

ACHARYA NAGARJUNA UNIVERSITY

CENTRE FOR DISTANCE EDUCATION

NAGARJUNA NAGAR,

GUNTUR

ANDHRA PRADESH



PROGRAM PROJECT

REPORT

**139. MASTER OF SCIENCE (FOOD &
NUTRITION SCIENCE)**

Master of Science (Food & Nutrition Science)

PROGRAMME CODE: 139

MISSION :

To give opportunity to develop advanced skills in the design and implementation of research in the field of human nutrition and dietetics.

OBJECTIVES :

The course aims at giving students an advanced understanding of Nutritional Sciences at a master's level. The course is designed to prepare students for teaching and research positions in colleges and universities. Students are also prepared for research, consulting and administrative positions in private and public sectors, including hospitals and the community that require advanced training. It will be achieved through lectures, practicals/tutorials and training in research..

RELEVANCE :

The M.Sc., Foods and Nutritional Sciences programme offered through Open and Distance Learning mode is purely relevant and aligned with the goals and mission of CDE, ANU. This programme is structured in order to equip the learners with core competence in research and analytical aspects of scientific evolution there by new areas will be unfolded. This programme is helpful for enhancing the employability skills with the global perspective and conforming to the vision and mission of ANU.

NATURE OF PERSPECTIVE TARGET GROUP OF LEARNERS :

Aim of open and distance education is to enhance the academic competence in those who were deprived of higher education for various socio-economic reasons. This programme is designed for candidates which is helpful in their career advancement, updating the knowledge, upgrading their qualification for school teachers, Scientists, Laboratories, to become Dieticians, Health departments etc.

SKILLS AND COMPETENCE OF THE PROGRAMME :

In consideration of the huge gap in education and industry and also in skill development now it is imperative on the part of every university to reach out every nook and corner of the country where the institutions with significant infrastructure are not available in order to elevate the status of the marginalised sections of the society especially living in rural areas of the country. The only solution appears to be "open and distance education" and Acharya Nagarjuna University takes initiative by reaching out those unreached by ICT enabled blended mode of distance learning programmes. M.Sc., Foods and Nutritional Sciences programme is an innovative programme. The learning outcomes of this programme are as follows:

- Professional development of teachers.
- Incorporating generic transferrable skills and competencies
- To develop critical learning, analytical skills and research skills.

INSTRUCTIONAL DESIGN: Course structure and detailed syllabi

CENTRE FOR DISTANCE EDUCATION: ACHARYA NAGARJUNA UNIVERSITY
Master of Science (Food & Nutrition Science)- Program code: 40
Program Structure

Program code	Program	Internal assessment	External exams	Max. Marks	credits
SEMISTER 1					
101FN24	Nutrition Through Life Cycle	30	70	100	4
102FN24	Food Chemistry and Analysis	30	70	100	4
103FN24	Clinical Nutrition and Dietetics	30	70	100	4
104FN24	Food Science and Experimental Foods	30	70	100	4
105FN24	Practical-I	30	70	100	4
106FN24	Practical-II	30	70	100	4
SEMISTER 2					
201FN24	Nutritional Biochemistry	30	70	100	4
202FN24	Food Processing and Packaging Technology	30	70	100	4
203FN24	Entrepreneurship Development	30	70	100	4
204FN24	Food Regulation and Quality Control	30	70	100	4
205FN24	Practical-I	30	70	100	4
206FN24	Practical-II	30	70	100	4
SEMISTER 3					
301FN24	Therapeutic Nutrition	30	70	100	4
302FN24	Food Microbiology and Toxicology	30	70	100	4
303FN24	Research Methodology	30	70	100	4
304FN24	Nutraceuticals and Food Biotechnology	30	70	100	4
305FN24	Practical-I	30	70	100	4
306FN24	Practical-II	30	70	100	4
SEMISTER 4					
401FN24	Advanced Studies in Nutrition	30	70	100	4
402FN24	Statistics and Computer Applications	30	70	100	4
403FN24	Institutional Food Service Management	30	70	100	4
404FN24	Nutritional Status Assessment Methodologies	30	70	100	4
405FN24	Practical-I	30	70	100	4
406FN24	Practical-II	30	70	100	4

SEMESTER -1
Master of Science (Food & Nutrition Science)
101FN24 -NUTRITION THROUGH LIFE CYCLE

Course Objectives -To enable the students to:

1. Learn and understand the Nutritional requirements during different physiological stages of life.
2. Know the nutritional problems associated with different physiological stages of life.
3. Understand the influences of the nutritional problems on growth and development at different stages of life.
4. Know the intervention and management strategies to overcome the nutritional problems.

THEORY

Unit-1:

- **Food groups:** Classification – food composition and nutritive values of different foods, Functions of foods. Balanced Diet, RDA for all age groups. Food exchange list.
- **Pregnancy:** Nutrient requirements, intake and gaps, prenatal and postnatal nutritional importance, metabolic adjustments in pregnancy; nutrition intervention and pregnancy outcome; common symptoms (nausea and vomiting, Heartburn- Pica, habits, constipation), nutritional management, problems and complications, adolescent pregnancy.
- **Lactation:** Nutritional requirements, intake, gaps, physiology of milk production, hormonal control, importance of breast feeding, factors affecting breast milk quality and composition and comparative advantages & disadvantages of breast milk, buffaloes and cow's milk.

Unit-2:

- **Infancy:** Nutritional requirements, intake and gaps, Need for formula feedings, types of infant formulae, importance of preparation of weaning foods using locally available foods, Home prepared versus commercial weaning foods. Feeding problems-vomiting, diarrhea, teething problemsetc-Lactose and cow's milk protein intolerance, concept of human milk bank.
- **Pre-school children:** Growth and development, nutrient requirements, intake and gaps, Effect of malnutrition on physical and mental development.
- **School-going children:** Nutritional demands, intake and gaps, Importance of breakfast and its impact on school performance, Specific nutritional problems, Macro and Micro nutrient deficiencies and their impact on health and nutritional status and control measures. Government Nutrition Programmes- ICDS and Mid Day Meal Programme (MDMP).

Unit-3:

- **Adolescence:** Nutritional requirements, intake and Gaps, Consequences of Nutritional deficiencies, adolescent pregnancy, Food habits in adolescence, Metabolic consequences

of slimming diets & weight maintenance, specific nutritional problems-Anaemia, Anorexia, Bulimia, Amenorrhea and Obesity.

- **Adults:** Nutritional Requirements, Intake and Gaps, Consequences of Nutritional deficiencies, Effect of stress on Nutritional status, Specific nutritional problems of adults.

UNIT-4:

- **Geriatric nutrition:** The process of Ageing, Physiological, biochemical, body compositional changes and Theories of ageing. Sociocultural and psychological aspects of ageing. Food and Nutritional needs of the elderly – Dietary management – Special problem of women – menopausal, post-menopausal problems. Chronic degenerative diseases, nutrition and health problems of the elderly.

UNIT-5:

- **Sports nutrition:** Classification of sports events and RDA for sports person. Nutritional requirements and special needs of sports person, pre, during, post sports events, water and electrolyte balance, ergogenic aids. Endurance and fatigue in sports performance. Assessment-strategies.
- Nutritional needs for Industrial workers, space Nutrition.

REFERENCES

1. Anne loader, 1998. Pregnancy and Parenthood, Oxford, University press.
2. Bhavana Sabarwal, 1999. Public Health & Nutritional care, Common Wealth Publishers.
3. Benjamin I. Borton, 1990. Human Nutrition. New Delhi: Tata Mc. Grow Hill Publishers.
4. Mehtab S. Bamji, 1998. Text Book of Human Nutrition. New Delhi:Oxford and IBFI Publishing Co. (p) Ltd.
5. B.Srilakshi 2006 Dietetics. Bangalore: New Age International Pvt. Ltd. Publishers.
6. Shubhangini A Joshi, 2004 Nutrition and Dietetics, Second edition. New Delhi: Tata Mc Graw-Hill.
7. Gopalan C. Ramasastri B.V. and Balasubramaniam S.C 1999. Nutritive value of Indian
8. Foods. Hyderabad: NIN,

Course Outcomes -After completion of this course, students will be able to:

CO1 Interpret and apply health and nutrition concepts to evaluate and improve the nutritional health of communities.

CO2 Determine nutritional demands, deficiencies at various stages of life.

CO3 Notice nutritional requirements and food requirements during adulthood and oldage.

CO4 Learn about degenerative changes during oldage.

CO5 Provide knowledge on health and nutrition to sports persons, Industrial workers, Astronauts.

SEMESTER -1
Master of Science (Food & Nutrition Science)
102FN24 - FOOD CHEMISTRY AND ANALYSIS

Course Objectives -To enable the students to:

1. Acquire knowledge on chemical composition of different foods.
2. Understand the physical, chemical, and functional properties of foods.
3. Know the principles and working applications of different analytical techniques associated with food.
4. Perform skills in qualitative and quantitative estimation of nutrients in different foods.

THEORY

Unit –I:

Water Chemistry and Dispersed Systems

- Water chemistry – Structure of Water, Free, Bound and Entrapped Water.
- Water Activity and Relative Vapour pressure– Definition and measurement, factors affecting water activity, Moisture sorption isotherms, Hysteresis and Moisture Determination.
- Dispersions- Food as dispersed systems, Liquid dispersions.
- Colloids- Definition, Characteristics of Colloids, Gels, Emulsions, Foams.

Unit – 2:

Starch Chemistry:

- Types of starches, chemical structure of starch, properties of different starches, method of extraction of starch, determination of reducing sugars and non reducing sugars and crude fibre.

Lipid chemistry:

- Lipids – Nomenclature, classification – Milk fats, Animal fats, Vegetable fats.
- Physical properties – Crystallization, Plasticity
- Chemical properties – Thermal decomposition, Chemistry of Frying, Hydrogenation, Inter esterification, Rancidity of fats.
- Fats – Analysis of solid and liquid fats, Rancidity.

Unit – 3:

Protein chemistry:

- Nature and types of proteins – Plant foods, Egg, Milk and fleshy foods, properties of different proteins.
- Proteins – Electrophoresis, Micro-Kjel dahl method.

Unit – 4:

Fruits and vegetables:

- Post harvesting changes- Chemistry- composition of fruits and vegetables. Plant tissues and relationship with texture.

Plant pigments:

- Water insoluble plastid pigments- Chlorophyll and carotenoids – Chemical structure. Water soluble pigments- anthocyanins, anthoxanthins, flavones and tannins.

Food enzymes:

- Types of enzymes in foods and their importance to food quality.
- Methods of determination of total ash
- Vitamins and Minerals - Ca, Phosphorus, iron, Vitamin A, Beta carotene, Riboflavin and Vitamin C

Unit-5:

Instrumentation:

- Basic principles and applications of spectroscopy- UV, UV- visible, AAS, AES, Electromagnetic Resonance.
- Chromatography- principles and applications of Chromatography- HPLC, GC/ MS and LC/ MS.

REFERENCES:

1. Berk.Z., Introduction to bio-chemistry of foods, dept. of food Engineering and biotechnology, Israel Institute of technology, Amsterdam, New York.
2. Clipton. E.Meloan, food analysis 3rd edition (Theory &Practice).
3. David and Robinson, Bio-chemistry and Nutritional value.
4. Dennis .D, Muller., Food chemistry, a Laboratory Manual by inter sciencepublication, John Willey&Sons Inc.
5. W.S.wong, mechanism and theory of food chemistry, CBS publishers and distributors 1996.
6. Seemayadav, Food chemistry, Publication of anmolpvt., ltd., 1997.
7. Owen R. Food chemistry 2nd edition.

Course Outcomes -After completion of this course, students will be able to:

CO1Develop an understanding of different forms of water and water activity

CO2 Acquire knowledge on chemical nature and analytical techniques of starch and lipids.

CO3 Analysis and identification of protein molecules in plant and animal food stuffs.

CO4 Identification of post harvesting changes in fruits and vegetables. Analytical techniques of micronutrients in fruits and vegetables.

CO5 Provide awareness about the principles, methods and applications of spectroscopy and chromatography techniques.

SEMESTER -1
Master of Science (Food & Nutrition Science)
103FN24 - CLINICAL NUTRITION AND DIETETICS

Course Objectives -To enable the students to:

1. Understand the role of dietitian.
2. Gain knowledge about the principles of Diet therapy and different therapeutic diets.
3. Develop aptitude for taking up dietitian as a profession.

Unit I

- Introduction to clinical Nutrition and Dietetics: Definition and history of dietetics, optimum nutrition and health- interrelationship between food, nutrition and health, Basic principles of planning healthy diet,
- Regulation of food intake - hunger, satiety - Role of neurotransmitters.

Unit II

- Diet counseling: Theories of diet counseling
- Counseling strategies
- Nutrition care process
- Specific functions of a therapeutic, administrative and consultant dietitians, team approach in patient care.
- Physiologic/Metabolic Stress: Phases of stress, Consequences, Dietary management in stress, stress relieving foods.

Unit III:

- Therapeutic Diets: Definitions: Normal diets, Therapeutic modifications of the normal diets. Principles in planning therapeutic diets.
- Progressive diets: Routine/Regular hospital diets, Liquid diets, Soft diets
Special feeding methods: Enteral and Parenteral Nutrition, Types, methods and formulation of feedings.
- Planning of special diets for
 - a. Surgical conditions
 - b. Transplant patients.
 - c. Burns

Unit IV:

- General principles of diet for the conditions-
 - a. Musculoskeletal and Rheumatic Disorders- Osteoporosis, Osteoarthritis, Rheumatoid Arthritis, Gout.
 - b. Cancer - Effect of cancer therapy on nutrition of the patient.
 - c. AIDS.
- Neurological Disorders –Migraine syndrome, Alzheimer’s disease, Parkinson’s disease.

UNIT V:

- Food and Drug Interactions: Risk factors for food and drug interactions.
- Effect of food on drug therapy.

- Effect of drug on food and nutrition.
- Modifications of drug action by food and nutrition.
- Effect of drug on nutritional status.

TEXT BOOKS:

1. B. Srilakshmi. (2010).Dietetics, 4th edi. 1969, 3rd edi. New Age International (P) Ltd., Publishers Bangalore, Chennai, Hyderabad.
2. Anderson. L. et. al. (1982).Nutrition in Health and Disease. 17th edi. J.B. Lippin Cott Company, Philadelphia, Toronto
3. Whitney NE, Cataldo BC, Rolles RS. (1987).Understanding Normal and Clinical Nutrition” West Pub.Company. St Paul, New York, Los Angeles, San Fransisco.
4. June R. Payne-Palacio and Deborah D. canter. (2011). The Profession of Dietetics. Jones and Bartlett Learning Publishers. USA.
5. Kathy k. and Bridget Klawitter. (2003). Nutrition Therapy- Advanced Counseling. Lippincott Williams and Wilkins Publishers.
6. Alexander G. Kazaks.(2013). Nutrition and Obesity.Jones and Bartlett Learning Publishers. USA.
7. Mahtabs.Bamji and N.Pralhad Rao. (2004).Text book of Human Nutrition, Second Edition, Oxford and IBH Publishing co. Pvt Ltd. New Delhi.
8. Heather Hedrick Fink, Alan E. mike sky. (2012). Practical Applications in Sports Nutrition, Third Edition, Library of Congress Cataloging in Publication Data. United States of America.
9. N.MentaNitin.Jmenta. (2014). Nutrition and Diet for Children Simplified MeenakshiJaypee Brothers Medical Publishers (P) LTD.
10. Davidl. Katzwolters Kluwer/LippinCottWilliams and Wilkins. (2007). Nutrition in Clinical Practice Second Edition.
11. C.Gopalan, B.V.RamasastriandS.C.BalaSubramanian. (2012). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council Medical Research Hyderabad.
12. Nutrient Requirements and Recommended Dietary Allowance for Indians A Report of the Expert Group of ICMR. 2010.
13. Dr.M Swami Nathan. (2010). Food and Nutrition Volume-2 Second Edition the Bangalore Printing and Publishing Co Ltd Bangalore 560018.
14. Shubhangini A.Joshi. (2010). Nutrition and Dietetics Third Edition Tata Mecgraw Hill Education Private Limited New Delhi.

Course Outcomes -After completion of this course, students will be able to:

- CO1**Integrate nutrition principles in to the treatment and prevention of diseases.
- CO2** Implement diagnostic and treatment measures through the nutrition care Process.
- CO3** Generate knowledge on therapeutic diets.
- CO4** Assess principles and importance of therapeutic diets for various diseases

CO5 Generate knowledge on food and drug interactions

SEMESTER -1
Master of Science (Food & Nutrition Science)
104FN24 - FOOD SCIENCE AND EXPERIMENTAL FOODS

Course Objectives -To enable the students to:

1. Acquire knowledge on Plant and Animal foods composition, processing and preservation of nutritive values.
2. Understand the principles of cookery of different foods and methods of evaluation.
3. Apply knowledge about different processing techniques on nutritive quality of foods.
4. Apply skills in standardization of foods using different processing techniques

UNIT-I: Introduction to Food Science

- Food groups, food in relation to health.
- General Methods of cooking- dry and moist heat methods, microwave and solar cooking, advantages and disadvantages, Nutrient losses during cooking.

UNIT II: Foods of Plant Origin

- Cereals and Millets: Starch- Structure, Characteristics of some food starches. Gelatinization, Factors effecting gelatinization. Modified food starches-Applications.
- Pectin and Gums: Functional roles in food products.
- Baking process: Cereal flours, Flour mixes -dough and batter, Leavening agents- Applications
- Pulses and Legumes: Composition, Toxic constituents, Processing, Effect of cooking.
- Vegetables and Fruits: Classification, Composition, Pigments and Flavors constituents - Cooking effect, Browning reaction.

UNIT III: Foods of Animal Origin

- Milk: Composition, Kinds of milk and Functional properties of Milk.
- Egg: Structure, grading, quality and Functional properties of eggs.
- Meat and Poultry: Structure, Muscle composition, Postmortem changes, Heat-induced changes in meat, Tenderness – Tenderizers.
- Fish and Marine foods: Classification and Composition, Selection and cooking.

UNIT IV: Sugars and Fats

- Sugars, sugar crystals and Confections: Types of sugars and sugar syrups, Sugar cookery, Crystallization of sugars, Confectionery-Types, raw materials and their role, Indian confectionery.
- Fats and oils: Sources, Composition, Absorption, Functional properties of fat, Rancidity.

UNIT V: Sensory Evaluation

- Sensory Attributes of food quality and its characteristics.
- Requirements to conduct sensory evaluation- Sensory panel, Preparing and Presenting Samples for Testing, Panel booth.
- Sensory Tests – Analytical and Affective Tests.

REFERENCES:-

1. Belle Lowe. (1998).*Experimental Cookery*, John Wiley & Sons, INC, New York.

2. Griswold. R.M. (1962).*The Experimental Study of Foods*. Houghton and Mifflin company, Boston, New York.
3. Marjorie P. Penfield & Adamarie Campbell.(1990). *Experimental Food Science*, Third Edition, Academic Press, New York.
4. N.ShakuntulaManay& M. Shadaksharswamy.(2001).*Foods- Facts and Principles*, second edition, New Age International Publishers, New Delhi.
5. Norman N Potter.(2007).*Food Science*, Fifth edition, An Aspen Publication, Mariland.
6. Paul,E. and Palmer A.H.(2002). *Food Theory and Application*, John Wiley & Sons, New York.
7. SethiMohini.(2011).*Food Science: Experiments and Application*, second edition, Jain book Agency, New Delhi.
8. Srilakshmi,B.(2001).*Food Science*, 2nd edition New Age International (P) Ltd., Publishers, Bangalore, Chennai & Hyderabad.
9. Subbulakshmi&Shobha A. Udipi.(2001).*Food processing and preservation*. New Age International (P) Ltd., Publishers Bangalore, Chennai.
10. Swaminathan, M.(1979).*Food science and Experimental foods*. Ganesh & Co., Madras.
11. Vijayakhader.(2001).*Text book of food science and Technology*, ICAR, New Delhi.
12. Sumathi,R.Mudamby and ShaliniM.Rao.(2003). *Food science*, New age international Pvt. ltd., publishers, New Delhi.
13. Edwards, W.P. (2007). *The science of bakery products*, RSC publishing, Cambridge.

Course Outcomes -After completion of this course, students will be able to:

- CO1** Learn about changes occur in food and nutrients during cooking.
- CO2** Understand the structure, characteristics and processing of cereals and millets.
- CO3** Learn about nutrient composition of milk, egg, meat and fish.
- CO4** Knowledge on sugar cookery and confectionary.
- CO5** Acquire skills in sensory evaluation techniques.

SEMESTER -1

Practical I

Master of Science (Food & Nutrition Science)

105FN24 - NUTRITIONAL THROUGH LIFE CYCLE & CLINICAL NUTRITION AND DIETETICS

I.

1. Food Exchange list
2. Standardization of Dietary Assessment Vessels/cups
3. Planning and preparation of suitable diets for pregnant women.
4. Planning and preparation of suitable diets for lactating women.
5. Planning and preparation of suitable diets for infants.
6. Planning and preparation of suitable diets for pre-schools.
7. Planning and preparation of suitable diets for school going children.
8. Planning and Preparation of suitable diets to adolescents.
9. Planning and Preparation of diets to adults and elderly.
10. Planning and preparation of diets for sports persons, Astronauts and industrial workers.

II

1. Visit the local hospitals to study food preparation and service to patients.
2. Planning and preparation of Progressive Diets
 - a. Clear Diet ,
 - b. Full Fluid Diet,
 - c. Soft Diet,
 - d. Regular Diet,
3. Therapeutic Adaptations of Normal Diet
 - a. High and Low calorie diet,
 - b. High and Low Protein Diet,
 - c. Low fat and Low Cholesterol Diet,
 - d. High and Low Fibre Diet,
 - e. Sodium Restricted Diet,
 - f. Low Carbohydrate Diet,
 - g. Acid ash and alkaline ash diet.
4. Visits to hospitals to collect case reports.
5. Planning and preparation of different Special Feeds.

SEMESTER -1
Practical II
Master of Science (Food & Nutrition Science)
106FN24 - FOOD CHEMISTRY AND ANALYSIS & FOOD SCIENCE AND EXPERIMENTAL
FOODS

I

1. Determination of moisture content in different foods.
2. Estimation of protein by Kjeldahl method.
3. Fats and oils – Determination of
 - Iodine number
 - Free fatty acid number
 - Saponification number
 - Peroxide value of fresh and heated oils
 - Determination of fat in milk.
4. Carbohydrates- determination of starch
 - Diastatic value of wheat flour
 - Reducing sugars- Sucrose in Honey
5. Determination of total mineral content of foods
6. Estimation of vitamin C
7. Calcium
8. Qualitative analysis of enzymes in plant foods
9. Qualitative analysis of enzymes in animal foods

II

1. Standardization of weights and measures of various foods
2. Starch cookery- Structure, gelatinization and factors affecting gelatinization
3. Baking –Determination of gluten content, Preparation of plain cake, Bread and evaluation by subjective and objective methods.
4. Pulse cookery – effect of different processing methods-Soaking, germination, malting-effect of factors.
5. Vegetable cookery – Effect of time, temperature, media and cooking methods on pigments.
6. Fruit - Enzymatic Browning- Preventive measures.
7. Sugars and confections - Factors affecting crystallization in candies like fondant, experiments on applying scientific methods to Indian confectionary, preparation of confections – role of ingredients and processing of confectionary.
8. Fats and oils – Smoke points, oil absorption and stability of emulsion – mayonnaise.
9. Milk cookery - preparation of milk products-Effect of cooking.
10. Egg cookery - Egg white foams: preparation of the eggs acting as binding, emulsifying and thickening agent.
11. Meat and Fish cookery - Effect of different cooking methods and tenderizers
12. Sensory Evaluation of food.

SEMESTER 2
Master of Science (Food & Nutrition Science)
201FN24-NUTRITIONAL BIOCHEMISTRY

Course Objectives -To enable the students to:

1. Understand the metabolism of Nutrients
2. Examine the interrelationship between metabolism of macro nutrients in normal health deficiency and diseased conditions.
3. Study the role of enzymes and hormones in the metabolism of macro and micro nutrients in normal, deficiency states and diseased conditions.

THEORY

Unit-I

- Carbohydrate Metabolism: Carbohydrates, Oxidation of glucose by Glycolysis, TCA cycle, Electron Transport Chain (ETC), Oxidative Phosphorylation, HMP path way, Glycogenesis, Glycogenolysis and Gluconeogenesis. Glycogen storage in normal and diseased states.
- Endocrinal influences on carbohydrate metabolism, Regulation of blood glucose concentration, the renal threshold for glucose disturbance in carbohydrate metabolism. Diabetes Mellitus, Diabetic ketoacidosis, inborn errors of carbohydrate metabolism.

Unit- II

- Proteins and Amino Acids: Sources, structure, functions, digestion and absorption of proteins.
- Classification of amino acids – peptides and proteins. Metabolism of amino acids - Amino Acid decarboxylation, Tran's peptidation.
- Formation and Disposal of Ammonia - Hepatic coma, creatine and Creatinine - biosynthesis.
- Nucleic acid - DNA, RNA, Bases - Purines and Pyrimidines, Synthesis of Nucleic Acids - Steps of replication - Initiation, Elongation and Termination. Protein biosynthesis.
- Enzymes – Classification, functions of enzymes; factors affecting enzyme activity.
- Hormones - Classification and functions of hormones.

Unit- III

- Fatty Acid Metabolism: Oxidation and bio synthesis of fatty acids, Ketone bodies and Ketosis, Bio synthesis of cholesterol and their regulation, Metabolism of bilepigments.
- Lipids of biological significance - Lipoproteins and prostaglandins in health and disease.
- Metabolic Interrelationships between Carbohydrate, Lipid and Proteins.

UNIT - IV

- **Vitamins:** sources, functions (also their role as cofactors in metabolism) deficiency states, factors influencing bioavailability and requirements.

UNIT – V

- **Minerals:** sources, functions (also their role as cofactors in metabolism) deficiency states, factors influencing bioavailability and requirements of Calcium, Phosphorus, Iron, Iodine, Zinc, Sodium, Potassium, Chloride and Fluorine. Metabolism of Calcium and Phosphorus.

REFERENCES

1. Victor L. Davidson and Donald B. Sisman. (1994). Biochemistry, The National Medical Series for Independent Study. Harward Publishing.
2. Keith Wilson and John Walker. (2000). Practical Biochemistry Principles and Techniques". 5th Edition. Cambridge University Press.
3. Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2000). *Lehninger principles of biochemistry*. New York: Worth Publishers.
4. Sathyanarayana.U, 2001. Biochemistry. Calcutta: Books&Al lied (P) Ltd,8/ I — Chintharnani Das Lane.
5. Talwar G.P. (1989). Text book of Biochemistry and Human Biology" 2nd Edn. National Book Trust in India.
6. Nath R.L. (1996).Text book of Medicinal Biochemistry. New age International (P) Limited, Publishers, New Delhi.
7. J.J. Rodale and Staff. (1976). "The complete book of nutrients for health," Rodale books.INC,
8. Witney E.N., Cataldo, C.B., Sharn, R.R. (1986). Understanding Normal and Clinical Nutrition West Publishing Company, St. Paul, NY.

Course Outcomes -After completion of this course, students will be able to:

- CO1** Knowledge on metabolic pathways and disorders of metabolic pathways.
- CO2** Information on functions of proteins, aminoacids, enzymes and hormones.
- CO3** Understand fatty acid metabolism and interrelationships between carbohydrates, proteins and fats
- CO4** Knowledge on functions, deficiencies and bioavailability of vitamins.
- CO5** acquired information on functions, deficiencies and bioavailability of minerals

SEMESTER 2
Master of Science (Food & Nutrition Science)
202FN24- FOOD PROCESSING AND PACKAGING TECHNOLOGY

Course Objectives -To enable the students to:

1. Knowledge of basic and applied aspects of food processing and technology
2. Knowledge of principles and methods of preservation
3. Knowledge of potential use of various by-products of food industry

UNIT I:

- Food Processing and Preservation – Introduction, Need, Purpose and scope, Principles and Methods of food processing and preservation.
- Traditional Methods of food processing and preservation.
- Preservatives and Additives - Classification, applications, permissible limits and safety aspects.

UNIT II:

- Methods of Food Processing and Preservation: Processing and preservation by Heat - Principles of thermal processing, blanching, pasteurization, UHT processing, thermal sterilization, canning, extrusion.
- Processing and preservation by Cold- Refrigeration and freezing, methods of freezing, effect on quality of foods.
- Processing and preservation by Dehydration and Concentration – Types, Methods and their suitability for different food products.

UNIT III:

- Processing and Preservation by Fermentation: Definition, types, Importance, Technology, Benefits and Limitations.
- Processing and preservation of fermented foods - Cereal and pulse products, Vegetables, Milk products, Beverages, meat products.

UNIT IV:

- Processing and Preservation by Novel Methods: Irradiation, High Pressure, Ultrasonic, High Intensity Light, Pulse Electric Field, Ohmic Heating, Pulsed X-rays, Microwave, Radio Frequency, Minimal Processing, Edible Coatings and Films, Membrane Processing, Hurdle Technology, Nanotechnology and Application in foods.
- New Food Products: New food product: Definition, Characteristics and Need for New food product development. Classification: Line extensions - Repositioning of existing products - New form of existing product - Reformulation - New packaging - Innovative products - Creative products and Value added products.

UNIT V:

- Packaging Materials : Definition, importance and scope of packaging of foods Origin of packaging materials, types, properties, advantages & disadvantages of packaging materials
- Types of packaging material and their testing: Forms of packaging – box, bottle, tetra, pouch, shrink, vacuum, gas, CAP, MAP, aseptic etc. WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test, puncture test, impact test etc.

REFERENCE BOOKS & TEXT BOOKS

1. Anuradha Subramanian.(1998). *Concise Food Science*, Soundariya Publication, Erode.
2. Fellows,P. and Ellis,H. (1990). *Food Processing Technology: Principles and Practice*,New York.
3. Harry. W. Von Loesecke.(1998). *Drying and dehydration of Foods*, Allied Scientific,NewDelhi.
4. Jelen,P. (1985). *Introduction to Food Processing*, Prentice Hall, Reston Virginia, USA.
5. Lewis, M.J. (1990). *Physical Properties of Food and Food Processing Systems*, Woodhead, UK.
6. Norman, N. Potter, Joseph H. Hotchkiss.(1996). *Food Science*, 5th edition, CBS Publishers &Distributors, New Delhi.
7. Rama swamy,H. and Marcote,M. (2005).*Food processing- principals and applications*, a. Tamil Nadu.
8. Vijayakhader.(2000). *Text book on food storage and preservation*, Kalyani Publishers,
9. NIIR Board. *Modern technology on food preservation*,Asia pacific business press, New Delhi.
10. NIIR Board of consultant and engineers.

Course Outcomes -After completion of this course, students will be able to:

CO1 Learn about principles of processing and preservation

CO2 Generate new knowledge about the thermal, cold and dehydration methods of processing and preservation.

CO3 Understand the processing and preservation by fermentation techniques

CO4 Knowledge about processing and preservation by novel methods and development of new product

CO5 Importance and types of packaging materials

SEMESTER 2
Master of Science (Food & Nutrition Science)
203FN24- ENTREPRENEURSHIP DEVELOPMENT

Course Objectives -To enable the students to:

1. The objective of the Entrepreneurship in graduates and advanced level of entrepreneurial vision and entrepreneur will.
2. The ability to identify opportunities that exist, that represent untapped markets and underserved markets, and those that can be created by applying existing technologies to new fields and new markets.

UNIT I:

- Concept of Entrepreneurship and enterprising.
- Growth of Entrepreneurs and Entrepreneurship, factors determining the growth of entrepreneurship.
- Role of Entrepreneurship in economic development.
- Entrepreneurial culture and spirit: Assessment of Entrepreneurship qualities and personalities, Entrepreneurship skills, creation of different visions-Emerging-Central and secondary visions.
- Entrepreneurial motivation: The motivating factors, Entrepreneurial ambitions, compelling factors, facilitating factors and achievement motivation.

UNIT II:

- Process of entrepreneurship development: Stagewise tasks to be performed. The learning required to perform the tasks.
- Women Entrepreneur: Concept of women entrepreneurs, contribution of female entrepreneurs to the economy, psycho, socio-economic and demographic profiles of women entrepreneurs in India.
- Problems of women entrepreneurs and role of women entrepreneurs association.

UNIT III:

- Entrepreneurial development programs in India: Concept of entrepreneurial development.
- Need for training and development, phases of entrepreneurial development program, contents of training for entrepreneurial development.
- Target groups, special agencies and schemes.
- Institutions conducting entrepreneurial development program and evaluating entrepreneurial development programs.

UNIT IV:

- Development of the business plan: Idea generation and validating the idea.
- Statement of objectives and description of product/service, clients and scope- Market research and analysis, location choices, operations plan, analysis of risks, organization of the management team and distribution of tasks.

- Overall schedule of activities leading to start up and the finance management.

UNIT V:

- Negotiations with the family friends, relatives, shareholders and financial institutions- Angel' money.
- Entrepreneurship support systems: Institution set up DISCS and Industrial estates, SIDCO, SIDO, NSIC, SISI, SIPCOT, IIC, NAYE, NSIET, NPC, KVIC, TCUC, CTCOT, Commercial banks SHG (Self help groups).
- Developing leadership among women entrepreneurs and Networking amongst entrepreneurs.

REFERENCES:

1. Harish, Economic development and role of Indian women, common wealth publishers, New Delhi-110 002.
2. Jain P.C. Hand book for new Entrepreneurs Oxford University press.
3. Medha Dubhashi, women Entrepreneurs in India, common wealth publishers, New Delhi-112 002
4. Rush, H.A. Economic development & Role of Indian women, common wealth publisher, New Delhi-112 002.
5. Uddin Entrepreneurship development in India, Sami, University press.
6. Indian journal of Nutrition and Dietetics.
7. NIN Journals
8. Current Science
9. Journal of Medical microbiology
10. American journal of clinical nutrition.

Course Outcomes -After completion of this course, students will be able to:

CO1The ability to identify opportunities that exist and motivate the entrepreneurship

CO2 Understand the process of entrepreneurship development

CO3 Learn about concept of entrepreneurial development

CO4 Acquired knowledge on development of the business plan

CO5 Understand about entrepreneurship support systems

SEMESTER 2
Master of Science (Food & Nutrition Science)
204FN24- FOOD REGULATION AND QUALITY CONTROL

Course Objectives -To enable the students to:

1. Standardize food products through sensory evaluation.
2. Understand the fundamental food quality control procedures.
3. Know about Food standards and Laws.

UNIT I

Concept of quality:

- Quality attributes-physical, chemical, nutritional, microbial, and sensory-their measurement and evaluation.
- Sensory and instrumental methods for testing quality.
- Objectives, importance and functions of quality control.
- Methods of quality, assessment of food materials-fruits, vegetables, cereals, dairy products, meat, poultry, egg and processed food products.

UNIT II

Concepts of quality management:

- Objectives, importance and functions of quality control.
- Quality management systems in India. Sampling procedures and plans.
- Domestic regulations. Global Food safety Initiative.

UNIT III

- Common adulterants, tests to detect adulterants contaminants, naturally occurring toxins in food metallic pesticide and preservative contaminants.
- Non nutritive food components and their potential health effects, phyophenols, tannins, phytoestrogens, cyanogenic compounds, lecithin, saponins.

UNIT IV

Food laws and regulations:

- Government and trade standards for quality – food laws and regulations – PFA, FPO and Food Safety Act 2006, 2011.
- BIS standards, Agmark standards, Compulsory National legislation Act, Essential Commodities Act, Consumer protection Act. International Standards for export, Codex Alimentarius, USFDA, WTO, ISO 2200, WHO and FAO, FSSA, APEDA and MPEDA.

UNIT V

Quality Assurance:

- Rules and regulations for setting up of a processing unit.
- Criteria for ingredients and finished products.
- Aspects of microbiological safety in food preservation technologies, Establishment and implementation of HACCP, Continuous Assessment System, Total quality management

and quality audits in food industries.

REFERENCES:

1. BIS Standards
2. GiridarillalSidappa G.S., and Tandon, G.L. (1979) Preservation of fruits and vegetables, ICAR, New Delhi.
3. FPO (1955) Quality control.
4. Horace D.Graham. 1980 The safety of foods, 2nd Ed. AVI Publishing Co. Inc. Westport.
5. Julie Miller Jones. 1992 Food Safety, Enagan Press, USA.
6. Lewis M.J. 1987 Physical Properties of Food and processing system. Ellis Horwood Ltd., England.
7. Picgott, J.R.1984. Sensory analysis of Foods Elsevier. Applied Science Publisher, New York.
8. Principles and practices for the safe processing foods, David Ashapton.
9. Early. R. (1995): Guide to Quality Management Systems for the Food Industry.

Course Outcomes -After completion of this course, students will be able to:

CO1 Students will have a thorough understanding on the quality attributes, their measurement principle and instrumentation of various instruments used in food quality analysis.

CO2 Awareness about quality control and management

CO3 The students will know the importance of various methods to identify any adulteration aspect of food.

CO4 Students will have a thorough understanding on various food laws with their amendments and regulation guidelines followed in national and international level.

CO5 Knowledge about microbiological safety

SEMESTER 2
Practical I
Master of Science (Food & Nutrition Science)
205FN24- NUTRITIONAL BIOCHEMISTRY&FOOD REGULATION AND QUALITY
CONTROL

I

1. Quantitative analysis of Serum / Blood constituents
 - Blood glucose
 - Serum proteins
 - Serum Cholesterol
 - Serum Iron
 - Serum Phosphorous
 - SGOT (Serum Glutarnic Oxaloacetate Transaminase)
 - Serum Alkaline phosphatase
2. Urinary Estimations
 - Normal and abnormal constituents
 - Creatinine and Urea
 - Calcium
 - Phosphorous

II

1. Determination of threshold value for basic tastes
2. Odour recognition
3. Determination of threshold value for various odours
4. Perform preference tests: Paired Comparison
5. Perform discrimination tests: Duo-trio
6. Perform discrimination tests: Triangle
7. Perform discrimination tests: Ranking test
8. Selection of judging panel
9. Training of judges, for recognition of certain common flavour and texture defects using different types of sensory tests
10. Descriptive analysis methodology-Perform descriptive sensory test
11. Sensory evaluation of various food products using different scales, score cards etc.
12. Texture profile analysis of selected food product
13. Estimation of color of food product
14. Relationship between objective and subjective methods

SEMESTER 2
Practical II
Master of Science (Food & Nutrition Science)
206FN24- FOOD PROCESSING AND PACKAGING TECHNOLOGY
&ENTREPRENEURSHIP DEVELOPMENT

I

- I. Preparation, packaging, storage and shelf life studies of following food products
1. Squashes and juices from locally available fruits
 2. Mixed fruit jam, guava jelly, morabba, marmalade
 3. Candied peels and jelly crystals
 4. Tomato ketchup and green chilli sauce
 5. Pickles and chutneys from mango, tomato, lime, carrots etc.
 6. Dehydrated products from vegetables
 7. Papads from sago, rice, dal
 8. Salad dressings
 9. Visit to packaging industry
 10. Identification of different types of packaging and packaging materials
 11. Determination of tensile strength of given material
- II. Visits to: Food analysis laboratories, Bakeries, Food processing Industries & Food packaging industry

II

ENTREPRENEURSHIP DEVELOPMENT

1. Case studies of women entrepreneurs (2 sessions)
2. Visits to enterprises run by women entrepreneurs and regional entrepreneurship support systems (3 sessions)
3. Development of Business plans (4 sessions)
4. Hands on experience in business (2 sessions)

SEMESTER 3
Master of Science (Food & Nutrition Science)
301FN24- THERAPEUTIC NUTRITION

Course Objectives - To enable the students to:

1. Enable the students to develop skills in planning calculation of therapeutic dietetics.
2. Understand the need for Dietary Management in chronic disease condition.
3. Acquire the skills in developing nutrition care plan.
4. Develop skills in diet counseling in various disease conditions.

Unit -I

- Medical nutrition therapy – Introduction, important components and goals of nutrition therapy
- Nutritional management in pulmonary diseases: Chronic obstructive Pulmonary disease, cystic fibrosis, pneumonia, tuberculosis; causes, pathology, effect of malnutrition, nutritional management.

Unit -II

- Dietary Principles, Management and counseling for diseases of the liver– Jaundice, Hepatitis (A,B,C), Cirrhosis, functional tests
- Gall bladder -Cholecystitis, Cholelithiasis.
- Pancreas - Pancreatitis

Unit -III

- Diabetes Mellitus: classification, Etiology, symptoms, Diagnosis, complications, Glycemic index, Dietary management of Diabetics, hypoglycemia.
- Inborn Errors of Metabolism Phenylketonuria (PKU), Maple syrup urine disease (MSUD), Galactosemia, Tyrosinemia, Homocystinuria.
- Overweight and Obesity: Classification, Etiology, assessment, factors affecting weight gain, Consequences. Management of Obesity- Dietary and Lifestyle Modifications, Preventive Aspects.

Unit -IV

- Diseases of the renal system: Renal Disorders-Nephrotic syndrome, glomerular nephritis, renal failure, Nephrolithiasis, urinary tract infection, dialysis.
- Atherosclerosis, Coronary Heart disease (CHD), Hypertension (HT), Congestive Heart Failure, Angina pectoris, myocardial infarction (MI), Rheumatic Heart Disease (RHD).

Unit -V

- Diseases of the Upper Gastro intestine - Gastro Esophageal Reflux Disease (GERD), Esophagitis, Hiatal Hernia.
- Diseases of the Stomach: Gastritis, Peptic Ulcer, Dumping syndrome.
- Diseases of intestine: Inflammatory bowel disease, Celiac disease, Irritable bowel syndrome, Short bowel syndrome
- Common GI problems: Diarrhea, constipation, Flatulence, Food sensitivities.

References:

1. Michael. J. Gibney et al; Clinical Nutrition Black well Science, 2005.

2. Shubhangini. A. Joshi; Nutrition and Dietetics, 3rd edition, McGraw Hill Education (India) Private Limited.
3. Srilakshmi . B; Nutrition Science, 15th edition, New Age International (p) Limited, publishers, 2016.
4. Swaminathan. M; Advanced Text-Book on Food and Nutrition, Volume I and 11 2nd Edition, The Bangalore printing and publishing co., LTD. Reprint 2015.
5. Sunetra Roday; Food Science and Nutrition, 2nd edition, Oxford University press, 2013.
6. Carol Byrd – Bredbenner; Wardlaw's perspectives in Nutrition, 9th edition McGraw Hill International Edition, 2013.

Course Outcomes -After completion of this course, students will be able to:

CO1 Provide information about medical nutrition therapy and nutritional management pulmonary diseases .

CO2 Information on dietary management on liver, pancreas and gall bladder

CO3 Learn about dietary management of lifestyle diseases and inborn errors of metabolism

CO4 Know about dietary management of renal and cardiac disorders

CO5 Understand about dietary management of diseases of gastro intestinal tract

SEMESTER 3
Master of Science (Food & Nutrition Science)
302FN24- FOOD MICROBIOLOGY AND TOXICOLOGY

Course Objectives - To enable the students to:

1. Study the issues of Food safety, Food preservation and Food production.
2. Learn about physical, chemical toxicants that contaminate food.
3. Provide the most recent development in food packaging.

UNIT I:

Introduction to Food Microbiology

- Classification and growth of microorganism, factors affecting microbial growth
- General characteristics, structure, morphological characteristics, cultural characteristics of bacteria, mould and yeast.
- Role of Harmful and beneficial microorganisms in food.

UNIT II: Food Contamination and Spoilage

- General principles underlying spoilage: causes of spoilage, classification of foods based on spoilage and changes caused by microorganisms.
- Sources of contamination and types of spoilages among plant origin foods:
 - Cereals, Legumes, nuts and oil seeds
 - Fruits and Vegetable products
 - Spices and condiments

Food Contamination and Spoilage of Animal origin and Processed Foods

- Sources of contamination and types of spoilages among :
 - Milk and Milk products
 - Eggs, poultry and Meat
 - Fish and Other sea foods
 - Sugars and sugar products
 - Processed foods

UNIT-III:

Food Borne Diseases and Food Safety

- Food borne diseases – Food Infection and Intoxication Sources of infection of food by pathogenic organisms and physiological action, Signs and symptoms of various Bacterial Food-borne poisoning and Non-bacterial food-borne poisoning.
- Food safety: concept, factors affecting food safety, biological hazards.
- Applications of Food Microbiology- probiotics, prebiotics, microbial enzymes, fermentation process.

UNIT-IV:

Food Allergies and Sensitivities:

- Introduction, Immunological food hypersensitivities (true food allergies) - Mechanisms, Nature and chemistry of food allergens, avoidance of true food allergies, allergen cross-contact and its control and celiac disease.
- Non-immunological food sensitivities – Anaphylactoid reactions, metabolic food disorders and idiosyncratic reactions.

UNIT-V:

Food Toxicology:

- Classification of toxic agents, Principles, characteristics of exposure and evaluation of toxicity and Determination of toxicants in foods.
- Natural Toxins of different foods: Natural toxins in animal foodstuffs (meat and seafood), Natural toxins in plant foodstuffs, fungal toxins occurring in foods (mycotoxins), Bacterial toxins and its sites of action and their toxicity mechanisms.

Reference Books:

1. William.C.Frazier and Denni, S.C. Westhoff. (2004). *Food Microbiology*, 4th edition, Tata McGraw-Hill publishing company Ltd, New Delhi.
2. Food Microbiology M.R.Adams
3. Basic Food Microbiology J.Banart
4. Modern Food Microbiology James Nd. Jay
5. Microbial Food Poisoning R. Hey
6. Practical Food Microbiology & Technology Mountv& Gould
7. Fermentation Fechnology- Singli& Pandit
8. Food Toxicology - William Helferich, Carl K. Winter 2001
9. Handbook of *Food Toxicology* - Deshpande – 2002
10. *Food toxicology: a perspective on the relative risks-* Steven L. Taylor, Richard A. Scanlan, Institute of Food Technologists – 1989
11. Introduction to *Food Toxicology-* Takayuki Shibamoto, Leonard F. Bjeldanes - 2009

Course Outcomes -After completion of this course, students will be able to:

CO1 Study the characteristics of microorganisms, factors affecting growth and significance.

CO2 Learn about food contamination and spoilage

CO3 Acquire knowledge on food borne infections

CO4 Learn true and untrue food allergies and sensitivities and their control.

CO5 Study the classification of toxicants and techniques to identity toxic substances in foods.

SEMESTER 3
Master of Science (Food & Nutrition Science)
303FN24- RESEARCH METHODOLOGY

Course Objectives - To enable the students to:

1. Understand the importance of research methods and its applications
2. Acquire knowledge on research process and preparing research projects

UNIT – I: Research Purpose and Types

- Research – Significance, meaning, objectives, Approaches,
- Research process, Criteria of good research, Variable- types
- Types of Research: Historical, descriptive, experimental, case study, survey research, participatory research, Fundamental, applied and action, exploratory research.
- Research hypothesis-Characteristics of good hypothesis.
- Research Design – Meaning, Need, Concepts, Principles and Types of research design

UNIT – II: Research Problem and Sample design

- Definition and Identification, Necessity and Selection of Research problem, Technique involved in defining the research problem.
- Population and Sample – Implications, Steps, Criteria and Characteristics of a good design
- Sampling Methods :*Probability sampling*- Simple random, systematic random sampling, two Stages and multi stage sampling, cluster sampling and *Non-probability sampling* - Purposive, quota and volunteer sampling / Snowball Sampling.

UNIT –III: Methods of Data Collection

- Primary and Secondary Data, Selection of appropriate method for data collection
- Different Methods and techniques of data collection - Interview, Observation, Social mapping, Participatory assessment Techniques, Observation check list, Questionnaire, Interview schedule, Group discussions, Case studies

UNIT –IV: Measurement Scales

- Measurement in Research, Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling, Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques

Unit - V

- Preparing a research project formulating project idea, general comments, defining the problem and setting objectives, literature search, data sources and collecting and preparing notes. .

REFERENCES:-

1. Aalan bryman, quantity and quality and social research, unwinhyman limited U.K.
2. Bajapai,S.Methods of social service and research
3. Basotia.G.Rand, Sharma.KK research methodology,Mangal Deep Publications, Jaipur 1999.
4. Burns. RB, Introduction to research methods, Saga publications pvt. 2000.
5. Davin W.Stewart, sercondary research-information sources and methods,saga publications.
6. Gary R.Beecher, human nutrition research, first edition 1979.
7. Kothari, research methodology-methods and techniques,Wishwa Prakasam New Delhi 2000
8. Misra RP, Research Methodology concept ,publishing Co., A/15-16 commercial block New Delhi-2001
9. Research made simple, A hand book of social workers, Raymond, Saga publications 1996.

Course Outcomes -After completion of this course, students will be able to:

CO1Know about research types, variable and hypothesis.

CO2Learn about selection of research problem and methods of sampling

CO3Understand about methods and techniques of data collection

CO4 Knowledge on measurement of scaling techniques

CO5 Know the preparation of research proposal in appropriate scientific style

SEMESTER 3
Master of Science (Food & Nutrition Science)
304FN24- NUTRACEUTICALS AND FOOD BIOTECHNOLOGY

Course - Objectives: To enable the students to:

1. Study the processing of nutraceuticals, pharma foods, dietary supplements and non nutritive sweetness
2. Study the importance of technologies and organisms for food biotechnology

UNIT-I

- Nutraceuticals– History, definitions, functional food versus pharmaceuticals, classification. Nutraceutical properties of nutrient components of foods:
- Pro active carbohydrates – Trehalose, poly saccharides, soluble fibers (pectin, guar gum and β – glucons), insoluble fiber, resistant starches (their role in blood lipids, mineral absorption, control of blood glucose, risk of developing colon cancer), slowly digestible starches;
- Prebiotics – definition, inulin, oligo saccharides and lactulose as prebiotic compounds and polyphenols as prebiotics.

UNIT-II

- Nutraceutical properties of bioactive lipids – Butyric acid, medium chain fatty acids, long chain fatty acids (MUFA, PUFA, omega-3 and omega-6 fatty acids) and conjugated linoleic acid as nutraceuticals.
- Nutraceutical properties of bioactive peptides – Antihypertensive peptides, antilipidemic and antidiabetic peptides, opioid peptides, caseinophospho peptides, calmodulin – binding peptides, antioxidant peptides, anticancer and immune – modulating peptides, antithrombotic peptides; co-enzyme – Q10.
- Nutraceutical properties of bioactive polyphenols and carotenoids.

UNIT-III

- Nutraceutical properties of vegetables, fruits, nuts and oil seeds: Bio active components of tropical fruits and citrus fruits and berries and their functional properties;
- bio active compounds of cruciferous vegetables and their biological activities.
- Health benefits of olive oil and flax seeds.
- Nutraceutical properties of spices and herbs: Cinnamon, turmeric, ginger, garlic, onion, pepper fruit.
- Nutraceutical properties of foods from animal sources.
- Nutraceutical properties of miscellaneous foods: Seaweeds, tea and honey.

UNIT-IV

- Biotechnology – Introduction – biotechnological applications of animals, plants and microbes.
- Concepts of genetic engineering and molecular cloning and their application in food production, transgenic plants, application of genetic engineering in food science and technology.
- Genomics, proteomics and bio informatics.

UNIT-V

- Genetically modified foods: concept, types and applications; safety assessment of genetically modified foods.
- Application of biotechnology to food products: Yeast based processes and products – alcoholic beverages, industrial alcohols, bread and related products.
- Bacteria based processes and products – dairy products, fermented meat and fish products, fermented vegetable products, vinegar and other organic products, bacterial bio mass.

REFERENCES:

1. Birch G.G. &Parker, K.J. Nutritive sweeteners - 2 applied sciences publishers, NewJersey, 1982.
2. Creighton, T-E. Proteins 2nd edition, W.H. Freeman &Company New York 1993.
3. Hettiarachahy, S.N Ziegler R.G. Protein function in food systems, It'sbasic symposium series, Hongkong, 1994.
4. National Research council Designing foods, (Animal product options in Marketplace) National academy press, Washington, 1988.
5. Parker, K.G.Green, T.H, Developments in sweeteners. Applied sciences publisherws, London, 1983.

Course Outcomes -After completion of this course, students will be able to:

CO1Learn about the nutraceuticals verses pharma foods, pro active carbohydrates and prebiotics.

CO2Knowthe nutraceutical properties of bioactive lipids and peptides

CO3Acquire knowledge onnutraceutical properties of vegetables, fruits, nuts and oil seeds.

CO4 Know about genetic engineering and bioinformatics

CO5 Understand about genetically modified foods and application of biotechnology in processing of food products.

SEMESTER 3
Practical I
Master of Science (Food & Nutrition Science)
305FN24- THERAPEUTIC NUTRITION&FOOD MICROBIOLOGY AND TOXICOLOGY

I

1. Preparing: Equipment and educational material using in counseling and Assessment surveys.
2. Visit to general and specialized hospitals to observe and take case studies & history
3. Planning, calculation, preparation and counseling Sessions for;
 - Obesity
 - GIT disorders
 - Liver and Gall bladder and pancreas disorders
 - Cardio Vascular Diseases
 - Diabetes
 - Renal disorders
 - Pulmonary Disorders
4. Monitoring and Evaluation of counseling Sessions for above conditions.

II

1. Sterilization methods
2. Sampling techniques
3. Isolation techniques
4. Various types of media preparation and Methods of sterilization of media
5. Microbial Staining Techniques
6. Microbial examination of fresh food products: Identification, isolation and confirmation
7. Microbial examination of processed foods: Identification, isolation and confirmation.
8. Detection of E.coli from food sample
9. Analysis of food adulterants
10. Tests for food additives, food colours, heavy metals, pesticidal residues
11. Determination of Aflatoxin

SEMESTER 3
Practical II
Master of Science (Food & Nutrition Science)
306FN24- RESEARCH METHODOLOGY & NUTRACEUTICALS AND FOOD
BIOTECHNOLOGY

I

1. Identification of different variables in specialization of study.
2. Framing of hypothesis-Null and alternate Hypothesis
3. Preparation of schedule/questionnaire.
4. Preparation of research proposal
5. Study of an article in a journal-Abstract, Methodology, Results and Bibliography

II

1. Market research analysis of nutraceuticals functional foods.
2. Product development of functional food.
3. Raw material testing
3. Selection and screening of panel for sensory evaluation of developed functional food.
4. Training of panel for sensory evaluation.
5. Conducting sensory tests and preparation of score cards
6. Ranking, rating, description and sensitivity tests and preparation of score cards
7. Shelf life studies on developed product.
8. Extraction and estimation of oil or crude fat content in oil seeds.
9. Estimation of total phenols and chlorogenic acid (Phenolic compound) in plant material.

SEMESTER 4
Master of Science (Food & Nutrition Science)
401FN24- ADVANCED STUDIES IN NUTRITION

Course - Objectives: To enable the students to:

1. To acquire knowledge in new and emerging frontiers of Nutrition
2. To acquire knowledge and skills in techniques of nutrient/food quality assessment using animal (Rats) models in Research.

THEORY

UNIT I:

- Carbohydrates: Functions, Storage, effect of excess/low intake of carbohydrates, dietary carbohydrates and oral diseases.
- Lipids- Lipids and fatty acid- requirements, functions, storage, lipid transformation in the liver, lipotropic factors, role of essential fatty acids, prostaglandins, deposition of fat in the body, effects of deficiency and excess of fats.

UNIT II:

- Proteins and amino acids: Review of functions, sources, protein turnover, synthesis and stores, proteins as a source of energy, protein requirements through factorial method and balance study.
- Amino acids: Essential amino acids, amino acid balance and imbalance, toxicity, evaluation of dietary protein quality, effects of protein deficiency.

UNIT III:

- Energy measurement — direct and indirect calorimetry,
- Energy Expenditure: Physical activity, energy utilization in cells, basal metabolism, specific dynamic action of food.
- Energy requirements, energy balance and body weights.

UNIT IV: Nutrition and Immunity

- Innate and Acquired immunity – Primary and secondary immune response, Active and Passive, Antigen, Antibody Cell mediated immunity, Humoral immunity- Formation, maturation and activation of B and T cells, Immune effectors system- cytokines complement system, K cells and NK cells, Cell mediated effectors response,
- Role of nutrients in immunity
- Effect of malnutrition on immunity

UNIT V:

Nutrition, Brain and Behaviour

- Brain – Structure, composition and functions and neurological tests-EEG, PET, MRI.
- Neurotransmitters- Nutrient precursors of neurotransmitters – Tryptophan, tyrosine, choline and lecithin

- Role of neurotransmitters in Brain function
- Role of Nutrients on Brain growth and development

Endemic Nutrition Problems and their Management

- Fluorosis – Aetiology, prevalence, symptoms and nutritional management
- Iodine deficiency disorders - Aetiology, prevalence, symptoms and nutritional management

REFERENCES

1. Berry. Ed. P. Ottaway, 1993. The Technology of vitamins in food. NZ: Blackie Academic & Professional..
2. David A Bender, Introduction to Nutrition & Metabolism, Second Edition
3. Erric Conn. Paul K. Stumpt, George Bruening and Roy.M. Doi 1987. "Outlines of Biochemistry 5/E". Canada: John Wiley & Sons.
4. Garrow Ed. Sanal. J. James W.P.T, 1993. Human nutrition & dietetics. U.K: Churchill livingstone publication
5. Henrietta Fleck, 1981. Introduction to Nutrition 4th edition Published by New York: McmillanCo.. INC.
6. Kenneth. Ed. T. Smith, 1988. Trace minerals in foods. New York: Marcel dekker, I tic.
7. Mullar .H.G. G.Tobin, 1980. Nutrition and food processing. East part connectic.: Avi publishing company INC
8. Hamintion — Glopper. Biochemistry of human Nutrition,.S.T.pauly MN: West publishing company.
9. M.S. Bamiji, N. Prahlad Rao and Vinodini Reddy . (1998). Text Book of Human Nutrition" Oxford and IBFI Publishing Co. Pvt. Ltd., New Delhi.
10. Baby Depuru. (1999). Some Selected Biochemical, behavioural and environmental correlates of Malnutrition in Children, U.G.C. S.V. University.
11. World Cancer Research Fund and American Institute for Cancer Research, "Food, Nutrition and the Prevention of Cancer - a global perspective". WCRF - America Institute of Cancer Research - Washington - 1997.
12. John. W. Kimball. (1990). Introduction to Immunology (Third edition) : Maxwell, Macmillan -International editions. Macmillan Publishing Company, New York.
13. Heather Hedrick Fink, Alan E. mike sky. (2012). Practical Applications in Sports Nutrition, Third Edition, Library of Congress Cataloging in Publication Data. United States of America.
14. Michelle McGuire, Kathy A Beer man. (2011). Nutritional sciences From Fundamental to Food, Second Edition, Wadsworth Cengage Learning, Belmont, USA.
15. N.MentaNitin.J Menta. (2014).Nutrition and Diet for Children Simplified MeenakshiJaypee Brothers Medical Publishers (P) Ltd.
16. Davidl. Katzwolters Kluwer/LippinCottWilliams and Wilkins. (2007). Nutrition in Clinical Practice Second Edition.
17. C.Gopalan, B.V.RamasastriandS.C.BalaSubramanian. (2012). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council Medical Research Hyderabad.
18. MadhuSharma. (2013). Pediatric Nutrition in Health and Disease, Jaypee Brother's Medical Publishers (P) Ltd New Delhi London Philadelphia Panama.
19. Nutrient Requirements andRecommended Dietary Allowance forIndians A Report of The Expert Group of ICMR. 2010.

20. Dr.M Swami Nathan. (2010). Food and Nutrition Volume-2 Second Edition the Bangalore Printing and Publishing Co Ltd Bangalore 560018.

Course Outcomes -After completion of this course, students will be able to:

- CO1** Acquire knowledge on functions, deficiencies of carbohydrates and fats.
- CO2** Know about novel proteins and classification of aminoacids.
- CO3** Awareness about energy measurement of foods
- CO4** Knowledge on types of immunity and role of nutrients
- CO5** Information about brain and neurotransmitters

SEMESTER 4
Master of Science (Food & Nutrition Science)
402FN24- STATISTICS AND COMPUTER APPLICATIONS

Course - Objectives: To enable the students to:

1. To make the student to calculate and apply measures of location and measures of dispersion.
2. To provide the student to apply discrete and continuous probability distributions to various problems.
3. To Perform Test of Hypothesis.
4. To Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.
5. To Compute and interpret the results of Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test.

UNIT-I

- Meaning and scope of statistics-Role of statistics in research.
- Descriptive statistics – classification, tabulation, frequency distribution, diagrammatic and graphic representation, analysis, categorization, coding and sampling.

UNIT II:

- Measures of central tendency and dispersion (absolute and relative), skewness and kurtosis. Probability distributions, normal distribution, use of normal probability tables.
- Testing concepts of hypothesis,
- Formulation of hypothesis,
- Levels of significance.

UNITIII:

- Large sample tests for significance of difference between sample mean and population mean, difference of sample proportions and population proportions,
- true sample proportions,
- Small sample tests(test for significance of the difference between small sample mean and population mean).

UNITIV:

- Correlation, co-efficient of correlation and its interpretation, rank correlation, regression equation and predictions,
- Chi-square test for goodness of fit and independent attributes,
- F- test (ANOVA)

UNIT V:

- Introduction to Computer-Block diagram, PC and its components, Memory capacity, Physical storage of data, various devices, Hardware and software operating- DOS commands for file handling.

- MS Office and its component – Word and its applications/ creating documents, editing spell check, auto correct and print preview, creating tables and sorting data in tables, mail merge and its usage.
- Excel – Data entry, data Analysis, Statistical functions in excel statistical packages in social sciences (SPSS).

REFERENCES:

1. Fisher A.R. Yates.F. “Statistical table “6th Edition Longman group ltd, England, 1982.
2. Freud E.J.Smith,M.R. “Statistics – a first course” 4th edition prentice –hall Inc.New Jersey.
3. Gupta S.P. “Sultan chand& sons, New Delhi, 1995.
4. Norma Gilbert “Statistics” 2nd edition, Holt saunders International.
5. Steel G D R ., Torrie, H.J.”Principles and procedures of Statistics”2nd edition, M.hill International, 1981.
6. Welkowitz J.Ewen, B.R.Cohen.J.”Introductory statistics for the behavioural Sciences”3rd edition, academic press, New York, 1982.
7. William.C.Hays, “Statistics” 3rd edition, Holt – Saunders International, 1980.
8. William C.Guenther “concepts of statistical inference” 2nd edition, Mc Graw Hill International 1981.
9. Verna,B.L, Sukla, SrivastavaR.N.”Biostatistics” CBS publishers & distributors, New Delhi, 1994.

Course Outcomes -After completion of this course, students will be able to:

- CO1** Learn about descriptive statistics
- CO2** Information on central tendency and dispersion
- CO3** Demonstrate the ability to carry out statistical tests.
- CO4** Acquire knowledge on statistical analytical techniques
- CO5** Understand the about functions of computer

SEMESTER 4
Master of Science (Food & Nutrition Science)
403FN24- INSTITUTIONAL FOOD SERVICE MANAGEMENT

Course - Objectives: To enable the students to:

1. Understand different types and systems of food services.
2. Acquire knowledge and skills in planning organizing and evolution of different types of public catering units in community.
3. To build capacity for self employment.

THEORY:

UNIT I: Introduction to food service Industry

- Principles and functions of food service management.
- Need and importance
- Tools of Management.
- Management of resources.
- Types: Hotels and Restaurants - Hotels/Motels, restaurants, cafes, clubs, winebars, specialty restaurants, fast foods, take-away, street foods.
- Welfare and Industrial - Residential establishments - School, colleges, hostels, old people House, Hospitals, nursing homes, Industrial canteens, Temple feeding and Marriage feeding.
- Transport - Railway, Airlines and Sea.

UNIT II: Infrastructure and Equipment in Food Institutions

- Building plans, outlays of work places - kitchen spaces, storage spaces and service areas.
- Equipment - Classification of equipment, selection of equipment, Design, installation, operation and maintenance.
- Menu – types of menu in Food service institutions, principles and planning
- Food services - mechanics of waiter service, self-service, vending and mobile catering.
- Food services systems - Introduction, Cook-chill system and benefits, Cook-freeze system and benefits and Souse-vide.
- Computers in food service - Introduction, catering controls.

UNIT III: Food safety in public catering

- Health and Hygiene of personnel.
- Laws governing food service in public catering.
- Sanitation of food service establishments.
- Food safety in hotels, restaurants, street foods, industry and canteens, hospitals, hostels, airlines, railways, temple and mass feeding programmes.
- Food safety awareness programmes to food handlers and consumers.
- Role of media in food safety education.

UNIT IV: Financial Management

- Definition and scope of financial management.
- Cost concept, cost control and pricing.

- Book keeping and accounting.

UNIT V: Personnel Management

- Recruitment, selection and Induction, Job analysis, description, Monitoring work.
- Employee facilities and benefits in service Training.
- Skills to operate and manage food service system.

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1. Ronald kinton and victor cesarani (1992), 'the theory of catering', Bulter and Tanner Ltd,, France and London.
2. Mohinisethi and surjeet Mohan (1993), catering management an integrated approach, second edition, wiley esteem limited, New Delhi.
3. Ramesh VBhat and R.Nagesswara Rao (1996), Food safety, Bappco (ltd), Mysore, Banglore.
4. Ramesh, V,Bhat, and R.Nagesswara Rao(1992), Food safety in public catering,NIN,1CM R, Hyderahad.

Course Outcomes -After completion of this course, students will be able to:

CO1 Learn about functions, tools and types of food service establishments.

CO2 Acquire knowledge on the food service institutions infrastructure, equipment, food service operations and systems.

CO3 Understand the role of food safety in personnel and laws in a variety of food service settings.

CO4 Make use of the costing and financial management principles.

CO5 Perceive the sales promotion techniques.

SEMESTER 4
Master of Science (Food & Nutrition Science)
404FN24 NUTRITIONAL STATUS ASSESSMENT METHODOLOGIES

Objectives: To enable the students to:

1. To acquire skills in Nutritional status assessment of different age groups.
2. To learn to compare the results with standards and identify the gaps in nutrition.
3. To know the methods of assessing tools for feasibility, reliability and validity.

Unit I:

- Nutritional status- meaning, indicators.
- Nutritional Surveillance: Need, determinants, Nutritional Surveillance, methods of assessment of Nutritional status-Direct and Indirect methods.
- Role of National Nutrition Monitoring Bureau (NNMB).

Unit -II

- Anthropometry: Meaning, importance, methods, measurement of Height, Weight
- Mid- Upper- arm circumference, Head circumference, Chest circumference,
- Fat folds triceps and sub scapular assessment tools and techniques.
- Reference standards for comparison, classification of Nutritional Status.

Unit -III

- Diet survey: Meaning and significance
- Methods - Food Balance Sheet Method, Inventory Method, Weighment Method, Expenditure Pattern Method, Diet history, Oral Questionnaire Method, Duplicate Sample Method, Dietary Score Method, Recording Method and Standardization of Dietary Assessment Vessels.
- Analysis and interpretation, problems in dietary surveys and management.
- Vital statistics and other Records

Unit - IV

- Clinical assessment: Methods and Techniques for Clinical Assessment of Nutritional Status and diagnosis of signs and symptoms in relation to various nutrient deficiencies.
- Biochemical Assessment: Need and importance, Laboratory tests, Protein Energy Malnutrition. Essential Fatty Acids. Fat Soluble Vitamins, Water soluble vitamins, minerals and trace elements. Normal levels for comparison.
- Biochemical assessment in diseased and normal state.

Unit – V

Growth and Metabolic Studies

- Principles, objectives.
- Growth studies with infants on feeding different protein sources. (case study experiences and report of research studies)

- Growth studies with preschool children, school children and adolescents: Effect of supplementation
- Nitrogen balance studies, in growing children, adolescents and adults- Procedure for conducting metabolic and balance studies and interpretation of results.

REFERENCES:

1. Mahtab S. Bamji .1999. Textbook of Human Nutrition. Oxford & IBH publishing Co. Pvt.Ltd..
2. Park and Park .1983. A textbook of preventive and social medicine, M/s. Banrasidas Bhanot publishers.
3. Robinson, Collier,1979. Fundamentals of Normal Nutrition, Mac. Millan International edition.
4. Shukla P.K, 1982. Nutrition Problems of India,, Prentice Hall of India.
5. Tara Gopaldas and Subadra Seshadri. 1987. Nutrition, monitoring and assessment. Oxford University press.

Course Outcomes -After completion of this course, students will be able to:

CO1 Provide knowledge on nutritional surveillance

CO2 Learn the techniques of anthropometry

CO3 Assess skill in diet survey

CO4 Students learn clinical signs and biochemical tests for diseased and normal state.

CO5 Acquire knowledge on growth and metabolic studies

SEMESTER 4
PRACTICAL I
Master of Science (Food & Nutrition Science)
405FN24 ADVANCED STUDIES IN NUTRITION& INSTITUTIONAL
FOOD SERVICE MANAGEMENT

I

1. Animal experiments and growth study (Optional).
2. Human growth studies on HIG, LIG Children.
3. Prepare and demonstrate different recipes related to Nutritional deficiencies in adopted villages

II

1. Survey of different types of food service establishments
2. Portioning, costing and multiplication of the recipes.
3. Practice in preparation of volume meals at different costs for different service.
4. Cyclic menu planning for various food service systems.
5. Exercise on preparation of work schedule
6. Visit to the following types of Hotels/restaurants, welfare, industrial and transport.
7. Layout design (equipment personnel and organizational setup) of food service institutes.

SEMESTER 4
PRACTICAL II
Master of Science (Food & Nutrition Science)
405FN24- STATISTICS AND COMPUTER
APPLICATIONS&NUTRITIONAL STATUS ASSESSMENT
METHODOLOGIES

I

1. Graphic and diagrammatic presentation of data.
2. Calculation of Averages- Arithmetic means, mode and median.
3. Calculation of Standard deviation and 't' test for large and small samples.
4. Calculation of Correlations, Regressions
5. Calculation of chi square to find out significance of association.

II

I. Direct Methods:

1. Standardization of Dietary Assessment Vessels/cups
2. Diet survey:
 - Weighment method
 - Oral questionnaire
 - Demonstrations of other methods.
3. Anthropometric measurement for Pre- school children
4. Clinical assessment — Examination of clinical signs and symptoms in children and adolescents in diseased state
5. Bio-chemical assessment: Blood drawing technique, Estimation of Hemoglobin, creatinine and albumin

II. Indirect Methods

Application of Participatory Rural Appraisal Techniques: Food Resource Mapping, Frequency of Food Intake Matrix.

Duration of the Programme:

Minimum: Two Academic Years from the year of joining of the course (Four Semesters).

Maximum: Five Academic Years from year of joining of the course for securing First Class or Second Class.

INSTRUCTIONAL DESIGN :

Instructional delivery mechanism: University has its own faculty for M.Sc. Foods and Nutritional Sciences department and all the faculty members will act as resource persons. Our University has blended mode delivery mechanism i.e., ICT and Conventional modes.

Media of delivery mechanisms:

- **Printing:** The study material delivery media include Printing of books which are issued to the students who are enrolled for the programme.

- **Online:** On line PDF format content is also given access to the students who wish to study through online mode.

- **Interactive sessions, and Discussion boards:** In distance Education, face to face contact between the learners and their tutors is relatively less and therefore interactive sessions are conducted. The purpose of such interactive session is to answer some of the questions and clarify doubts that may not be possible in other means of communication. This programme provides an opportunity to meet other fellow students. The Counsellors at the study centres are expected to provide guidance to the students. The interactive sessions are conducted during week ends and vacations to enable the working students to attend.

- **Student support services:** Student support services include Internet enabled student support services like e-mails, SMS and even an app is planned. Student feed back mechanism is created and feed back is designed. Student Learning Management System (LMS) is customized to every student. For every student customized examination management system (EMS) is also created facilitating self evaluation, demo tests, model question papers and periodical Internal Assessments.

- **Credit System:** University has adopted Choice Based Credit System (CBSE) under semester mode from 2013. The same has been approved by relevant Statutory boards in Distance mode also.

- **Admission procedure:** In M.Sc., Foods and Nutritional Sciences programme candidates can take admission directly. For this purpose, CDE, ANU will advertise for admissions. Then candidates should apply in prescribed format of the CDE after publication of the advertisement.

- **Eligibility Criteria:** The eligibility for admission into this course is B.SC. (Home Science)/ B.SC. (Applied Nutrition) /B.H.Sc. (Rural) / B.Sc. (Critical Nutrition and Dietetics) / B.Sc. (Food Science and Quality Control) / B.Sc. (With Nutrition / Foods as one paper) / B.H.Sc. (Home Science special 4 year course) / B.Sc. (Microbiology, Biotechnology, Biochemistry) / B.Sc. (BZC).

- **Fee Structure:** The total course fee is Rs.29,900/-.

- **Policy of programme delivery:** Our University has blended mode delivery mechanism i.e., ICT and Conventional modes. In conventional mode printed material is given and also online mode of delivery with learning management system is adopted.
- **Activity planner:** There is

an yearly academic plan and as per plan interactive sessions, assignments, examinations etc are conducted to the candidates.

• **Evaluation System:** Periodical progress of learning is evaluated by web based feed back mechanism in the Learning Management System. Evaluation of learner progress is conducted as follows:

(i) The examination has two components i.e., continuous evaluation by way of assignments (30 %) and term end University Examination (70 %).

(ii) Each student has to complete and submit assignment in each of the theory paper before appearing to the term end examination. The term end examination shall be of 3 hours duration.

(iii) Minimum qualifying marks in each paper is 40 % individually in internal and term end examination. The candidates who get 60 % and above will be declared as passin First Division, 50 % to below 60 % as Second Division and 40 % to below 50 % as Third Division.

(iv) The Centre for Distance Education, Acharya Nagarjuna University will conduct the examinations, evaluations and issue certificates to the successful candidates.

(v) All the term end examinations will be conducted at the examination centres fixed by the CDE.

(vi) Qualitatively the examinations conducted for the students of the Distance Education are on par with the examinations conducted for the regular University students.

LIBRARY SUPPORT AND LIBRARY RESOURCES :


The M.Sc., Foods and Nutritional Sciences program is based on the theory and practical papers. Laboratory support is available to students. Further, entire University Library is accessible to all the students of distance education. Additionally every department in the University has a well equipped library which is accessible to all the students. CDE also provides a compendium of web resources to every student to support learning.


COST ESTIMATE :

The Programme fee for I year is Rs.14,300/-, and II year is Rs. 15,600/-. The university will pay the remuneration to Editors and lesson writers as per university norms. DTP charges, Printing of books and Examination fees will be paid by the ANUCDE as per prescribed norms. This institution is providing high quality programmes at low cost.

QUALITY ASSURANCE :

Quality assurance comprises the policies, procedures and mechanisms which that specified quality specifications and standards are maintained. These include continuous revision and monitoring activities to evaluate aspects such as suitability, efficiency, applicability and efficacy of all activities with a view to ensure continuous quality improvement and enhancement. The programme is designed with a focus on the proposed learning outcomes aimed at making the learner industry ready also for career advancement, enterpreneural development, and as wealth creators. There is a continuous evaluation of learning and of competence internally and also by ICT enabled feed back mechanism and Centre for Internal Quality Assurance (CIQA). The University ensures maintaining quality in education provided through open and diatance learning mode. As per the need of the information society and professional requirement, the University ensures to change the mechanism from time to time along with enhancement of standard in course curriculum and instructional design. Therefor, the outcomes of the programme can meet the challenges in the changing society.


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