B	Food and Nutrition Security	Pr	1	25	
BND 354A	Public Health Nutrition	Th	3	75	
BND 355 A	Nutrition for Athletic and Sport persons	Th	2	50	
BND 356A	Research Methodology	Th	2	50	
Total	Theoretical courses	6	14	350	
	Practical Courses	3	3	75	

Semester VII

Course Code	Subject	Nature of Course	Credit hours	FM	Total Credit hours
BND 401 B	Community Based Posting (2 months)	Pr	6	150	14
BND402B	Hospital Based Posting (3months)	Pr	8	200	
Total	Practical Courses	-	14		

Semester VIII

Course Code	Subject	Nature of Course	Credit hours	FM
BND 451 B	Dissertation (Six months)	Pr	12	300

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1st YEAR, SEMESTER – I

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Course: Biophysics

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: I

Course Code: BND 101A

Credit hrs: 3

Full Marks: 75

Nature of Course: Theory

Course description and objectives

The main objective of the course is to impart fundamental concept of physics in relation to nutrition and dietetics. The student will acquire knowledge of properties of matter, thermodynamic, wave and optics, electricity and modern physics.

Unit	Content	Teaching hrs
1	Properties of matter a) Elasticity: different types of elastic constants and their relations, coefficient of rigidity of a cylinder, bending moment, stress, strain and their relation. b) Surface tension: surface tension and surface energy, excess pressure inside a liquid drop or an air bubble, excess pressure inside a soap bubble, angle of contacts, capillarity. c) Viscosity: stream line motion and rate of flow, equation of continuity, Bernoulli's theorem, coefficient of viscosity, Stoke's law, Poiseuille's method for determination of coefficient of viscosity, Ostwald viscometer.	8
2.	Thermodynamics a) Introduction, thermal equilibrium, Zeroth law of thermodynamics, thermodynamic scale of temperature, principle of thermocouple. b) First law of thermodynamics, isothermal and adiabatic changes. c) Second law of thermodynamics: statement of second law of thermodynamics, Carnot's engine, Carnot's reversible cycle and its efficiency, Carnot's theorem, entropy, S-T diagram, entropy of a perfect gas. d) Refrigeration: production of low temperature, freezing mixtures, cooling by evaporation, vapour compression refrigeration and vapour absorption refrigeration. e) Thermal radiation: introduction, concept of black body radiation, Stefan-Boltzmann law, Kirchhoff's law of black body radiation, Wein's displacement law, Planck's quantum theory of radiations, detection of thermal radiations.	12
3.	Wave and Optics a) Wave: introduction, types, production and properties, ultrasonic	12

	wave - production, properties and uses. b) Interference: Young's double slits experiment, optical path, coherence, Newton's rings, colour in thin films due to transmitted and reflected light. c) Diffraction: Fresnel and Fraunhofer diffraction, diffraction patterns due to narrow slit, plane diffraction grating, resolving power. d) Polarization: polarized and unpolarized light, Brewster's law, Malus law, Nicol's prism, polarizing microscope.	
4.	a) Alternating Current: average and R.M.S. values of A.C., A.C. through L and C, A.C. through R-L, R-C, L-C and L-R-C series circuits, resonance, power in A.C., Skin effect, choke coil, transformers. 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 – their sources, properties and applications, hazards to human health, micro-ovens.	8
5.	a) High energy radiations and health physics: X-rays and gamma rays-their productions, properties and practical applications, isotopes and radio-isotopes, applications of radio-isotopes in medicines, industries, agricultures and scientific research, ionizing radiations, biological effect of radiations, hazards due to external and internal sources, radiation dose and radioactivity units. b) Pollution: thermal pollution, noise pollution and environment pollution- sources, effects, prevention and control, green-house effect and climate change.	8
		48 hrs

Course: Biophysics

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: I

Course Code: BND 101B

Credit hrs: 1

Full Marks: 25

Nature of Course: Practical

Practicals

1. Determination of Sp heat capacity
2. Determination of low temperature of materials
3. Measurement of radiation energy
4. Determination of surface tension of liquid by Jaeger's method.
5. Determination of coefficient of viscosity of given liquid by Stoke's method.
6. Determination of wavelength of sodium light by measuring diameter of Newton's Ring.
7. Determination of specific rotation of sugar solution by using Laurent's half-shade polarimeter.
8. Study the magnetic field produced by current carrying solenoid using a search coil and an A.C. source.
9. Study the relationship between current and frequency in a series L-C-R circuit and find
 - (a) the resonant frequency
 - (b) the quality factor and
 - (c) the band width of resonant circuit.
10. Draw the Plateau curve by using Geiger Muller counter and find out the half-life of given radioactive substance.

References

1. Alpen, E.L. (1997) *Radiation biophysics*, 2nd Sdn, Prentice-Hall, New Jersey.
2. Sybesma, C. (1989) *Biophysics: An Introduction*, Kluwer Academic Publishers, Netherland , revised edition of *Introduction to biophysics*, 1977, Newyork
3. Green, E. S. *Principle of Physics*

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Course: General Chemistry and Instrumental Techniques of Analysis

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: I

Course Code: BND 102A

Credit hrs: 3

Full Marks: 75

Nature of Course: Theory

Course description and objectives

Chemistry is fundamental to the study of all aspects of food and nutrition. This course is designed to provide a very firm background for the understanding of properties, interactions and nutritional significance of various chemical components and to provide principles and instrumentations of different analytical techniques.

Units	Content	Teaching hours
1.	Chemical bonding Review, hybridization, types of hybridization involving s and p orbitals.	1
2.	Atomic structure Bohr's postulates and limitations (review), de-Broglie equation, Heisenberg's uncertainty principle, wave mechanical model of atom, quantum numbers, shapes of s, p & d orbitals, Pauli's exclusion principle, Hund's rule and Aufbau principle, electronic configuration (in terms of s, p, d & f), stability of half-filled and full-filled orbitals.	5
3.	Co-ordination complexes Transition elements and their position in periodic table, characteristic properties of transition metals with reference to electronic configuration, metallic character, variable valency, complex formation, magnetic property, alloy formation, catalytic activity and colors, double salts, complex salts, Werner's co-ordination theory, nomenclature of co-ordination compounds.	3
4	Chemical thermodynamics Terms used in thermodynamics (review), internal energy, enthalpy, relation between enthalpy change and internal energy change, enthalpy of reaction, exothermic and endothermic reactions. Hess's law of constant heat summation, calorific values of food or fuel, Enthalpy change from bond energy, molar heat capacities, relation between C_p and C_v , variation of heat of reaction with temperature (Kirchoff's equation), concept of entropy and second law of thermodynamics.	5
5	Ionic equilibrium Ostwald's dilution law (review), auto ionization of water, pH and pH scale, theory of acid-base indicators, Choice of indicator in acid-base titrations, buffer solutions, mechanism of buffer action, Henderson's equation, hydrolysis of salt (no derivation).	4



6	Chemical kinetics Rate of reaction and its measurement (review), order and molecularity, derivation of rate constant for zero and first order reactions, examples and half-life period of such reactions. Method to determine the order of reaction, effect of temperature on rate of reaction, Arrhenius equation and concept of energy of activation.	4
7	Colloids Classification, preparation and applications, general physical properties of colloids, kinetic property, electrical property and optical property.	3
8	Introduction to organic chemistry Introduction to organic reactions and mechanism, substitution reaction (SN1 and SN2), addition reactions, elimination reaction (E1 and E2), rearrangement reaction. Stereochemistry, types of stereoisomerism, optical and geometrical isomerism.	6
9	Aromatic compounds Aromaticity, aromaticity of heterocyclic compounds; aromatic nitro-compounds and amines, conversion of nitrobenzene to ortho, meta and para-dinitrobenzene and TNT., aromatic nitrocompound reduction in neutral, acidic and alkaline media, relative basic strength of aliphatic and aromatic amines, ring substitution in aromatic amines, diazotization and its mechanism, synthetic application of diazonium salts.	5
10	Chromatographic techniques Introduction, types and principle- paper chromatography, thin layer chromatography (TLC), column chromatography, choice of adsorbent and solvent, preparation of chromatogram, R _f value and application. Gas chromatography (GC) and high performance liquid chromatography (HPLC) - principle, experimental technique and applications	5
11	UV-visible spectroscopy Introduction, principle - Beer's-Lambert law, absorbance and absorptivity. Instrumentation- photocolormeter and spectrophotometer and their applications.	4
12	Conductometric and pH titrations Introduction, principle and application in acid base titrations, calibration of pH meter.	3
	Total	48 hrs



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Course: General Chemistry + Instrumental Technique of Analysis

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: I

Course Code: BND 102B

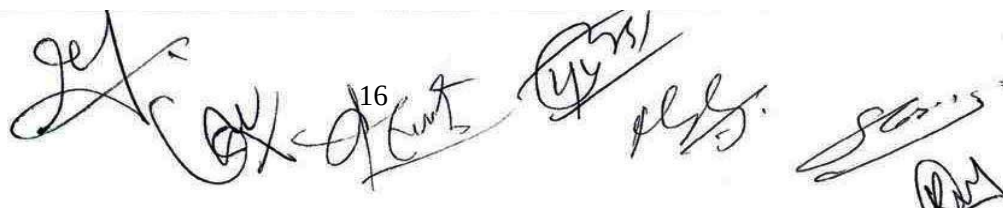
Credit hrs: 1

Full Marks: 25

Nature of Course: Practical

Practicals

1. Estimation of amount of NaOH and Na_2CO_3 from the given alkali mixture.
2. Estimation of amount of sulphuric acid and oxalic acid from the given acid mixture.
3. Estimation of amount of Iron from the Mohr's salt by using standard solution of potassium permanganate.
4. Estimation of amount of copper from copper sulphate by using standard sodium thiosulphate solution.
5. Determination of total hardness, temporary hardness and permanent hardness of water samples by EDTA complexometric method.
6. Preparation of standard buffer solutions using acetic acid and sodium acetate and to measure the approximate pH of the given unknown solution by universal indicator.
7. Preparation of standard buffer solutions using ammonia and ammonium chloride and to measure the approximate pH of the given unknown solution by universal indicator.
8. Estimation of amount of phosphoric acid presents in the cola beverages by the use of pH meter.
9. Calibration of the pH meter using two buffer solutions and determine the strength of given NaOH solution using standard solution of HCl by pH titration method.
10. Study the kinetics of acid catalyzed hydrolysis of methyl acetate.
11. Measurement of conductance of given NaOH solution and determine its strength using standard solution of HCl by conductometric titration method.
12. Verification Beer's-Lambert law for determination of concentration of potassium permanganate solution spectrophotometrically.



13. Estimation of amount of sodium in a given sample of food using flame photometer.
14. Determination of melting of given solid and boiling points of given liquid substances by using Thiel's tube.
15. Re-crystallization of the given organic compounds and compare melting points.
16. Organic reactions of the following compounds: a) urea, b) glucose, c) benzaldehyde, d) acetophenone, e) benzoic acid and f) aniline.

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8. Cunningham, W.P & Cunningham, M.A. (2004) Principles of Environmental Science: Inquiry and Applications, 2nd Edition. Boston: Mc Grow Hill.
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Course: Basic and Food Microbiology

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: I

Course Code: BND 103A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

The course include of Basic Microbiology and Food Microbiology. 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.

Unit	Contents	Teaching hours
	Basic Microbiology	
1	History and scope of microbiology	1
2	Microscopy Light (bright field, dark field), phase contrast, fluorescent, stereo), electron (TEM, SEM) microscopy	2
3	Morphology and cytology of virus, bacteria, fungi, and protozoa	3
4	Sterilization Physical and chemical methods of sterilization	2
5	Concept of metabolism Phosphorylation and types, EMP pathway, ED pathway, HMP pathway, electron transport chain. Bacterial growth and growth curve: diauxic and synchronous, Nutrition: types of bacteria based on nutrition requirement, mechanisms of uptake of nutrients.	3
6	Microbial genetics: introduction, structure of DNA and RNA, plasmid, genetic code. Bacterial recombination: conjugation, transformation and transduction, replication, transcription and translation, Mutation; types of mutation, and mutagens. Concept of genetic engineering: tools, steps of gene cloning, PCR technique: types, steps and application.	4
	Food Microbiology	
7	Introduction Scope of food microbiology, important micro-organisms in food (molds, yeast, bacteria).	1
8	Principles of food spoilage spoilage of cereals, vegetables, fruits, meat and meat products, milk and	6



	milk products, poultry, fish and sea foods, spoilage of canned foods, factors associated with food spoilage (extrinsic and intrinsic).	
9.	Food borne infections and intoxication Toxins, antigens, symptoms and control of <i>Staphylococcus aureus</i> , <i>Bacillus cereus</i> , <i>Clostridium spp</i> , <i>Escherichia coli</i> , <i>Salmonella enteric vartyphi</i> , <i>Vibrio spp.</i> borne food poisoning.	6
10	Microbiology of Nepalese fermented foods <i>Kinema</i> , <i>sinki</i> , <i>gundruk</i> , <i>tama(mesu)</i> , <i>khalpi</i> , <i>chhurpi</i> , <i>sherkhem</i> , <i>dahi</i> , <i>jujudhau</i> , <i>bhakka</i> ; <i>kimchi</i> , <i>natto</i> , <i>tempeh</i> , <i>kefir</i> , <i>koumiss</i> , <i>yoghurt</i> , <i>idli</i> ; Therapeutic and nutritional values of fermented foods, fermented foods and food security (importance and relationship).	4
	Total	32 hrs

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Course: Basic and Food Microbiology

Level: Bachelor of Science in Nutrition and dietetics (BSc. ND)

Semester: I

Course Code: BND 103B

Credit hrs: 1

Full Marks: 25

Nature of Course: practical

Practicals

1. Study of different equipments used in microbiology laboratory
2. Study the working principle and parts of a compound microscope.
3. Preparation of media: basic, selective, differential media, media slant preparation
4. Staining of micro-organisms: monochromatic staining (simple & negative), Gram staining, spore staining, capsule staining, flagella staining
5. Inoculum isolation and enumeration: pour plate technique, spread plate technique, streak plate technique, standard plate count (SPC) method, anaerobic culture method: Gas Pak Jar method, Deep Agar tube method
6. Biochemical tests: catalase, oxidase test, IMViC test, gelatin liquefaction test, TSIA test, urease test, H₂S test, starch hydrolysis test, carbohydrate fermentation test.
7. Determination of generation time by spectrophotometer method.
8. Determination of quality of milk: MBRT, resazurin test, phosphatase test, DMC, COB.
9. Determination of coliforms in water: MPN technique, membrane filter technique.
10. Antimicrobial susceptibility test by Kirby-Bauer method.
11. Demonstration of oligodynamic effect of heavy metal.
12. Evaluation of disinfectants by phenol coefficient method.
13. Isolation of micro-organisms from fermented foods, flour, liquid beverages, carbonated non-alcoholic beverages.
14. Isolation of lactic acid bacteria from *dahi* of different places.
15. Isolation of bacteria and fungi from spoiled food materials: fruits, bread, meat, egg, milk, vegetable.
16. Production of *kinema* by solid substrate fermentation..
17. Sterility testing of utensils, food plants and equipments.

References

1. Adams, M.R. and Moss, M.O. (1996). Food Microbiology New Age International. (P) Ltd publication, New Delhi.
2. Cappuccino J.G. and Sherman N., (2002). Microbiology. A Laboratory Manual. The Benjamin Cumming Publishing Company.



3. Frazier N. C. and Westhoff DC. (2005). Food Microbiology Tata McGraw Hill Publishing Company LTD.
4. Kharel G. P., Acharya P. P. and. Rai B. K. (2009). Traditional Foods of Nepal. Highland Publisher (P) Ltd publication, Kathmandu.
5. Steinkrauss K. S. (1996). Handbook of Indigenous Fermented Foods. Marcel Dekker.

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Course: Mathematics

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: I

Course Code: BND 104A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

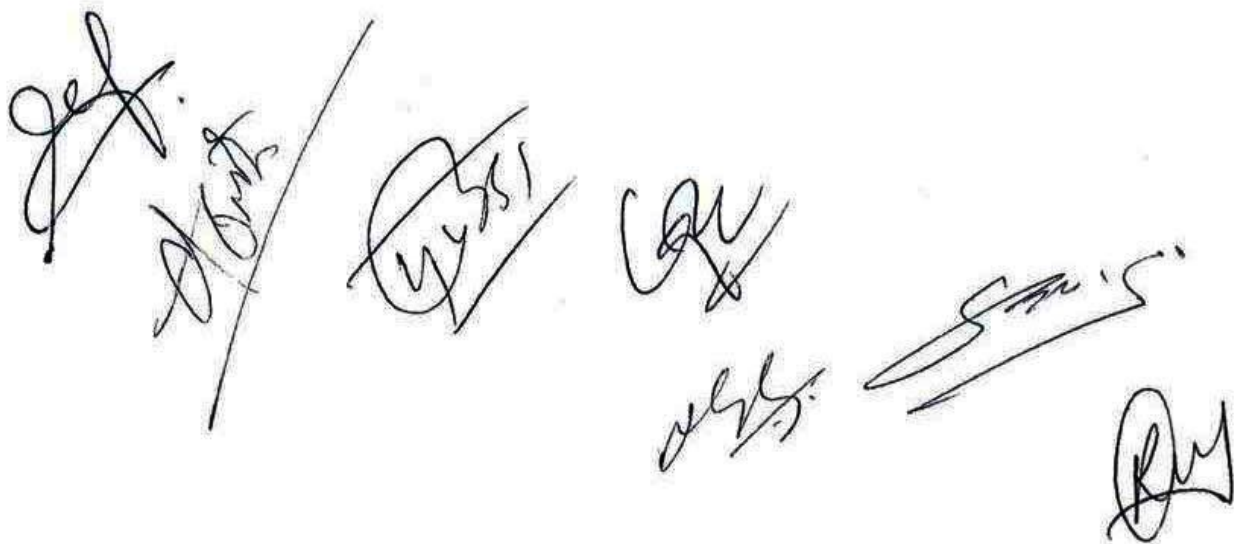
The main purpose of this course is to provide theoretical and practical knowledge on using the techniques of differentiation, Integration and differential equations to the related problems.

Unit	Content	Teaching hours
1.	Differential calculus a) Limits, continuity and derivatives b) Successive derivatives and use of Leibnitz's theorem c) Mean value theorem [Rolle's Theorem, Lagrange's mean theorem, Taylor's theorem with Lagrange's form of remainder and Maclaurin series;(without proof)] d) Indeterminate forms and L hospital rule e) Maxima and minima (one variable) f) Partial differential and use of Euler's theorem	12
2.	Integral calculus a) Rules and different standard method of integration b) Anti-derivatives of some standard forms and rational fractions c) Properties of definite integrals d) Infinite Integral e) Area under plane curves (with reference to under plane curve, ellipse, parabola, circle and between curves and lines) f) Double integral (simple problem)	10
3.	Differential equation a) Definition and classification, formulation of differential equations b) Solutions of differential equations of first order first order first degree (variable separation, homogenous equations, exact equations and linear equations method) c) Linear differential equations with constant coefficients (equations of second order) d) Homogeneous linear equations	10
	Total	32 hrs

References

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1. Singh, M.B and Bajracharya, B.C (2004) Differential Calculus, Sukunda pustak Bhawan, Kathmandu, Nepal
2. Pant, G.D. and Shrestha , G.S. (2003) Integral Calculus and Differential Equation, Sunil Prakasan, Kathmandu, Nepal
3. Das, B. C. and Mukhurjee, B.N. (1996) Differential Calculus, U.N. Dhur and Sons Pvt. Ltd. India
4. Das, B. C. and Mukherjee , B.N.(1996) Intergral Calculus and Differential Equation, U.N. Dhur and sons Pvt. Ltd. India
5. Thomas ,G.B. and Finney, R.L. Calculus and Analytical Geometry, Pearson Education Asia, India



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Course: Principles of Food Science and Processing-I
Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)
Semester: I
Course Code: BND 105A
Credit hrs: 3
Nature of Course: Theory

Full Marks: 75

Course description and objectives

The main purpose of this course is to provide knowledge about basics of food and its components. Since almost all the foods that we consume come in processed form in one way or other, this course also introduces and gives knowledge about basic principles of food processing and preservation. It also deals with food packaging, food laws, labeling and food safety so as to provide holistic knowledge about various aspects of food.

Unit	Content	Teaching hours
1.	Introduction to food science Definition, scope, role and responsibilities of food scientist	1
2.	Food: Types of functions	1
3.	Constituents of food a) Carbohydrates, proteins and fats: introduction, functions, properties b) Vitamins and minerals: introduction, types, functions c) Fiber: definition, types, functions d) Water: functions, forms, properties e) Organic acid and their roles f) Natural food toxicants and anti-nutritional factors: their effect and methods of removal from foods g) Natural pigments in food: definition, types, function, uses and preservation	16
4.	Food quality and deterioration Meaning, quality attributes, factors affecting deterioration and spoilage	2
5.	Introduction to food preservation Historical development of food preservation, purpose of food preservation, major food preservation technique	2
6.	Harvesting, treatment and handling of foods of plant origin a) Harvesting factors and quality: preharvest factors, maturity at harvest, harvesting methods, post harvest physiology (lifespan of fruits, classification of fruits and vegetables based on respiratory behaviour, role of ethylene in fruit ripening) b) Postharvest handling and treatments: postharvest factors and handling methods, postharvest treatments	5
7.	Preparation of raw materials for processing a) Cleaning (definition, functions and methods) , sorting and grading: (definition, function and methods), peeling: meaning and methods	2

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	b) Blanching: definition, objectives, methods, tests for the adequacy of blanching, effects of blanching on nutrients, meaning of trimming, coring, pitting	
8.	Fresh produce storage Introduction, principles and application of cellar storage, cold storage, evaporative cool chamber storage, CA storage, MA storage, hypobaric storage, limitations of CA storage.	2
9.	Combined methods of food preservation Introduction, principles, illustration of hurdle effects, homeostasis, metabolic exhaustion, application of hurdle technology	2
10.	Food preservation by chemicals a) Introduction, classification and properties of food preservatives; factors affecting preservative actions b) Introduction, mode of action, pH dependency and application of sulphur dioxide, benzoic acid, parabens, sorbic acid and nitrates and nitrites c) Biopreservative: introduction to biopreservatives, properties and uses of nisin, pediocin and tetracyclines	6
11.	Non-conventional methods of food preservation (non-thermal preservation of foods) Pulse electric field and high pressure processing: introduction, process, mechanism of action and application	2
12.	Food packaging Principle, types, properties	4
13.	Food fortification and enrichment Definition, important and purpose of fortification and enrichment, general guideline for food fortification and enrichment	2
14.	Food labeling Definition, types of information in labeling and their application to consumer, industry and regulatory organizations.	1
	Total	48 hrs

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Course: Principles of Food Science and Processing-I

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: I

Course Code: BND 105B

Credit hrs: 1

Full Marks: 25

Nature of Course: Practical

Practicals

1. Test for the adequacy of blanching of fruits and vegetables.
2. Preparation of brines and syrup.
3. Vitamin C estimation in fruits and vegetables.
4. Market study of food labelling/nutrition labelling/nutrition claim.
5. Detection technique of food adulteration in milk, spices, oil.
6. Determination of moisture content, iron, iodine, calcium and phosphorous.
7. Determination of organic acid in apples and citrus fruits.

References

1. Desrosier, N. W., & Desrosier, J. N. (1987). The Technology of Food Preservation (4th ed.). Delhi: CBS Publishers and Distributors.
2. Insel, P., Turner, R. E., & Ross, D. (2003). Discovering Nutrition. Massachusetts: Jones and Bartlett Publishers.
3. Meyer, L. H. (1987). Food Chemistry. Delhi, CBS Publishers and Distributors.
4. Norman, N. P. (1978). Food Science (3rd ed.). USA, AVI Publishing Company.
5. Potter, N. N. & Hotchkiss, J. H. (1995). Food Science (5th ed.), New Delhi: CBS Publishers & Distributors Pvt. Ltd.
6. Rahman, M. S. (2007). Handbook of Food Preservation (2nd ed.). USA: Taylor & Francis Group.
7. Swaminathan, M. (2008). Essentials of Food and Nutrition (2nd ed. Vol. I & II). Bangalore: The Bangalore Printing & Publishing Co., Ltd.
8. Fellows, P. (2000) Principle of Food Processing Technology: Principle and Practices (2nd ed.), Woodhead Publishing Limited, Cambridge, England
9. KC, J. B. & Rai, B. K. (2007). Basic Food Analysis Handbook. Kathmandu: Maya KC.

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1st YEAR, SEMESTER II

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Course: Principles of Food Science and Processing-II
Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)
Semester: II
Course Code: BND 151A
Credit hrs: 3
Nature of Course: Theory

Full Marks: 75

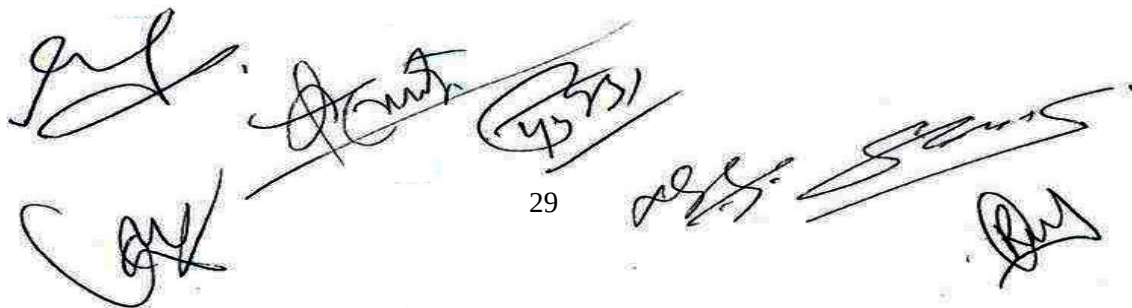
Course description and objectives

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.

Unit	Content	Teaching hours
1.	Food preservation by drying /dehydration. - Principles of food preservation, moisture content Vs water activity, difference between drying and dehydration. - Pretreatments in drying and dehydration: sulphiting/sulphuring, dipping, freezing, and cooking. - Brief introduction and uses of different drying equipment (kiln, cabinet, fluidized bed, rotary, tunnel, spray, freeze, osmotic). - Post-dehydration operations: sweating, screening, instantiation. - Effects of drying on plant tissues: shrinkage effect, browning, casehardening, volatile constituents, rehydration property, texture, nutritive value. - Freeze drying: definition, principles and steps in freeze drying; advantages of freeze drying, problems in freeze dried products, difference between conventional drying and freeze drying. - Quality evaluation of dehydrated fruits and vegetables.	9
2.	Food preservation by high temperature (canning) - Introduction and principles of food preservation by canning, canning process. Containers for canning: size and types of can; types and functions of fillers; preparation, testing and calculation of syrups and brines; meaning, objectives and methods of exhausting. - Role of pH in food preservation, pH classification of foods, determination of thermal process time, aseptic canning (definition, process, advantages and limitations). 12-D concept, hot packs method and flash 18 processes, thermo-bacteriology. - Spoilage in canned foods (can swelling, leaker and breather cans, discoloration of canned foods, microbial spoilage of canned foods). - Effects of heat treatment on foods.	9
3.	Food preservation by freezing. Principles of food preservation by freezing, theory of food freezing, concentration effect of food freezing, types of food freezing systems (air-blast freezer, still-air freezers, belt freezers, fluidized	7

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	bed freezers, plate freezers, liquid immersion freezers, cryogenic freezers). Factors determining freezing rate, effect of freezing and frozen storage (ice crystal damage, mechanical injury, freezer burn). b. Meaning and methods of thawing. c. Storage life of frozen foods (brief introduction to PSL, HQL and time-temperature integrator).	
4.	Radiation preservation of foods. a. Introduction to food irradiation, radiation sources, mechanisms of action of ionizing radiations, attempts to limit indirect effects of ionizing radiations. b. Radiation dose and dosimetry, dose distribution, dose determining factors, safety aspects of irradiated foods; effects of radiation on microorganisms, enzymes, packaging materials and food components. c. Potential applications, technological problems and limitations of irradiation; legal and safety aspects of food irradiation.	7
5.	Principles of food concentrate. a. Principles behind food preservation by high TSS and acidity, definition and characteristics of fruit jellies, commercial methods of jelly making, jelly strength, pectin grade, gel formations by LMPs and HMPs, tests for pectin content in fruit extracts, problems in jelly making. b. Definition and methods of jam, marmalades and preserves making, Differences among jam, jelly and marmalades, jam and jelly calculation.	6
6.	Principles of food preservation by fermentation. a. Principles, definition and types of food fermentation; order of food fermentation, additional benefits from food fermentation. b. Definition, types, and process of beer and wine making. c. Vinegar: definition and types of vinegar; mechanism of acetic acid fermentation, methods of vinegar production, post-production operations. d. Pickling of fruits and vegetables: introduction, process and uses of salt stock.	7
7.	Traditional methods of food preservation a) Introduction, traditional methods of preparing <i>gundruk</i>, <i>sinki</i>, <i>kinema</i>, <i>dahi</i>, dried fish (<i>sidra</i>), dried meat (<i>sukuti</i>), pickle (<i>khalpi</i>). Problems and improvements on traditional methods of food preservation.	3
	Total	48 hrs



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Course: Principles of Food Science and Processing II
Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)
Semester: II
Course Code: BND 151B
Credit hrs: 1
Nature of Course: Practical

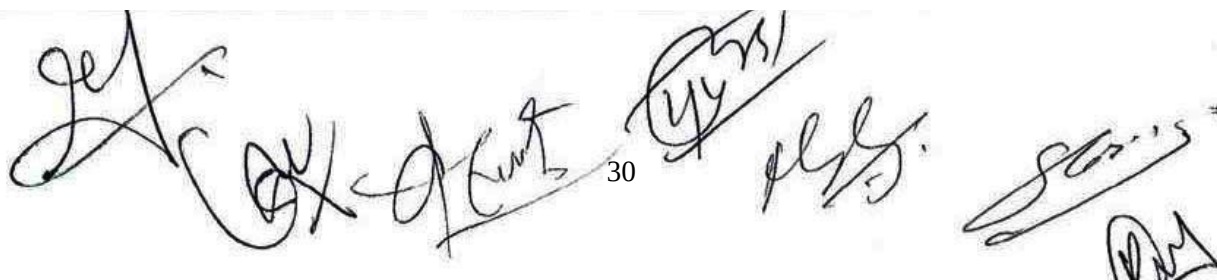
Full Marks: 25

Practicals

1. Study of different food processing equipment.
2. Preparation and testing of brines and syrups.
3. Drying/Dehydration of fruits and vegetables and their quality evaluation.
4. Canning of fruits and vegetables.
5. Preparation of squash.
6. Tests for the pectin contents in fruit extract.
7. Preparation of jam, jelly and preserves.
8. Preparation of salt stock.
9. Preparation of wine.
10. Visit to neighboring food processing industries.
11. A survey of traditional methods of food preservation.

References

10. Fellows P. (2000) Principle of Food Processing Technology: Principle and Practices (2nded.) ; Woodhead publishing Limited, Cambridge, England
11. Desrosier, N. W., & Desrosier, J. N. (1987). The Technology of Food Preservation (4th ed.). Delhi: CBS Publishers and Distributors.
12. Insel, P., Turner, R. E., & Ross, D. (2003). Discovering Nutrition. Massachusetts: Jones and Bartlett Publishers.
13. Meyer, L. H. (1987). Food Chemistry. Delhi: CBS Publishers and Distributors.
14. Norman, N. P. (1978). Food Science (3rded.). USA: AVI Publishing Company.
15. Potter, N. N., & Hotchkiss, J. H. (1995). Food Science (5th ed.). New Delhi: CBS Publishers & Distributors Pvt. Ltd.
16. Rahman, M. S. (2007). Handbook of Food Preservation (2nd ed.). USA: Taylor & Francis Group.
17. Swaminathan, M. (2008). Essentials of Food and Nutrition (2nd ed. Vol. I & II). Bangalore: The Bangalore Printing & Publishing Co., Ltd.

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Course: Medical Microbiology

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: II

Course Code: BND 152A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

The main objectives of the course are to provide the theoretical knowledge and practical skill on medically important microorganism. This course include the information about pathogenic microbes and their impact on public health , the mechanisms of disease causing process, role of nutrition in building resistance against infectious and non-infectious diseases, the immune system, hypersensitivity to foods, antimicrobial therapy, diagnostic microbiology

Units	Contents	Teaching hours
1.	Microorganisms of diseases Classifications of medically important bacteria, viruses, fungi and parasites, virulence factors of pathogens, disease causing process	3
2.	Concept of epidemiology and epidemiological measurements Definitions, branches and uses of epidemiology, concept of health and disease, indicators of health and disease, disease frequency measures (mortality, morbidity, incidence, prevalence, incidence density, Disease burden. QALY, DALY), measure of method of transmission of disease, epidemic, endemic, sporadic and pandemic, Investigation of outbreaks , mode of transmission and management of disease outbreaks, chain of infection, cases, carrier and host	5
3.	Basic concept of immunology Immunology, types of immunity: innate and acquired Immunity, humoral and cell mediated immunity, cells and organs of immune system, components in immune system, antigens, antibody and their types	6
4.	Immune disorders Hypersensitivity types, autoimmunity and allergy; congenital and acquired immune deficiency	3
5.	Antigen-antibody reactions Types, principle, procedures and applications of precipitation, agglutination, immunofluorescence assay, ELISA, radioimmuno assay, immuno blotting methods, sero-diagnosis of different diseases	4
6.	Microbial diseases	6

	General information, virulence factors, pathogenesis, clinical manifestation, laboratory diagnosis, prevention and treatments of diseases caused by: <i>Mycobacterium tuberculosis</i> , <i>Vibrio cholerae</i> , <i>Salmonella typhi</i> , human immunodeficiency virus (HIV), hepatitis B virus, <i>Giardia lamblia</i> , <i>Entamoeba histolytica</i> , <i>Plasmodium</i> species, <i>Candida albicans</i> and <i>Cryptococcus neoformans</i>	
7.	Vaccine Overview of vaccine and vaccination, types of vaccines- killed organism as a vaccine, attenuated vaccine, DNA vaccine, methods of attenuation, concepts of disease Eradication, quality and efficacy of vaccine, adverse events following immunization, recent developments and prospects, vaccine recommended in Nepal	5
	Total	32 hrs

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Course: Medical Microbiology

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: II

Course Code: BND 152B

Credit hrs: 1

Full Marks: 25

Nature of Course: Practical

Practicals

1. Preparation of different culture media for identification of pathogenic bacteria
2. Laboratory diagnosis of different Bacterial diseases with references to: cholera, enteric fever, tuberculosis, urinary tract infections, blood infections
3. Laboratory diagnosis of *salmonella* by blood culture
4. Prepare a report describing the epidemiology of major infectious diseases of Nepal
5. Isolation and identification of medically important bacteria by conventional biochemical techniques
6. Antibiotic susceptibility testing of bacteria
7. Serological identification using test kits and ELISA
8. Sputum culture and microscopy
9. Use of rapid test kits for the diagnosis of infectious diseases- malaria, HIV, hepatitis B, rota virus, dengue, hepatitis C
10. Fungal stains preparation and staining techniques
11. Fungal culture techniques
12. Detections of stool parasites
13. Occult blot test in the stool samples
14. Tuberculosis diagnosis laboratory visit

References

1. Park, K. (2007) Park's Textbook of Preventive and Social Medicine, 19th Edition, Banarasidas Bhanot Publications, India
2. Greenwood, D., Slack R., Barer M. and Irving, W. (2012), Medical Microbiology. 18th Edition, Churchill, Livingstone
3. Baron, E. J., Peterson, L. R. and Finegold, S. M. (1994), Baily and Scott's Diagnostic Microbiology, Mosby
4. Collee J. G, Fraser A. G., Marmion, B. P. and Simmons, A, (eds) (1996), Mackie and McCartney Practical Microbiology, 14th Edition, Churchill Livingstone, New York
5. Aneja, K. R. (2005) , Experiments in Microbiology, Plant Pathology and Biotechnology, Fifth Edition, New age International Publisher, New Delhi
6. Collee, J. G., Mackie T. J., McCartney, J E., (1996) Mackie & McCartney practical medical microbiology, New York: Churchill Livingstone,

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Course: Food Chemistry

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: II

Course Code: BND 153A

Credit hrs: 3

Full Marks: 75

Nature of Course: Theory

Course description and objectives

The course in food chemistry is designed to provide student knowledge on the components of foods, their structure, properties, their effect and changes during preparation, processing and storage of foods. The course covers various areas such as major components of food like moisture, carbohydrates, proteins, lipids, vitamins and minerals and also food additives and browning in foods, and natural pigments.

Unit	Contents	Teaching hours
1.	Introduction to food chemistry: food chemistry definition and its significance in nutritional studies, and composition of food.	1
2.	Moisture in foods a) Introduction and importance of moisture in foods. Structure of water and hydrogen bonding. b) Methods of moisture determination: drying methods (e.g. hot air oven, vacuum oven, infrared drying), distillation method (e.g. immiscible solvent distillation method), chemical methods and physical methods (e.g., hydrometer, lactometer, electrical moisture meters).	3
3.	Carbohydrates a) Definition and functions of carbohydrates, classification of carbohydrates. b) Monosaccharides: introduction, structure properties and uses of glucose and fructose, difference between reducing and non – reducing sugars. c) Disaccharides: introduction, structure properties, and uses of sucrose and lactose; manufacture of sucrose. d) Polysaccharides: definition, types; starch (structure, components, functional properties, manufacture and uses); chemistry of glycogen and introduction to pectin; crude fibre and dietary fibre, gums.	15
4.	Proteins a) Introduction, important functions of proteins, introduction to	8

	amino acids, nutritional classification of amino acids. b) Classification of proteins: based on solubility, shape & size, composition and nutritional value. c) Properties of protein: physical: shape and size, molecular weight, solubility, isoelectric point, denaturation (effects, denaturing agents and types of denaturation); chemical: hydrolysis, salt formation, ester formation, reaction with formaldehyde, ninhydrin and foscene; gelation. d) Methods of protein determination: Kjeldahl method, formol titration method and other chemical and physical method.	
5.	Lipids/ Fats a) Definition, occurrence & components, classification fatty acids. b) Fats/oils: types, physical and chemical properties; Identification of natural fats/oils; extraction, refining of edible fats/oils, hydrogenation). c) Rancidity (types, antioxidant), introduction to salad, cooking and frying oils; shortening and margarine.	8
6.	Mineral in foods Biochemical functions, effect of processing's, method of determination of Ca, Fe, K and Na, iodine.	2
7.	Vitamins in foods Occurrence, types, structure and functions; stability of vitamins and effect of processing.	2
8.	Food additives Definition, types and importance, colorings, flavorings, emulsifier and stabilizer, nonnutritive sweetener (saccharin), preservatives (benzoic acid, SO₂), (in brief).	3
9.	Browning in foods a) Definition, desirable and undesirable aspect of browning, types of browning. b) Non-enzymatic browning: types or mechanism (maillard reaction, caramelization, ascorbic acid oxidation and lipid peroxidation (in brief)), factors influencing and preventions. c) Enzymatic browning: Occurrence, mechanism and prevention.	4
10.	Plant pigment and colorants Introduction, types and effect of processing.	2
	Total	48hrs



Course: Food Chemistry

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: II

Course Code: BND 153B

Credit hrs: 1

Full Marks: 25

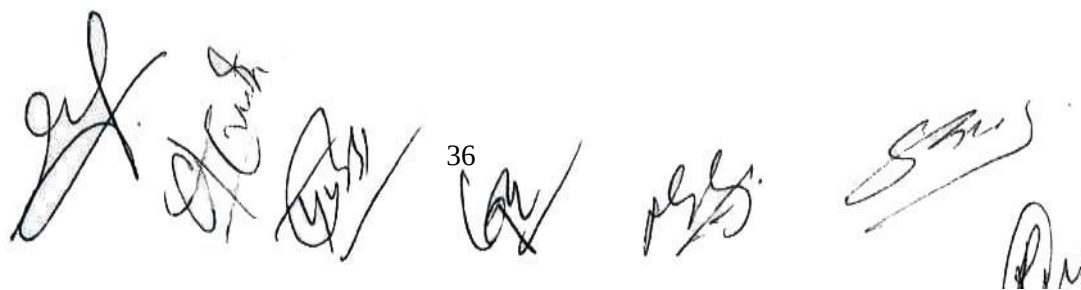
Nature of Course: Practical

Practicals

1. Determination of proximate composition of food items (moisture, crude protein, crude fat, crude fibre, total ash and carbohydrate).
2. Determination of a) reducing b) non-reducing sugars and c) total sugar.
3. Determination of total available carbohydrate of food by acid hydrolysis and by enzymatic hydrolysis process.
4. Determination of dietary fibre and crude fiber of the vegetable (carrots, Spinach etc)
5. Determination of AV & FFA, peroxide value, saponification value, iodine value of fat and oils.
6. Determination of chlorophyll, total caretenoids and carotene content of the green leafy vegetable or fruits
7. Determination of vitamin E as a tocopherol in food samples
8. Minerals determination in lab (phosphorous, sodium and potassium)

Reference

1. Mayer, L. H. (1987). Food chemistry; CBs publisher
2. Jain, J. L. (2008). Fundamental of biochemistry; Schand and Co.
3. Lee, F.A (1983). Basic Food Chemistry; AVI Publ. Co
4. KC, J. B. and Rai, B. K. (2007). Essentials of Food Chemistry
5. Fennema, O. W. (1976). Principle of Food Science – Food Chemistry. Mareel &Decker, New work (1976)
6. KC, J. B. and Rai, B. K. (2007). Basic Food Analysis Handbook. Kathmandu: Maya KC.

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Course: Human Physiology I
Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)
Semester: II
Course Code: BND 154A
Credit hrs: 2
Nature of Course: Theory

Full Marks: 50

Course description and objectives

Human physiology is a fundamental course for all health related degree. Physiology defines the characteristics of human beings in health and provides a basis for studying the deviations from this towards the disease. In this context, this course provides the knowledge of functions of systems of the healthy organism at different levels of organization and integration processes leading to homeostasis, body system and functions, develop skills needed to perform certain functional explorations and laboratory techniques and the acquisition of the methodology for the study and development of attitudes toward health maintenance and treatment of the disease. This course is also useful to students for further understanding the pathophysiology and etiology of disease's mechanisms, therapeutic bases for maintaining a good health and nutrition and the prevention of diseases.

Unit	Content	Teaching hours
1.	Introduction human physiology An overview of human physiology. Importance and significance of human physiology for nutritional research and study.	2
2.	The body's cell Chemical constitute of cells, structure of the cell, physiology of the cell; body fluids-types, pH, normal value, regulation and variation, cell reproduction, cellular genetics	4
3	Human tissues Different types of tissues and structure and basic functions characteristics, location, function and formation of muscle tissue, nervous tissue, connective tissues	3
4	Composition and function of blood Blood composition, red blood cells (erythropoiesis, stage of differentiation, function, counts, physiological variations) , haemoglobin (structure, function, concentration, physiological variation, estimation of haemoglobin (Hb)), white blood cells (production, function , life span, count), platelets(origin, normal count , morphology and function), plasma protein (production, concentration, types , albumin, globulin, fibrinogen prothrombin functions) , haemostatis- (definition ,normal hemostatis,	5

37

	clotting factors, mechanism of clotting , disorders of clotting factors), blood groups (ABO system and Rh system, blood grouping & typing), anticouglulants (classification , examples and uses), anemia (classification, effect of anemia in the body)	
5	Cardiovascular System . Introduction to circulatory system and circulatory organs, heart-physiological anatomy and nerve supply, properties of cardiac muscle. Cardiac cycle – systole, diastole, intra ventricular pressure curves, cardiac output, heart sounds (normal heart sounds, cause , characteristics and signification), heart rate and areas of auscultation, blood pressure (definition, normal value, clinical measurement of blood pressure), physiological variation, regulation of heart rate, cardiac shock, hypotension, hypertension, pulse-radial pulse, triple response, electrocardiogram (ECG) and its significance.	7
6	Lymphatic System . Tissue fluids, lymph, functions, formation of lymph, lymph gland – structure and functions, lymphoid organs in body	3
	Digestive System a) Physiological anatomy of GI tract, function of digestive system, structure and function of mouth pharynx, oesophagus, stomach, intestine and intestinal villi. b) Salivary gland-structure and functions, deglutition (swallowing)-stages and regulations, gastric secretion – composition, functions, regulation of gastric juice secretion; pancreases-structure, functions composition, regulation of pancreatic juice) c) Liver - function of liver in digestive system, bile secretion, composition, function, regulation of bile secretion; bilirubin metabolism- types of bilirubins ,Vandenberge reaction, jaundice – types & significance d) Intestine : small intestine and large intestine , function in digestion, absorption, movements, digestions absorption of carbohyhydrate, protein fat and defecation (in brief)	8
	Total	32 hr

Course: Human Physiology I

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: II

Course Code: BND 154B

Credit hrs: 1

Full Marks: 25

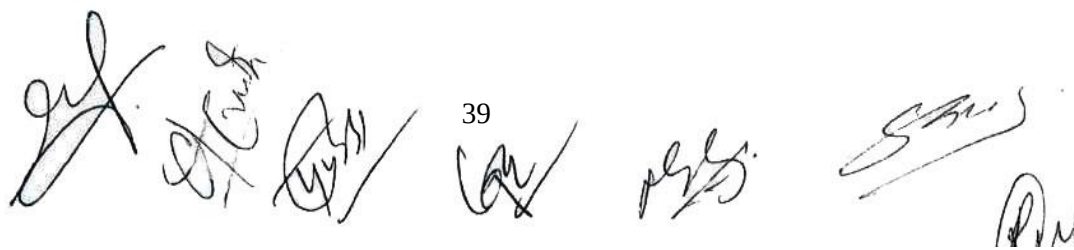
Nature of Course: Practical & Assignments

Practicals

1. Handling of compound microscope
2. Microscopic examination of chick cell, saliva, blood
3. Physical examination of body
 - a) Pulse rate at rest and after exercise
 - b) Determination of arterial blood pressure
 - c) Measurement of body temperature
4. Enumeration of RBC of human blood
5. Enumeration of WBC of human blood
6. Determination of haemoglobin level in human blood
7. Testing of blood group
 - b) Bleeding time : Duke's method
 - c) Blood clotting time : Wright's method
8. ESR estimation

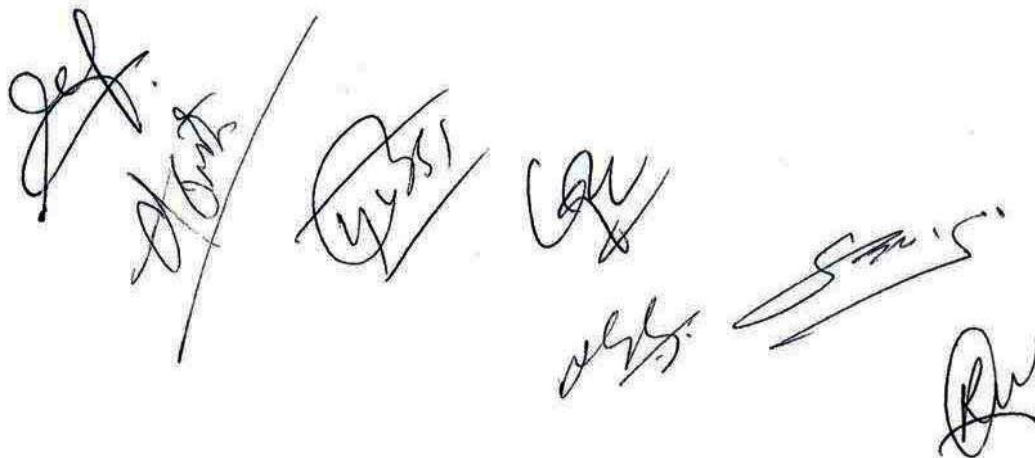
Assignments:

1. Drawing general structure of human cell and locate different organelles of cells and indicates their function
2. Drawing structure of different types of tissues and mentioned their role and function in the body
3. Drawing of labeling of human digestive system, locating different part of digestive system and organelles and mention their role and function in digestion process
4. Drawing of structure of salivary gland, gastric gland, pancreases and report the function of different parts.
5. Drawing and labeling of systematic and pulmonary circulatory system and locate different organelles and blood vessels and capillaries and their function
6. Draw and labeled the structure of heart and their part, mention the function of each part of heart.



References

1. Chatterjee, C. C. (2005) Human Physiology , Volume I & II Medical Allied Agency, 82/1, Mahatma Gandhi Road , Kolkata – 700009.
2. Gytton and Hall (2000) Text book of Medical Physiology , 10th ed., Harcourt Asia LTD Singapore
3. Hole, J.W (1989) Essentials of Human Anatomy and Physiologyv (3rd edition), WCB publishers, Dubuque, Iowa.
4. Subramanyam , S , Madavankutty , K and singh , H.D (2001) Text book of Human Physiology, S. chand and Co. Ltd , Ramnagar , New Delhi – 110055.
5. Wilson, K .J. and Waugh, A. (1999), Ross and Wilson Anatomy and Physiology in Health and Illness.
6. Chandrasekar, C.N, (2007), Manipal Manual of Physiology, 1st ed., CBS Publisbers and Distributors, New Delhi.
7. Indu Khurana and Arushi (2009), Text Book of Anatomy and Physiology for Health Professionals, CBS Publishers and Distributors, New Delhi.
8. Guyton A.C. (1991), Textbook of Medical Physiology, 8th ed., Philadelphia: W B Saunders
Vidya, R. (2004), Handbook of Human Physiology, 7th ed. (Reprint), Jaypee Bros Medical Publishers (P) Ltd, New Delhi
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Sood, R. Haematology for students and practitioners. Jaypee Publishers.
12. Martin T.R. David S., Butler J., and Lewis R. (2003) Human Anatomy and physiology laboratory Manuals 8th ed., Willam C. Brown Pub.

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Course: Hygiene and Sanitation

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: II

Course Code: BND 155A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

This course deals with various elements of hygiene and sanitation at household and community level. The aim of the course is to provide knowledge and skill to the students on various components of hygiene and sanitation which makes them capable to think nutrition and dietetics in a holistic and integrated way to raise the quality of life in the community.

Unit	Content	Teaching hours
1.	Concepts Hygiene and sanitation; Water, hygiene and sanitation (WASH) guideline/standards. Hygiene and sanitation with respect to food, water, meat, livestock, surroundings, household, hospital and industrial level. Liquid waste management, Solid waste management, Promotion of hygiene and sanitation, safe excreta disposal & types.	11
2.	Personal hygiene Age specific personal hygiene Staff personal hygiene	3
3.	Status Status of hygiene and sanitation in rural and urban areas of Nepal. Status of health impact due to poor hygiene and sanitation-demographic (age and sex), seasonal, spatial locations (geographic regions, urban and rural)	4
4.	Impacts Role of hygiene and sanitation in livelihoods, malnutrition due to poor hygiene and sanitation, health impact due to poor hygiene and sanitation, gender and equity in WASH, WASH in school and communities	8
5.	Efforts WASH during emergency/disaster, HACCP in WASH. Government policies related to hygiene and Sanitation & its promotion; organization/institutions working in H & S promotion, hygiene behavior change and participatory management in WASH	6
	Total	32 hrs

41

References

1. MWSS. (2016). Water, Sanitation and Hygiene (WASH) Sector Status Report. Nepal: MWSS.
2. Roday, S. (2011). Food Hygiene and Sanitation (2nd ed.). New Delhi: Tata McGraw Hill Education Private Limited.
3. SACOSAN. South Asian Conference on Sanitation (SACOSAN) report.
4. WHO.(1989). Health Principles of Housing. Geneva: WHO.
5. WHO. (2017). Guidelines for Drinking Water Quality (4th ed.): WHO.

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2nd YEAR SEMESTER III

Prof. Dr. A. K. S. / 43731
Prof. Dr. S. K. S. / 43731
Prof. Dr. S. K. S. / 43731
Prof. Dr. S. K. S. / 43731

Course: Nutritional Biochemistry I

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: III

Course Code: BND 201A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

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

Unit	Contents	Teaching hours
1.	Buffer Definition, classification, Henderson haselbalch equation, biological buffers & types, blood buffers, mechanism of pH of blood.	3
2.	Water, electrolyte and acid base balance Total body water, functions of water, water turnover and balance, factors affecting water balance, electrolyte balance, acid-base balance, blood buffers, maintenance of pH of blood.	3
3.	Enzymology Nomenclature, chemical nature, IUB classification of enzymes, properties, factors affecting enzyme activity, enzyme kinetics, Michaelis Menten equation, enzyme inhibition, specificity, mechanism of enzyme action, apoenzyme, coenzyme, cofactor, prosthetic groups, regulation of enzyme activity in living system, enzymes in clinical diagnosis.	4
4.	Basics of bioenergetics Units of energy measurement in biological system, high energy and low energy compounds, endergonic and exergonic reactions, coupled process, phosphorylation, dephosphorylation, oxidative phosphorylation.	2
5.	Carbohydrate metabolism Digestion and absorption of carbohydrates, glycolysis, Kreb's cycle, electron transport chain, Pentose phosphate pathway, interconversion of monosaccharides, gluconeogenesis, glycogen metabolism, regulation of blood glucose level, regulation of carbohydrate metabolism.	8

6.	Lipid metabolism Digestion and absorption of lipids, role of lymphatic system in lipid absorption and transport, catabolism of fatty acids, beta oxidation of fatty acids, omega oxidation, alpha oxidation, ketogenesis, biomedical significance of ketone bodies, biosynthesis of fatty acids, triacylglycerol synthesis, cholesterol synthesis, regulation of lipid metabolism.	6
7.	Amino acid metabolism Nutritional classification of amino acids, digestion and absorption of proteins and amino acids, amino acid pool, amino acid turnover, catabolism of amino acids, transamination, oxidative deamination, ammonia transport to liver, urea cycle, metabolism of ammonia in human body, hyperammonemia, biosynthesis of non-essential amino acids, catabolism of essential amino acids.	6
	Total	32

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Course: Nutritional Biochemistry I

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: III

Course Code: BND 201B

Credit hrs: 1

Full Marks: 25

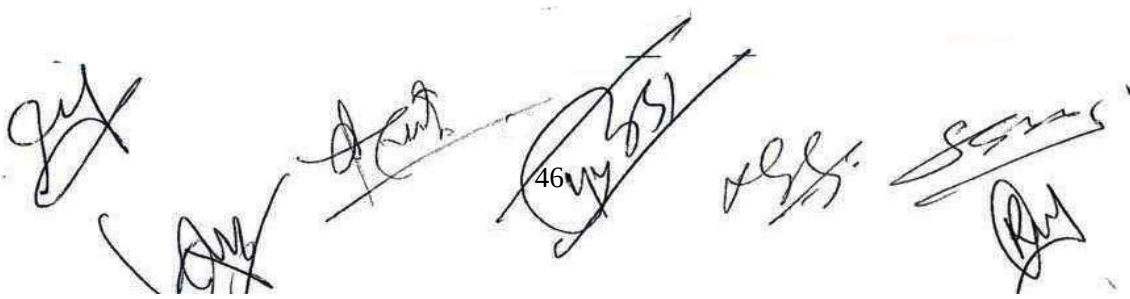
Nature of Course: Practical

Practicals

1. Preparation of percentage, normal and molar solutions.
2. Preparation of buffer solutions.
3. Qualitative analysis of carbohydrates.
4. Qualitative analysis of amino acids.
5. Qualitative analysis of peptides and proteins.
6. Qualitative analysis of lipids.
7. Study of enzyme activity: determination of achromatic point of salivary amylase.
8. Determination of iso-electric point of proteins.
9. Isolation of glycogen from liver.
10. Urinalysis: Assay of normal and abnormal constituents of urine.
11. Separation of amino acids from their mixture by paper chromatography.
12. Separation of amino acids from their mixture by thin layer chromatography.

References

1. Murray, R.K.; Bender, D. A.; Botham, K. M.; Kennelly, P. J.; Rodwell, V. W.; Weil, P A. (2009) Harper's Illustrated Biochemistry, (29th edition); McGraw Hill, New York.
2. Nelson, D.L. & Cox, M. M. (2004) Lehninger Principles of Biochemistry (4th ed.), Freeman W H and Company.
3. Harvey, R.A. & Ferrier, D. R. (2011) Lippincott Illustrated Reviews, Biochemistry, 5th edition, Wolters Kluwer, Philadelphia
4. Jain, J.L.; Jain, S. & Jain, N. (2008). Fundamentals of Biochemistry. S. Chand and Co.
5. Satyanarayan, U. (2008) Biochemistry(3rd ed.), Books and Allied (P) Limited, Kolkata, India
6. Deb A.C. (2001) Fundamentals of Biochemistry(7th ed.) , New Central Book Agency (P) Ltd, India

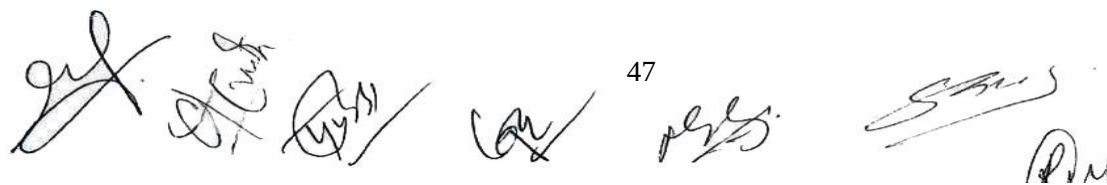


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Course: Health & Nutritional Aspects of Food**Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)****Semester: III****Course Code: BND 202A****Credit hrs: 3****Full Marks: 75****Nature of Course: Theory****Course description and objectives**

This course provides health and nutritional significance of food and different food groups. The main objective of the course is to provide diverse knowledge about health and nutritional significance of food and food groups including effect of food processing on nutritional and functional properties of food and their quality parameters.

Unit	Contents	Teaching hours
1.	Fruits and vegetables Compositions, quality factor, nutritive values, effect on health, effect of processing on nutritional quality.	7
2.	Dairy and dairy products Milk components, physicochemical properties, fresh milk quality, fermented milk & milk products, nutritive values, effect on health, effect of processing on nutritional quality.	10
3.	Meat, poultry, fish and egg Introduction, composition, physical, chemical, and microbial qualities, preservation, nutritive values, effect on health , effect of processing on nutritional quality	10
4.	Cereals, legumes, and oil-seeds Introductions, compositions, structure, nutritive values, effect on health , effect of processing on nutritional quality, nutritional changes in milling, effect of soaking, germination and malting on nutrition enhancement of cereals & legumes.	10
5.	Beverages Nutritive values, effect on health, effect of processing on nutritional quality (fruit beverages, tea, coffee, alcoholic beverages)	4
6.	Sugar confectionary and chocolate products Introduction, types, nutritive values, effect on health, effect of processing on nutritional quality	4
7.	Species and condiments Introduction, types and use in food, effect on health	3
	Total	48 hrs



References

1. Shing N. and Singh IS(2018) Food Nutrition, Science & Technology, Woodhood Publishing Ltd, New Delhi
2. Potter, N. N. (1987) *Food Science*. AVI Publ. Co., Westport, Connecticut.
3. Watson R., Collier R.J. , Preedy V. (2017) Nutrients in Dairy and their implication for Health and Diseases 1st Ed. Academic Press, USA
4. Miller, G. D. , Jarvis J.K, Mcbean L.D. (2019)Handbook of Dairy Food and Nutrition, 3rd Ed. , CRS Press, Taylaor andFrancis Group.
5. Thomas, Sc. Li. (2008) Vegetable and Fruits : Nutritional and Neutraceutical Values, 1st Ed., CRC Press.
6. Watson, R., and Preedy V. (2016) Fruits , Vegetables and herbs, Bioactive Foods in Health promotion, 1st Ed. Academic Press.
7. Kent, N. L. (1975) *Technology of Cereals*, Pergamon Press, London
8. Lawrie, R.A. and ledward D.A (2006) Lawery's *Meat Science*, 7th ed., Woodhood publishing Ltd and CRC Press LLL.
9. Vernam, A. and Sutherland, J.M. (1999). Beverages: Technology, Biochemistry and Microbiology, 1st Ed, Springer US.
10. NPCS Board of Food technologist. Confectionary product Hand book (chocolate, Toffee, Chewing Gum, and Sugar free Confectionary,Asia Pacific Bussiness press Inc Publisher.
11. Minife BW. (1999) Chocolate Cocoa and confectionary , Science & Technology Ed. A Chapman and Hall Food Science, An auspen Publication, Germany
12. Prakash, J., Waisundara V., and Prakash V. Ed. (2020) Nutritional and Health Aspect of Food in South Asian Countries, Elsvier Academic Press

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Course: Human Physiology II**Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)****Semester: III****Course Code: BND 203A****Credit hrs: 2****Full Marks: 50****Nature of Course: Theory**

Human physiology is a fundamental course for all health related degree. Physiology defines the characteristics of human beings in health and provides a basis for studying the deviations from this towards the disease. This is continuous part of human physiology I. In this context, this course provides the knowledge of functions of systems of the healthy organism at different levels of organization and integration processes leading to homeostasis, body system and functions, develop skills needed to perform certain functional explorations and laboratory techniques and the acquisition of the methodology for the study and development of attitudes toward health maintenance and treatment of the disease. This course is also useful to students for further understanding the pathophysiology and etiology of disease's mechanisms, therapeutic bases for maintaining a good health and nutrition and the prevention of diseases.

Unit	Content	Teaching hours
1.	Endocrine system Endocrine glands: structure and functions of pituitary, thyroid, parathyroid, adrenal, pancreas, placenta, ovary, testes, thymus and pineal body. Disorders of over and under secretions	4
2.	Respiratory system Organs of respiration – structure and functions, volume and capacity of lungs, mechanism of respiration, artificial respiration, compliance of lung and chest wall, cell respiration	4
3.	Nervous system Structure and function of neuron (nerve cells), neuroglia (glial cells), nerve fiber, brain and spinal cord, classification of nervous system CNS, PNS, ANS and their function, nerve impulse, synapses & synaptic transmission of impulse, reflex action and reflex behavior	6
4.	Excretory system - Kidneys: structure, location and functions, renal blood vessels - Mechanism of urine formation (glomerular filtration, effective filtration pressure, effective glomerular filtration rate, control & regulation of GFR, factors affecting GFR, determination of GFR - Tubular reabsorption (selective reabsorption, sites of reabsorption, substances reabsorption, mechanism of reabsorption of glucose and urea, HCl, amino acids.	10

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	- Tubular secretion : TMG, tubular load, renal threshold % of reabsorption of different substances - Selective secretion: urea and uric acid, urine composition. - Regulation of urine concentration and volume - Elimination of urine : process of elimination, role of ureters, urinary bladder, urethra, micturition	
6.	Reproductive system - Function of reproductive system , puberty - Male reproductive system organs:, function of testes, spermatogenesis site, stages and factor influencing semens, endocrine function of testes , androgens –testosterone structure and function - Female reproductive system organs, ovulation, menstrual cycle, physiological changes during pregnancy, pregnancy test, lactation, composition of milk, factor controlling lactation	4
7.	Muscular system General account of the system, types of muscles, muscle contraction, sliding filament theory, biochemical events in muscular contraction, skeletal muscles of organs (in brief)- pharynx, larynx, diaphragm, abdominal wall etc.	4
	Total	32 hrs

Course: Human Physiology II

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: III

Course Code: BND 203B

Credit hrs: 1

Full Marks: 25

Nature of Course: Assignments and Practical

Practicals

1. Clinical examination of urine
 - Physical examination: volume, colour, odour, appearance, pH, specific gravity
 - Test for abnormal constituents of urine- sugar, blood, albumin, bile salt, bile pigment, ketone body etc.
2. Analysis of saliva: amylase, mucin, calcium, inorganic phosphate
3. Recording blood pressure using Sphygmomanometer.
4. Effect of physical exercise on pulse rate and blood pressure

Assignments

5. Microscopic structure of various glands – thyroid, pituitary and adrenal
6. Microscopic structure of reproductive organs ovary, uterus, mammary glands and testis
7. Microscopic structure of nervous system : nerve cell, neuroglia (glial cells), nerve fiber , brain and spinal cord

References

1. Chatterjee, C.C. (2005), Human Physiology , Volume I & II Medical Allied Agency, 82/1, Mahatma Gandhi Road , Kolkata – 700009.
2. Gyton and Hall (2000), Text book of Medical Physiology , 10th edition , Harcourt Asia LTD Singapore
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4. Subramanyam , S , Madavankutty , K and singh , H.D (2001) Text book of Human Physiology, S. chand and Co. Ltd , Ramnagar , New Delhi – 110055.
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12. Martin T.R. David S., Butler J., and Lewis R. (2003) Human Anatomy and physiology laboratory Manuals (8thed.) Willam C. Brown pub.

Course: Human Nutrition I**Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)****Semester: III****Course Code: BND 204A****Credit hrs: 2****Full Marks: 50****Nature of Course: Theory****Course description and 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.

Unit	Content	Teaching hours
1.	Introduction Definition, history and development of nutrition, historical and geographical perspective.	2
2.	Nutrition and human development	1
3.	Factor affecting human nutrition	1
4	Human body composition and measurement Human body composition at different level and its importance in health and nutrition, methods use in determination of human body composition	4
5.	Regulation of food intake	2
6	Food and nutrients - Digestion absorption and metabolism of carbohydrates, protein and fat and their utilization (review) - Utilization of carbohydrate, regulation of blood glucose level, gluconeogenesis, glycogenesis (review). - Utilization of protein, protein quality of food and determination of protein quality, body nitrogen balance, way to improve protein quality of food , supplementation, fortification of amino acid - Essential fatty acids, regulation of lipdemia	6

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7.	Energy value of food and energy requirement - Energy value of food and units of energy, determination of energy value of food, fuel value of food: gross and physiological value, relation between oxygen requirement, direct calorimetry and RQ - Energy requirement of body: basal metabolism, determination of basal metabolism, standard for basal metabolism, basal conditions and factors affecting BMR - Determination of energy requirement during works, SDA of food, Physical activity and energy requirement, - Recommended allowances for calorie by different organization FAO & ICMR at different condition. - Energy balance and weight management	10
8.	Recommended dietary allowances Definition, importance and significance of RDA, RDA for energy and specific nutrients.	2
9.	Concept of healthy diet Food diversity, principles of healthy diet and balanced diet, dietary guidelines ; basic food groups, food composition table, and food pyramid, My plate, national & international dietary guidelines.	4
	Total	32 hrs

Course: Human Nutrition I

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: III

Course Code: BND 204B

Credit hrs: 1

Full Marks: 25

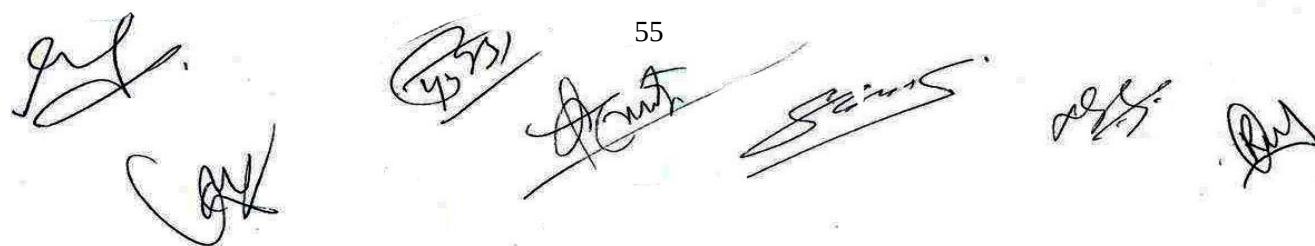
Nature of Course: Practical

Practicals

1. Preparation of food and estimation of energy yielding nutrients (carbohydrate, fat and protein)
2. Determination of energy value of food by
 - using Bomb calorimeter
 - Food composition (carbohydrate, fat and protein)
3. Determination of physiological energy value of food and energy density of food by using food composition table.
4. Gap analysis of Nepalese food pyramid and food pyramid of other countries
5. Calculation of total energy requirement of an adult by different methods
6. Demonstration on instruments for measuring body composition at whole body level
7. Estimation of body fat, fat free mass and other composition based on
 - body densitometry, Bio Electric Impedance Analysis (BIA)
 - Anthropometric measurement (such as BMI, age and gender, skin fold thickness)
8. Demonstration of estimating energy requirement and energy expenditure by using different instrument

References

1. Begum, R.M. (2000). A textbook of food, Nutrition and Dietetics. Sterling publisherspvt. Ltd., New Delhi.
2. Eleanor, N.W. & Eva, M.N.H (1991). Understanding Nutrition ,2nd ed., West publishing co. America.
3. Gordon, M.W., War, D.C., Margaret, K. (2002) Perspectives in Nutrition, 1st edn , McGraw hill Publication
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5. Nibe, M. (1987). Human Nutrition. RTP-FNP UPLB College, Laguna, philippines.
6. Swaminathan, M. (1993) Essentials of Food and Nutrition, Vol I & II. Bapco,India
7. Swaminathan, M. (1993). Human Nutrition and Diet. Bappco, India.



Course: Pharmacology

Level: Bachelor of Science in Nutrition and dietetics (BSc. ND)

Semester: III

Course Code: BND 205A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

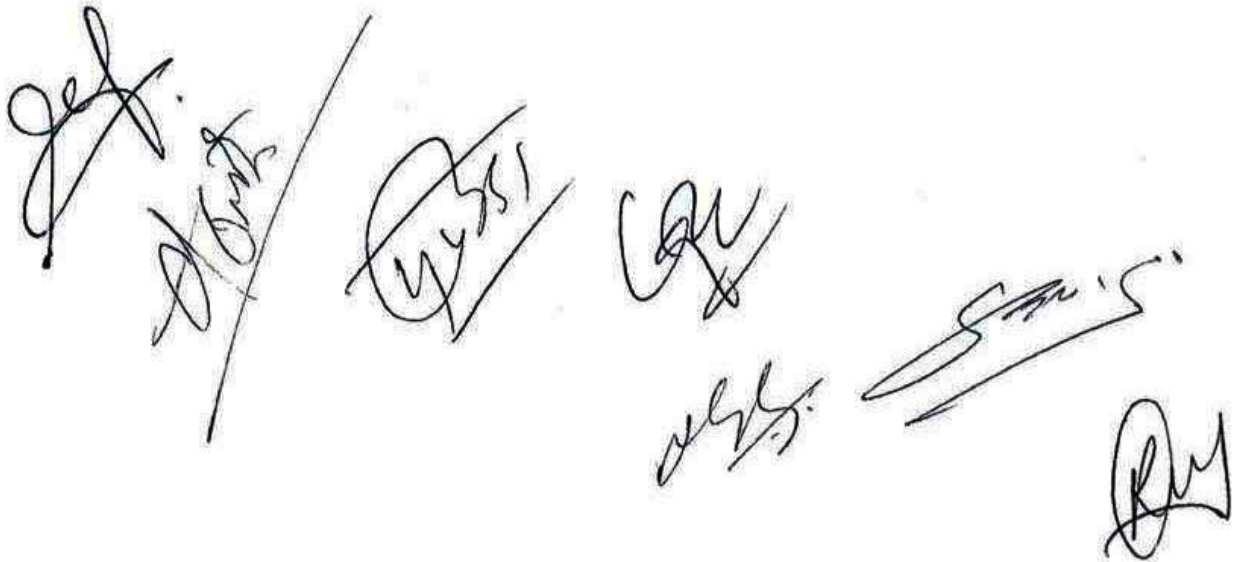
The general concept of drug and information about common drug will add advantage to nutritionist and dietitian in the part of diet planning and counseling for patients. After completion of this course student will be able to understand about drug, general action of drugs, common drug that is used in different disease conditions and their side effects.

Unit	Content	Teaching hours
1.	Introduction to pharmacology Definition, pharmacy, drug, pharmacodynamics, pharmacokinetics, adverse reactions, dose, indication, contraindication, preparation and dispensing, expiry date and shelf life	7
2.	Analgesic, antipyretic and anti-inflammatory drugs Definition of analgesic and anti-inflammatory, mode of use, dose, common side effect and contraindication of aspirin, paracetamol, ibuprofen, indomethacin, and naproxen	4
3.	Drugs used in common respiratory problems Definition of cough, sedative cough expectorant, bronchodilator, anti-histamine and mucolytics; dose and side effect of ephedrine, aminophylline, salbutamol, chlorpheniramine, pheniramine, volatile oils & vasaka	4
4.	Drugs used in infection & infestations Definition and use of antibiotics, chemotherapeutic agents, antitubercular, antileprotic, anthelmintic, antiamebic antifilarial and antimalarial agents	4
5.	Drugs used locally Definition and use of local anesthetic, soothing agent, antifungal, antiseptic, disinfectant, and vasoconstrictor.	2
6.	Drugs used in common cardiovascular problems Definition of antihypertensive and diuretics. Uses and side effect of digoxin, reserpine, thiazides and furosemide	4
7.	Drugs used in common nervous system problems Definition of sedative, hypnotic, tranquillizer, anticonvulsant, antiepileptic, and drug dependence with example of drug causing dependence. Uses and common side effect of phenobarbitone, paraldehyde, diazepam, morphine, pethidine and codeine	5
8.	Drug dependency and drug addiction Drug dependency and drug abuse, commonly abused drugs	2
	Total	32



References

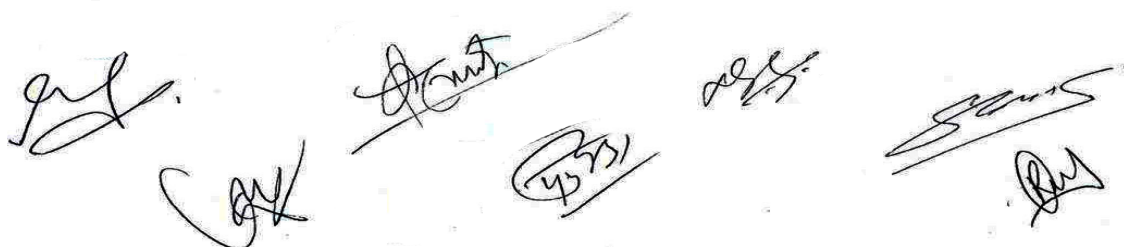
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- Text book of pharmacology Satoshkar
- Tripathi, K. D. (2013) Essential of Medical Pharmacology . 7th ed, Jaypee Brothers Medical Publishers, New Delhi, India.

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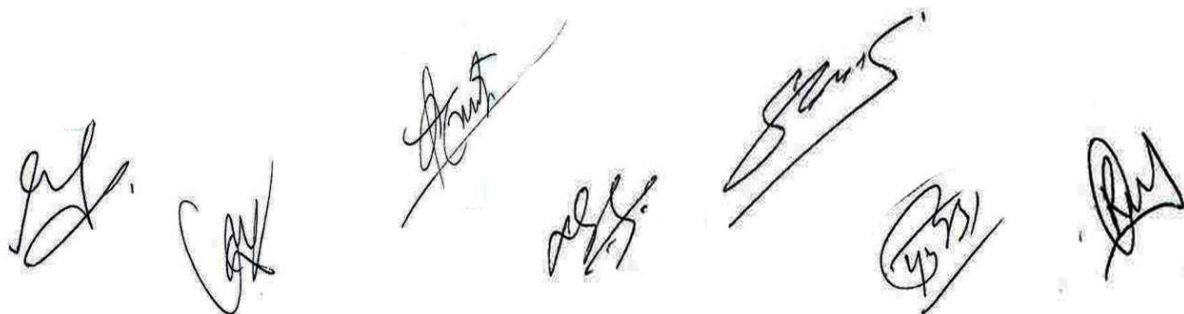
Course: Computer Applications**Level: Bachelor of Science in Nutrition and Dietetics (BSc.ND)****Semester: III****Course Code: BND 206 A****Credit hrs: 2****Full Marks: 50****Nature of Course: Theory****Course description and objectives**

The aim of this course is to give fundamental concepts of computer system and its various applications and enable students to use the computer for analyzing and manipulating huge volume of data.

Units	Contents	Teaching hours
1.	Computer basics Introduction, characteristics of a computer, generations of computer, classification of computers, applications of computer, basic components of personal computer, computer architecture.	4
2.	Number systems Introduction, classification of number system, binary, octal, hexadecimal, binary coded decimal (BCD), conversion of bases, binary arithmetic (addition and subtraction)	4
3.	Hardware and software Introduction, computer memory, secondary memory, computer peripheral, programming language, types of programming languages, language translators, software, types of software, system software MSDOS, windows and linux, utility software, application software, MS word, MS power point, MS excel workbook, worksheet, formatting in excel, advanced formatting in excel, working with formulas, EPI Info, SPSS	8
4.	Database and data base management system Introduction to database and DBMS, hierarchy of data, characteristics of data in database, types of DBMS, entity-relationship diagram, relationship and relationship sets KEY constraints and normalization, SQL query, database security, introduction to data warehousing and data mining.	8
5.	Network and Internet Internet- introduction to networks and internet, network applications, types	8



	of network topology, peer to peer and client server networking, working of internet, modes of connecting to internet, ISPs, internet address, mac address, domain name, modems . World wide web- introduction, web browsers, search engines, search fundamentals, Telnet, FTP and HTTP	
	Total	32 hrs



Course: Computer Applications

Level: Bachelor of Science in Nutrition and Dietetics (BND)

Semester: III

Course Code: BND 206B

Credit hrs: 1

Full Marks: 25

Nature of Course: Practical

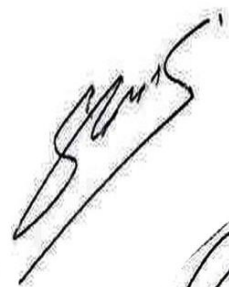
Practicals

1. Familiarization with basics of operating system, file and directory management, email, internet and search engines.
2. Understanding word processing, word processing basics, saving, page setup, printing, text creation and manipulation, formatting text, table manipulation.
3. Understanding elements of electronics spread sheets, manipulation of cells, formulas and functions, chart and graphs.
 - a. Understanding MS access and working on a database
 - b. Creating database in design view, by using wizard, and by entering data.
 - c. Implementing various SQL queries on a database in design view and by using wizard.
 - d. Create forms, reports to work on a database in design view and by using wizard
 - e. Implement the concept of macros in MS-access

References

1. Goel, Anita (2010) Computer Fundamentals, , Pearson Education, India
2. Leon A and Leon, M. (2009) Fundamentals of Information Technology, 2nd edition, Vikash Publication
3. Norton, P. (2009) Introduction to Computers, Peter Norton, 7th Edition, McGraw Hill Education
4. Sinha, P.K. and Sinha, P (2007) Computer Fundamental, 6th edition, BPB Publications

2nd YEAR SEMESTER IV

Course: Nutritional Biochemistry II

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: IV

Course Code: BND 251 A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

The course gives knowledge about the cellular interaction of nutrients with biomolecules and its regulation in metabolism which is essential for the student of B.Sc. in Nutrition & Dietetics.

Unit	Content	Teaching hours
1.	Metabolism of nucleotides and nucleic acids Structure of nucleotides and nucleosides, biosynthesis of purine and pyrimidine nucleotides, synthetic derivatives of nucleotides, structure of nucleic acids, Watson crick model of DNA, chromosome, concept of gene, DNA replication, inhibitors of DNA replication, RNA synthesis, inhibitors of RNA synthesis, protein synthesis, inhibitors of protein synthesis, catabolism of nucleic acids.	10
2.	Lipoprotein metabolism Definition of lipoprotein, metabolism of chylomicrons, very low density lipoproteins, low density lipoproteins, high density lipoproteins, reverse cholesterol transport, lipoproteins and cardiovascular health.	4
3.	Integration of metabolism Regulation of carbohydrate, lipid and amino acid/protein metabolism, integration of metabolism, metabolism of human body during fed, fasting and starvation states, metabolic interrelationship between liver, adipose tissues and extra-hepatic tissues.	4
4.	Inborn errors of metabolism Definition, inborn errors of carbohydrate metabolism, inborn errors of lipid metabolism, inborn errors of amino acid metabolism, inborn errors of nucleotide metabolism, hereditary anemia.	4

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5.	Obesity, metabolic and cardiovascular diseases Obesity, metabolic syndrome, diabetes, insulin resistance, risk factors, prevention, treatment.	2
6.	Hormones Mechanism of hormone action, concept of target tissue and hormone receptor, mechanism of action of group I and group II hormones, second messengers, hypothalamic and pituitary hormones, thyroid hormones, hormones of adrenal cortex and medulla, gonadal hormones, gastrointestinal hormones.	4
7.	Vitamins and minerals Structure and biochemical functions of fat soluble and water soluble vitamins, biochemical functions of minerals: Ca, P, Mg, Na, Cl, S, Fe, Cu, I, Mn, Zn, Mo, F, Se, Cr.	4
	Total	32 hrs

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Course: Nutritional Biochemistry II

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: IV

Course Code: BND 251 B

Credit hrs: 1

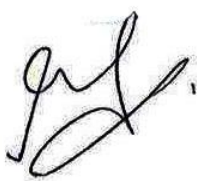
Full Marks: 25

Practicals

1. Estimation of serum glucose.
2. Estimation of serum total protein.
3. Estimation of serum cholesterol.
4. Estimation of serum urea.
5. Estimation of serum creatinine.
6. Estimation of serum uric acid.
7. Estimation of serum bilirubin.
8. Oral glucose tolerance test.
9. Renal function test.
10. Extraction of genomic DNA from blood.
11. Electrophoresis of serum proteins.
12. Agarose gel electrophoresis of DNA.

References

1. Harvey, R.A. & Ferrier, D. R. (2011) Lippincott Illustrated Reviews, Biochemistry, 5th ed., Wolters Kluwer, Philadelphia.
2. Burtis, C.A; Ashwood, E. R. & Bruns, D. E. (2012) Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5th ed., Elsevier Saunders, Missouri.
3. Nelson, D.L. & Cox, M. M. (2004) Lehninger Principles of Biochemistry, 4th ed., Freeman W H and Company.
4. Jain, J.L.; Jain, S. & Jain, N. (2008). Fundamentals of Biochemistry. S. Chand and Co.
5. Satyanarayan, U. (2008) Biochemistry, 3rd ed., Books and Allied (P) Limited, Kolkata, India
6. Deb A.C. (2001) Fundamentals of Biochemistry, 7th edition, New Central Book Agency (P) Ltd, India.




Course: Human Nutrition II (Life Cycle Nutrition)

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: IV

Course Code: BND 252 A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

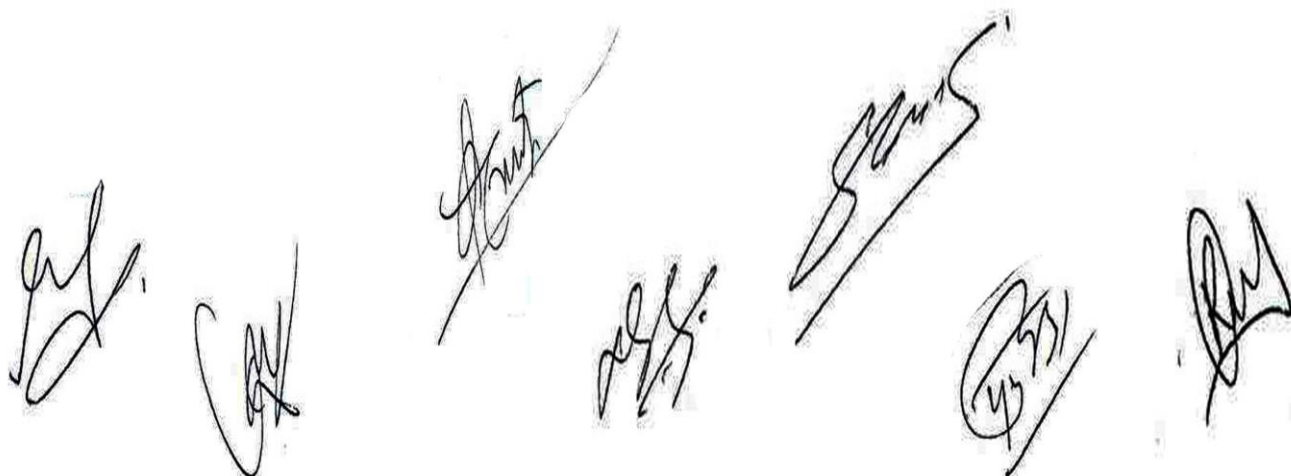
This course is the continuous part of Human Nutrition-I of previous semester. This course enables the students to understand physiological changes and nutrition during life cycle. The course also provides detailed theoretical and practical knowledge regarding the RDA, and meal planning. After studying this subject, students will be able to prepare and plan diet for peoples of different age groups.

Unit	Content	Teaching hours
1.	Menu planning Recommended dietary allowances for menu planning, principles and objectives of menu planning, points to be considered while planning meals, food exchange lists, food composition database, dietary calculations and guidelines	2
2.	Nutrition and feeding through infancy Growth and development during infancy, concept of golden thousand days and nutrient and care requirement, nutritional requirements during infancy, importance of breast feeding, composition of human milk, weaning food and complementary feeding and supplementary feeding , commercially available infant foods and weaning foods	6
3.	Nutrition for preschooler, school age and adolescent Growth and developments, food habits and nutritional requirements for each age groups	4
4.	Nutrition during pregnancy Physiological changes during pregnancy, nutritional requirements of a pregnant women, and complications during pregnancy	4
5.	Nutrition during lactation Physiology of lactation, role of hormones, food and nutritional requirements during lactation, expressed milk	4
6.	Geriatric nutrition (Nutrition during old age) Theory of ageing, physiological changes during old age, nutritional	4

65



	requirements of old people, problems associated with old age	
7.	Food fads and taboos	1
8.	Nutritional deficiency diseases Malnutrition: definition, forms and causes of malnutrition, protein energy malnutrition- types, treatment and management Micronutrient deficiency - overview of micronutrient deficiency, deficiency diseases related vitamin A, vitamin D, vitamin C, vitamin B1, folic acid, iodine, iron, calcium & zinc.	5
9.	Food fortification and enrichment Principle and purpose of fortification and enrichment, guideline for food fortification and enrichment, common food fortification practices in Nepal	2
	Total	32 hrs



Course: Human Nutrition II (Life Cycle Nutrition)

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: IV

Course Code: BND 252 B

Credit hrs: 1

Full Marks: 25

Nature of Course: Practical

Practicals

1. Understanding the portions of common food items
2. Use of food composition database for diet planning and calculations
3. Planning and preparation of balanced diet according to
 - a) Sex
 - b) Occupation
4. Planning a healthy diet for physiological condition such as pregnancy, lactation, old age people etc.
5. Preparation of weaning food and estimation of nutritional composition.
6. Preparation of iron fortified supplementary food and determination of iron content of fortified food.
7. Diet planning for PEM
8. Preparation of the therapeutic & ready to eat supplementary foods based on local ingredients for malnourished children.
9. Survey of nutrition deficiency disorders

References

1. Robinson, C.H and Lawler, M. R. (1982). Normal and therapeutic nutrition, Mc.millan Co. , New York
2. Swaminathan, M.S Advanced text book on food and nutrition, Vol. 1 & 2, the Bangalore printing and publishing company ltd.
3. Srilaxmi, B. (2014) Dietetics. (7th eds). New age international limited. Chennai
4. Begum , R.M. (2000) A textbook of food, Nutrition and Dietetics. Sterling publisher's Pvt. Ltd., New Delhi.
5. Mann, J. and Truswell, S. (2002) Essential of Human Nutrition, 2nd Edition, oxford University Press, USA
6. Joshi, S.A. (1992). Nutrition and Dietetics. (latest edition) Tata Mcgraw Hill, New Delhi.
7. Mudambi, S. R and Rajagopal, M. V. (1993). Fundamentals of food and Nutrition. 3rd edn. Wiley eastern ltd. New Delhi.
8. Barasi, M.E and Morris, M.(2003) Human Nutrition : A Health Perspectives, 2nd edition, A hodder Arnold Publication

9. Sharma, S. and Sheely, T and Kolahdooz, F (2016) Nutrition at Glance 2nd edition
Wiley Blackwell



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Course: Food Toxicology

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: IV

Course Code: BND 253A

Credit hrs: 3

Full Marks: 75

Nature of Course: Theory

Course description and 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.

Unit	Content	Teaching hrs
1	General Introduction: introduction to general toxicology and food toxicology, important and significance.	1
2.	Toxins: introduction, definition, occurrence, common types and effect on human health, natural toxins in foods from plant and animal sources - definitions, occurrence, common types, effect on human health, and simple processes of detoxifications; ant nutritional factors 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.	7
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
4.	Basic concepts of nutrigenomics and toxicogenomics: functional genomics and safe diet, concept of receptor-mediated gene expression modulation in food toxicology	3
5	Toxicology of metals: lead, mercury and aluminum - introduction, occurrence, contaminations, factors affecting metal toxicity, exposure of food to metals, metals toxicity and epidemiology, chelators	4
6	Food allergy: concepts, common types and forms of allergy generated by foods, common food allergens, food allergy and	5

	food sensitivity; mechanisms of induction of food allergic reactions- IgE and non IgE mediated, epitopes, cross reactivity; food sensitivity due to food additives, food sensitivity due to food toxins and poisons, diagnostic test for food hypersensitivity.	
7	Basic concepts of xenobiotic compounds: biotransformation and kinetics, influence of nutrition, age, gender on kinetics and biotransformation, introduction of combination toxicology.	3
8	Persistent organic pollutants (POPs) in human food chain: introduction, types and contamination in foods, distribution and route to human diet and health effect	3
9	Polychlorinated biphenyls (PCB's) and dioxin: introduction, occurrence, types and contamination in foods, distribution and route to human diet and health effect.	3
10	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.	4
11	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.	3
12.	Toxicological risk assessment of foods: general concept, importance, field and scope, methods and steps of risk assessment, application of risk assessment to different stakeholders	5
13.	Toxicological aspects of food additives: effect of preservatives and additives on human health (sulfite, sulfur dioxide, benzoic acid, artificial colors, oxidants, antioxidants), concept of hyperactivity in relation to food additives and diet, regulatory mechanism of some commonly used food additives in Nepal	2
14	Toxicology of drinking water: fluorosis, arsenicosis, contaminants (i.e. pesticides and nitrates), residual chlorine and its effect on health	2
	Total	48 hrs

Course: Food Toxicology

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: IV

Course Code: BND 253B

Credit hrs: 1

Full Marks: 25

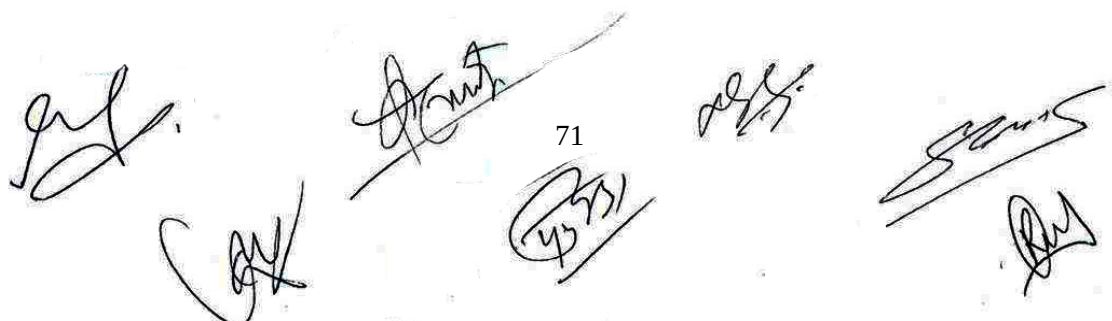
Nature of Course: Practical and assignment

Practicals

1. Determination phytochemicals : total polyphenol, B- carotene, flavonoids
2. Determination of antioxidant activity of the food plant and spices extracts
3. Determination of anti-nutritional factors (phytic acid, oxalate, hydrogen cyanides, saponine, trypsin inhibitors in food)
4. Determination of mycotoxins (Aflatoxin) in different cereals (maize, nuts, rice & spices)
5. Determination of pesticide residue- qualitative and semi quantitative methods.
6. Demonstration of cytotoxicity test and estimation of EC50, reporter gene assay, EROD, PROD test etc.
7. Assignment on
Risk Assessment of following foods/compounds - solanine, coumarin, methyleugenol, benzo (α) pyrene, genistein, quercetin, saccharine, hydroxymethylfurfural, curcumin, DDT (group work on risk assessment: report writing, presentation, submission of the prepared report selecting any one of the foods/compounds)

References

1. Omaye, S.T. (2004). Food and Nutritional Toxicology, 1st edition, CRC Press Inc.
2. Helferich, W. and Winter, C. K. (2001) Food Toxicology, CRC Press Inc.
3. Shibamoto, T., Bjeldanes, L.F. and Taylor, S. (1993). Introduction to Food Toxicology, 1st edition, Academic Press.
4. Shibamoto, T., Bjeldanes, L.F. (2003) Introduction to Food toxicology , 2nd edition Academic Press.
5. Tenant, D.R. (1997) Food Chemical Risk Analysis, 1st edition, Chapman and Hall
6. Deshpande, S.S (2002) Hand Book of Food Toxicology, CRC Press
7. Flanagan, R.J., Taylor , A. , Watson I.D &Whelpton, R. (2007) Fundamentals of Analytical Toxicology, John Wiley & Sons Ltd.



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Course: Catering and Food Service Management

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: IV

Course Code: BND 254A

Credit hrs: 3

Full Marks: 75

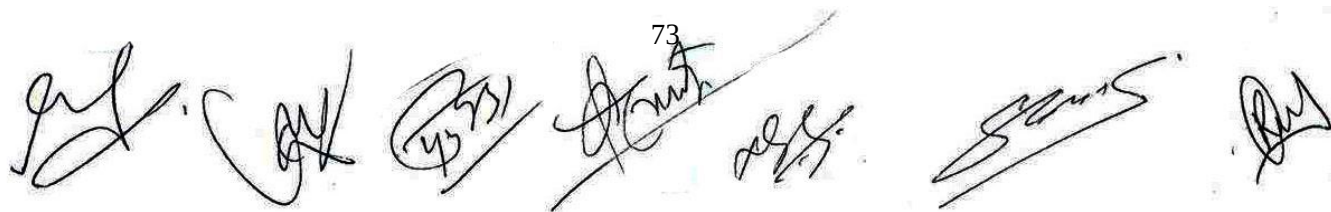
Nature of Course: Theory

Course description and objectives

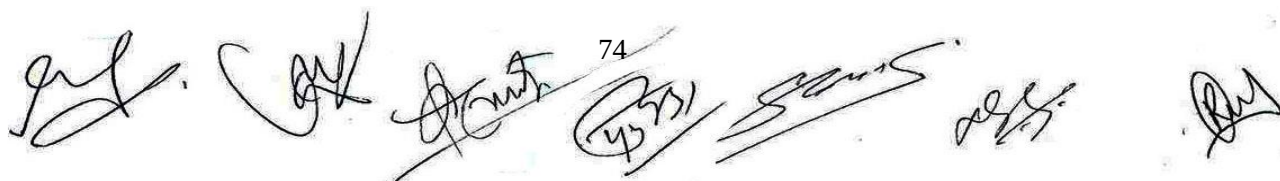
This course is given to assist the students to operate at levels of efficiency which can provide quality food and service. This course also lays a special emphasis on the development of skills needed for the efficient working of the catering management. It also highlights the abilities required to translate 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

Unit	Content	Teaching hours
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	4
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	3
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	3
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.	2
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	5

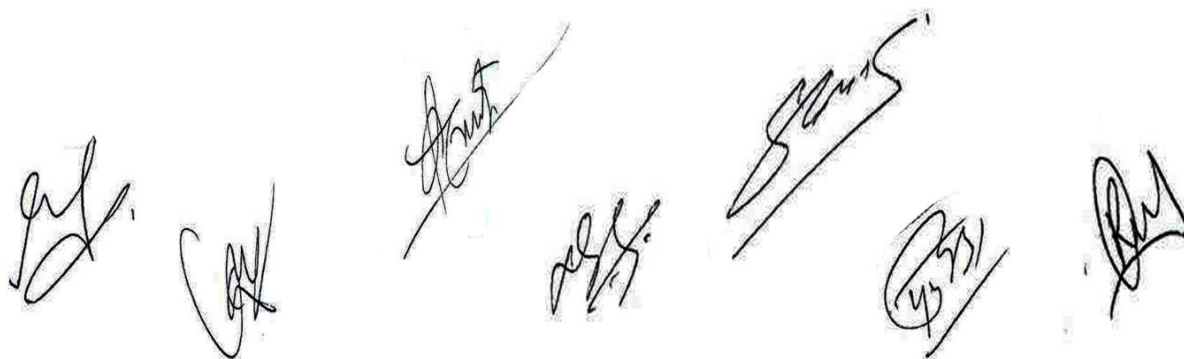
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	equipment, types of equipment, care and maintenance, cook ware, knives and basic cutting tools; kitchen safety - how accidents occur; prevention of cuts, prevention of fires, burns; hygiene - personal hygiene, kitchen and dining room hygiene, food hygiene, contamination by microorganisms, contamination by pests, spoilage by non-bacterial contaminants.	
6.	Cooking method and practices Dry heat, wet heat, microwave (Principle, methods, applications , merits and demerits)	5
6.	Preparing and presenting food Assessing food, reasons for eating, evaluating food, flavoring of food seasoning, herbs and spices, vinegars, sauces, appetizers, hors d'oeuvres, canapes and sandwiches <u>Soups</u> : unthickened soups, thickened soups, principles of making soup. <u>Pasta and rice</u> - pasta, types of pasta, storing pasta, cooking pasta, rice, cooking rice, boiling rice, pilaf method <u>Eggs</u> : uses in cookery, thickening, binding, glazing, emulsifying, cooking eggs, poaching, boiling, frying eggs, scrambled eggs, storing eggs. <u>Fish and shellfish</u> : structure and nutritive value, classification of fish, buying and selecting fish, cooking fish, storage of fish. <u>Meat and poultry</u> : meat, marinating meat, cooking meat, roasting, grilling, frying, braising, simmering, types of meat; poultry - chicken, turkey, duck and goose. <u>Vegetables</u> : purchasing and storing vegetables, classification of vegetables, preparation and cooking methods <u>Pulses</u> : nutritional value, uses of pulses. <u>Salads</u> : Place on the menu, making salads, basic ingredients, garnishing of salad	7
7.	Food controlling 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.	4
8.	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	5



	measurement, contract catering in hospitals	
9.	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.	3
10.	Food management in geriatric center, children home, campus hostel, orphan home etc.	4
11.	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	3
	Total	48 hrs



Course: Catering and Food Service Management
Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)
Semester: IV
Course Code: BND 254B
Credit hrs: 1
Nature of Course: Practical

Full Marks: 25

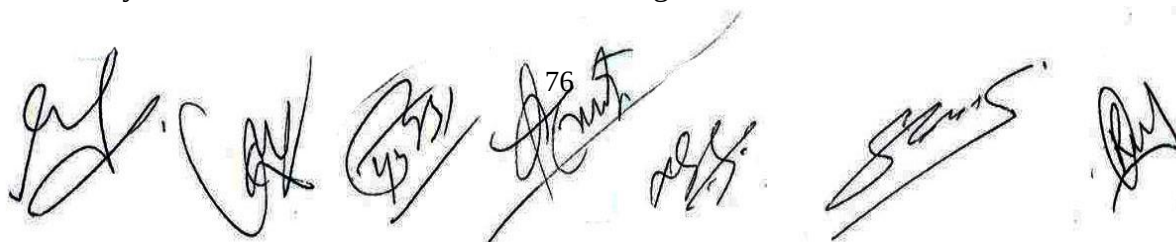
Practicals

Preparation and Servicing of:

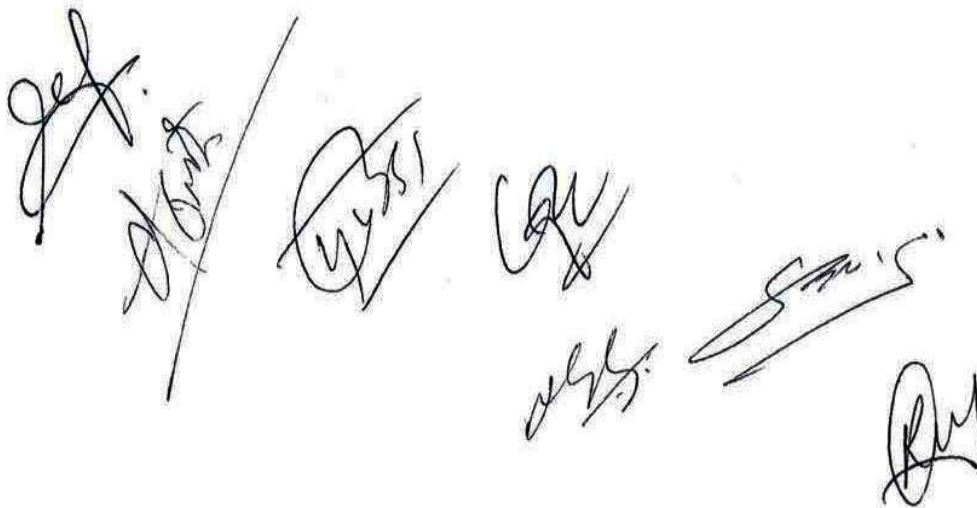
1. Chicken sweet corn soup
2. Mixed vegetable soup
3. Cream of tomato soup
4. Chinese fried rice
5. Spaghetti with chicken and mushroom
6. Stuffed capsicum
7. Cauliflower stuffed *paratha*
8. Vegetable *pakodas*
9. Vegetable spring rolls
10. Fried chicken chilly
11. Chicken *biryani*
12. Vegetable/chicken cutlet
13. Meat ball
14. Sweet and sour fish
15. Scotch egg
16. Chocolate cake
17. Fruit cake
18. Pizza
19. Cheese biscuits
20. Chilled pudding
21. Food presentation and serving

References

1. Raina, U., Kashyap, S., Narula, V., Vir, S, and Chopra, S.(2005.) Basic Food Preparation, A Complete Manual, 3rd edn. Orient Longman.
2. Cullen, P. (1997) The Food and Beverage Manager, 1st edn., Hospitality Press, Melbourne.
3. Davis, B., Lookwood A., Alcott, A. and Pantelidis, I.S. (2008) Food and Beverage Management, 4th edn., Butterworth-Heinemann, A division of Reed Education and Professional Publishing Ltd.
4. Humphries, C and Willams,F (1997). The Best 1000 Quick & Easy Recipes,Foulsham
5. Joners, P. (2010) Food Service Operations: A Comprehensive Survey of the Catering Industry, 2nd edn., Redwood Books, Throw bridge, Wiltshire, Great Britain.

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6. Kinton, Ceserani, and Foskett, D.(1992) The Theory of Catering,7th edn., ELBS with Hodder and Stoughton, Educational Low-priced Books scheme funded by British Government, Great Britain
7. Cousins, J., Lillicrap, D., and Weekes, S. R.(2014) Food and Beverage Service,9th edn., Hodder Education, UK.
8. Marzia and McCreery, C. (1995) An Introduction to Food & Beverage Studies, Hospitality Press, Melbourne.
9. Verghese, B.(2015) Professional Food & Beverage Service Management, Laxmi publication, New Delhi,India

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Course: Food Quality Control & Management
Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)
Semester: IV
Course Code: BND 255A
Credit hrs: 2
Nature of Course: Theory

Full Marks: 50

Course description and 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, use of certain standard 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.

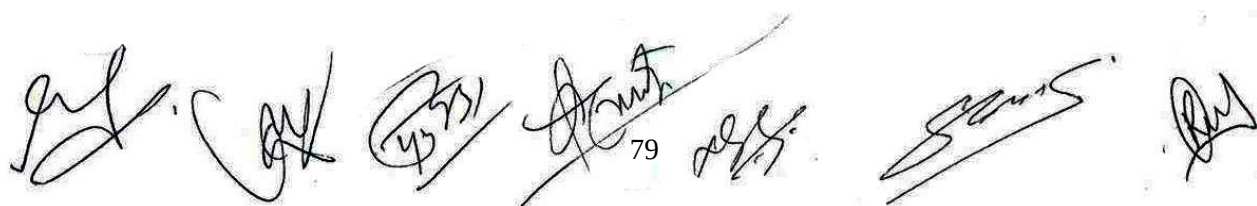
Unit	Content	Teaching hours
1.	Principles of quality control Principles of Quality Control and Quality Assurance: Raw material control, process control, finished products inspection, Basic requirements for food quality control and quality assurance in food services, and function of Q. C. department.	3
2.	Food standard Food Standard : Introduction, definition, objectives and importance of food standard, types of food standards (voluntary and mandatory, verticals and horizontal food standards), standard of Nepalese food products	2
3.	Food laws and regulation Salient features of food act & food regulation , Food control system of Nepal,	2
4.	Total Quality Management (TQM) Total Quality Management (TQM); Introduction, definition, principles of TQM, objectives and tools of TQM, elements of TQM	3
5.	Statistical quality Control (SQC) Concept of SQC, function of SQC and importance of SQC, general tools of SQC.	2
6.	Food quality management Definition, Concepts of quality management: Objectives, importance and functions of quality management systems, series of ISO 9000 system.	6

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	Food safety management system (FSMS) ISO22000, guide lines for ISO 22000.Importance and objectives of ISO 22000. Prerequisite program and integration HACCP for supporting ISO 22000	
7.	Food adulteration and contamination Food Adulteration : definition, causes, condition of adulteration, types of adulteration, effect of adulteration on human health, common adulteration problem and simple detection technique, extraneous matter in food Food Contamination: Introduction, definition, physical, chemical and microbial contaminants; Food commodities and common Food Contaminant (heavy metals, pesticide residues, antibiotics, agrochemicals, veterinary drug residues, environmental pollutants, solvent residues, radioactivity and Natural toxins)	6
8.	Sensory analysis of food Definition, introduction, significance. Methods of sensory analysis, preparation of taste panelist, preparation of taste booth, tasting tables and other facilities, water, light, environment, technique of smelling, tasting, chewing etc, analysis of sensory data.	4
9.	Food quality in emergencies Probable natural disaster in Nepal, possible fraud and selling of sub-standard food during natural disaster, maintenance of food quality and technique of safe food distribution during natural disaster.	4
	Total	32 hrs

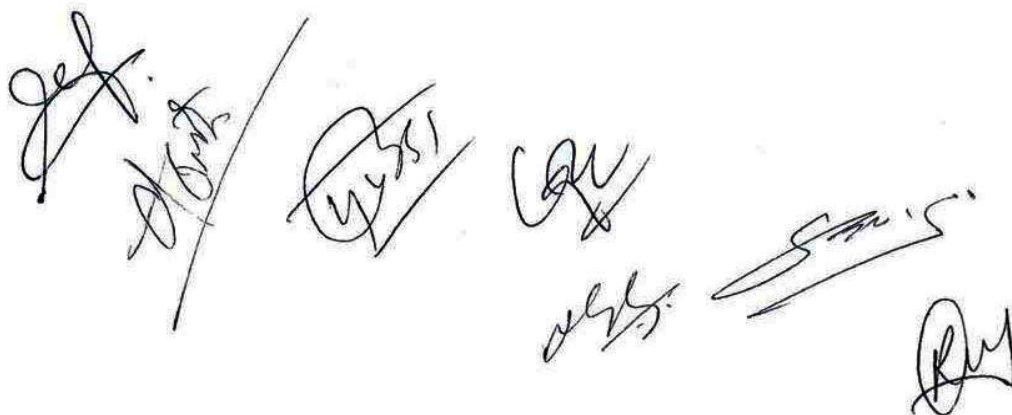
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1. Alli ,I. (2004) Food Quality Assurance: Principles and Practices, 1st ed., CRC PRESS, Boca Raton London New York Washington, D.C.
2. Banks, J. (1989) Principle of quality control, Wiley, publisher: Johan,Weley and sons New York
3. Debby, L and Newslow, (2001). The ISO 9000 Quality System: Applications in Food and Technology, Publisher John wiley& Sons
4. Early, R. (1995). Guide to Quality Management Systems for Food Industries, Blackie Academic.
5. Gould and Wilbur, A (2001).Total Quality Assurance for the Food Industries. 3rd ed. CT1 Publications.



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6. Hubbard and Merton R. (2003). *Statistical Quality Control for the Food Industry*. 3rd Edition. Chapman and Hall, New York.
7. Krammer, A. & Twigg, B.A. (1973). "*Quality Control in Food Industry*" Vol. I, II. AVI Publ.
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9. Nepal food act and regulation and published material in dftqc.gov.np websites.



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3rd YEAR SEMESTER V

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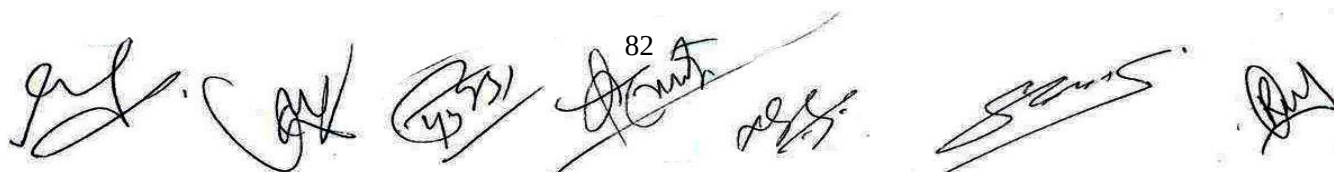
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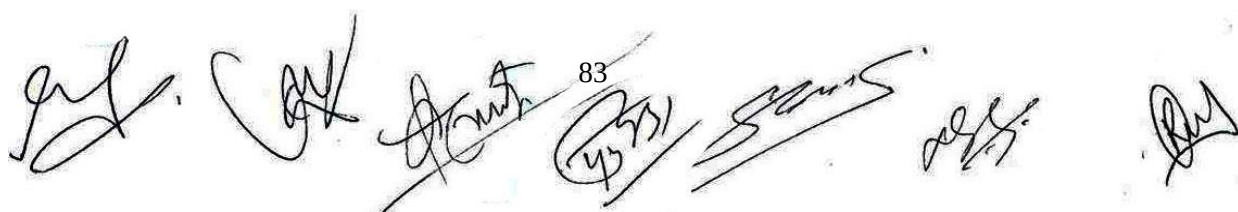
Course: Clinical Nutrition I**Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)****Semester: V****Course Code: BND 301A****Credit hrs: 2****Full Marks: 50****Nature of Course: Theory****Course description and objectives**

A clinical nutritionist should be able to screen and assess nutritional problems at clinical practices and are also concerned with how nutrients in food are processed, stored and discarded by the body, along with how what one eats affects the overall well-being of an individual. This course deals in detail about the nutritional and functional elements of food and assesses nutritional problems in clinical settings which will assist the nutritionist and dietitian to advise on change on the diet to help prevent/manage disease and nutritional disorders. After completion of the course, student will be able to understand protein, lipids and carbohydrates and their effects on health, get knowledge about proper ratio, minimum and maximum healthy amounts of these macronutrients; be familiar with functions, deficiency state, potential toxicity, RDA's and interaction of vitamins, minerals and electrolytes, understand the deleterious effects of oxidative stress and the role of antioxidants, get insight of various dietary supplements and phytochemicals and their uses in different diseased conditions, know basics of enteral and parenteral nutritional supports.

Unit	Content	Teaching hrs.
1.	Introduction of clinical nutrition and terminologies Explanation of the terms: health, nutrition, clinical nutrition, nutrients, nutritional status, malnutrition, under nutrition, obesity, RDA, DRI etc	1
2.	Carbohydrates: Nutritional significance of carbohydrates; Dietary fibre: Types, sources, role and mechanism of action and physiological significance; metabolism of carbohydrate, TCA cycle, gluconeogenesis, glycogen synthesis, alcohol metabolism, glycemic index and glycemic load: concept, types, application; low calorie sweeteners, nutritional requirement; deficiency and excess state of carbohydrates	3
3.	Protein: Therapeutic applications of specific amino acids and peptides,	2



	nutritional requirement, deficiency and excess state, branch chain amino acids	
4.	Fats Nutritional significance of fatty acids – SFA, MUFA, PUFA: functions; role of ω -3 and ω -6 fatty acids, ω -6/ ω -3 ratio; trans fatty acids, conjugated linoleic acid, medium chain triglycerides, cholesterol, fat replacers, nutritional requirements; deficiency and excess state	3
5.	Micronutrients: Vitamins: functions, deficiency and excess state. Quasi vitamins: functions, sources Minerals: functions, deficiency and excess state	4
6.	Water and electrolytes Water balance: Hormonal regulation, water intake and intoxication, elimination. Electrolytes: Sodium, calcium, chlorides, bicarbonates, potassium, magnesium and phosphate function, sources and imbalances	2
7.	Nutrition screening and assessment in clinical practice: a) Nutrition screening & assessment concept and tools, Direct and indirect method , merits and demerits b) Anthropometric/body composition measurement and interpretation: height, weight, skin fold, circumferences, bioelectric impedance analysis; c) Biochemical assessment and interpretation: assessment of nutritional anemia, vitamin A status and iodine status, nutrition interpretation of routine medical laboratory tests, chronic disease risk assessment, protein assessment d) Clinical assessment and interpretation: clinical/physical signs; e) Dietary intake assessment: diet history, 24 hour recall, food record/food diary, food frequency, observation of food intake, evaluation and interpretation of dietary analysis information. Nutritional assessment of various age group (infants/children/adolescents/adult/pregnant female/elders/bed ridden person) , various tools used in assessment	8
8.	Functional foods, nutraceuticals and dietary supplements: Phytochemical: sources and health benefits Probiotics: definition, mechanism of action, therapeutic uses Dietary supplements: vitamins and minerals, natural health products, their use, legal provisions and guidelines	2
9.	Food sensitivity Types of food sensitivity, foods involved diagnosis and treatment,	2


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	nutritional modification for food sensitivity.	
10.	Enteral and parenteral nutrition Enteral feeding: indication, short term and long term access, feeding techniques, complication Parenteral nutrition: indication, access, complication	3
11.	Evidence based guidelines in nutrition Introduction, interpretation and use; tabulation of various guidelines	2
	Total	32hrs

Course: Clinical Nutrition I

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: V

Course Code: BND 301B

Credit hrs: 1

Full Marks: 25

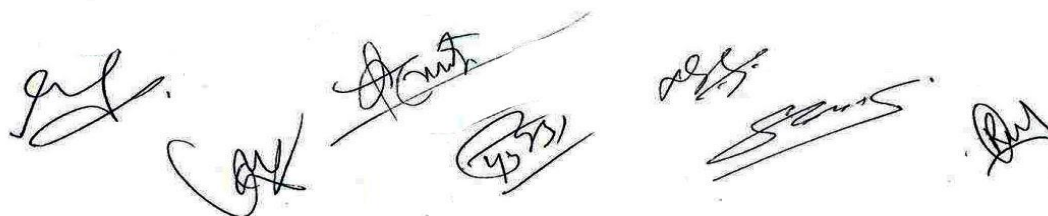
Nature of Course: Practical

Practicals

1. Assessment of nutritional status for adults, infants, children, adult, pregnant woman, elderly, hospitalized patient, bedridden person
2. Use of skin fold calipers/BIA to assess body fat
3. Estimated energy expenditure calculation for different age group and at different physical activity level
4. Biochemical investigations - hemoglobin, serum proteins and albumin, serum retinol, urinary iodine, lipid levels, glucose levels and their interpretation
5. Presentation/demonstration on deficiency and excess state of various nutrients
6. Determination of glycemic index and glycemic load of food
7. Study and selection of evidence based guidelines for various disease for practical use
8. Survey and tabulation of nutrient composition of processed foods available in the market
9. Survey on nutritional/dietary supplements and its use
10. Preparation of enteral feed
11. Observation of enteral and parenteral nutrition at hospital
12. Case study on enteral/parenteral nutrition
13. Development of a ready-reckoner for calculating nutrient content of various foods, portion size and volume, conversion of cooked to raw equivalent of various foods
14. Preparation of exchange list for carbohydrates, sodium, potassium, fiber, phosphorus and other nutrients

References

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Course: Dietetics I

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: V

Course Code: BND 302A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

The objective covers all aspects of nutrition including nutritional science and therapeutic nutrition. This course describes the roles and responsibilities of a dietitian in a hospital and community. Students are going to learn about how different modifications are done in normal diet for therapeutic use. The course also teaches about the special feeding methods used in various hospitals for feeding critical patients. The course enables students to plan and prepare therapeutic diets for patients suffering from various diseases.

Unit	Content	Teaching hours
1.	Introduction: Definition, growth and scope of dietetics , types and role of dietitian in the hospital , community and other sectors	2
3.	Organizational structure of hospital dietary section	1
4.	Dietary supplements, team approach to nutritional care-role of doctors, dietician and nurses in treatment of a patient.	2
5.	Basic concept of diet therapy Principles of therapeutic diets, factors to be considered in planning therapeutic diets.	3
6.	Modification of diet Routine hospital diets: clear liquid diet, full fluid diet, soft diet, regular diet	2
6.	Special feeding methods Tube feeding – Types , enteral feeds, feeding requirements, method of administration Parental feeding, its advantages and disadvantages	4
7.	Diet in obesity and undernutrition Obesity: etiology, theories of obesity, assessment of obesity and types of obesity, complications associated with obesity, treatment and dietary guidelines Underweight: causes and dietary management	5
8.	Diet in febrile conditions Fever, causes, types of fever (short term and long term),	3



	metabolic changes in fever, dietary guidelines for fever	
9.	Nutrition for HIV patients Introduction to HIV and AIDS, stages of HIV disease, nutritional problems of HIV patients, nutritional requirements and diet management	2
10.	Nutrition metabolic disorders Gout- nature and occurrence of gout, causes, symptoms and role of diet & nutrition in treatment. Joint diseases- osteoarthritis, rheumatoid arthritis- causes and symptoms, role of diet & nutrition in treatment. Hyperthyroidism: causes and symptoms, role of diet & nutrition in treatment.	6
13.	Eating disorders Anorexia nervosa, bulimia nervosa and binge eating disorder	2
	Total	32 hrs

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Course: Dietetics I

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: V

Course Code: BND 302B

Credit hrs: 1

Full Marks: 25

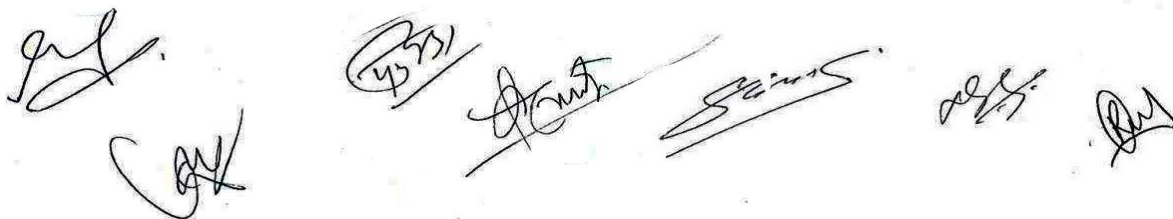
Nature of Course: Practical

Practicals

1. Modification of diet for therapeutic purpose : Planning of soft diet
2. Planning and preparation a clear liquid diet
3. Planning and preparation of full fluid diet
4. Planning and preparation of blenderized diet
5. Planning and calculation of diet low/high in nutrients in reference to common disease
 - a) Energy – high and low
6. Observation of tube feeding
7. Case study : Observation of common diseases cases
8. Survey on supplementary products available in market for different diseased conditions

References

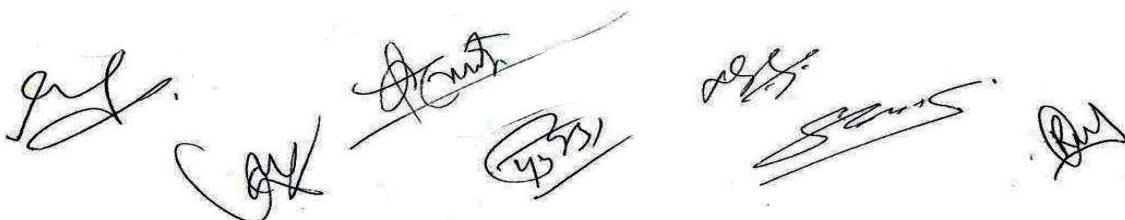
1. Robinson, C.H. and Lawler, M.R. (1982) Normal and Therapeutic nutrition, McMillan Co. , New York
2. Swaminathan, M.S (1985) Advanced text book on Food and Nutrition, Vol 1 & 2, (2nd ed.) , the Bangalore Printing and Publishing Company Ltd.
3. Gopalan, C. and Sastri, B. (2011). Nutritive value of foods. NIN. India
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5. Swaminathan, M. (2008). Essentials of Food and Nutrition (2nd ed. Vol. I & II). Bangalore: The Bangalore Printing & Publishing Co., Ltd
6. Winterfeldt, E.A., Bogle, M.L. & Ebro L.L (2017) Nutrition and Dietetics Practice and Future Trends , 5th edition, Jones & Barlet Learning
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Course: Applied Statistics in Health and Nutritional Research**Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)****Semester: V****Course Code: BND 303A****Credit hrs: 3****Full Marks: 75****Nature of Course: Theory**

Survey is one of major part in health and nutritional research. This course is designed to provide a basic knowledge on theoretical and practical concept about sampling size determination analysis of different types of data generated in health and nutrition related study and provide the way to interpret it. This course also provide concept of using statistical software in analysis of data. Overall this course provide student to use statistical tools and guidance for appropriate in their research.

Unit	Content	Teaching hours
1	Introduction to statistics Introduction, concept of descriptive and inferential statistics, importance and applications of statistics in nutrition related field, terminologies, notions used in statistics and its limitation	1
2	Data organization and presentation Meaning of data organization (mining, editing, coding and management of data). nature, type and sources of data. variable and its type (quantitative, qualitative, discrete and continuous). Scales of measurement of data, classification of data. frequency distribution and its construction, presentation of data (tabular, diagrammatic and graphic), stem and leaf display, some numerical examples and exercises	4
3.	Measures of central tendency Concepts, characteristics of a good statistical average, mean (AM, GM, HM), median, mode, empirical relation between mean, median and mode, partition values (quartiles, deciles and percentiles), choice of an appropriate average. some numerical examples and exercises related to health and nutrition.	3
4.	Measures of dispersion Concepts of variability, characteristics of good measure of dispersion, absolute and relative measures of dispersion (range, semi-interquartile range, mean deviation, standard deviation), some numerical examples and exercises related to health and nutrition	4



5.	Skewness and kurtosis Concept of skewness, its type, Karl Pearson, Bowley's and moments based measures of skewness, exploratory data analysis(EDA): five number summary, box and whisker plot; assessing normality through normal probability plots concepts, types, partition value and measure of kurtosis. application of skewness and kurtosis in health and nutrition, some numerical examples and exercises related to health and nutrition.	3
6.	Correlation Concept, importance and type of correlation, methods of studying correlation (scatter diagram, Karl Pearson's correlation coefficient, Spearman's correlation coefficient), some numerical examples and exercises related to health and nutrition	2
7.	Introduction to probability Concepts of probability; basic terminologies in probability; definitions of probability: mathematical (classical), statistical (relative frequency) and subjective definition; laws of probability: additive and multiplicative rules; conditional probability; Bayes theorem. Concept of random variables, probability distribution, probability mass function and probability density function, types of distribution (discrete and continuous), Binomial distribution, Poisson distribution(concepts, definitions, properties(without proof), applications), normal distribution (concepts, definition, standard normal variates , properties, area under normal curve and applications), some numerical examples and exercises related to health and nutrition	4
8.	Inferential Statistics Sampling and sampling distribution: Concepts of sample and population with examples, need and importance of sampling, sampling survey Vs. census. Probability sampling: types (simple random sampling, systematic sampling, stratified sampling, cluster sampling, multi-stage sampling, PPS sampling). Non probability Sampling: types (Judgment sampling, convenience sampling, quota sampling, snowball sampling). Sample size and power calculation, estimation of sample size for descriptive study. Sampling and non sampling errors, concept of sampling distribution	4

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9.	Regression Concept and importance of regression, lines of regression, coefficients of regression, properties of regression (without proof), fitting of simple (straight line) regression, coefficient of determination	3
10.	Least squaring fitting Concepts of fitting, principle of least square, fitting of second degree polynomial and exponential curves, concepts and applications (specially in nutrition related field) only focusing on numerical problems and interpretations	3
11.	Test of significance (Parametric tests) Simple mean test, independent sample t-test, paired sample t-test, two proportion z- test, test of correlation coefficients (Each test should be explained with examples and exercise.)	6
12.	Analysis of variance (ANOVA) Test for equality of more than two means, analysis of variance (ANOVA) for one way and two way classification , coefficient of determination, post hoc tests (each test should be explained with examples and exercise.)	5
13.	Non parametric test Chi- square Test, types and applications, Rank order test for two or more samples, Wilcoxon test, Mann Whitney U test for two ranked samples, Kruskal Walis H test for more than two ranked samples (each test should be explained with examples and exercise.)	6
	Total	48 hrs

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Course: Applied Statistics in Health and Nutritional Research

Level: Bachelor of Nutrition and Dietetics (B.Sc. ND)

Semester: V

Course Code: BND 303B

Credit hrs: 1

Full Marks: 25

Nature of Course: Practical

Hand on Training on computer application in statistics (one week practice session for application of any one of the statistical software (SPSS, EPI Info, Stata etc.)

- Data coding, categorization, entry into statistical software,
- Data analysis and interpretation for descriptive statistics
- Data analysis and interpretation for regressions and correlations
- Data analysis and Interpretation for inferential statistics ANOVAs (one way and twoway)
- Data analysis and interpretation for non parametric test

References

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2. Harry Frank & Steven C. Althoen (1995). Statistics concepts and applications, Cambridge University Press (Low price edition).
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4. Montgomery D.C. (2004) Introduction to Statistical Quality Control, 5th ed., John Wiley & Sons.
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11. Monsen, E.R. Cheney C. L. (1988) Research Methods in Nutrition and Dietetics: Design, Data Analysis and Presentation. J Am Diet Assoc. 88(9):1047-65.

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Course: Basic and Nutritional Epidemiology
Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)
Semester: V
Course Code: BND 304A
Credit hrs: 3
Nature of Course: Theory

Full Marks: 75

Course Objectives

This course deals with basic concept of epidemiology and epidemiological research perspectives and applied epidemiology in nutrition. After completion of the course student will be able to explain the agent, host, and environment interactions and be familiar with the model of disease occurrence, understand measure of frequency distribution, describe type of epidemiological studies and potential errors, describe association and causal interference in epidemiology, use epidemiological concept, methods and strategies for prevention and control of nutritional problems and disease, apply epidemiological principles and a methods for the planning and evaluation of health and nutritional services and programmes including screening, understand and describe the application of epidemiological principles and methods in prevention and control of nutritional related diseases., understand importance of screening and surveillance program in public health and nutrition services, apply burden of disease concept to plan , organize, and manage food, health & nutrition programs, conduct field based epidemiological studies in the nutrition and health sectors.

Content details

Units	Content	Teaching hour
Part I	Basic epidemiology	
1.	Epidemiological Concepts Concept of disease and health, health & nutrition, principle of epidemiology, scope, concept and use of epidemiology and its historical development, distribution by time, place, and person. Characteristics of persons- intrinsic condition (age, sex, religion, ethnicity) & extrinsic condition (education, language, socioeconomic status), characteristics of place (rural –urban, regional, national & international), characteristics of time (short term fluctuations: common sources, propagated, slow epidemics, periodic fluctuations: seasonal and cyclic trends, long term and secular trends); Application of vital statistics, nutrient database in	6

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	epidemiological study. Nutritional & health indicators for non communicable disease, epidemiological triangle and linkage to nutrition, mode of transmission of food born disease.	
2.	Measure of frequency distribution of nutritional problem and diseases Rate, ratio, proportion, population at risk, prevalence (rate), incidence (rate), commulataive incidence, proportion. Concept of nutritional disease burden (morbidity, mortality, QALY and DALY, productivity and economic loss)	2
3.	Measure of association Absolute risk: risk difference, attributable fraction, population attributable risk, relative risk/risk ratio, odds ratio	2
4.	Epidemiological study designs Introduction, types of epidemiological study designs - descriptive studies/observational studies, analytical studies (ecological, cross sectional, case control, cohort) , experimental studies (randomized control trials, field trial, community trials); meta-analysis its uses and application, hierarchy of study designs	8
5.	Ethics in nutritional research and study	2
Part II	Applied nutritional epidemiology	
6.	Establishment of causal relationship in nutrition causal model in nutrition, method to develop causal model for the local setting, causal tree, different models to describe the causes of malnutrition and way out for the intervention i.e. UNICEF model, types of association, issues in deriving causal inferences -bias, confounding, interaction	4
7.	Epidemiological classification of nutritional diseases concept and need of classification, principle of classification, classification of nutritional disease based on frequency distribution (under nutrition: wasting, stunting, underweight, Over nutrition overweight & obesity, and non communicable diseases)	3
8.	Nutrition survey and nutritional assessment Introduction, purposes, types, planning, field work, sampling, data collection analysis interpretation and action, biomarker validity and reliability, error and biases	4
9.	Food Consumption or Dietary survey	6

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	Introduction, purposes, types dietary survey and method of dietary Assessment based on record (weighing and inventory methods) and recall (diet history, 24 hr recall, FFQ) , sampling, field work (data collection), analysis of data, interpretation, conversion of food amount in nutrient intake, error and biases, application of adult consumption unit, biomarker of dietary & nutrient intake	
10	Assessment of physical activity Linkage between nutrition, physical activity and public health , Methods (subjective and objective) to assess physical activity, their validity and reliability	3
11.	Measuring changes in nutritional status objectives, target population, methods, issues in the measurement of nutritional status	2
12.	Trend analysis and fore casting Trend analysis and forecasting, significance and application, concept of trend analysis and forecasting by using linear model, data transformation for trend analysis and forecasting	3
13.	Nutritional epidemic and management Applying nutritional epidemiology to evaluation and formulation policy, program and intervention, evaluation of nutrition and health services and screening of programmes, epidemiology and nutritional policy.	3
	Total	48 hrs

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Course: Basic and Nutritional Epidemiology

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: V

Course Code: BND 304B

Credit hrs: 1

Full Marks: 25

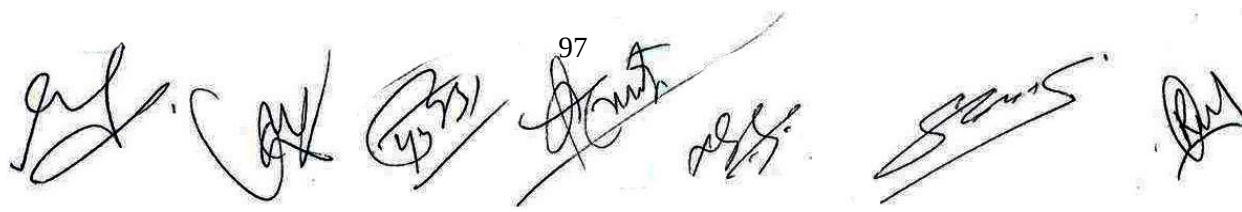
Nature of Course: Practical

Practicals

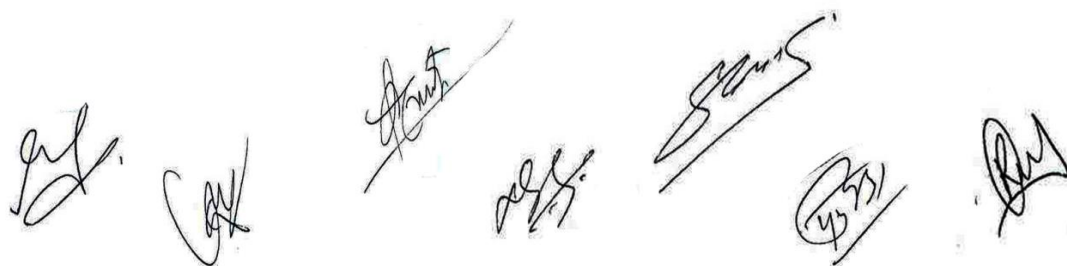
1. Exercise on causal model preparation and development of overweight/obesity/ under nutrition
2. Hands on training for nutrition data analysis (anthropometric and dietary) and Data coding, encoding, analysis and interpretation through WHO anthro, WHO Z score chart and diet calculator etc.)
3. Hand on training on the collection and use of vital statistical data , nutrient database
4. Perform different anthropometric method in community along with supporting sociodemographic and dietary assessment
5. Nutrition survey of the community (data collection, analysis & interpretation)
6. Food consumption survey household in the community and calculation of adequacy level of food intake (3 days survey)
 - a) By using 24 hr Recall method
 - b) Food Frequency Questionnaire
7. Determination of association between dietary inadequacy and nutritional status.
8. Hands on training on measurement of physical activity by objective and subjective methods.
9. Exercise on trend analysis and fore casting and data transformation for trend analysis and fore casting

References

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7. Gibson. R.S (1993) Nutritional Assessment; A laboratory manual, Oxford University Press, Newyork

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8. Hartog, A.P.D. and Staveren, W.A.V. (1983) *Manual for Social Survey on Food Habits and Consumption in Developing Countries*. The Netherlands
9. Jelliffe, D.B. (1996). *The Assessment of the Nutritional Status of the Community*. WHO monograph series 53

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Course: Nutrition Education and Behavior Change Communication

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: V

Course Code: BND 305A

Credit hrs: 3

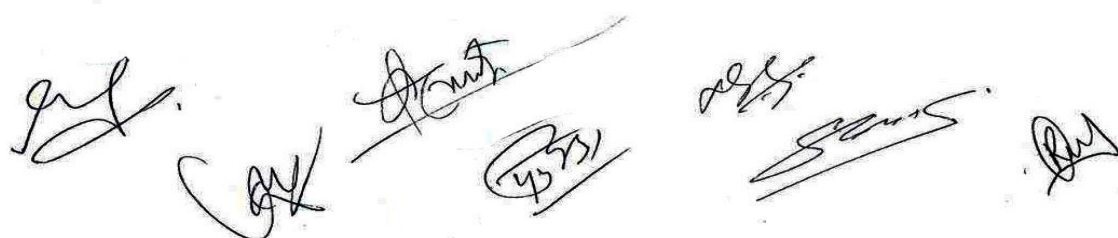
Full Marks: 75

Nature of Course: Theory

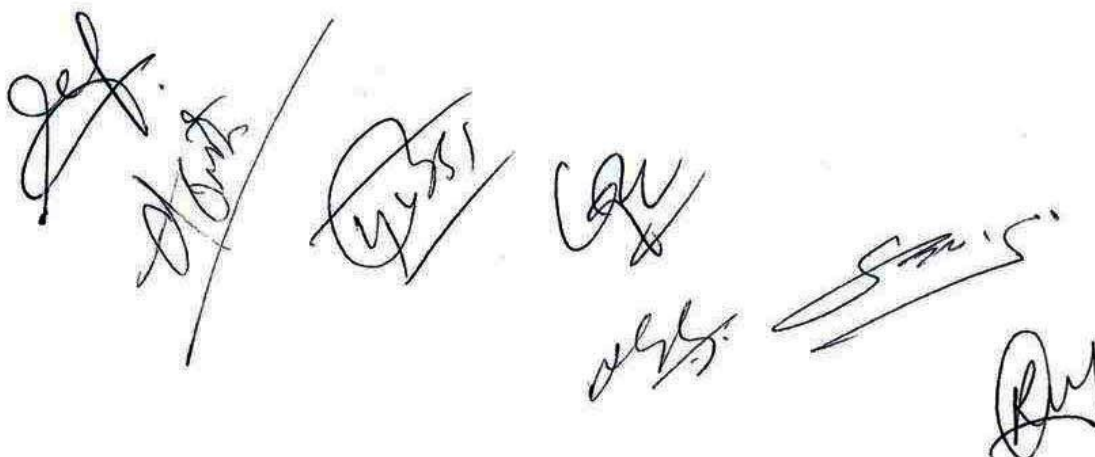
Course description and objectives

This course provides the knowledge about community, important of nutrition education, in community, preparing and delivering nutrition education in community and common tools and techniques used in nutritional education and educational intervention, its planning management and evaluation. After completion of this course, 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.

Units	Contents	Teaching hours
1.	Concept of community and community nutrition: community, characteristics of community, types of community, characteristics of rural and urban communities, common characteristics of family, distinctive feature of family organization, type and function of family ,community nutrition , community health, factor affecting community Nutrition and health, community organization	3
2.	Nutritional Education: concept, components, basic elements of nutrition education, principles of nutrition education, scopes and objectives	2
3.	Concept of PRA & RRA and its applications	5
4.	Diet and behavior change communication : behavior change theories and models (social cognitive theory), theory of planned behavior, trans theoretical model, ecological model, strategies used to change dietary behaviors and food intake ; individual and upstream approaches, advantages and limitations	7
4.	Nutritional education method & media: individuals, group and mass methods, preparation and planning of face to face, group counseling or participation of demonstration, media:- audio, video and audiovisual	6
5.	Quality of effective communication: barrier of communication, social approach of communication , preparation of communication and education tools	2
6	Tools for nutrition education: Growth charts, food groups and list of locally available foods, food values and food composition table, food	12

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	belief, household cooking method and practices, and their effect on nutritive values	
7.	Preparation and planning of nutritional educational tools : need/gap analysis, planning and management	2
8.	Monitoring and evaluation of community nutrition educational program	3
8.	School nutrition, breastfeeding and its promotion, group feeding practice and nutrition rehabilitation	6
	Total	48 hrs



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Course: Nutrition Education and Behavior Change Communication

Level: Bachelor of Nutrition and Dietetics (B.Sc. ND)

Semester: V

Course Code: BND 305B

Credit hrs: 1

Full Marks: 25

Nature of Course:

Practicals

1. Preparation of poster for dissemination of nutritional message to community
2. Preparation of flipchart for different nutritional message
3. Preparation of audio/ video/ audiovisual aids for nutritional education
4. Role play, group discussion on common nutritional problems and issues
5. Innovation in cooking practices and its demonstration
6. KII for community leader, related organization peoples, policy maker
7. Social mapping of a particular location
8. Assessment of breastfeeding practices and behavior of a community
9. Visit to different Nutritional Rehabilitation Centre, Community hospital and hospital settings of Nepal, different organization working in community nutrition and development settings (2 days)- Shifted to PHN

References

1. Das, Suryatapa (2016). Text book of Community nutrition, 2nd edition, Academic Publishers, Kolkata, India
2. Buttris, J.L., Welch, A.A., Kearney, J.M, and Lanham-New, S. A. (2018). Public Health Nutrition; the Nutrition Society textbooks series, (2nd edition). Willey Blackwell Publications
3. Jelliffe, D.B. (1966). The Assessment of the Nutritional Status of the Community. WHO monograph series, 53
4. Hale, C., Shrestha, I. B and Bhattacharya, A. (1996) *Community Diagnosis Manual*, HLM Center, Institute of Medicine, Kathmandu, Nepal
5. Pradhan H.B.(1999) *A Textbook of Health Education*, 3rd edition, Educational Publishing House
6. Temple, N.J, and Steyn, N (2016). Community Nutrition for Developing Countries, AU Press, Canada
7. Adhikari R.K. and Krantz M.E. *Child Nutrition and Health*, HLM Center, Institute of Medicine, Maharajgunj, Kathmandu
8. Adhikari R.K. *Nutrition and Health (in Nepali)*, Educational Publishing House

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3rd YEAR SEMESTER VI

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Course: Clinical Nutrition II (Clinical Nutrition and Diet Therapy)

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: VI

Course Code: BND 351A

Credit hrs: 2

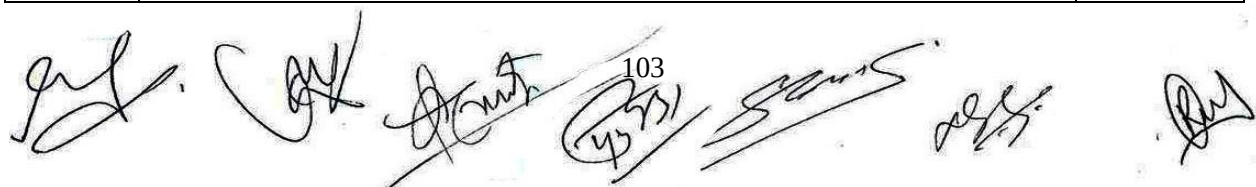
Full Marks: 50

Nature of Course: Theory

Course description and objectives

A graduate in nutrition and dietetics should be able to identify person suffering from nutritional disorders and advise appropriately for their amelioration. Professionals in clinical nutrition assess the nutritional needs based on medical history, laboratory tests and family/lifestyle history in order to make recommendations on diet and individual nutritional needs. This course will assist the nutritionist and dietician to follow nutrition care process and helps to advise person to prevent disease and to manage nutrition of person suffering from nutritional disorders or illness appropriately. After completion of this course student will be able to effectively assess a patient's nutrition status and requirements, understand the basics of nutrition care process, be able to discuss critically the changes in nutritional requirements in various common disease of children and non-communicable disease of adult and know the guidelines for the management of acute malnutrition, understand food and drug; and nutrition and gene interaction.

S. No.	Content	Teaching hrs.
1.	Nutrition care process Nutrition care concept and purpose, nutrition screening/assessment, nutrition diagnosis, nutrition intervention, monitoring and evaluation, documentation	2
2.	Nutrition in health and disease a) Physiological and pathological changes in infants and children in health and disease (diarrhea, pneumonia, measles) and suitable nutrition intervention; nutritional requirement for LBW infants (parenteral feeding, enteral feeding, feeding method, selection of enteral feeding) b) Physiological and pathological changes with appropriate nutritional implications, diet planning and management in common non communicable disease i.e., diabetes, cardiovascular disease (hypertension, atherosclerosis, Ischemic heart disease, peripheral arterial disease, heart failure), respiratory disease (chronic obstructive pulmonary disease and asthma),	5



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		8
3.	Integrated Management of Malnutrition Objective, principle, organization and structure of IMAM, community mobilization, Assessment and classification. Management of SAM at outpatient therapeutic care and Inpatient therapeutic care : assessment, admission or referral, Medical management, nutritional management, counseling, monitoring discharge, follow up) Management of MAM: assessment, admission or referral, medical management, nutritional management, counseling, monitoring discharge, follow up, Implication of CBIMCI in IMAM.	10
4.	Food and drug interaction: Effect of food on drug therapy, effect of drugs on food and nutrition; modification of drug action by food and nutrients, effect of drugs on nutritional status, alcohol-drug interaction	3
5	Nutritional genomics Genetic basics; transcription & translation (genetic code). Nutrigenetics and nutrigenomics concept; nutrigenetic influences on health and disease; nutritional genomics in disease and early diagnosis (cardiovascular disease, diabetes, cancer, bone mineralization and weight management)	4
	Total	32 hrs

Course: Clinical Nutrition II (Clinical Nutrition and Diet Therapy)

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: VI

Course Code: BND 351B

Credit hrs: 1

Full Marks: 25

Nature of Course: Practical

Practicals

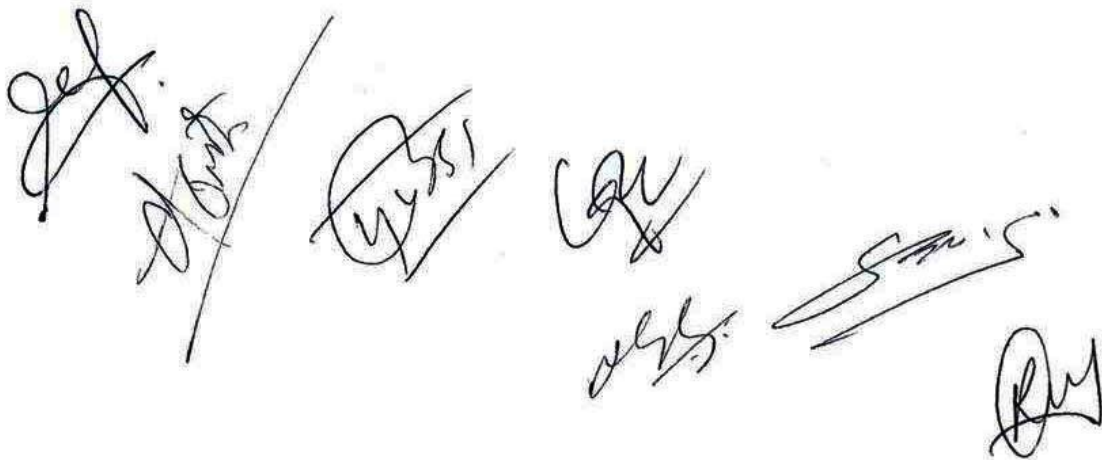
1. Survey on available ergogenic aids and its use
2. Various case discussion and presentation
3. Disease specific product development and demonstration/presentation
4. Field based observation on management of acute malnutrition
5. Use of standardized tool for nutritional assessment or screening (MUST, SGA, MNA etc)
6. Preparation and use of tool for nutrition screening or assessment of diseased person or hospitalized patients
7. Planning and calculation of diet plan for Diabetes
8. Planning and calculation of diet plan Heart disease
9. Field based nutrition counseling
10. Role playing session for nutrition counseling
11. Hospital observational visit for dietary management of CVD, diabetes, respiratory disease

References

1. Antia, F. P., & Abraham, P. (2010). Clinical Dietetics and Nutrition (4th ed.). New Delhi: Oxford University Press.
2. Brown, J. (1998). Nutrition Now (2nd ed.). USA: Wadsworth Publishing Company.
3. Gopalan, C., Rama Sastri, B. V., & Balasubramanian, S. C. (2011). Nutritive Value of Indian Foods. Hyderabad: National Institute of Nutrition, ICMR.
4. Indian Council of Medical Research. Nutritive Value of Indian Foods - Latest Publication.
5. Indian Council of Medical Research. Recommended Dietary Intakes for Indians - Latest Recommendations.
6. Insel, P., Turner, R. E., & Ross, D. (2003). Discovering Nutrition. Massachusetts: Jones and Bartlett Publishers.
7. Joshi, Y. K. (2008). Basics of Clinical Nutrition (2nd ed.). New Delhi: Jaypee Brothers Medical Publishers (P) Ltd.
8. Mahan, L. K., Escott-Stump, S., & Raymond, J. L. (2012). Krause's Food and the Nutrition Care Process (13th ed.). Missouri, USA: Elsevier Saunders.
9. Nelms, M. N., Sucher, K., Lacey, K., & Roth, S. L. (2011). Nutrition Therapy and Pathophysiology (2nd ed.). USA: Wadsworth Cengage Learning.



10. Robinson, C. H., Lawler, M. R., Chenoweth, W. L., & Garwick, A. E. (1986). Normal and Therapeutic Nutrition (7th ed.). New York: Macmillan Publishing Company.
11. Srilakshmi, B. (2014). Dietetics (7th ed.). New Delhi: New Age International (P) Ltd.
12. Swaminathan, M. (2008). Essentials of Food and Nutrition (2nd ed. Vol. I & II). Bangalore: The Bangalore Printing & Publishing Co., Ltd.

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Course: Dietetics II

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: VI

Course Code: BND 352A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

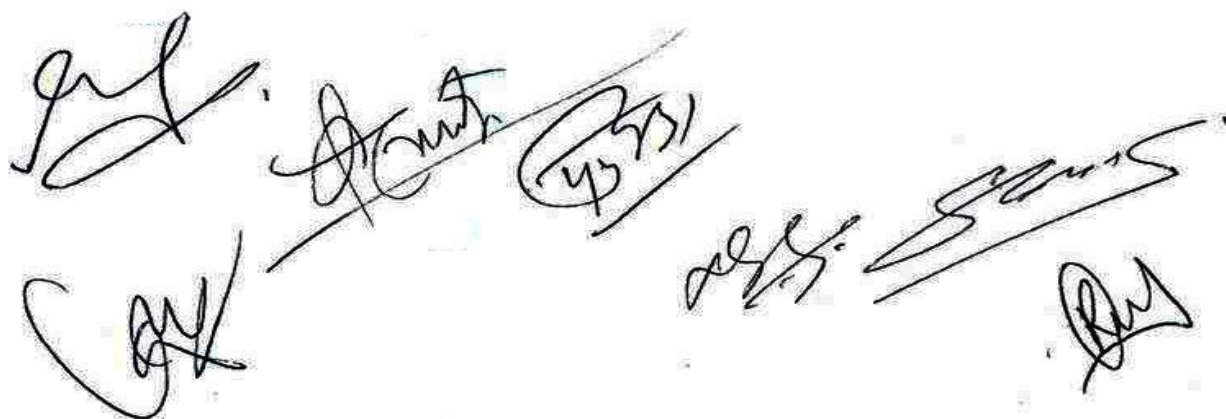
Course description and objective

The objective covers all aspects of human body in diseased condition, understanding the pathology of disease, its causes and symptoms and the specific nutritional implication for the diseased condition. This course will help to develop skills and techniques in planning therapeutic diets for patients suffering from various diseases after proper medical and diet history assessment of the patient. Course also teaches the counseling techniques to conduct dietary counseling for patients.

S.No.	Content	Teachig hours
1	Gastrointestinal disorders and Diet management Structure and functions and of gastrointestinal tract. Etiology , symptoms, and dietary guidelines for gastritis (acute and chronic), peptic ulcers (gastric and duodenal ulcer) diarrhea (acute and chronic), child and adult diarrhea, constipation, flatulence, steatorrhoea, ulcerative colitis and irritable bowel syndrome.	8
2	Diet management for liver, gall bladder and pancreas diseases Structure and functions of liver, damage caused to liver. Etiology, symptoms, and dietary treatment for Jaundice, hepatitis, Cirrhosis of liver, hepatic coma. Role of alcohol in liver disease, gall bladder stone, acute & chronic pancreatitis.	6
3	Diet management for diseases of kidney and urinary tract: Structure and function of kidney (review). Etiology of disease ,symptoms of diseases and dietary treatment in acute and chronic glomerulonephritis, nephrotic syndrome, renal failure (acute and chronic) Dialysis- definition and types, urinary calculi- causes & treatment, dietary care and management	9
4	Food and nutrition in surgery and burn	3



.		
5	Nutrition in cancer Classification, risk factors and symptoms of cancer, nutritional problems for cancer therapy, diet & nutritional requirements for cancer patients, diet planning & management.	3
6	Diet and nutritional counseling Importance of diet counseling and patient education, steps in counseling process, counseling guidelines	3
	Total	32hrs


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Course: Dietetics II

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: VI

Course Code: BND 352B

Credit hrs: 1

Full Marks: 25

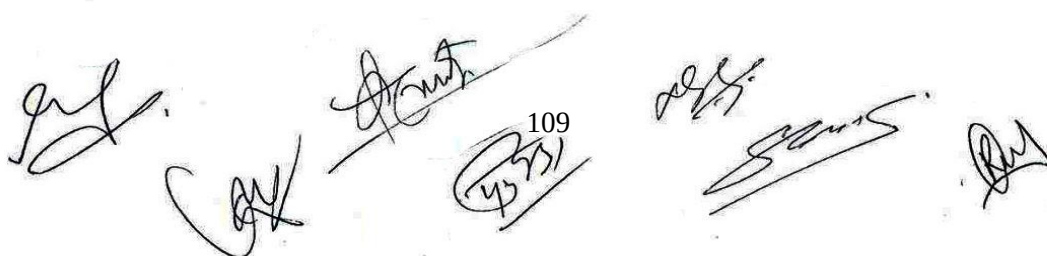
Nature of Course: Practical

Practicals

1. Planning and calculation of diet plan for diarrhea
2. Planning and calculation of diet plan for constipation
3. Planning and calculation of diet plan for peptic ulcers
4. Planning and calculation of diet plan for liver disease
5. Planning and calculation of diet plan for kidney disease
6. Planning and calculation of diet for cancer diseases
7. Preparation of aids for dietary counseling.
8. Conducting a dietary counseling session
9. Preparation of list of normal/ reference level of various blood parameters
10. Visit to a dietary department of hospital.
11. Observation of cases of common chronic diseases: case study.

References

1. Robinson, C. H., Lawler, M. R., Chenoweth, W. L., & Garwick, A. E. (1986). Normal and Therapeutic Nutrition (7th ed.). New York: Macmillan Publishing Company
2. Swaminathan, M.S Advanced text book on Food and Nutrition, Vol 1 & 2, Bangalore Printing and Publishing company ltd.
3. Gopalan, C., Rama satri, B.V & Balasubramaniam, S.C (2011). Nutritive value of Indian foods. NIN.Hyderabad, India
4. Indian Council of Medical Research. Nutritive Value of Indian Foods - Latest Publication
5. DFTQC (2012) Food Composition Table for Nepal.
6. Srilakshmi, B. (2014). Dietetics (7th ed.). New Delhi: New Age International (P) Ltd
7. Antia, F.P., & Abraham, P.(2010). Clinical dietetics and nutrition. New Delhi: Oxford University press
8. Begum, R.M. A (2000). Textbook of Food, Nutrition and Dietetics. Sterling Publishers Pvt Ltd, New Delhi.

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Course: Food and Nutrition Security

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: VI

Course Code: BND 353A

Credit hrs: 3

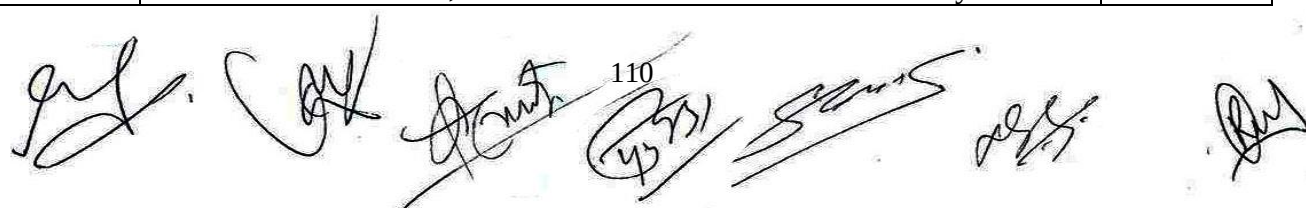
Full Marks: 75

Nature of Course: Theory

Course description and objectives

The main objective of this course is to provide knowledge about Food and nutrition security, current situation and methodology for assessment. The initial part focus on food habits of people, ecological, social, cultural and other dynamics aspects of food and interrelation with nutrition. Then second part deals with concept of food and nutrition security, its components, scope and method of assessing food and nutrition security at different level and intrahousehold food distributions.

Unit	Chapters	Teaching hrs
	Food and nutrition security Introduction, concept, components and factor responsible for food and nutritional security, food and nutrition security as fundamental right of public and community	3
1.	Food and culture Food culture, aspect of food culture, social role and function of food, social aspect of eating (conservation of cuisine, food taboos, etiquette, religious , symbolic aspect), South Asian diet, globalization of food culture – Food acculturation, diffusion of food and food acceptance .	4
2.	Food habit and ecology	11
	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
	Influence of town to food habits and urbanization	2
	Food faddism and faulty food habits	2
	Economic factors affecting food consumption	2
	Social and psychological aspect of food consumption	2
	Dynamism of food habits- Nutrition transition in developing country, factor influencing in nutritional transition, nutrition transition and food environment , impact on health and formulation of policy	4
	Food ethnography, food habit and food consumption	2
10.	Situation of food & nutrition security Current situation in global level and national level, household level and individual level, indicator for food and nutrition security at each	4



	levels	
11	Assessment of food & nutrition insecurity at different level Direct and indirect method for measurement of food insecurity situation (outline of method, data collection and analysis, interpretation), biases and errors	10
12.	Household food distribution Food distribution pattern, internal and external influences in household food distribution, assessment of intra household food distribution, indicator and indices of intra-household food distribution, need and importance intra-household food distribution surveillance	6
13	Program and Policy for food & nutrition security Monitoring and surveillance system of food and nutrition security,. Program and policy to improve food and nutrition security in local, national and international level	4
	Total	48 hrs

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Course: Food & Nutritional Security

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: VI

Course Code: BND 353 B

Credit hrs: 1

Full Marks: 25

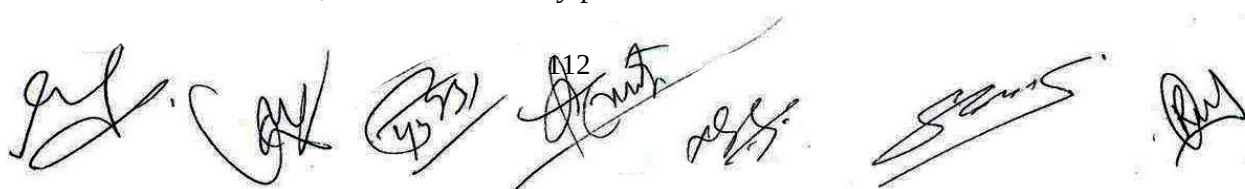
Nature of Course: practical

Practicals

1. Survey of food habit of consuming snack by school children
2. Rapid ecological visit of a community.
3. Determination of factor associated with nutritional status/ Iron deficiency anemia
4. Preparation of food balance sheet based on agriculture statistics of production, consumption, losses and import and export data from literature search.
5. Estimation of national level Food security using FAO methods
6. Food insecurity assessment based on
 - Food diversity score
 - HFIAS Score and
 - Coping strategies
7. Conduction of intrahousehold food distribution survey - at least 50 household of eastern hilly region
8. Exercise on measurement of household calorie adequacy ratio, group calorie adequacy ratio and relative calorie adequacy ratio.

References

1. Hartog, A.P.D. and Staveren, W.A.V. (1983) *Manual for Social Survey on Food Habits and Consumption in Developing Countries*. The Netherlands.
2. Tempe, N.J. and Steyn, N. (2016). *Community Nutrition for Developing Countries* published by AU press Athabasea University and Unisha press University of SouthAfrica.
3. Anonymous. *Policy Issue on Nutrition and Welfare*. UPLB Agricultural Policy Working Group. UPLB, College Laguna, Philippines.
4. Begum, R.M. A (2000). *Textbook of Food, Nutrition and Dietetics*. Sterling Publishers Pvt Ltd, New Delhi. (2000)
5. Gopaldas, T. and Seshadri, S. (1987). *Nutrition - Monitoring and Assessment*. Oxford University Press, India. (1987)
6. Ivan, B., Miriam, C. and Bruno, D. A (1988). *Guide to Nutritional Assessment*. WHO, Geneva, Laxman Chand Arya, Krishan Nagar, India.
7. Jelliffe, D.B. (1996). *The Assessment of the Nutritional Status of the Community*. WHO monograph series 53.
8. King, F.S., Burgess, A. Quinn, VJ. & Osei, A.K. (2015). *Nutrition for Developing Countries*. 3rd edition, Oxford University press. Walton Street.

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Course: Public Health Nutrition

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: VI

Course Code: BND 354A

Credit hrs: 3

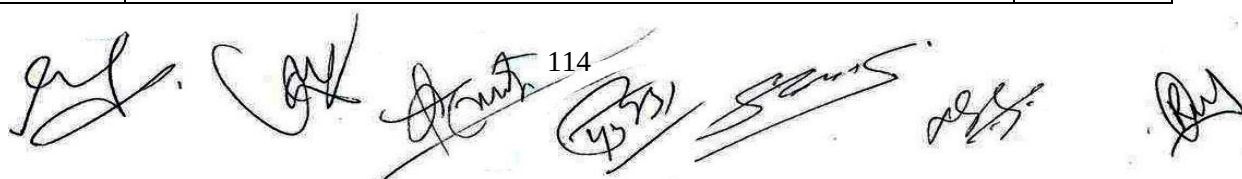
Full Marks: 75

Nature of Course: Theory

This course includes diverse aspect of public health nutrition. After completing of this course student will able to understand linking between nutrition and public health , different dimension of public health nutrition, Nutritional epidemiology and application, public health program and policies related to nutrition, management and monitoring aspect of public health and community Nutrition intervention and programs ,agency and their contribution on health and nutrition.

Unit	Content	Teaching hours
1.	Introduction to public health nutrition and health promotion: Introduction to public health and public health nutrition health promotion, public health nutrition cycle; public health approaches- socio ecological approach, life style approach and biological approach.	4
4.	Public health nutrition programme planning and management: Approaches to food and nutrition planning, Situation analysis, problem identification, problem definition, indicator setting for evaluation and different steps of planning process (planning and management cycle) for formulation of nutrition programme and projects at various level ie local, provincial and national.	6
5.	Nutrition monitoring and surveillance: Nutritional monitoring – objectives, component of nutritional monitoring, current programme of nutritional monitoring in Nepal, Nutrition surveillance – introduction , nutritional monitoring versus surveillance, nutritional surveillance process-triple A cycle , Aim and objective of surveillance, methodology of nutritional surveillance system, infrastructure for nutritional surveillance in Nepal, key indicator of nutritional surveillance system, application and use of nutritional surveillance system.	6
6.	Common nutritional problem and issues in Nepal and South East Asia : Status of types of malnutrition and nutritional related non communicable disease, disease burdens (prevalence, rate, morbidity, mortality, QALY and DALY).	3

	Maternal and infant and young child (MIYCN) feeding practices, guideline and status	
7.	Agencies and organization to combat malnutrition Agencies, International agencies (WHO, UNICEF, FAO, World Bank, USAID) National level agencies - Ministry of health, Department of Health & Nutrition service, Ministry of agriculture, DFTQC, DoA, DOLs, NARC, Academic institution (Tribhuvan University other institutions), voluntary and non government agencies in food, health and nutrition, other social agencies	8
8.	Strategies , policy and programme to combat Malnutrition : Sustainable development goal, health and nutritional strategies, national nutritional policy. Health based national nutritional program and intervention to combat malnutrition and micronutrient deficiency, growth monitoring programme. Food based national nutritional programme- agriculture perspective plan, food safety and quality control program, food law & regulation, food labeling, dietary guideline and recommendation, supplementation and fortification program in Nepal, nutritional sensitive and nutrition specific agriculture, program and policy, multi sector nutritional policy and plan (MSNP). 7 days visit to different organization to know about current policies, programs and Nutritional settings of the country.	10
9.	Health & nutrition Information management system ; Introduction, objective, institution set up, methods , tools, recording and reporting, constraint and issues	4
10	Assignment: Assignment on nutrition programme planning and management: (student will be grouped into 4-5groups and do the assigned task , submit report and present the their work at the end of the course) - Perform situation analysis based on available literatures on any one of the nutritional problem - find gap for improvement, and develop strategies and advocacy , - develop and plan intervention framework and - establish monitoring and evaluation indicator - visit to different organization to know about current	7


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	policies, programs and nutritional settings of the country , - Report Submission and presentation of report (Assignment and Educational Visit).	
	Total	48 hrs

References

1. Lowery, M., Lawrence, M. and Worsley, T. (2008). Public Health Nutrition from Principles to Practice, Chennai microprint (P) Ltd., Chennai.
2. Das, Suryatapa (2016). Text book of Community nutrition, 2nd edition, Academic Publishers, Kolkata, India
3. Sehgal, S., and Raghuvanshi, R.S (2007).Text book of community nutrition ,Indian Council of Agricultural Research, Sangam book Depot, Dariyagunj, New Delhi, India
4. Watson, R. R., Tabor, J. A., Ehiri, J and Preedy, V.R. (2015) Handbook of Public Health in Natural Disaster, Wageningen Academic publishers.
5. Vir, S.C. (2011). Public Health Nutrition in Developing Country, 1st edition Woodhead publishing India.
6. Edelstein S (2011). Nutrition in Public Health., 3rd edition, Jones and Bartlett Learning.
7. Hughes, R . and Margetts, B.M (2011) Practical Public Health Nutrition (1st edition) Wiley-Blackwell , John Wiley & Son Ltd, UK
8. Buttris, J.L., Welch, A.A., Kearney, J.M, and Lanham-New, S. A. (2018). Public Health Nutrition; the Nutrition Society textbooks series, (2nd edition). Willey Blackwell Publications
9. Jelliffe, D.B. (1966). The Assessment of the Nutritional Status of the Community. WHO monograph series, 53
10. Spark, A.J. (2007) .Nutrition in Public Health ; Principles, Policies and Practice, Taylor & Francis Group, CRC Press

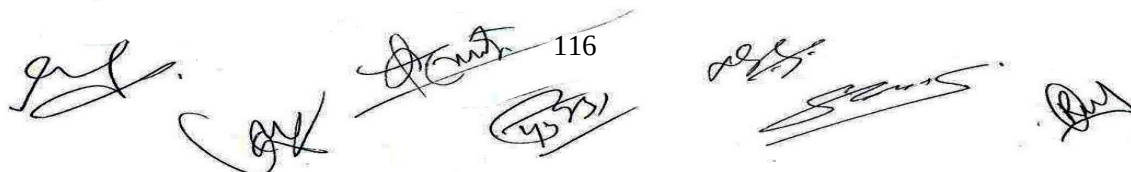
Course: Nutrition for Athletics and Sport persons
Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)
Semester: VI
Course Code: BND 355A
Credit hrs: 2
Nature of Course: Theory

Full Marks: 50

Course description and objectives

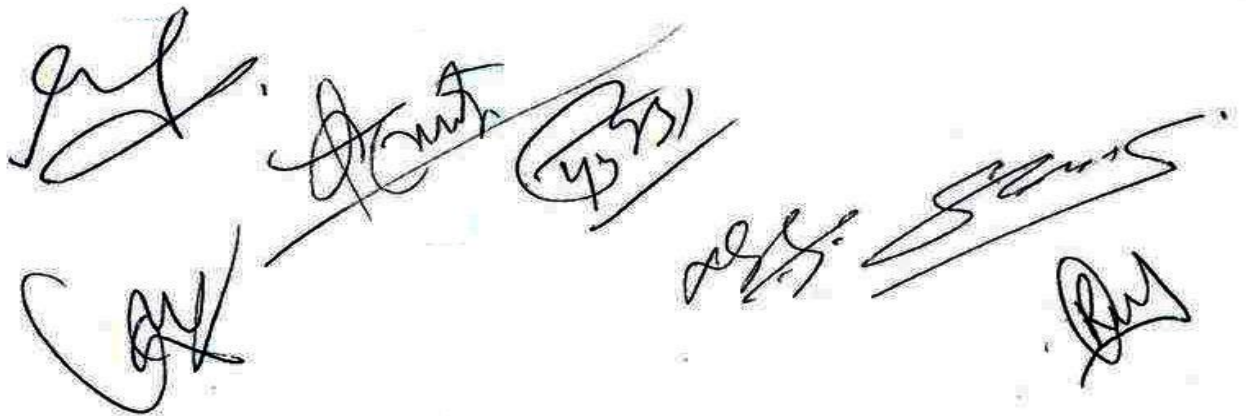
Nutrition and diet planning and management is fundamental need for sport and athletes person to be healthy and keep them fit every time. After completion of this course student will be able to understand the nutritional need of athletes and apply the knowledge acquired for planning diet for athletes and sports persons

Unit	Content	Teaching Hours
1.	Physical Fitness: Definitions, benefits of physical activity, Physiology and biochemistry of exercise: Muscle contraction, weight and body composition of athletes, adaptation of muscle and physiology to exercise, Effect of excessive physical exercise on cardio vascular and pulmonary system	6
2.	Energy source of muscle use: ATP, Phospho-creatine, glucose, fat, protein, anaerobic metabolism for high intensity bursts and power, aerobic metabolism for endurance, nutritional assessment and counseling for athletes and sports persons.	6
3.	Nutritional requirement of athletes and sport persons: Effect of differential intake of macro nutrients (carbohydrates, protein and fats) on athletes endeavor, Hydration strategies to optimize physical activity capacity, importance of timing the nutrient and fluid intake to match tissue requirements	6
4.	Nutrition needs and plans for sports: Nutrition need and plans for sports requiring power and speed before, during and after exercise, Nutritional needs and plans for sports requiring endurance before, during and after exercise Nutrition plan for sports requiring combined power and endurance.	8
5.	Nutritional needs of male, female younger and older athletes Ergogenic aids, effect of ergogenic aids and other substances on Physical activity, sport drink for endurance activities, nutrition supplements available for athletes.	6
	Total	32 hrs

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References

1. Gordon, M. W. (1999).Perspective in nutrition, fourth edition , Mc. Graw Hill companies 1999
2. Anita F.P and Philip Abhraham , (2002).Clinical Dietetics and Nutrition, 4th edition , Oxford University press2002
3. Srilakshmi B.(2014) Dietetics , 7th edition , New age international (p) Ltd
4. Mahan,L. K. and Sylvia, E.S. (1996) Krause's Food , Nutrition and Diet Therapy , 9th edition WB Saunders Company , 1996
5. Benordot, Don (2012). Advanced Sports Nutrition , 2nd edition, Human Kinetics

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Course: Research Methodology

Level: Bachelor of Science in Nutrition and Dietetics (BSc. ND)

Semester: VI

Course Code: BND 356A

Credit hrs: 2

Full Marks: 50

Nature of Course: Theory

Course description and objectives

After completion of this course, students will be able to , recognize principles behind research methodology and gain efficient knowledge of research procedures and make able to develop proposal for food, health and nutritional research works, acquired knowledge on research process, make able to prepare research proposal and research report for their research works.

Unit	Content	Teaching hours
1.	The philosophy of research Paradigms of research and phenomenology of research, naturalistic, constructivism, positivism, interpretative research ideas, deductive and inductive approaches	1
2.	Introduction to research and research process a) Definitions, purpose, levels and general types, conceptualizing the problem, reviewing the literature, formulating objectives, hypotheses and research questions, identifying and labeling of variables, constructing operational definitions of variables b) Phases of research methodology (conceptual, empirical and analytical), research strategies and designs c) research proposals, format of research proposal	8
4	Method in nutritional research a) Qualitative research - study designs and methods (naturalistic ; ethnography, biography, phenomenology, case study, grounded theory , unstructured and structured observational studies, unstructured interviews, focus group discussion) b) Quantitative Research- study designs and methods (Cross sectional, case control, and cohort study design),concept of experimental study, concept of meta analysis, , Characteristics of qualitative and quantitative research, interdisciplinary research approach, mixed methods	10

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5	Analysis of data and interpretation of findings a) Methods of analysis of qualitative and quantitative data b) Critical appraisal of the analyzing process, analysis of mixed methods	4
6	Documentation and dissemination of research Work a) Scientific report writing: Structure and components of Scientific writing, step of scientific writing Citation and referencing, Example of dissertation report b) Preparation of scientific paper and publications: Structure and component of Scientific paper, bibliography, Referencing, citations, foot notes, plagiarism, and acknowledgement, concept of ISBN and ISSN, Indexing of journals, journal appraisal	9
	Total	32 hrs

Home works and assignments (at least any two as convenient, in groups or individually)

- Sketching research proposal
- Designing a survey instrument
- Performing a short case study
- Preparing a report of small survey
- Presentation of literature reviews/ reports/ articles etc
- Analyzing references and citations

References

1. Bowling, Ann (2014). Research methods in health: investigating health and health services. McGraw-Hill Education (UK)
2. Chrzan, Janet and Brett , John (2017). Research Methods for anthropological studies of food and nutrition, Volumes 1-3. Berghahn Books
3. Julie A. Lovegrove, Leanne Hodson, Sangita Sharma, Susan A. (2015). Nutrition Research Methodologies Lanham-New, Wiley
4. Khatiwada, R. P., Pradhan, B. L., and Poudyal, N. (2015). Research methodology. KEC publication and distributors (Nepal)
5. Nyklíček, Ivan (2006). Research methods in health. *Journal of Psychophysiology*, 14, pp. 126-128. <https://doi.org/10.1027//0269-8803.14.2.126>.
6. Rucker, Robert B., and Rucker, Michael R. (2016). Nutrition: ethical issues and challenges. *Nutrition Research*, 36, pp. 1183 – 1192

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4th Year SEMESTER VII

Prof. Dr. H. K. S. / 45731
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Course: Community Based Posting (2 Months)
Level: Bachelor of Nutrition and Dietetics (BND)
Semester: VII
Course Code: BND 401B
Credit hrs: 6
Nature of Course: Practical

Full Marks: 150

Course Description and Objective

The student will undergo community based posting in order to gain practical experience in the related field. The decision on the posting will be made by Department of Nutrition & Dietetics.

The possible places for posting will be:

- NGOs and INGOs conducting nutritional program.
- Government bodies related nutritional programs
- Other related institutions and organizations

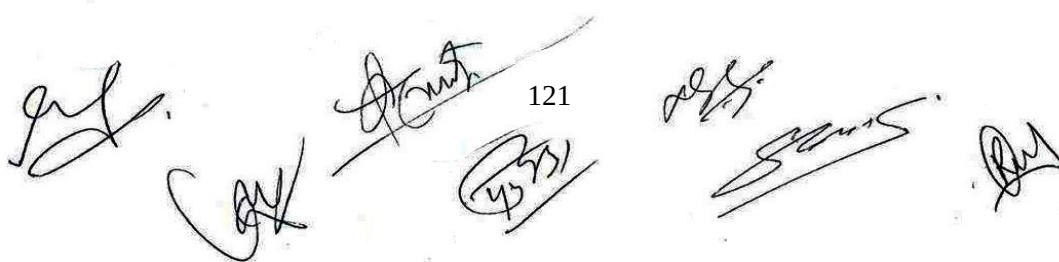
At the end of the field based posting, students will have to prepare a report and present it before of expertise consisting of head of the Department of Nutrition & Dietetics and teachers related to subjects. The distribution of marks and the system of evaluation will be as follows:

Evaluation	Weightage	Mark
*External (placement supervisor)	50	75
**Internals	20	30
***Report Presentation	30	45

*External means the external expert (placement supervisor where student carry their Field based posting or internship) on the relevant field/topic

**Internal means the teacher for the inspection of student in the field based posting

***Report Presentation means the presentation of the field or intern report before the panel of expert.

The bottom of the page features several handwritten signatures in black ink. In the center, there is a circular stamp containing the number '121' and some illegible text below it. To the right of the stamp, there are more signatures, including one that appears to be 'S. S. S.' and another that looks like 'R. S.'.

Course: Hospital Based Posting (3 Months)

Level: Bachelor of Nutrition and Dietetics (B.Sc. ND)

Semester: VII

Course Code: BND 402B

Credit hrs: 8

Full Marks: 200

Nature of Course: Practical

Course description and objective

The student will undergo hospital based posting in order to gain practical experience in the related field. The decision on the posting will be made by Department of Nutrition & Dietetics.

At the end of the hospital based posting, students will have to prepare a report and present it before of expertise consisting of head of the Department of Nutrition & Dietetics and teachers related to subjects. The distribution of marks and the system of evaluation will be as follows:

Evaluation	Weightage	Mark
*External (placement supervisor)	50	100
**Internals	20	40
***Report Presentation	30	60

*External means the external expert (placement supervisor where student carry their Field based posting or internship) on the relevant field/topic

**Internal means the teacher for the inspection of student in the field based posting

***Report Presentation means the presentation of the field or intern report before the panel of expert.



Course: Dissertation (6 months)

Level: Bachelor of Nutrition and Dietetics (B.Sc. ND)

Semester: VIII

Course Code: BND 451B

Credit hrs: 12

Full Marks: 300

Nature of Course: Practical

Course description and objective

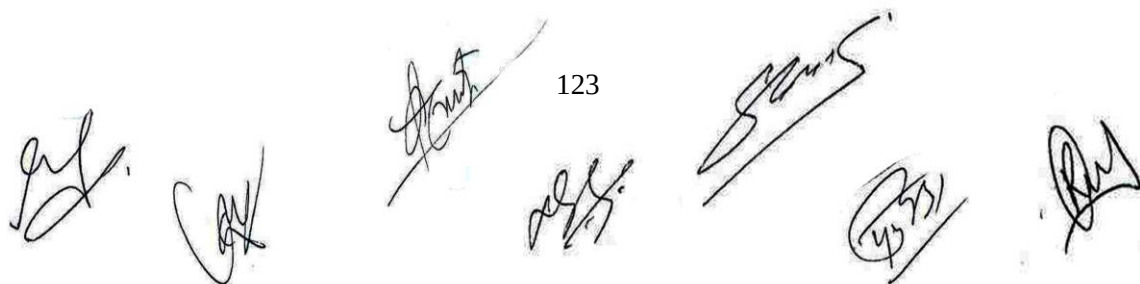
The student will carry out dissertation work on the approved topic. Topics for dissertation work will be decided after recommendation from the Department of Nutrition & Dietetics and approval from the Nutrition and Dietetics Subject Committee. The department will assign a guide teacher who will supervise the student dissertation, and internal to review the dissertation report.

After completion of the project works, students will have to prepare a report as per dissertation format and present it before panels of examiners. The dissertation of the students will be evaluated by a panel of examiners composed of external subject expert, guide teacher (supervisor), internal and head of the department. The student will have to present their dissertation before the panel.

The distribution of marks and the system of evaluation will be as follows:

Evaluation	Weightage	Mark
External subject expert	40	120
Guide Teacher (Supervisor)	20	60
Internal	20	60
Department head	20	60

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The bottom of the page features several handwritten signatures and marks. From left to right, there is a signature that appears to be 'J.L.', a signature that looks like 'C.A.', a signature that is partially obscured by the page number '123', a signature that looks like 'S.K.', a signature that looks like 'S.K.', a signature that looks like '45/751', and a signature that looks like 'R.S.'.