

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly known as West Bengal University of Technology)

Syllabus of B.Sc. (Dietetics and Nutrition)
Effective from academic session 2023–2024

Semester VIII

FYBDN 801 Research Methodology II

5 credits, Total- 50 hours + 10 Tutorial hours

Course objectives:

1. To familiarize students with the basic concepts of statistics in the healthcare field.
2. To develop an understanding of data and its processing
3. To align the minds of the students to the application of software in data analysis

Sl. No.	Course Outcomes (COs)
1.	Make use of the concept of Statistics including primary data, secondary data etc
2	Demonstrate about various concept of probability
3	Experiment with sampling method, ANOVA
4	Assess and apply the knowledge and skills required for data analysis using correlation, regression
5	Make use of basic techniques required for R programming

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Unit 1: **8hrs**

Types of Data, Collection of data; Primary & Secondary data, Classification and Graphical representation of Statistical data. Measures of central tendency and Dispersion. Measures of Skewness and Kurtosis.

Unit 2: **8hrs**

Probability classical & axiomatic definition of probability, Theorems on total and compound probability), Elementary ideas of Binomial, Poisson and Normal distributions.

Unit 3: **8hrs**

Methods of sampling, confidence level, critical region, testing of hypothesis and standard error, large sample test and small sample test. Problems on test of significance, t-test, chi- squaretest for goodness of fit and analysis of variance (ANOVA).

Unit 4: **12hrs**

Correlation and Regression. Emphasis on examples from Biological Sciences. Basic introduction to Multivariate statistics. Curve fitting.

Unit 5: **12hrs**

R Programming.

Reference Books:

1. Agresti, A. & Franklin C.A. (2009) Statistics: The Art and Science of Learning from Data (Second Edition) Boston,MA: Pearson Prentice Hall, ISBN 978-0-13-513199-2

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2. Bernard, H.R. (2000). Social Research Methods: Qualitative and Quantitative Approaches. Thousand Oaks, CA: Sage.
- Black, J.A. and Champion, D.J. (1976).
3. Methods and Issues in Social Research. New York: John Wiley and Sons. Blaxter, L., Hughes, C, and Tight, K. (1999).
4. How to Research. New Delhi: Viva books. Diez, D. M., Barr, C. D., Cetinkaya-Rundel M. (2015). OpenIntro Statistics:(Third Edition). CreateSpace Independent Publishing Platform. ISBN-10: 194345003X, ISBN- 13: 978- 1943450039 <http://www.openintro.org/stat/textbook.php>.
5. Elmes, D.G., Kanowitz, B.H. and Roediger, H.L. (1989). Research Methods in Psychology (Third Edition). New York: West Publishing Company. Fowler, F.J. (1988).
6. Survey Research Methods. Applied Social Research Methods Series, Vol. 1. Newbury Park, CA: Sage. Greene, S. and Hogan, D. (Eds.). (2005).
7. Researching Children’s Experiences: Methods and Approaches. London: Sage. Gordis L. (2013)

FYBDN 802 Functional Food & Nutraceuticals

Credits (5) Total Hours : 50 hours + 10 Tutorial hours

Course Objectives :

1. To introduce them to various functional food groups and food products
2. To understand the category of nutraceuticals based on sources, chemical function and mechanism of action.
3. To enable students understand the relation between Functional Foods, Nutraceuticals and Food and Drugs.
4. To make them aware of the National & International regulatory aspects of functional food.

UNIT– I INTRODUCTION TO FUNCTIONAL FOODS & NUTRACEUTICALS (9 Hours)

Functional foods and Nutraceuticals – Definition and history, Classification Designer foods and pharma foods.

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Teleology – definition, primary and secondary metabolites.

Organisational Models for Nutraceuticals - a) Food Sources b) Mechanism of Action c) Chemical Nature

Consumer Marketing - Factors for marketing functional foods and nutraceuticals

UNIT -II Categorization of Nutraceuticals (9 Hours)

Classification based on food source, mechanical action, chemical nature, isoprenoids, phenolic substances, fatty acids and structural lipids, terpenoids – saponins, topotrienols and simple terpenes, carbohydrate derivatives, amino acid derivatives and isoflavons.

UNIT III – Probiotics, Prebiotics & Synbiotics (7 Hours)

General Functions of Intestinal Microflora

Prebiotics - Definition, role of prebiotic as functional ingredient, examples.

Probiotics - Definition, role of prebiotic as functional ingredient, examples.

Synbiotics - Definition, functions, examples.

UNIT IV – Functional Nature of Nutraceuticals (9 Hours)

Polyphenols – Flavonoids, Catechins, Isoflavones, Tannins, Phytoestrogens, Phytosterols, Glucosinolates, Organosulphur Compounds, Proteins and peptides, Conjugated linoleic acids.

Bioactive Compounds : Saponins, Haemagglutinins, Resveratrol, Kaempferol, Quercetin, Cinnamaldehyde, Capsaicin, Piperine, Gingerol, Eugenol, Apigenin, Thymoquinone.

UNIT –V HERBS AND FLOWERS AS FUNCTIONAL FOODS (9 Hours)

Action of Herbs and Efficacy on:

a) Nervous System–Ginseng, St.John's wort, Ginkgo biloba, Bacopa

Monnieri & Centalla asiatica

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- b) Heart and Circulatory System-Hawthorn plant
- c) Immune System -Echinacea
- d) Digestive System-Ginger valerian root fennel
- e) Respiratory System-Licorice root, kava kava
- f) Urinary System-Cranberry, Saw palmetto
- g) Musculoskeletal System-Fever few

Flowers

Medicinal values, nutritional importance, culinary uses, effect of cooking of

Edible flowers – Drumstick, Neem, Agathi, Plantain

Ornamental edible flowers – Hibiscus, lotus, rose

Unit VI Regulatory aspects of functional food & Nutraceuticals (7Hours)

Regulatory Aspects : International & National regulatory aspects of functional foods in India, ICMR guidelines for probiotics ,
Advances in research in functional foods. Regulatory prospectives of FOSHU foods.

Reference Books :

1. Chatwick. R. (2003), Functional Foods Springer.
2. David H Watson (2001), Performance Functional Foods, Culinary and Hospitality Industry Publications.
3. Israel Goldberg (2001), Functional Foods Designer Foods Pharma

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Food, Nutraceuticals, Culinary and Hospitality Industry Publications.

4. Mary K Schmidl and Theodore P. Labuza, (2000), Essentials of Functional Foods, Culinary and Hospitality Industry Publications Services.

5. Mazza G. (1998), Functional Foods Biochemical Processing Aspects, Culinary and Hospitality Industry Publications.

6. Robert E C Wildman (2001), Handbook of Nutraceuticals and Functional Foods, Culinary and Hospitality Industry Publications.

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Elective Subjects

FYBDN 801A Nutrigenomics

5 credits, Total-50 hours + 10 Tutorial hours

Course Overview

1. Gain knowledge about nutrigenomics.
2. Understanding the molecular level interaction between nutrients and other dietary bioactive with human genome.
3. Know the applications of Nutrigenomics in wellness and disease management.

Learning Objectives

SL. No.	Course outcome
1	To learn the concept of nutrigenomics and nutrigenetics.
2	Articulate and advocate the principle of nutrigenomics in controlling life style diseases.

UNIT 1: 9hrs

Molecular Biology- Structure and functions of Nucleic Acids: structure of different The DNA Double Helix, Different DNA Structures, DNA in the Cell, RNA Structure, The organization of DNA in chromosome

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UNIT 2: 9hrs

DNA Replication and Repair: Unit of replication, enzymes involved, fidelity of replication, DNA damage and repair mechanisms.

RNA synthesis and processing: Structure and function of RNA polymerases. Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA processing, editing, and splicing. Structure and functions of different types of RNA, RNA transport.

Translation and Transport1: Translation machinery; ribosomes; composition and assembly; universal genetic code; degeneracy of codons; termination codons; isoaccepting tRNA; Wobble hypothesis; mechanism of initiation, elongation and termination; Co- and post-translational modifications; genetic code in mitochondria; transport of proteins and molecular chaperones; protein stability; protein turnover and degradation.

UNIT 3: 9hrs

Introduction to Gene-diet interactions: Nutrigenomics: Scope and Importance to Human Health and Industry. Transporter gene polymorphisms -interaction with effects of micronutrients in humans. Polymorphisms in genes affecting the uptake and transport of omega-6 and omega-3 polyunsaturated fatty acids: interactions with dietary lipids and chronic disease risk. Nutrigenomics approaches to unravelling physiological effects of complex foods. The intestinal microbiota - role in nutrigenomics.

UNIT 4: 9hrs

Nutrigenomics & Nutrigenetics in Disease: Modulating the risk of following diseases through Nutrigenomics: • cardiovascular disease • Diabetes • Obesity • Cancer • Ageing •Dementia

UNIT 5: 9hrs

Technologies in nutrigenomics:

Genomics techniques: Different sequencing approaches, Microarray, SNP genotyping, PCR and RT-PCR techniques

Proteomics Techniques:1-D, 2-D gel electrophoresis, Differential gel electrophoresis (DIGE), novel peptide identification, peptide sequencing methods

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Metabolomics techniques: Chromatography and mass spectrometry techniques, Discovery and validation of biomarkers for important diseases and disorders

UNIT 6: 5hrs

Educating the public about nutritional genomics: Is direct-to-consumer testing the future of this field? collaboration with medical experts to introduce nutrigenomics to the general public; Is modern society prepared for nutrigenomic research? The importance of nutrigenomics and nutrigenetics for public health

Reference Books

1. QI L. Gene-Diet Interactions in Complex Disease: Current Findings and Relevance for Public Health, *Curr Nutr Rep* 2012: 1: 222-227.
2. TUCKER K. L., SMITH C. E., LAI C. Q., ORDOVAS J. M. Quantifying diet for nutrigenomic studies, *Annual review of nutrition* 2013: 33: 349-371.
3. PETERS L. L., ROBLEDO R. F., BULT C. J., CHURCHILL G. A., PAIGEN B. J., SVENSON K. L. The mouse as a model for human biology: a resource guide for complex trait analysis, *Nature reviews Genetics* 2007: 8: 58-69.
4. FRAZER K. A., MURRAY S. S., SCHORK N. J., TOPOL E. J. Human genetic variation and its contribution to complex traits, *Nature reviews Genetics* 2009: 10: 241-251.
5. DAVID L. A., MAURICE C. F., CARMODY R. N., GOOTENBERG D. B., BUTTON J. E., WOLFE B. E. et al. Diet rapidly and reproducibly alters the human gut microbiome, *Nature* 2013.
6. KUCZYNSKI J., LAUBER C. L., WALTERS W. A., PARFREY L. W., CLEMENTE J. C., GEVERS D. et al. Experimental and analytical tools for studying the human microbiome, *Nature reviews Genetics* 2012: 13: 47-58.
7. PERRY G. H., DOMINY N. J., CLAW K. G., LEE A. S., FIEGLER H., REDON R. et al. Diet and the evolution of human amylase gene copy number variation, *Nat Genet* 2007: 39: 1256-1260.
8. LUCA F., PERRY G. H., DI RIENZO A. Evolutionary adaptations to dietary changes, *Annual review of nutrition* 2010: 30: 291-314.
9. LEDDA M., KUTALIK Z., SOUZA DESTITO M. C., SOUZA M. M., CIRILLO C. A., ZAMBONI A. et al. GWAS of human bitter taste perception identifies new loci and reveals additional complexity of bitter taste genetics, *Hum Mol Genet* 2014: 23: 259-267.

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10. TEPPER B. J. Nutritional implications of genetic taste variation: the role of PROP sensitivity and other taste phenotypes, Annual review of nutrition 2008: 28: 367-388.
11. FRAYLING T. M., TIMPSON N. J., WEEDON M. N., ZEGGINI E., FREATHY R. M., LINDGREN C. M. et al. A common variant in the FTO gene is associated with body mass index and predisposes to childhood and adult obesity, Science 2007: 316: 889-894.
12. ZHANG X., QI Q., ZHANG C., SMITH S. R., HU F. B., SACKS F. M. et al. FTO genotype and 2-year change in body composition and fat distribution in response to weight-loss diets: the POUNDS LOST Trial, Diabetes 2012: 61: 3005-3011.
13. TANAKA T., NGWA J. S., VAN ROOIJ F. J., ZILLIKENS M. C., WOJCZYNSKI M. K., FRAZIER-WOOD A. C. et al. Genome-wide meta-analysis of observational studies shows common genetic variants associated with macronutrient intake, Am J Clin Nutr 2013: 97: 1395-1402.
14. CHU A. Y., WORKALEMAHU T., PAYNTER N. P., ROSE L. M., GIULIANINI F., TANAKA T. et al. Novel locus including FGF21 is associated with dietary macronutrient intake, Hum Mol Genet 2013: 22: 1895-1902.
15. DO R., XIE C., ZHANG X., MANNISTO S., HARALD K., ISLAM S. et al. The effect of chromosome 9p21 variants on cardiovascular disease may be modified by dietary intake: evidence from a case/control and a prospective study, PLoS medicine 2011: 8: e1001106.
16. CORNELIS M. C., EL-SOHEMY A., KABAGAMBE E. K., CAMPOS H. Coffee, CYP1A2 genotype, and risk of myocardial infarction, Jama 2006: 295: 1135-1141.
17. MADDEN J., WILLIAMS C. M., CALDER P. C., LIETZ G., MILES E. A., CORDELL H. et al. The impact of common gene variants on the response of biomarkers of cardiovascular disease (CVD) risk to increased fish oil fatty acids intakes, Annual review of nutrition 2011: 31: 203-234.
18. GARCIA-CALZON S., MARTINEZ-GONZALEZ M. A., RAZQUIN C., CORELLA D., SALAS-SALVADO J., MARTINEZ J. A. et al. The Pro12Ala Polymorphism of the PPARgamma2 Gene Interacts with a NUTR/GNET 865: Nutrigenomics: Understanding gene x diet interactions Syllabus 2015 4 Mediterranean Diet to Prevent Telomere Shortening in the PREDIMED-NAVARRA Randomized Trial, Circ Cardiovasc Genet 2014.

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19. DOLINOY D. C., WEIDMAN J. R., WATERLAND R. A., JIRTLE R. L. Maternal genistein alters coat color and protects Avy mouse offspring from obesity by modifying the fetal epigenome, *Environmental health perspectives* 2006: 114: 567-572.
20. JIRTLE R. L., SKINNER M. K. Environmental epigenomics and disease susceptibility, *Nature reviews Genetics* 2007: 8: 253-262.
21. NG S. F., LIN R. C., LAYBUTT D. R., BARRES R., OWENS J. A., MORRIS M. J. Chronic high-fat diet in fathers programs beta-cell dysfunction in female rat offspring, *Nature* 2010: 467: 963-966.
22. DONOHOE D. R., BULTMAN S. J. Metaboloepigenetics: interrelationships between energy metabolism and epigenetic control of gene expression, *Journal of cellular physiology* 2012: 227: 3169-3177.
23. COONEY C. A., DAVE A. A., WOLFF G. L. Maternal methyl supplements in mice affect epigenetic variation and DNA methylation of offspring, *J Nutr* 2002: 132: 2393S-2400S.

FYBDN 801B : Medical Nutrition Therapy

Total Credit:5, Total Hours: 50hours + 10 Tutorial hours

Course Overview

On successful completion of this course, students will able to:

1. Identify and infer accurate nutrition information and be able to better interpret nutrition information.
2. Evaluate the basis for dietary standards & guidelines
3. Demonstrate a knowledge of medical terminology and medical abbreviations associated with nutrition related diseases and conditions.
4. Examine nutrient & drug interactions
5. Compare medical nutrition therapy for various disease states including critical care patients

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Unit 1: 6hours

Introduction to Medical Nutrition Therapy: Definitions and Role of Dietitians in Health Care, The Nutritional Care Process (NCP), Patient Screening, Assessment, Care and counselling.

Modifications of the Normal Diet: General or Regular, Soft Diet, Liquid Diets- Clear Liquid Diet, Full Liquid Diet, Mode of Feeding- Enteral or Oral Route- Enteral (via) tube feeding Parenteral – Peripheral Vein Feeding, Total Parenteral Nutrition (TPN)

Unit 2: 7hours

Nutritional Anaemia: Erythropoiesis and haemoglobin synthesis, nutrients involved in Erythropoiesis. Classifications of Anaemias- Normocytic anaemia – aplastic anaemia, Megaloblastic anaemia, Microcytic anaemia, Sickle cell anaemia and Thalassemia, Haemolytic anaemia and Nutritional Care.

Unit 3: 4hours

Food Allergies: Definition, Symptoms and mechanism of food Allergy Diagnosis – Biochemical, immune testing (brief), history and food record, Elimination diets, Food Selection. Food allergy in infancy (milk sensitive enteropathy, colic prevention of food allergy)

Unit 4: 5hours

Nutrition in Pulmonary Disease: Effects of Malnutrition on Respiration, Chronic Obstructive Pulmonary Disease, Etiology and Pathogenesis, Respiratory Failure and Nutritional Care.

Unit 5: 20hours

Nutritional Care in Hyper metabolic Conditions: Cancer, Burns, Sepsis and Surgery.

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Unit 6: 8hours

Drug-Nutrient & Nutrient-Nutrient Interactions: Effects of diet and nutritional status on drug absorption, Drug induced maldigestion and malabsorption. Effects of drugs on vitamin and mineral status, diseased state and risk of drug-nutrient and drug- nutritional status interactions & Nutrient-Nutrient Interactions.

Reference

6. Antia, F.P. (2005): Clinical Nutrition and Dietetics, Oxford University Press, Delhi Mahan, L.K.,Arlin, M.T. (2000): Krause's Food, Nutrition and Diet therapy, 11th edition, W.B.Saunders Company,London.
7. Robinson,C.H;Lawler,M.R.Chenoweth,W.L;and Garwick,A.E(1986):Normal and Shubhangini A Joshi (2002): Nutrition and Dietetics 2nd edition, Tata McGraw-Hill Publishing Company Limited,NewDelhi.
8. Srilakshmi,B.(2005):Dietetics,5th edition, New Age International(P) Limited Publishers, New Delhi
9. Therapeutic Nutrition,17th Ed., Mac Millan Publishing Co
10. Williams's (1989): Nutrition and diet Therapy.6th edition. Times Mirror/Mosby College Publishing,St.Louis

FYBDN 801 C

Credits 5, Total- 50 hours + 10 Tutorial hours

NUTRITION COMMUNICATION AND ITS APPLICATION

Course Overview

- Apply the national and international dietary guidelines addressing nutrition and health aspects.
- Examine the determinants of food behaviour.
- Plan, implement and evaluate behaviour change communication for promotion of nutrition and health among the vulnerable groups.
- Utilize the concept of nutrition advocacy, and

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Develop skills in preparation of communication strategies and communication aids for nutrition / health promotion of the community.

- Plan, implement and evaluate nutrition education programme for the community.
- Evaluate plans and proposals for public health nutrition programme.
- Implement and evaluate an action plan for a public health nutrition programme in the community.

Unit I 10 hrs

Dietary guidelines for nutrition and health related concerns

National / international guidelines and their role in nutrition promotion. Critical appraisal of the current guidelines.

Unit II Nutrition and Behaviour Inter-relationship 10 hours

Food and health behaviour, models/theories of health behaviour, food choice, strategies for intervention at the ecological and individual level

Unit III Behaviour Change in Communication for nutrition and health promotion 20 hrs

- Concept and objectives of communication for behaviour change
 - Planning of communication strategies for behaviour change programme
- Communication needs analysis, stakeholders in nutrition promotion, developing nutrition education plan, identifying communication strategies and approaches for nutrition and health promotion (e.g. social marketing), designing nutrition and health messages, selecting communication channels, developing and field testing of communication materials, designing training strategy for trainers and building capacity.

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- Implementing behaviour change communication intervention: overview
- Evaluation of communication for behaviour change programmes
- Ethics in nutrition and health communication

Unit IV Nutrition Advocacy – 10 hrs

Role in policy formulation and execution.

Theory of advocacy, Advocacy vs Behaviour Change Communication, analysis of the policy environment, preparation of policy briefs, monitoring and evaluation of policy related activities and outcomes.

RECOMMENDED READING

- Gibney M.J., Margetts, B.M., Kearney, J.M., Arab, L. (Eds) (2004) *Public Health Nutrition*. NS Blackwell Publishing.
- Prochaska, K.L., *The Transtheoretical Model of Behavioural Change*, Shumaker SA(Eds).
- Public Health Communication: Evidence for Behavior Change* by Robert C. Hornik © 2002 by Lawrence Erlbaum Associates, Inc.
- Communication and Health: Systems and Applications*. Edited by Eileen Berlin Ray and Lewis Donohew © 1990 by Lawrence Erlbaum Associates, Inc.
- Designing health messages: Approaches from Communication Theory and Public Health Practice*. Editors: Edward Maibach and Roxanne Louiselle Parrott © 1995 by Sage Publications, Inc.
- Community Nutrition in Action: An Entrepreneurial Approach*. Fourth Edition. Marie A. Boyle and David H. Holben. © 2006 Thomson Wadsworth.
- Suryapadas (2018) *Textbook of community nutrition*. Academic publishers.

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Note: Evaluation rubric for Capstone/Research project shall be duly notified in advance