Course Work for Ph.D Programme in (Food Science & Technology) Under Semester Course Credit System of Teaching and Examination Effective from January 2011

Detail Course Scheme

FST/P 611 – Current Trend in Food & Nutrition	(Theory Compulsory)	4 CH

Elective Paper – A Student shall opt for any one of FST 612(A/B)

FST/P 612 A – Food Science & Analysis	(Theory, Elective)	4 CH
FST/P612 B- Food Marketing & Quality Control	(Theory, Elective)	4 CH
FST/P 613 - Research Methodology **(Quantitative Analysis and Computer Application)**	(Theory Compulsory)	4 CH
FST/P 614- Data Analysis and Computer Application Practical		4CH
FST/P 615 – Review of Research papers published in Referred Journals Review of Report-2CH and Seminar-2CH		4CH
	Total	**20CH**

Instruction to the Paper Setter

1. In theory papers question will be set unit-wise with maximum 2 questions from each unit (Total 8 questions, students shall be asked to answer one question from each unit with 50% choice from each unit. (Total 4 questions.)
2. Maximum 60% of the questions shall be long answered type and 40% shall be short answered type.

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(Approved)

Vice-Chancellor

FST /P-611- CURRENT TRENDS IN FOOD & NUTRITION 4CH

Objective: To develop the skills for structure, functions, metabolism of various components of food and their role in body.

Learning Outcome:

- Students will have a thorough understanding of structure and classification various components of food.
- The students will know the process of complete digestion and assimilation of food component.

Unit-I

Food Science & Application: Nutritional factor and active principles and changes of active Principles during cooking and their nutritional implications for the following: Cereals, Pulses, vegetables & fruits, nuts & oilseeds, milk &Milk Product, beverages, spices & condiments, meat, fish, poultry & egg, fats & oils. Application of natural & synthetics flavours & colours, latest trend in the concept of Functional foods, their role in designer foods, nutraceuticals, phytochemicals, antioxidants, genetically modified foods.

Unit-II

Biochemical Aspects of Macro Nutrients:

Carbohydrates: digestion, absorption & metabolism& effect of deficiency Proteins: digestion, absorption & metabolism& effect of deficiency, protein quality evaluation, amino acids & their role in health & diseases ,Fat: digestion, absorption & metabolism&, types of fatty acids & their role in health & diseases Energy Metabolism: BMR, SDA and energy requirement, respiratory quotient & metabolism in starvation, interrelation between the nutrients

Unit-III

Biochemical Aspects of Micro Nutrients:

Vitamins: Functions, digestion, absorption & metabolism of fat soluble & water soluble vitamins, effect of deficiency & interrelationship. Minerals and Trace elements: Functions, absorption, metabolism, effect of deficiency & interrelationship, Water & electrolyte balance

Unit-IV

Nutrition through Life cycle:

RDA and nutritional importance during pregnancy, Lactation, infancy & childhood years, adolescents, adulthood and nutrition in aging, Nutritional problems in changing society-Psychosocial influence on food habits, food & gender, food taboos, food choice, and Problem of malnutrition

Books Recommended

1.pauline C.Paul& HelenH palmer, Food Theory & application, John Wiley & sons
2.GladysG.Peckham , Foundations of Food Preparation, Macmillion Publication
3.Seema Yadav, Food hazards & Food Hygiene , Annco publication Pvt. Ltd.
4.Agarwal O.P. Agarwal's Text Book of Biochemistry, Goel Publishing House, Meerut
5. Stanley Davidson, Passmore, R. Brock, J.F. and Truswell A.S. Human Nutrition & Dietetics, the English language Book Society& Churchill Livingstone

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6. Shils Maurice, E. Modern Nutrition in Health & diseases, Young Vernon publishers
7.WHO, Trace elements in Human Nutrition & Health
8. Margaret mc Williams , Nutrition for growing Years- Jhon Wiely & Sons
9. Paul Field House, Food & Nutrition, Customs & culture, Chandan publishers
10.Z.S.C. Okoye Biochemical aspects of Nutrition, Prentice Hall of India

FST/P-612A FOOD SCIENCE & ANALYSIS 4 CH

Objective: To develop the skills on the quantification technique of various components, allergens present in food products.

Learning Outcome:

- Students will have a thorough understanding on the working principle and instrumentation of various instruments used in food analysis.
- The students will know the importance of various methods to identify any malfunction aspect of food.

Unit- I

Food production: Status, Scope, need and major constraints in growth of Food processing in India. Production & Processing Techniques in cereals,& millets, legumes, nuts & oil seeds,Fruits & Vegetables, Beverages, condiments & Spices, Confectionary products, Milk & Mlk Products, Meat & Meat products, Poultry,Seafoods.

Unit-II

Food Spoilage: Causes of food spoilage. Microorganism in food (mold, yeast, bacteria): primary sources, morphology, cultural characteristics and biochemical activities, of microorganism, factors affecting growth & survival of microorganism in food, physical & chemical means to control microorganism, contamination & spoilage of foods (cereals, sugar, vegetables & fruits, meat, fish, eggs, milk).

Unit- III

Food Processing & Preservation:Physico Chemical properties of Foods, Nutritive aspects of food constituents and effect of processing on them, colours in food & their affect in food processing. Flavour in food , Food additives . Preservation Techniques(Heating , Cooling, Dehydration, Irradiation, Microwave heating, and Fermentation).

Unit-IV

Food Analysis: Chromatographic techniques: Paper, TLC, GC, HPLC, Separation techniques: Gel filtration, dialysis, electrophoresis, ultra filtration and centrifugation, isotopic techniques. Immunoassay techniques; Isotopic, non-isotopic and enzyme immunoassays; thermal methods in food analysis (bomb calorimeter),colour and texture measurement techniques.

Recommended Books:

1.Douglas M, CousidineP.E. and GlennDComidine : Food & Food Production Encylopedia, CBS Publishers New Delhi

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2.Robin M, Philip : Convenience Foods – Recent Technologies Boyes Data Corporation New Jersey USA
3.Thomas Richards , M. JhonW, Finley: Chemical Changes in Food During Processing- AVI publication West Port, Connecticut
4.Lal G. Sidappa, C.E. Tandon , Preservation of Fruits & Vegetables.
5. Norman Desroisier , Technolgy of preservation The AVI publishers Inc.
6.Branen A.L. and Davidson, P.M. 1983. Antimicrobials in Foods. Marcel Dekker, Newyork.
7.Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York.
8.Robinson, R.K. Ed. 1983. Dairy Microbiology. Applied Science, London.
9.Banawart GJ. 1989. *Basic Food Microbiology*. 2nd Ed. AVI Publ.
10.Frazier J & Westhoff DC. 1988. *Food Microbiology*. 4th Ed. McGraw Hill.
11.Garbutt J. 1997. *Essentials of Food Microbiology*. Arnold Heinemann.
12.Jay JM, Loessner MJ & Golden DA. 2005. *Modern Food Microbiology*. 7th Ed. Springer.
13.Ray B. 2004. *Fundamentals of Food Microbiology*.3rd Ed. CRC.
14.Robinson RK. (Ed.). 1983. *Dairy Microbiology*. Applied Science.
15 Steinkraus KS. 1996. *Handbook of Indigenous Fermented Foods*. Marcel Dekker.
16. Walker , Wilson , Biochemical & Molecular Biology Techniques.
17.Leo ML. 2004. *Handbook of Food Analysis*. 2nd Ed. Vols. I-III.
18.Linden G. 1996. *Analytical Techniques for Foods and Agricultural Products*. VCH.
19.Macleod AJ. 1973. *Instrumental Methods of Food Analysis*. Elek Sci.Marcel Dekker.
20.Nielsen S. (Eds.). 1994. *Introduction to Chemical Analysis of Foods*. Jones & Bartlett.
21.Pomrenz Y & Meloan CE. 1996. *Food Analysis - Theory and Practice*. 3rdEd. CBS.
22.Ranganna S. 2001. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*. 2nd Ed. Tata-McGraw-Hill.
23.Robinson JW. 1970. *Undergraduate Instrumental Analysis*. Marcel Dekke

FST/P- 612B FOOD MARKETING & QUALITY CONTROL 4 CH

Objective: To develop the skills on the standardization of food products with respect to quality and its marketability worldwide.

Learning Outcome:

- Students will have a thorough understanding on marketing strategy for commercialization of the product.
- Students will have a thorough understanding on the quality attributes, their measurement principle and instrumentation of various instruments used in food quality analysis.
- The students will know the importance of various methods to identify any adulteration aspect of food.
- Students will have a thorough understanding on various food laws with their amendments and regulation guidelines followed in national and international level.

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Unit- I

Marketing of food products: Concepts and elements of marketing mix , market structure, micro and macro environments; Consumer behaviour; Marketing opportunities- Analysis, , Market measurement- present and future demand; Market forecasting; market segmentation, targeting and positioning, Allocation and marketing resources, Marketing Planning Process,

Unit-II

Product policy and planning: Product-mix; product line; product life cycle, New product development process. Product brand, packaging, services decisions. Marketing channel decisions, Pricing Decisions, Price determination and pricing policy of food products in organized and unorganized sectors.Promotion-mix decisions: Advertising , Deciding advertising objectives, advertising budget and advertising message, Media Planning, Personal Selling, Publicity; Sales Promotion .

Unit- III

Quality Control & Evaluation: Quality attributes- Physical, Chemical, Nutritional, Microbial & Sensory; Their measurements & evaluation, sensory Vis-avis instrumental methods for testing quality, Governmental Regulation of Food and nutrition labeling, various organizations dealing with inspection , traceability, authentication, certification & quality assurance(PFA, FPO, MPO, AGMARK, BIS etc)

Unit-IV

Food Packaging & Labeling: Principles & Characteristics of Packaging material, labeling and its types, codex guidelines, FDA guidelines for nutrition claims, ensuring proper labeling – guiding principles, Recent development on the food labeling front in India, Food fortification and Novel food production. Food safety, Sanitation and hazards, Food toxins, & Food adulteration.

Recommended Books:

1. Amerine MA, Pangborn RM & Rosslos EB. 1965. *Principles of Sensory Evaluation of Food*. Academic Press.
2. Early R.1995.*Guide to Quality Management Systems for Food Industries*. Blackie Academic.
3. Furia TE.1980. *Regulatory status of Direct Food Additives*. CRC Press. Florida.
4. Jellinek G. 1985. *Sensory Evaluation of Food - Theory and Practice*. EllisHorwoood.
5. Krammer A & Twigg BA.1973. *Quality Control in Food Industry*. Vol. I,II. AVI Publ. Westport.
6. Macrae R, Roloson R & Sadlu MJ. 1994. *Encyclopedia of Food Science &Technology & Nutrition*. Vol. XVI. Academic Press.
7. Piggot J.R. 1984. *Sensory Evaluation of Foods*. Elbview Applied Science.
8. Ranganna S. 2001. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*. 2nd Ed. Tata-McGraw-Hill. New Delhi
9. Export/Import policy by Govt. of India.
10. Birk, G.G., Herman, J.G. and Parker, K.J. Ed. -1977. Sensory Properties of Foods.Applied Science, London.

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11. Charalambous, G. and Inglett, G. 1981. The Quality of Foods and Beverages. (2 vol. set). Academic Press, New York.
12. Pattee, H.E. Ed. 1985. Evaluation of Quality of Fruits and Vegetables. AVI, Westport. Tannenbaum, S.R. Ed. 1979. Nutritional and Safety Aspects of Food Processing, marcel Dekker, New York.
13. Branson, R.E. and Norvell, D.G. 1983. Introduction to Agricultural Marketing McGrawHill Book Comp., New York.
14. Chowdhry, N.K. and Aggarwal, J.C. 1994. Dunkel Proposals. Vol. III. Shipra Pub.,New Delhi.
15. Darrah, L.B. 1971. Food Marketing. The Ronald Press Comp. New York.
16. Kacker, M. Ed. 1982. Marketing and Economic Development, Deep and Deep Pub.,New Delhi.
17. Rich, S.U. 1970. Marketing of Forest Products: Text and Cases, McGraw Hill BookComp., New York.
18. Shepherd, G.S. 1947. Marketing of Farm Products. The Lows State College Press, Ames, Lowa.
19. Painy, F.A. and Painy, H.Y. 1983. A Handbook of Food Packaging. Leonard Hill, Glasgow, UK.
20. Scicharow, S. and Griffin, R.C. 1970. Food Packaging. AVI, Westport.

FST/P-613 RESEARCH METHODOLOGY 4 CH
(Quantitative Analysis and Computer Application)

Objective: To develop the skills on statistical methods and to understand data analysis for writing up a dissertation/ thesis/research article.

Learning Outcome:

- Students will have a thorough understanding the arrangement of data to draw an analytical conclusion.
- The students will know the importance of various methods to design the research work.
- Students will have a thorough understanding on relation, deviation and accuracy of their experimental data..
- The students will know the importance of research work and have some contribution towards science.

Unit-I

Application of statistical concepts/procedure, Data, Diagrammatic representation of data, Probability, Measures of central tendency, Measures of dispersion, Skewness Kurtosis, Normal distribution: Simple correlation, multiple correlations, regression analysis, Sampling: Simple random sampling, Stratified random sampling, Systematic Sampling.

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Unit-II

Testing of Hypothesis, Tests: X^2 (Chi-square), 1 and F-tests, Analysis of variance, covariance: Principal component analysis, Experimental design, completely randomized block design, Randomized block design, Latin square design, one-way analysis of variance, Two way analysis of variance, follow up test: Non parametric procedure, Writing of research reports.

Unit-III

Windows and/or Linux operating system, programming fundamentals; Basics of high level programming language-c, Editing, compilation, and running a program storing data: Elementary numerical methods(as per requirement of the subject),Plotting graph, preparing paper/ report using latex.

Unit-IV

Role of Research methods and statistics in Food Science & Technology, Uses of MS excel : basics, creation of data file, analysis of data by various statistical methods and creation of charts & graphs. Use of SPSS : basics, creation of data file, analysis' of data by descriptive statistics, chi square &t test, correlation & regression, one way ANOVA etc

Recommended Books:

1. Bhattacharyya, D.K., Research Methodology Excel Books, New Delhi, II Edition,
2. Gupta, S.C. and kapoor, V.K S. Fundamentals of Mathematical Statistics, Chand, New Delhi.
3. Sinha, P.K. and Sinha, Priti Computer Fundamentals, BPB Publication Comdex Computer Course Kit, BPB Publication.
4. Russell, A. Stultz ,Learn Microsoft office, ,
5. Paul Young.,Scientific Social survey and Research -
6. T.S.Wilkinson and P.L.Bhandarkar Methodology and Techniques of Social Research - .Himalaya publishing house
7. C.R.Kothari Research Methodology – Methods and Techniques Wiley eastern limited
8. D.N.Elhance Fundamentals of Statistics-.
9. Garret and Word.Statistics in Psychology and Education-
10. S.P. Gupta.,Statistical Methods –Sultan Chandand Sons Publisher NewDelhi
11. Kulbir Singh Sidhu Methodology of Research.
12. M. Singhal,Elements of statistics- Theory and Practice-
13. S.K.Kapur ,Elements of practical Statistics –.
14. C.B.Gupta.,An Introduction to Statistical methods –

FST/P-614 DATA ANALYSIS & COMPUTER APPLICATION PRACTICAL 4 CH

1. Formulation of Research proposals.
2. Preparation of interview schedule, Questionnaire and other tools for collection and generation of data .

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3. Classification and tabulation of data.
4. Diagrammatic and graphical presentation of the data.
5. Statistical analysis: use of different statistical tools in the analysis of data.
6. Computer Application: computing concepts, disk operating system, Copy, delete, restore, format and other important commands, operation of windows, MS word, MS Excel, MS Power point etc.
7. Presentation of data: Preparation of line graph, histogram, bar diagram, pie diagrams etc. by the help of computer.
8. Computer application in data analysis – Calculation of average, Standard deviation, Correlation, regression, analysis of variance and other statistical tests (chi-square, 't' test and 'z' test) by the help of computer.
9. Any other related topics to be decided by the teachers' council.

Recommended Books:

1. A Hand Book of Methodology of Research – R.P.Devdas and Dr K.Kulandeivel – Sri Rama Krishna Mission Vidyalaya College of Education.
2. Research Methodology – Methods and Techniques C.R.Kothari – Wiley Eastern Ltd.
3. Methodology and Technique of Social Research – Wilkinson and Bhandarkar – Himalaya Publ. House.
4. Research method in Behavioural Science – S.M.Mohesin – Orient Longman Publication.
5. Statistical Methods-S.P.Gupta

FST/P-615 REVIEW OF RESEARCH PAPERS PUBLISHED IN REFERRED JOURNALS 4CH
Review of Report-2CH and Seminar-2CH

Each student has to select a topic for the review work immediately after admission. He/She shall undertake the work under the supervision of a recognized teacher of the Department. On the basis of the review of literature specifically research papers published in referred Journals on the topic selected, the student has to prepare a report and submit the same for evaluation by the teachers council. The student has to make a presentation of the review report before the faculty, Research scholars and students in the Department. Evaluation of the review report and seminar will be done by the teacher's council of the department.

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Chairman/Head Co-ordinator P.K.Naik S.Parida A.Priyadarshini

(Approved)

Vice-Chancellor