COURSE OUTLINE BRIEFS

INSTITUTE OF FOOD SCIENCE AND NUTRITION

SARGODHA UNIVERSITY
Pathway to Progress

FACULTY OF AGRICULTURE

Institute of Food Science and Nutrition

Academic Programs Offered

- BSc (Hons) Food Science & Technology
- BSc (Hons) Home Economics
- BSc (Hons) Human Nutrition and Dietetics
- MSc (Hons) Food Science and Technology
- MSc (Hons) Food and Nutrition
- PhD Food Science and Technology
- PhD Food and Nutrition

B.Sc. (Hons.) Food Science and Technology

Eligibility: At least 45% marks in F.Sc. (Pre-Medical/Pre-Engineering) or A Level
Duration: 04 Years Program (08 Semesters)
Degree Requirements: 133 Credit Hours

Semester-1

Course Code	Course Title	Credit Hours
URCE-5102	Language Comprehension & Presentation Skills	3(3+0)
URCI-5109	Introduction to Information & Communication Technologies	3(2+1)
URCP-5106	Pakistan Studies	2(2+0)
ZOOL-6141 / MATH-5128	Introduction to Biology I (for Pre-Engineering students) / Mathematics (for Pre-Medical students)	3(3+0)/ 3(3+0)
AGRO-5901	Basic Agriculture	3(2+1)
FSAT-5101	Introduction to Food Science and Technology	3(2+1)

Semester-2

URCE-5103	Academic Writing	3(3+0)
URCI-5105/ ISLS-5108	Islamic Studies / Ethics (for Non-Muslim Students)	2(2+0)/ 2(2+0)
AGEC-5501	Introduction to Agricultural Economics	3(3+0)
BIOT-5107	Microbiology	3(2+1)
FSAT-5102	Elements of Food and Nutrition	3(3+0)
FSAT-5103	Food Processing and Preservation	3(2+1)
URCC-5110	Citizenship Education and Community Engagement (Non-credit course)	3(1+2)

Semester-3

ANSC-5101	Introduction to Animal Husbandry	2(1+1)
PLBG-5201	Introductory Genetics	3(2+1)
ENTO-5102	Applied Entomology	3(2+1)
PLPT-5301	Introduction to Plant Pathogens	3(2+1)
FSAT-5104	Unit Operations in Food Processing	3(3+0)
FSAT-5105	Community Nutrition	3(3+0)

Semester-4

STAT-5126	Statistics for Agricultural Sciences	3(3+0)
AEXT-5402	Communication Skills in Agricultural Extension	3(2+1)
HORT-5602	Horticultural Crop Production	3(2+1)
FSAT-5106	Food Safety and Laws	3(3+0)
FSAT-5107	Food Packaging	2(2+0)
FSAT-5108	Plant Design and Layout	3(3+0)

Semester-5

FSAT-6109	Food Process Engineering	3(3+0)
FSAT-6110	Fruit and Vegetable Processing	3 (2+1)
FSAT-6111	Food Analysis and Sensory Evaluation	3(1+2)
FSAT-6112	Milk Handling and Processing	3(2+1)
FSAT-6113	Introduction to Cereal Technology	3(2+1)
FSAT-6114	Food Biochemistry	3(3+0)

Semester-6

FSAT-6115	Sugar Technology	3(2+1)
FSAT-6116	Poultry, Egg and Sea Food Technology	3(2+1)
FSAT-6117	Baking Science and Technology	3(2+1)
FSAT-6118	Post-Harvest Technology	3(2+1)
FSAT-6119	Dairy Technology	3(2+1)
FSAT-6120	Beverage Technology	3(2+1)

Semester-7

FSAT-6121	Food Product Development and Service Management	3(2+1)
FSAT-6122	Technology of Oils and Fats	3(2+1)
FSAT-6123	Confectionery and Snack Foods	2(2+0)
FSAT-6124	Meat Technology	3(2+1)
FSAT-6125	Food Microbiology	3(2+1)

Semester-8

BUSB-6124	Entrepreneurship and SME Management	3(3+0)
FSAT-6126	Food Biotechnology	3(2+1)
FSAT-6127	Food Quality Management	3(3+0)
FSAT-6128	Internship and Report Writing	4(0+4)
FSAT-6129	Introduction to Research and Scientific Writing	2(1+1)

URCE-5102 Language Comprehension & Presentation Skills 3(3+0)

The course aims at developing linguistic competence by focusing on basic language skills in integration to make the use of language in context. It also aims at developing students' skills in reading and reading comprehension of written texts in various contexts. The course also provides assistance in developing students' vocabulary building skills as well as their critical thinking skills. The contents of the course are designed on the basis of these language skills: listening skills, pronunciation skills, comprehension skills and presentation skills. The course provides practice in accurate pronunciation, stress and intonation patterns and critical listening skills for different contexts. The students require a grasp of English language to comprehend texts as organic whole, to interact with reasonable ease in structured situations, and to comprehend and construct academic discourse. The course objectives are to enhance students' language skill management capacity, to comprehend text(s) in context, to respond to language in context, and to write structured response(s).

Contents

1 Listening skills
2 Listening to isolated sentences and speech extracts
3 Managing listening and overcoming barriers to listening
4 Expressing opinions (debating current events) and oral synthesis of thoughts and ideas
5 Pronunciation skills
6 Recognizing phonemes, phonemic symbols and syllables, pronouncing words correctly
7 Understanding and practicing stress patterns and intonation patterns in simple sentences
8 Comprehension skills
9 Reading strategies, summarizing, sequencing, inferencing, comparing and contrasting
10 Drawing conclusions, self-questioning, problem-solving, relating background knowledge
11 Distinguishing between fact and opinion, finding the main idea, and supporting details
12 Text organizational patterns, investigating implied ideas, purpose and tone of the text
13 Critical reading, SQ3R method
14 Presentation skills, features of good presentations, different types of presentations
15 Different patterns of introducing a presentation, organizing arguments in a presentation
16 Tactics of maintaining interest of the audience, dealing with the questions of audience
17 Concluding a presentation, giving suggestions and recommendations

Recommended Texts

1 Mikulecky, B. S., & Jeffries, L. (2007). *Advanced reading power: Extensive reading, vocabulary building, comprehension skills, reading faster*. New York: Pearson.
2 Helgesen, M., & Brown, S. (2004). *Active listening: Building skills for understanding*. Cambridge: Cambridge University Press.

Suggested Readings

1 Roach, C. A., & Wyatt, N. (1988). *Successful listening*. New York: Harper & Row.
2 Horowitz, R., & Samuels, S. J. (1987). *Comprehending oral and written language*. San Diego: Academic Press.

URCI-5109 Introduction to Information & Communication Technologies 3 (2+1)

The course introduces students to information and communication technologies and their current applications in their respective areas. Objectives include basic understanding of computer software, hardware, and associated technologies. They can make use of technology to get maximum benefit related to their study domain. Students can learn how the Information and Communications systems can improve their work ability and productivity. How Internet technologies, E-Commerce applications and Mobile Computing can influence the businesses and workplace. At the end of semester students will get basic understanding of Computer Systems, Storage Devices, Operating systems, E-commerce, Data Networks, Databases, and associated technologies. They will also learn Microsoft Office tools that includes Word, Power Point, Excel. They will also learn Open office being used on other operating systems and platforms. Specific software's related to specialization areas are also part of course.. Course will also cover Computer Ethics and related Social media norms and cyber laws.

Contents

1. Introduction, Overview and its types.
2. Hardware: Computer Systems & Components, Storage Devices and Cloud Computing.
3. Software: Operating Systems, Programming and Application Software,
4. Introduction to Programming Language
5. Databases and Information Systems Networks
6. The Hierarchy of Data and Maintaining Data,
7. File Processing Versus Database Management Systems
8. Data Communication and Networks.
9. Physical Transmission Media & Wireless Transmission Media
10. Applications of smart phone and usage
11. The Internet, Browsers and Search Engines.
12. Websites Concepts, Mobile Computing and their applications.
13. Collaborative Computing and Social Networking
14. E-Commerce & Applications.
15. IT Security and other issues
16. Cyber Laws and Ethics of using Social media
17. Use of Microsoft Office tools (Word, Power Point, Excel), mobile apps or other similar tools depending on the operating system.
18. Other IT tools/software specific to field of study of the students if any

Recommended Texts

1. Vermaat, M. E. (2018). *Discovering computers: digital technology, data and devices.* Boston: Course Technology Press.

Suggested Readings

1. Timothy J. O'Leary & Linda I. (2017). *Computing essentials*, (26th ed.). San Francisco: McGraw Hill Higher Education.
2. Schneider, G. M., & Gersting, J. (2018). *Invitation to computer science*. Boston: Cengage Learning.

URCP-5106 Pakistan Studies 2(2+0)

The course is designed to acquaint the students of BS Programs with the rationale of the creation of Pakistan. The students would be apprised of the emergence, growth and development of Muslim nationalism in South Asia and the struggle for freedom, which eventually led to the establishment of Pakistan. While highlighting the main objectives of national life, the course explains further the socio-economic, political and cultural aspects of Pakistan's endeavours to develop and progress in the contemporary world. For this purpose, the foreign policy objectives and Pakistan's foreign relations with neighbouring and other countries are also included. This curriculum has been developed to help students analyse the socio-political problems of Pakistan while highlighting various phases of its history before and after the partition and to develop a vision in them to become knowledgeable citizens of their homeland.

Contents

1. Contextualizing Pakistan Studies
2. Geography of Pakistan: Geo-Strategic Importance of Pakistan
3. Freedom Movement (1857-1947)
4. Pakistan Movement (1940-47)
5. Muslim Nationalism in South Asia
6. Two Nations Theory
7. Ideology of Pakistan
8. Initial Problems of Pakistan
9. Political and Constitutional Developments in Pakistan
10. Economy of Pakistan: Problems and Prospects
11. Society and Culture of Pakistan
12. Foreign Policy Objectives of Pakistan and Diplomatic Relations
13. Current and Contemporary Issues of Pakistan
14. Human Rights: Issues of Human Rights in Pakistan

Recommended Texts

1. Kazimi, M. R. (2007). *Pakistan studies.* Karachi: Oxford University Press.
2. Sheikh, J. A. (2004). *Pakistan's political economic and diplomatic dynamics.* Lahore: Kitabistan Paper Products.

Suggested Readings

1. Hayat, S. (2016). *Aspects of Pakistan movement.* Islamabad: National Institute of Historical and Cultural Research.
2. Kazimi, M. R (2009). *A concise history of Pakistan.* Karachi: Oxford University Press.
3. Talbot, I. (1998). *Pakistan: A modern history*. London: Hurst and Company.

ZOOL-6141 Introduction to Biology I 3(3+0)

This subject aims to yield students with a sense of practical relevance of biology to everyday life. This will make students comprehend life by understanding some of the molecular processes that occur in and around cells, to make students cognizant of biologic phenomenon (nature, body, etc.) on an evolutionary, ecological, behavioral, physiologic, tissue, cellular, and molecular level. In this subject students will examine how life is organized into hierarchical levels; how living organisms use and produce energy; how life grows, develops, and reproduces; how life responds to the environment to maintain internal stability; and how life evolves and adapts to the environment. Moreover, it will also enable them to investigate the biological molecules, homeostasis in vertebrates, and the influence of hormones on coordination and control systems of animal body. Upon completion of this subject students will be have an enhanced knowledge and appreciation of the basics of growth and development plans of animals and can develop cogent and critical arguments based on the course material.

Contents

1. Introduction: Nature and scope of biology
2. Branches of biology
3. Relationship between biology and psychology
4. Biological molecules: Carbohydrates, Proteins, Fats, Nucleic acids, Water
5. The cell: Structure and function of cell
6. Cell organelles
7. Different types of cells
8. Homeostasis: Osmoregulation
9. Structure and functions of Nephron
10. Thermoregulation
11. Coordination and control: Structure and physiology of Neuron
12. Introduction to central and peripheral nervous system
13. Hormones
14. Basics of growth and development
15. Embryonic and post embryonic development

Recommended Texts

1. Michael, J., & Lenardo. (2013). *Immune Homeoststis: Methods and protocols*. New Jersey: Humama press.
2. Paradise, C. J., & Campbell, A. M. (2016). *Organismal Homeostasis*. New York: Momentum Press.

Suggested Readings

1. Lisa A. U., Michael L. C., Steven A. W., Peter V. M., Jane B. R., & Neil A. C. (2016). *Campbell biology*. (11th ed.) London: Pearson.
2. Cambell, N. A. Mitchell, l. G., & Reece, J. B. (2009). *Biology: Concepts and connections.* (6th ed.) San Francisco: Addison Wesley, Longman
3. Anna A. S., Richard B. P. (2019). *An Introduction to Conservation Biology* (2nd ed.) Oxford: Oxford University Press.

MATH-5128 **Mathematics** **3(3+0)**

To prepare the students, not majoring in mathematics, with the essential tools of algebra to apply the concepts and the techniques in their respective disciplines. Mathematics, as a study of patterns, both practical and abstract, involves analytical thought, logical reasoning, problem solving skills, and precise communication. Because of its power and versatility, mathematics has often been called the "Queen of the Sciences." There is no field of scientific inquiry that does not express itself through the language of mathematics. An undergraduate degree in mathematics provides an excellent foundation for students who are interested in pursuing an advanced degree in mathematics or in a related specialized profession. Mathematics can also provide an excellent foundation for students considering professional degrees in such allied fields such as Law, Business Administration, or Medicine. The kinds of analytical and logical thinking skills that one develops while studying mathematics are precisely the skills that recruiters look for in potential employees. Jobs involving significant mathematical background also consistently rank near the top of the list in annual career surveys.

Contents

1 Real Numbers
2 Relations and Functions
3 Inequalities
4 Quadratic Functions and Complex Numbers
1 Linear Equations and Quadratic Equations: Formation of Linear equation
2 Solving Linear equation involving one variable
3 Solution of Quadratic equation by factorization method
4 Solution of quadratic equation by square completion methods
5 Solution of quadratic equation by quadratic formula
5 Application of quadratic equation
6 Sequence and Series
7 Types of Sequences; A. P, A. M., G. P., H. P
8 Trigonometric Functions
9 Trigonometric Applications
10 Graph of Functions and Modelling
11 Limits and Continuity
12 Derivatives
13 Integration
14 Probability and Binomial Theorem.

Recommended Texts

1. Gantert, A. X. (2009). *Algebra 2 and trigonometry*. New York: AMCOS School Publication INC.
2. Kaufmann, J. E. (1994). *College algebra and trigonometry* (3th ed.) Boston: PWS-Kent Pub. Co.

Suggested Readings

1. Swokowski, E. W. (1993). *Fundamentals of algebra and trigonometry* (8th ed.) Boston: PWS-Kent Pub. Co.
2. Nauman, K. (2019). Basic mathematics-I: algebra and trigonometry (2nd ed.) Lahore: Al-Hassan Pub.
3. Anton, H. (1999). *Calculus: A new horizon* (6th ed.). New York: John Wiley.
4. Stewart, J. (2012). *Calculus* (7th ed.). Belmont: Brooks/Cole.

AGRO-5901 **Basic Agriculture** **3(2+1)**

This course is aimed to provide the basic knowledge and background about Pakistan's Agriculture. Agriculture, farming, cultivation, crop growing, gardening; these words describe the word agriculture but not how it is viewed in today's modern times. Why study agriculture? Agriculture is an ancient practice and key to sustaining human development on planet Earth. Today, the way we go about agriculture has changed dramatically with the introduction of technology that has revolutionized production and distribution. If you are looking for a career that touches all disciplines, including science and math, in a fast paced environment that will touch people's lives around the world, a degree in agriculture might just be for you. The importance of agriculture in today's world is critical. Much of the world still relies heavily on what we produce from the land, and as development throughout the world continues, so will demand. The introduction of technology has reshaped much of the industry which is constantly advancing the way we farm around the world.

Contents (Theory)

1 Agriculture, History, Importance, Branches and Allied Sciences
2 Salient features of Pakistan's agriculture. Climate, Land and Water resources
3 Agro ecological zones of Pakistan
4 Farming systems
5 Tillage objectives and types
6 Seed types and quality
7 Crop nutrients, Manures and fertilizers, Sources and methods of application
8 Irrigation systems, Types and management
9 Crop protection measures
10 Crop rotation. Harvesting, Processing, Storage and Marketing of farm produce
11 Agro-based industries
12 Environmental pollution and Health hazards

Contents (Practical)

1 Land measuring units.
2 Demonstration of hand tools and tillage implements.
3 Identification of meteorological instruments.
4 Identification of crop plants, weeds and seeds.
5 Identification of organic and inorganic fertilizers.
6 Calculation of nutrient-cum-fertilizer unit value.
7 Demonstration of various irrigation methods.
8 Field visits.

Recommended Texts

1 Asif, M. (2013). *Crop production*. London: InTech Open Ltd., under CCBY license.
2 Cheema, Z. A., & Farooq, M. (2007). *Agriculture in Pakistan*. Lahore: Allied Book Centre, Urdu Bazar.

Suggested Readings

1 Abbas, M. A. (2006). *General agriculture*. Lahore: Emporium Urdu Bazar.
2 Balasubramanian, K. (2004). *Principles and practices of agronomy*. Jodhpur: Agro bios.

FSAT-5101 Introduction to Food Science and Technology 3 (2+1)

This is an introductory course which enables the students to understand the basics of food science and technology. Students will explore and gain an understanding into the history of Food Science and the factors that have shaped Food Science in Pakistan, the organizations involved in Food manufacturing, food regulatory processes, Food composition, its classification depending on sources, consumption pattern and basic analysis of food components. The course is the study of the physical, biological, and chemical makeup of food; the causes of food deterioration; and the concepts underlying food processing. Food scientists and technologists apply scientific disciplines including chemistry, engineering, microbiology, and nutrition to the study of food to improve the safety, nutrition, wholesomeness and availability of food. Depending on their area of specialization, food scientists may develop ways to process, preserve, package, and/or store food according to industry and government specifications and regulations. It could involve enhancing the taste, making it last longer, making sure it's safe to eat, or even boosting its nutritional content.

Contents (Theory)

1 Introduction to food science, food technology, relationship with other disciplines
2 Career opportunities.
3 Significance of food science and technology
4 Food industry: history, developments
5 Important food industries in Pakistan
6 Food sources: plants, animals and marine
7 Food constituents and their functions: water, carbohydrates, lipids, proteins, vitamins, minerals.
8 Classification of foods on the basis of perishability and pH
9 Food spoilage agents: enzymes, microorganisms, pests, physical factors
10 Principles of food preservation
11 Prevention or delay of autolysis, microorganisms and pests

Contents (Practical)

1 Use of basic food laboratory equipment.
2 Estimation of Moisture, Fat, Protein, Carbohydrates, Fiber and Ash content in food samples.
3 Determination of soluble solids, total solids, pH, Acidity, total sugars, Specific gravity and Refractive index.

Recommended Texts

1 Awan, J. A. (2018). *Food science and technology*. Faisalabad: Unitech Communications.
2 Robert, L. S., Ramirez, A. O., & Clarke, A. D. (2015). *Introducing food science*. (2nd ed.) Florida: CRC Press.

Suggested Readings

1 Stewart, G. F., & Amerine, M. A. (2012). *Introduction to food science and technology*. Amsterdam: Elsevier.
2 Potter, N. N., & Hotchkiss, J. H. (2012). *Food science*. Berlin: Springer Science & Business Media.

URCE-5103 **Academic Writing** **3 (3+0)**

Academic writing is a formal, structured and sophisticated writing to fulfill the requirements for a particular field of study. The course aims at providing understanding of writer's goal of writing (i.e. clear, organized and effective content) and to use that understanding and awareness for academic reading and writing. The objectives of the course are to make the students acquire and master the academic writing skills. The course would enable the students to develop argumentative writing techniques. The students would be able to the content logically to add specific details on the topics such as facts, examples and statistical or numerical values. The course will also provide insight to convey the knowledge and ideas in objective and persuasive manner. Furthermore, the course will also enhance the students' understanding of ethical considerations in writing academic assignments and topics including citation, plagiarism, formatting and referencing the sources as well as the technical aspects involved in referencing.

Contents

1 Academic vocabulary
2 Quoting, summarizing and paraphrasing texts
3 Process of academic writing
4 Developing argument
5 Rhetoric: persuasion and identification
6 Elements of rhetoric: Text, author, audience, purposes, setting
7 Sentence structure: Accuracy, variation, appropriateness, and conciseness
8 Appropriate use of active and passive voice
9 Paragraph and essay writing
10 Organization and structure of paragraph and essay
11 Logical reasoning
12 Transitional devices (word, phrase and expressions)
13 Development of ideas in writing
14 Styles of documentation (MLA and APA)
15 In-text citations
16 Plagiarism and strategies for avoiding it

Recommended Texts

1 Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks and skills* (3rd ed.). Ann Arbor: The University of Michigan Press.
2 Bailey, S. (2011). *Academic writing: A handbook for international students* (3rd ed.). New York: Routledge.

Suggested Readings

1 Craswell, G. (2004). *Writing for academic success*. London: SAGE.
2 Johnson-Sheehan, R. (2019). *Writing today*. Don Mills: Pearson.
3 Silvia, P. J. (2019). *How to write a lot: A practical guide to productive academic writing*. Washington: American Psychological Association.

URCI-5105 **Islamic Studies** **2(2+0)**

Islamic Studies engages in the study of Islam as a textual tradition inscribed in the fundamental sources of Islam; Qur'an and Hadith, history and particular cultural contexts. The area seeks to provide an introduction to and a specialization in Islam through a large variety of expressions (literary, poetic, social, and political) and through a variety of methods (literary criticism, hermeneutics, history, sociology, and anthropology). It offers opportunities to get fully introductory foundational bases of Islam in fields that include Qur'anic studies, Hadith and Seerah of Prophet Muhammad (PBUH), Islamic philosophy, and Islamic law, culture and theology through the textual study of Qur'an and Sunnah..

Islamic Studies is the academic study of Islam and Islamic culture. It majorly comprises of the importance of life and that after death. It is one of the best systems of education, which makes an ethical groomed person with the qualities which he/she should have as a human being. The basic sources of the Islamic Studies are the Holy Qur'an and Sunnah or Hadith of the Holy Prophet Muhammadﷺ. The learning of the Qur'an and Sunnah guides the Muslims to live peacefully.

Contents

1. Study of the Qur'an (Introduction to the Qur'an, Selected verses from *Surah Al-Baqarah, Al-Furqan, Al-Ahzab, Al-Mu'minoon, Al-An'am, Al-Hujurat, Al-Saff*)
2. Study of the Hadith (Introduction to Hadith literature, Selected Ahadith (Text and Translation)
3. Introduction to Qur'anic Studies
4. Basic Concepts of Qur'an
5. History of Quran
6. Basic Concepts of Hadith
7. History of Hadith
8. Kinds of Hadith
9. Uloom –ul-Hadith
10. Sunnah & Hadith
11. Seerat ul-Nabi (PBUH), necessity and importance of Seerat, role of Seerah in the development of personality, Pact of Madinah, Khutbah Hajjat al-Wada' and ethical teachings of Prophet (PBUH).
12. Legal Position of Sunnah
13. Islamic Culture & Civilization
14. Characteristics of Islamic Culture & Civilization
15. Historical Development of Islamic Culture & Civilization
16. Comparative Religions and Contemporary Issues
17. Impact of Islamic civilization

Recommended Texts

1. Hassan, A. (1990). *Principles of Islamic jurisprudence*. New Dehli: Adam Publishers.
2. Zia-ul-Haq, M. (2001). *Introduction to al-Sharia al-Islamia*. Lahore: Aziz Publication.

Suggested Readings

1. Hameedullah, M. (1957). *Introduction to Islam*. Lahore: Sh M Ashraf Publisher.
2. Hameedullah, M. (1980). *Emergence of Islam*. New Dehli: Adam Publishers.
3. Hameedullah, M. (1942). *Muslim conduct of state.* Lahore: Sh M Ashraf Publisher.

ISLS-5108 **Ethics** **2(2+0)**

This course is an introduction to the philosophical study of morality, including the theory of right and wrong behavior, the theory of value (goodness and badness), and the theory of virtue and vice. Besides providing familiarity with the primary questions addressed within moral philosophy and the most influential answers given by well-known philosophers, this course is designed to help students develop their abilities to read, explicate, analyze, and evaluate philosophical literature, write and express themselves well about their own ethical positions, and think critically and analytically about ethical issues. This course is intended for the student who has had little or no prior exposure to philosophy. It will provide a broad but reasonably detailed examination of the central issues of moral philosophy and will also consider how these can be applied to several contemporary moral problems. This course has been designed to familiarize students to learn about some of the most important theories and figures of moral philosophy in the hope that you can develop a clear understanding of the questions that recur in ethical debate.

Contents

1. Overview of Moral Philosophy
2. Theoretical ethics
3. Moral concepts and justify moral principles and theories
4. Applied ethics: an Islamic point of view
5. Metaphysics and Morality
6. Moral Objectivism and Relativism
7. Features of moral objectivism
8. Qur'an and Sunnah on Ethics
9. Individual relativism:
10. God and Morality
11. Criticism and its manners
12. Reason and Emotion
13. Principles of moral reasoning
14. Ethics in *Seerah* and *Taswwuf*
15. Gender and Morality
16. Significant Muslim masters of ethics
17. Rule-utilitarianism, Moral foundations of authorities
18. The social contract, Libertarianism, Welfare liberalism.

Recommended Texts

1. Mackenzie, J. S., & Glasg, L. L. D. (1983). *A manual of ethics*. London: University Tutorial Press.
2. Nadwi, S. S. (1999). *Ethics in Islam*. Karachi: Darul-Ishaat.

Suggested Readings

1. Williams, B. (1972). *Morality: An Introduction to Ethics*. Cambridge: Cambridge University Press.
2. Cahn, S.M., & Markie, P. (2019). *History, Theory, and Contemporary Issues*. Oxford: Oxford University Press.

AGEC-5501 Introduction to Agricultural Economics 3 (3+0)

After completing the course, students will develop understanding of the basic concepts of economics and their application in agriculture. Agricultural economics is a branch of applied economics that takes the tools of both micro and macroeconomics and uses them to solve problems in a specific area. With food inflation soaring and agricultural disputes at the heart of the collapse of the latest round of world trade talks, the subject has seldom been so topical. At the micro level, we need to understand the relevant production functions and the relationship between labour and capital. Most courses will also look at the by-products (externalities) of some types of agricultural production, such as the effect of increased nitrogen fertilizer use. Equally, we can use consumer theory to understand how shoppers make choices about the food they buy (including diets and fads). Many courses will also look at the food sector more generally, and ask whether there is excessive market power in the hands of supermarkets.

Contents

1 Definitions and overview of economics and related terms
2 Subject matter and scope
3 Theory of consumer behavior
4 Scale of preferences
5 Utility, Indifference curve and related concepts
6 Demand and supply analysis
7 Elasticity of demand and supply
8 Market equilibrium
9 Production, Factors of production
10 Laws of return and their significance in agriculture
11 Concept of macroeconomics
12 Approaches to national income estimation
13 Growth, Unemployment and inflation
14 Important macroeconomic issues in agriculture sector of Pakistan

Recommended Texts

1 Gray, L. C. (2013). *Introduction to agricultural economics*. New York: Read Books Ltd.
2 Penson, J. B., Capps, O., Rossen, C. P., & Woodward, R. (2013). *Introduction to agricultural economics*. (5th ed.) New Jersey: Prentice Hall.

Suggested Readings

1 Mankiw, N. G. (2011). *Principles of economics.* (5th ed.) Boston: Cengage learning Publisher.
2 Cramer, G., Jensen C. W., & Southgate, D. D. (2001). *Agricultural economics and agribusiness*. (8th ed.) New Jersey: Wiley Publisher.

BIOT-5107 **Microbiology** **3 (2+1)**

This course aims to familiarize students with fundamentals of prokaryotic and eukaryotic microbial life including viruses. In this course students will learn about culturing of bacteria, nutritional requirements of microbes and control of microbes. Students will also learn about the importance of microbes in our life. This course will also help to student about knowledge of antibiotics and their mode of action. Students learning this course will be able to complete a substantial research project related to microbiology; seek and employ insights from others in implementing the project; evaluate a significant challenge or question faced in the project in relation to core concepts, methods or assumptions in microbiology; and describe the effects of learning outside the classroom on his or her research or practical skills. Food Microbiologists also develop new and rapid methods to detect pathogenic and spoilage microorganisms in foods. They study the genetic make-up of microorganisms to determine why bacteria have virulence and cause disease.

Contents (Theory)

1 Overview and history of microbiology including microbial diversity (Archaea, bacteria, fungi, algae, protozoa)
2 Nutrition and growth of microbes
3 Metabolism of microbes
4 Cultivation of microbes
5 Viruses
6 Control of microorganisms:
7 Sterilization and disinfection,
8 Antimicrobial agents
9 Antibiotics, antibiotic resistance and susceptibility
10 Antifungal and antiviral agents; cell death
11 Symbiosis
12 Carbon, nitrogen, sulfur and phosphorus cycles
13 Microbiology of soil
14 Microbiology of freshwater and seawater

Contents (Practical)

1 Sterilization techniques; culturing of bacteria in liquid and on solid medium
2 Gram-staining of bacteria
3 colony and cell morphology; bacterial cell count and growth curves; biochemical tests

Recommended Texts

1 Tortora, G. J., Case, C. L., & Funke, B. R. (2016). *Microbiologia.* (12th ed.) London: Pearson.
2 Talaro, K. P. (2009). *Foundations in microbiology: basic principles.* (7th ed.) New York: McGraw Hill Publisher.

Suggested Readings

1 Parija, S. (2016). *Textbook of microbiology and immunology*. (3rd ed.) Amsterdam: Elsevier.
2 Alcamo, I. E., (2010). *Fundamentals of microbiology*. (9th ed.) Massachusetts: Jones & Bartlett Publishers.
3 Cappuccino, J. G., & Sherman, N. (2016). *Microbiology: a laboratory manual*. (10th ed.) London: Pearson Education.

FSAT-5102 Elements of Food and Nutrition 3 (3+0)

This course enables the students to understand the composition, food processes and their interaction with health and diseases. The students learn how to prevent and cure the nutritional disorders. Nutrition has been playing a big role in our lives, affecting daily habits and health behaviours. A career in nutrition is ideal for those seeking to promote a balanced lifestyle and improve people's diets, while helping them to keep a healthy weight, boost their immune system, increase their energy levels, and reduce the risk of developing certain diseases. This course opens up different avenues for future, and depending on the role you choose, could make a real difference to people's lives. A nutritionist can help people to lead healthier lives through education in food and nutrition, or enhance their mental and physical performance through specially designed diets. Nutritionist could become a food analyst or work in public health – and look at the chemical and physical properties of food, or conduct tests for bacteria and disease.

Contents

1 Introduction: Food, diet, balanced diet, nutrients food groups, food guide pyramid, meal planning, menu planning, diet therapy, principles/factors of diet selection
2 Nutritional status assessment
3 Eating Food: Smell, taste, satiety
4 Water: Functions, sources, regulation in body, dietary requirements, content in food
5 Carbohydrates: Types, role in body, dietary fiber, sweeteners, dietary requirements, content in food.
6 Fats and Oils: Types, functions, dietary requirements, content in food, fat substitutes
7 Proteins: Amino acids, protein synthesis, classification, functions, quality of proteins, dietary requirements, content in foods
8 Vitamins: Classification, functions, deficiency and excess, content in food
9 Mineral Elements: Classification, functions, deficiency and excess, content in food
10 Digestion: Alimentary tract, digestive juices, secretions
11 Absorption and Metabolism of Nutrients: Carbohydrates, protein, lipids
12 Nutrient and Dietary Deficiency Disorders: Malnutrition, obesity, coronary diseases, diabetes, lactose and gluten intolerance, dental caries-symptoms, causes, prevention
13 Acid-Alkaline and Electrolytes status in relation to health and diseases
14 Different values of foods in nutrition
15 Nutrients and genes

Recommended Texts

1 Awan, J. A. (2007). *Elements of food and nutrition*. Faisalabad: Unitech Communications.
2 Gibney, M. J., Lanham-New, S. A., Cassidy, A., & Vorster, H. H. (2013). *Introduction to human nutrition*. (2nd ed.) Chichester: John Wiley & Sons.

Suggested Readings

1 Geissler, C., & Powers, H. (2017). *Human nutrition*. (13th ed.) Oxford: Oxford University Press.
2 Whitney, E. N., & Rolfes, S. R. (2018). *Understanding nutrition*. (15th ed.) Boston: Cengage Learning.

FSAT-5103 Food Processing and Preservation 3 (2+1)

The course provides students the knowledge and training on the process and the impact of the process on food product quality. The student will learn general processing flow for various food products, physical principles of operation for various types of equipment and impact of the processing on the physical, chemical and sensory properties of the food products. In the food processing industry, workers convert food materials from their raw unprocessed states into consumable items. Continue reading this article to learn more about education options and career prospects in the field of food processing. Food processing is the sector of food production whereby raw food materials, such as grains, livestock and fruit, become food items for sale in supermarkets, butcher shops and other food retail locations. Food processing occupations include bakers, butchers and food cooking machine operators. Food scientists are also part of this industry; these workers may develop new ways to process and package foods, research food additives or enforce sanitation laws at food processing sites.

Contents (Theory)

1 Preparation of Foods for food processing:
2 Introduction, Properties of raw materials, Storage and Transportation of raw materials.
3 Preparatory Operations: Cleaning, Sorting, Grading, Size reduction, Blanching, sulphiting.
4 Heat Processing: Methods thermisation, Pasteurization, HTST, Commercial sterilization, UHT.
5 Canning: Unit operations. Retort Operation. Equipment. Effect of heat processing on nutrients and microorganisms.
6 Low Temperature Preservation. Refrigeration: Methods and equipment.
7 Cold storage: requirements, insulation, air circulation, humidity, refrigeration load, controlled atmospheric storage.
8 Freezing: Theory, Methods, Equipment and Changes in foods.
9 Evaporation and Dehydration: Evaporation concentration and Condensation. Principles, Equipment, Applications.
10 Drying: Principles, Equipments, Types of driers. Dehydration: Applications, Dehydrated products vegetables, fruits and milk.
11 Use of Chemical Additives: Contaminants, Adulterants, Additives. Food Additives: Classification, Criteria for selection, Effect on food properties, Detection methods.

Contents (Practical)

1 Bottling/canning of selected fruits, vegetables.
2 Cold storage of fruits and vegetables. Freezing of fruits and vegetables.
3 Dehydration of fruits and vegetables. Use of chemicals in preservation of food products.
4 Production of vinegar, yoghurt and pickles. Evaluation of bottled, frozen and dehydrated products. Visit to food industries.

Recommended Texts

1 Rahman, M. S. (2007). *Handbook of food preservation*: Florida: CRC press.
2 Awan, J. A. (2011). *Food processing and preservation*. Faisalabad: Unitech Communications.

Suggested Readings

1 Fellow, P. J. (2005). *Food processing technology: principles and practices.* (2nd ed.) Florida: CRC Press, Taylor and Francis Group, Boca Raton.
2 Brennan, J. G. (2006). *Food processing handbook*. Weinheim: Wiley-VCH Verlag GmbH and Co. KGaA.

URCC-5110 Citizenship Education and Community Engagement 3 (1+2)

In recent years, community engagement has become a central dimension of governance as well as policy development and service delivery. However, efforts to directly involve citizens in policy processes have been bedeviled by crude understandings of the issues involved, and by poor selection of techniques for engaging citizens. This course will provide a critical interrogation of the central conceptual issues as well as an examination of how to design a program of effective community engagement. This course begins by asking: Why involve citizens in planning and policymaking? This leads to an examination of the politics of planning, conceptualizations of "community" and, to the tension between local and professional knowledge in policy making. This course will also analyze different types of citizen engagement and examine how to design a program of public participation for policy making. Approaches to evaluating community engagement programs will also be a component of the course. Moreover, in order to secure the future of a society, citizens must train younger generations in civic engagement and participation. Citizenship education is education that provides the background knowledge necessary to create an ongoing stream of new citizens participating and engaging with the creation of a civilized society.

Contents

1 Introduction to Citizenship Education and Community Engagement: Orientation
2 Introduction to Active Citizenship: Overview of the ideas, Concepts, Philosophy and Skills
3 Identity, Culture and Social Harmony: Concepts and Development of Identity
4 Components of Culture and Social Harmony, Cultural & Religious Diversity
5 Multi-cultural society and inter-cultural dialogue: bridging the differences, promoting harmony
6 Significance of diversity and its impact, Importance and domains of inter-cultural harmony
7 Active Citizen: Locally active, Globally connected
8 Importance of active citizenship at national and global level
9 Understanding community, Identification of resources (human, natural and others)
10 Human rights, Constitutionalism and citizens' responsibilities: Introduction to human rights
11 Universalism vs relativism, Human rights in constitution of Pakistan
12 Public duties and responsibilities
13 Social Issues in Pakistan: Introduction to the concept of social problem, Causes and solutions
14 Social Issues in Pakistan (Poverty, Equal and Equitable access of resources, unemployment)
15 Social Issues in Pakistan (Agricultural problems, terrorism & militancy, governance issues)
16 Social action and project: Introduction and planning of social action project
17 Identification of problem, Ethical considerations related to project
18 Assessment of existing resources

Recommended Texts

1 Kennedy, J. K., & Brunold, A. (2016). *Regional context and citizenship education in Asia and Europe*. New York: Routledge Falmer.
2 Macionis, J. J., & Gerber, M. L. (2010). *Sociology*. New York: Pearson Education

Suggested Readings

1 British Council. (2017). *Active citizen's social action projects guide.* Scotland: British Council
2 Larsen, K. A., Sewpaul, V., & Hole, G. O. (Eds.). (2013). *Participation in community work: International perspectives.* New York: Routledge.

ANSC-5101 Introduction to Animal Husbandry 2(1+1)

This course will help the students to understand the importance of livestock in national economy. They will get a comprehensive knowledge about nutrition, management, breeding and genetic potential of local breeds of livestock. Students will be trained to handle and manage animals for different procedures at livestock farm. The Animal Husbandry will teach the ins and outs of nutrition, immunology and diagnostics, disease control and animal welfare. Courses in applied research, scientific research methods and project management form an integral part of this programme. In addition, you will acquire scientific knowledge of the main species within the husbandry system: cattle, horses and poultry. This program will qualify for a wide array of jobs throughout the industry - ranging from entrepreneur or manager of your own business to consultant or supplier. As a degree programme with an international focus, the Animal Husbandry Bachelor has been shown to open doors worldwide.

Contents (Theory)

1 Importance of livestock in economy of Pakistan
2 Zoological classification of farm animals
3 Livestock management
4 Introduction to breeding and genetics
5 Local breeds of livestock
6 Reproductive cycle in farm animals
7 Common feeds and their classification
8 Basic principles of feeding dry, pregnant and milking animals
9 Classes, breeds and varieties of poultry
10 Broiler and layer management

Contents (Practical)

1 Demonstration and identification of various breeds of livestock
2 Demonstration of male and female reproductive organs
3 Body points of animals
4 Handling and restraining of animals
5 Grooming and cleaning of animals
6 Housing plans
7 Milk quality analyses; identification of
8 Feed samples; formulation of balanced ration for livestock
9 Poultry breeds
10 Visit to livestock shows/farms

Recommended Texts

1 Banerjee, G. C. (1998). *A Textbook of animal husbandry*. New Delhi: Oxford and IBH Pub. Co.
2 Shah, S.I. (1994). *Animal husbandry*. Islamabad: National Book Foundation, Pakistan.

Suggested Readings

1 Haq, A., & Akhtar, M. (2004). *Poultry farming*. Islamabad: Higher Education Commission of Pakistan.
2 Khan, B. B., Yaqoob, M., Riaz, M., Younas, M., & Iqbal, A. (2004). *Livestock management manual*. Faisalabad: Department of Livestock Management, University of Agriculture.

PLBG-5201 Introductory Genetics 3(2+1)

This course aims to enable students understand: Basic concepts of genetics, understanding, why the characters of off-springs are similar to their parents, what can be the possible reason for the variation that the off-springs show to their parents. Mechanism of heredity underlying laws of genetics and their practical manifestation in the form of various monohybrid as well as dihybrid crosses. Understanding the linkage and epistasis as potential reasons for deviation from law of independent assortment. Understanding the concepts of allele and gene both at genotypic as well as phenotypic level. Understanding process and purposes of the cell cycle, meiosis, and mitosis, as well as the outcomes of these processes. Enabling the students to solve various genetics problems, making calculated and accurate predictions about inheritance of genetic traits, and map the locations of genes. Chemical and molecular nature of nucleic acids i.e. RNA and DNA. Understanding the concept of gene expression from gene to its product.

Contents (Theory)

1. Definition of genetics, concepts of heredity and variation.
2. Cell and cell divisions. Mendelian genetics: chromosome theory of heredity, various genotypic and phenotypic ratios and their modifications.
3. Differences between allelic and non-allelic interactions (epistasis), illustration of epistasis with suitable examples.
4. Pleiotropy and multiple allelism. Multiple factor hypothesis. Linkage and crossing over.
5. Sex determination: sex linked and sex influenced traits.
6. Chromosomal aberrations.
7. Nucleic acids: nature, structure and function.
8. Classical vs modern concepts of gene.

Contents (Practical)

1. Study of cell divisions and gametogenesis.
2. Calculation of monohybrid and dihybrid ratios.
3. Numerical examples relating to gene interaction, multiple alleles and multiple factor inheritance.
4. Calculation of linkage from test cross and F_2 data.

Recommended Texts

1. Singh, B.D. (2004). *Genetics.* New Delhi: Kalyani Publishers.
2. Klug, W.S. & Cummings, M. R. (2003). *Concepts of genetics.* (7th ed.) Singapore: Pearson Education.

Suggested Readings

1. Singh, P. (2003). *Elements of genetics.* (2nd ed.) Delhi: Kalyani Publishers.
2. Stansfield, W.D. ((1988) *Theory and problems of genetics.* (4th ed.) New York: McGraw-Hill Book Co.
3. Khan, I. A., Azhar, F. M., Ali, Z., & Khan, A. A. (2008). *Solving numerical genetic problems*. Faisalabad: Department of Plant Breeding and Genetics, University of Agriculture.

ENTO-5102 **Applied Entomology** **3(2+1)**

The students would be able to acquire the knowledge of different practical aspects of entomology. For instance, they will learn to identify the major insect pest species of agricultural, horticultural and forest crops, vegetables, fruits, stored grains and household pests. Course aims to demonstrate the students about the identification of insect pests, their control methods and pesticide application equipment with basic objective to enhance farmer's productivity through better management and control of insect pests. Moreover, course includes the basic information and introduction related to entomological cottage industries (i.e. honeybee farming, silkworm rearing and lac culture) in order to enhance the productivity of farming community.

Contents (Theory)

1 Introduction
2 Causes of success and economic importance of insects
3 Principles and methods of insect control i.e. cultural, biological, physical, mechanical, reproductive, legislative, chemical and bio-technological control
4 Introduction to IPM
5 Insecticides, their classification, formulations and application equipment
6 Identification, life histories, mode of damage and control of important insect pests of various crops, fruits, vegetables, stored grains, household, termites and locust
7 Entomological industries
8 Apiculture
9 Sericulture
10 Lac-culture

Contents (Practical)

1 Collection, identification and mode of damage of insect pests of various crops, fruits, vegetables, stored grains and household
2 Insecticide formulations, their dilutions and safe handling
3 Use of application equipment
4 Instructions in apiculture, sericulture and lac-culture

Recommended Texts

1 Atwal, A. S. (2005). *Agricultural pests of Southeast Asia and their management*. Ludhiana: Kalyani Publishers.
2 Pedigo, L. P., & Rice, M. E. (2014). *Entomology and pest management* (6th Ed.). Illinois: Waveland Press Inc.

Suggested Readings

1 Duncton, P. A. (2007). *The Insect: beneficial and harmful aspects*. Ludhiana: Kalyani Publishers.
2 Mathews, G. A. (2004). *Pesticide application methods* (3rd Ed.) New York: John Wiley & Sons, Inc.

PLPT-5301 Introduction to Plant Pathogens 3 (2+1)

To objective of this course is to acquaint the students with basic concepts and identification of plant pathogens. The course covers all aspects of plant pathogens which include their economic importance, morphology, reproduction and ecology. The course also covers classification of different plant pathogens. In addition to plant pathogens, phanerogamic parasites, viroids and fastidious bacteria will also be covered briefly during this course.

Contents (Theory)

1 Introduction of plant pathology
2 Economic importance.
3 General characteristics (morphology, reproduction andecology).
4 Identification of plant pathogens
5 including fungi, prokaryotes, viruses, viroid, nematodes,
6 fungus like organisms
7 Phanerogamic parasites
8 Taxonomic position of economically important plant pathogens.

Contents (Practical)

1 Orientation of laboratory equipment.
2 Sterilization of glassware, preparation of media and isolation of different plan tpathogens.
3 Study of characteristics of various plant pathogens through slides,
4 live specimens and their comparative account/study.

Recommended Texts

1 Verpoorte, R., & Alfermann, A. W. (2013). *Metabolic engineering of plant secondary metabolism*: Berlin: Springer Science & Business Media.
2 Agrios, G. N. (2005). *Plant pathology*. (5th ed.) Massachusetts: Academic Press.
3 Ahmad, I., & Bhutta, A. R. (2005). *Textbook of introductory plant pathology*. Islamabad: National Book Foundation, Pakistan.

Suggested Readings

1 Ravichandra, N. G. (2013). *Fundamentals of plant pathology*. New Delhi: Prentice Hall Pvt. Ltd.
2 Trigiano, R. N., Windham, M. T., & Windham, A. S. (2008). *Plant pathology concepts and laboratory exercises*. (2nd ed.) London: CRC Press.
3 Vidhyasekram, P. (2004). *Concise encyclopedia of plant pathology*. New York: Food product Press and Haworth Press Inc. Binghamton.

FSAT-5104 Unit Operations in Food Processing 3 (3+0)

This course is the study of unit operations in preserving foods by thermal and alternative food processing methods. Recitation through problem solving and experimentation. Interdependence of food engineering, chemistry, and microbiology principles in food preservation. Food industry is in need of knowledgeable food scientists with background in engineering, chemistry, microbiology, consumer acceptance among others. Food scientists encounter variety of challenges in day-to-day job which include but not limited to develop novel food processes, operate a food process equipment, evaluate microbial safety, formulate new products, reformulate existing products to meet changing consumer demand, test nutritional content of processed food, develop strategies for improving manufacturing and packaging operation, enforce certain federal and state regulations for making safe product, and study consumer acceptance of formulated products. It is important to understand the process and packaging parameters that make the food safe and preserve food quality. During the semester we will also learn to do simple process calculations that may help answer "what-if" type processing questions. Hopefully, our journey during the semester will help you to better appreciate the importance and benefits of integrating knowledge from engineering, chemistry and microbiology for controlling different food process.

Contents

1 Introduction: Materials handling. Energy and Mass balance
2 Heat transfer fundamentals conduction, convection and radiation
3 Preparatory Operations: Receiving, Cleaning, Sorting, Grading, Peeling, Size reduction
4 Crystallization. Types of mixers, Centrifugation
5 Homogenization, Bleaching, Deodorization, Extraction, Grinding. Mechanical Separation
6 Screening, Filtration, Centrifugal filtration
7 Filtration based on motion of particles through fluids, Sedimentation
8 Transport of Fluids through Pipes: Laminar and turbulent regimes
9 Circulation of fluid through porous beds. Darcy'slaw: Permeability, porosity
10 Filtration: Fundamentals, Equipment, Maintenance problems, Prospects
11 Separation processes by membranes
12 Solid-liquid extraction

Recommended Texts

1 Earle, R. L. (2013). *Unit operations in food processing*. Amsterdam: Elsevier.
2 Fellows, P. J. (2009). *Food processing technology: principles and practice*. Amsterdam: Elsevier.
3 McCabe, W. L., Smith, J. C., & Harriott, P. (2005). *Unit operations of chemical engineering*. NewYork: McGraw Hill Inc.

Suggested Readings

1 Jeankopolis, C. J. (2004). *Transport processes and separation process*. New Jersey: Prentice Hall Professional Technical Reference.
2 Earle, R. L., & Earle, M. D. (2004). *Unit operations in food* processing. Palmerston North: The New Zealand Institute of Food Science and Technology.
3 Gustavo, A., & Barbosa-Canovas, V. (2002). *Unit operations in food Engineering*. Florida: CRC Press, Taylor and Francis Group, Boca Raton.

FSAT-5105 **Community Nutrition** **3 (3+0)**

Students will be able to evaluate community nutrition interventions. Explain the healthcare and nutrition policies. Interpret nutrition information for the public. Community nutrition is the process of helping individuals and groups develop healthy eating habits in order to promote wellness and prevent disease. The goal of community nutrition is to educate individuals and groups so that they adopt healthy eating habits. Dieticians and nutritionists work with many other health care professionals in promoting improved community nutrition. Their efforts emphasize a preventive approach in educating individuals in how a change in dietary habits will reduce the risk of illness. Community nutrition focuses on all age groups. The groups targeted range from babies to pregnant women to older adults. For example, a young pregnant woman may not realize how poor eating habits affect her developing fetus or she may be unaware of the importance of breastfeeding. Older adults may lose interest in eating due to loneliness, inability to prepare meals, or a physical condition such as difficulty chewing. Individuals with diabetes may not understand the need to control their blood glucose levels through diet as well as medication.

Contents

1 Introduction
2 Health care in America
3 The policy-making process
4 Food insecurity in united states
5 Assessing a community
6 Planning and evaluating community nutrition interventions
7 Opportunities in community nutrition
8 Emerging issues/ determinants of health/ HP2020 health care industry
9 Assessing community needs cont./ step 3 national nutrition monitoring/HP 2020
10 Understanding behavior change nutrition education
11 Domestic hunger programs
12 Maternal and child nutrition
13 Child and adolescent's nutrition
14 Senior nutrition

Recommended Texts

1 Boyle, M. A. (2017). *Community nutrition in action: an entrepreneurial approach*. (7th ed.) Boston: Cengage Learning.
2 Temple, N. J., & Steyn, N. (2016). *Community nutrition for developing countries*. Edmonton: Athabasca University Press and UNISA Press.

Suggested Readings

1 Burgess, A., Bijlsma, M., & Ismael, C. (2009). *Community nutrition: a handbook for health and development workers*. New York: Macmillan Pub., Ltd.
2 Nnakwe, N. (2017). *Community nutrition*. Massachusetts: Jones & Bartlett Learning.

STAT-5126 Statistics for Agricultural Sciences (3+0)

This course is designed for under graduate programs of agriculture sciences. The objective of this course is to impart basic and applied knowledge about statistics for collection, presentation, analysis and interpretations of data related to agriculture issues. After completing this course agriculture students will be able to understand the general concepts of basic statistics, to conduct agriculture surveys, to understand design of experiments, and other statistical tools. These statistical concepts are further will be helpful to complete a research related to agriculture sciences. Moreover over students will also learn some statistical softwares such as Minitab, SPSS and Design Expert to improve their computational and analytical skills.

Contents

1. Definition and importance of Statistics in Agriculture.
2. Data, Different types of data and variables
3. Classification and Tabulation of data.
4. Frequency distribution, Graphical representation of data.
5. Measure of Central tendency and Measure of Dispersion. Calculation of averages, Range, variance, Standard deviation and coefficient of variation.
6. Regression and Correlation Analysis: Simple and Multiple regression, correlation cases.
7. Sampling and its types: Probability and non-Probability Sampling, Simple random sampling, stratified random sampling, Systematic sampling, Sampling and non-sampling error
8. Sampling distribution of mean and difference between two means.
9. Inference Theory: Estimation and testing of hypothesis, Type-I and type-II error, Testing of hypothesis about mean and difference between two means using Z-test and t-test, Paired t-test.
10. Test of association of attributes using χ^2 (chi-square) Testing hypothesis about variance.
11. ANOVA and its assumptions, One-way ANOVA, Two-way ANOVA.

Recommended Texts

1. Muhammad, F. (2000). *Statistical methods and data analysis*. Lahore: Ilmi Kitab Khana.
2. Rao, G. N. (2007). *Statistics for agricultural sciences* (2nd ed.). Devon: BS Publication.

Suggested Readings

1. Lawal, B. (2014). *Applied statistical methods in agriculture, health and life sciences*. Berlin: Springer.
2. Sahu, P. K. (2016). *Applied statistics for agriculture, veterinary, fishery, dairy and allied fields*. Berlin: Springer.
3. Crawshaw, J. & Chambers, J. A. (1994). *Concise course in A. level statistic with world examples.* Berlin: Springer.

AEXT-5402 Communication Skills in Agricultural Extension 3 (2+1)

At the completion of this course, the students will be able to: define the given concepts of communication. Identify the types of communication. Conduct interviews. Demonstrate improved communication skills. The importance of communication needs to be viewed as a core value in your farming business. Effective communication is something that should be expected, routine and rewarded. Simple steps to improve communication on your farm can be taken by removing communication barriers, maintaining composure in all situations and removing misconceptions that may have been generated for farm. Gaining a strong understand of both verbal and non-verbal communication methods will help employees in a leadership position relate to their employees and improve the production of the farm, along with the job satisfaction level for employees. A better method of communication can also be utilized by implementing the use of different communication instruments such as charts, flag systems and meetings to help strength the understanding of the protocols, goals and expectations of the farm.

Contents (Theory)

1 Concept, Purpose and scope of communication in Agricultural extension.
2 Forms of communication in the past, present and future
3 Communication and the concept of global community
4 Communication as the problem solving approach
5 Communication process, elements and their role in effective communication
6 Principles of communication. Basic communication models
7 Forms of communication
8 Interpersonal, intrapersonal and impersonal
9 Written, verbal and non-verbal communication
10 Barriers to communication and measures to overcome these barriers

Contents (Practical)

1 The students will be involved in developing and critically analyzing different extension messages.
2 They will practice different forms of communication in the class

Recommended Texts

1 Leeuwis, C. (2013). *Communication for rural innovation: rethinking agricultural extension*: New Jersey: John Wiley & Sons.
2 Anderson, J. R., & Feder, G. (2004). *Agricultural extension: Good intentions and hard realities*. Oxford: The World Bank Research Observer.

Suggested Readings

1 Muhammad, S. (2005). *Communication skills and leadership development*. Faisalabad: Unitech Communications.
2 Calvert, P. (2000). *The communicator's handbook*; *tools, techniques and technology.* (4th ed.) Florida: Maupin House Publishing.
3 Murphy, H. A., Hildebrandt, H. P., & Thomas, J. P. (2000). *Effective business communication*. Islamabad: International Series, National Book Foundation, Pakistan.

HORT-5602 Horticultural Crop Production 3(2+1)

To make students familiar with production technology of important horticultural crops, Horticulture is the science and art of the development, sustainable production, marketing, and use of high-value, intensively cultivated food and ornamental plants. Horticultural crops are diverse; they include annual and perennial species, delicious fruits and vegetables, and decorative indoor and landscape plants. These specialty crops help sustain and enrich our lives by providing nutritious food, enhancing the beauty of our homes and communities and reducing our carbon footprint. Horticulture also contributes to quality of life, and the beauty, sustainability and rehabilitation of our environment and the human condition. Environmental horticulture (i.e., the "green industry"), is composed of careers in greenhouse production, wholesale brokers, commercial nurseries, garden centers, florists and landscape design and construction firms, as well as private and community gardens, municipal parks and state or national reserves.

Contents (Theory)

1 Establishment of orchards, vegetable farms and ornamental gardens;
2 Site selection, layout methods, wind breaks and their role.
3 Management practices; irrigation, manures and fertilizers, training and pruning, cultivation and weed control.
4 Climate, soil, propagation, rootstocks, cultivars.
5 Important pests,
6 Harvesting, post-harvest handling and marketing of important horticultural crops (fruits, vegetables and ornamentals) of the region.

Contents (Practical)

1 Practice in layout methods,
2 Selection of plants from nursery,
3 Propagation methods. Planting and after care.
4 Production techniques and identification of important cultivars of horticultural crops of the region

Recommended Texts

1 Acquaah, G. (2009). *Horticulture: principles and practices* (4th ed.) New Delhi: Prentice-Hall India Learning Pvt. Ltd.
2 Adams, C. R., Bamford, K. M., & Early, M. P. (2012). *Principles of horticulture.* (6th ed.) New York: Routledge.
3 Ingles, J. (2009). *Ornamental horticulture*. New York: Delmar, Maxwell Drive, Cifton Park.
4 Dhaliwal, M. S. (2008). *Handbook of vegetable crop*. New Delhi: Kalyani Publishers.

Suggested Readings

1 Chottopadhay, T. K. (2000). *A textbook on pomology*, Vol II. New Delhi: Kalyani Publishers.
2 Laurie, A., & Ries, V. H. (2004). *Floriculture: fundamentals and practices*. New Delhi: Agrobios.
3 Pradeepkumar, T., Suma, B., Jyothibhaskar, K. N., & Satheesan, K. V. P. (2008). *Management of horticultural crops (Part 1). Horticulture science series* Vol. 11. New Delhi: New India Publishing Agency.
4 Yadav, P. K. (2007). *Fruit production technology*. Lucknow: International Book Distributing Co., Publishing Division.

FSAT-5106 **Food Safety and Laws** **3 (3+0)**

The course aims to teach food safety as a scientific discipline describing handling, preparation, and storage of food in ways that prevent food-borne illness. Food can transmit pathogens which can result in the illness or death of the person or other animals. Objective of course is to give concepts of food safety and risk assessments and to provide knowledge about of food safety systems and food laws. The quality and safety of food is an important task, not only for the food industry. The issue of quality and safety of food is highly vital for each person. The way we eat affects our health, working capacity, quality of life, and the health and life of future generations. Food contamination can occur at any stage in the supply chain, and the primary responsibility for ensuring safety lies on food producers. Nevertheless, in many cases, incidents related to foodborne diseases are the result of non-compliance with the rules for handling food at home, catering, and marketing.

Contents

1 What is Food Safety?
2 Characterization of food hazards, biological, chemical and physical
3 Hazards from natural origin
4 Hazards produced during food processing, storage and preparation
5 Hazards associated with nutrient fortification
6 Food Safety systems, GMP, TQM
7 HACCP
8 Pakistan Standards and Quality Control Authority
9 Pure Food Rules
10 Punjab Food Authority
11 International Organization for Standardization
12 National Standard for Drinking Water Quality
13 Food labeling
14 Concept of Halal, Islamic food laws and regulations
15 Consumer laws in Pakistan
16 The World Trade Organization (WTO)
17 Codex Alimentarius.

Recommended Texts

1 Rai, V. R., & Bai, J. A. (2017). *Food safety and protection*. London: CRC Press, Taylor & Francis Group.
2 Gabriela, S., & Kiran, P. (2016). *International food law and policy*. Switzerland: Springer International Publishing.
3 Awan, J. A., & Anjum, F. M. (2010). *Food toxicology*. Faisalabad: Unitech Communications.

Suggested Readings

1 Schmidt, R. H., & Rodrick, G. E. (2003). *Food safety handbook*. New York: Wiley-Interscience, A John Wiley & Sons Publications.
2 PSQCA. (2010). *Standards for different food items*. Karachi: Pakistan Standards and Quality Control Authority.

FSAT-5107 **Food Packaging** **2 (2+0)**

This course will enable the students to learn principles of packaging science including legal and safety aspects, packaging functions and requirements, types of packaging materials, modified atmosphere packaging, active packaging, packaging for emerging processing technologies, shelf life and package testing among other relevant topics. Food packaging lies at the very heart of the modern food industry and very few foods are sold unpackaged. Good packaging prevents waste and ensures that the food retains its desired quality throughout its shelf life. Despite its importance and the key role that packaging plays, it is often regarded as, at best, somewhat superfluous, and, at worst, a serious waste of resources and an environmental menace. Food Packaging plays such an important role in the preservation and marketability of a product, many companies seek a contract packaging service to help them obtain the best quality packaging available. Benefits to a co-manufacturer include cost, speed, quality and innovation.

Contents

1 Food packaging: introduction, needs, functions, systems, development
2 Packaging types: primary, secondary, tertiary
3 Packaging materials: rigid containers, flexible packaging
4 Properties of food packaging: physical, chemical
5 Packaging guidelines: retail containers, shipping containers
6 Factors influencing design and selection of packaging materials: product, distribution, marketing, packaging operation, cost
7 Printing processes: inks, adhesives
8 Filling and labeling. Safety and legislation
9 Novel food packaging techniques
10 Food labeling: importance, types, methods

Recommended Texts

1 Yam, K. L., & Lee, D. S. (2012). *Emerging food packaging technologies: principles and practice*. Berlin: Elsevier.
2 Robertson, G. L. (2012). *Food packaging: principles and practice*. (3rd ed.) Florida: Taylor & Francis.
3 Lee, D. S., Yam, K. M., & Piergiovanni, L. (2008). *Food packaging science and technology*. Florida: CRC Press, Taylor and Francis Group, Boca Raton.

Suggested Readings

1 EIRI. (2007). *Handbook of packaging technology*. New Delhi: Engineers India Research Institute.
2 Robertson, G. L. (2006). *Food packaging: principles and practices*. Florida: CRC Press, Taylor & Francis Group, Boca Raton.

FSAT-5108 **Plant Design and Layout** **3 (3+0)**

The course has been designed to give introductory understanding about the food plant layout and sanitation. The students will learn about requirements and basics of food plant design and construction, selection of suitable site for construction of food plant, sanitation, and waste disposal and management procedures for development of food plant. The food processing industry is a subset of the manufacturing sector with unique challenges. Among these, ensuring food hygiene and preventing contamination are two issues of prime importance. Hence, designers have to overcome such challenges when designing facilities suitable for food processing. To begin with, food plant design and layout involves the arrangement of the equipment in a processing plant. Such an arrangement should take into consideration the efficiency and convenience/ease of use that will result after laying out all the equipment. Small scale food industries are identical with labor intensive, low efficiency, and bad housekeeping. It needs specific improvement of performance related to their raw material characteristics as agricultural commodities.

Contents

1 Food processing industry: introduction, investment.
2 Plant location and layout: significance, location analysis, selection criteria.
3 Freedom from pollution.
4 Availability of potable water.
5 Raw Material, labour and energy supply.
6 Communication facilities.
7 Facilities for waste disposal.
8 Building design and construction: floors, drains, walls, doors, windows, ceiling, ventilation, lighting, auxiliary facilities.
9 Food plant equipment: requirements, design, construction, choice of material, layout.
10 Plant cleaning: soil types, methods, detergents, water conditioners. Sanitizing: chemical, heat, and irradiation.
11 Cleaning methods – CIP, dismantling cleaning. Pests: types, inspection, control.
12 Waste management: fluid and solid wastes.

Recommended Texts

1 Awan, J. A., & Rehman, S. U. (2010). *Food plant layout and sanitation*. Faisalabad: Unitech Communications.
2 Arvanitoyannis, I. S. (2008). *Waste management for the food industries*. New York: Elsevier Academic Press.

Suggested Readings

1 Leliveld, H. L. M., Mostert, M. A., & Holah, J. (2005). *Handbook of hygiene control in food industry*. Cambridge: Woodhead Publishing Ltd., Abington Hall, Abington.
2 Farber, J.M., & Todd, E. C. D. (2000). *Safe handling of foods*. New York: Marcel and Dekker.

FSAT-6109 **Food Process Engineering** **3 (3+0)**

This course provides a thorough study of factors affecting the science, such as processing technology, the physical properties and engineering of different foods and thermal processing and preservation of Foods. Food engineering is a rapidly changing discipline. Traditionally, the main focus was on food preservation and stabilization, whereas trends now are on diversity, health, taste, and sustainable production. This discipline discusses the main fields within the discipline such as thermal and non-thermal stabilization processes, separation and isolation processes, chemical and biochemical conversions, mixing and structuring processes. Food engineering is a multidisciplinary field which combines microbiology, applied physical sciences, chemistry and engineering for food and related industries. Food engineering includes, but is not limited to, the application of agricultural engineering, mechanical engineering and chemical engineering principles to food materials. Food engineers provide the technological knowledge transfer essential to the cost-effective production and commercialization of food products and services.

Contents

1 Food Process Engineering: Introduction and applications.
2 Units, Dimensions and Conversions. Basic Definitions: Concentration, Surface area, Density, Specific gravity, Specific heat, Thermal conductivity, Moisture, Pressure and Temperature. Heat and Mass Transfer Fundamentals: Conduction, Convection and Radiation, Heat exchangers and microwave heating.
3 Thermodynamic Laws and equilibrium. Material and Energy balances.
4 Materials handling: equipments. Steam and its uses in industry.
5 Fluid flow in Food Processing: Rheology, Viscosity, Types of Fluid flow, Newtonian and Non-Newtonian Fluids, Fluid energy.
6 Psychrometry, psychrometric charts and their applications.
7 Colligative properties of food material.
8 Physical separation processes: Filtration, membrane processes, sieving and gravity separation. Packaging: Types of packaging material and the atmosphere in the package.
9 Thermal Processing of Foods: Pasteurization and sterilization. Low temperature. Preservation of Foods: Refrigeration and Freezing. Evaporation and Drying:
10 Equipment's used for evaporation and drying.
11 Adsorption and ion exchange in food processing.
12 Problem solving related to conversions of units, basic definitions,
13 Material and Energy balances, Fluid flow in Food Processing and colligative properties of food material.

Recommended Texts

1 Smith, P. G. (2011). *An introduction to food process engineering*. Berlin: Springer.
2 Heldman, D. R. (2012). *Food process engineering.* Berlin: Springer Science & Business Media.

Suggested Readings

1 Das, S. K., & Das, M. (2019). *Fundamentals and operations in food process engineering*. Florida: CRC Press.
2 Toledo, R. T., Singh, R. K., & Kong, F. (2018). *Fundamentals of food process engineering*. Berlin: Springer International Publishing.

FSAT-6110 Fruit and Vegetable Processing 3(2+1)

The course discusses the biological, chemical and physical properties of fruits and vegetables and their contribution to human nutrition and diet; and the application of food processing and preservation principles and technologies in the processing, preservation, extension of shelf life and value addition of fruit and vegetable products in terms of safety, nutritional and dietary quality. The aim is to equip the students with functional knowledge and practical skills in the principles, technologies and processes used in the processing, preservation, extension of shelf life and value addition of fruits and vegetables. The student will be equipped with knowledge and understanding of the basic properties of fruits and vegetables and their contribution to nutrition and diet, basic post-harvest biological, chemical, physiological and metabolic processes and changes in fruits and vegetables and how these can be controlled to prevent or reduce deterioration and loss of nutritional quality and value in fruits and vegetables production and processing.

Contents (Theory)

1 Heat processing: principles, blanching, exhausting, pasteurization, HTST, UHT, temperature distribution, heat transfer equipment–retorts. commercial sterilization,
2 Canning: unit operations, parameters for canning fruits, vegetables.
3 Thermal death time curves: F value, D value, Z value, calculations.
4 Effect of heat processing: microorganisms. Spoilage of canned foods.
5 Dehydration: principle, methods, dry specific fruit and vegetables.
6 Principles of low temperature preservation: refrigeration, cold storage, freezing, refrigeration plants, monitoring and control.
7 Cold storage: requirements, insulation, air circulation, humidity, controlled atmospheric storage, racking systems, calculation of refrigeration load.
8 Freezing and frozen storage: methods, types, slow and quick freezing, freezing point, freezing curve, rate, changes during freezing, damages during intermittent thawing.
9 Freezing different food commodities, packaging requirements. Defects: freeze burn, drip loss.

Contents (Practical)

1 Preparation of fruits and vegetables products: dried, frozen and canned.
2 Quality evaluation of the products during storage.
3 Manufacturing of pickle, juice concentrate, ready to serve juices, squashes, syrups and fruit candies.
4 Use of edible coating for fruits and vegetables.
5 Visit to fruit and vegetable processing units.

Recommended Texts

1 Siddiq, M., & Uebersax, M. A. (Eds.). (2018). *Handbook of vegetables and vegetable processing*. New Jersey: John Wiley & Sons.
2 Jongen, W. (Ed). (2002). *Fruit and vegetable processing – improving quality*. Cambridge: Woodhead Publishing. Ltd., Abington.

Suggested Readings

1 Girdhari, L., Siddappa, G. S., & Tandon, G. L. (1998). *Preservation of fruits and vegetables.* New Delhi: Publications and Information Division, Indian Council of Agricultural Research.
2 Sirivastava, R. P., & Sanjeev, K. (2002). *Fruit and vegetable preservation: principles and practices*. Lucknow: International Book Distributing Co.

FSAT-6111 Food Analysis and Sensory Evaluation 3(1+2)

The course has been designed to give introductory understanding about the food analysis and sensory evaluation methods. The students will learn how to analyze food by performing proximate and chemical analysis of different food products. Any product that is going to be used by humans needs to be rigorously tested, and because foodstuffs are ingested, the testing is often more crucial to avoid any health issues from occurring. There are many reasons why companies want to analyze foodstuffs, and there are quite a few general areas of food analysis. In terms of the techniques that are used, the go-to choices are a wide range of analytical characterization instruments that are found in almost all quality control laboratories. For food analyses, the range of instruments used includes spectroscopy, chromatography, to name a few common examples. The choice of technique(s) varies depending on what foodstuff is being analyzed, what is being analyzed within the foodstuff, and what the reasons for the analysis is.

Contents (Theory)

1 Food analysis: significance. Sampling: techniques, preparation, preservation.
2 Physical properties and analysis of foods and food products
3 Proximate analysis, acidity, pH, sugars, minerals, vitamins: significance, methods.
4 Chromatography: paper, thin layer. Spectroscopy: atomic emission, atomic absorption.
5 Analytical data: evaluation, interpretation, statistical applications.
6 Sensory evaluation, attributes, difference and preference tests, consumer acceptance.
7 General requirements for sensory testing. Organization and evaluation of sensory testing.
8 Measurement: difference, discrimination testing, scaling, threshold methods,
9 Descriptive analysis. Texture, Color and flavor evaluation.

Contents (Practical)

1 Lab safety requirements. Preparation and standardization of laboratory solutions.
2 Sampling. specific gravity, refractive index, moisture, ash, crude protein, crude fat, crude fiber, NFE, pH and acidity. Estimation of vitamin C.
3 Mineral analysis through flame photometer and atomic absorption spectrophotometer. Paper and thin layer chromatography. Sensory evaluation of foods. Taste, odor, trigeminal sensations.

Recommended Texts

1 Zhong, J., & Wang, X. (2019). An introduction to evaluation technologies for food quality. In: *Evaluation technologies for food quality*. Cambridge: Woodhead Publishing.
2 O'Mahony, M. (2017). *Sensory evaluation of food: statistical methods and procedures*. Abingdon: Routledge.
3 Horowitz, W. (2016). *Official methods of analysis of the Association of Official Analytical Chemists.* (3rd ed.) Maryland: Association of Official Analytical Chemists, Gaithersburg.

Suggested Readings

1 Awan, J. A., & Rehman, S. U. (2003). *Food analysis manual*. Faisalabad: Unitech Communications.
2 Kemp, S.E., Hollywood, T., & Hort, J. (2009). *Sensory evaluation: a practical handbook*. New York: John Wiley & Sons Inc.
3 Chambers, E., & Wolf, M. B. (2005). *Sensory testing methods*. Pennsylvania: American Society for Testing and Materials, West Conshohocken.

FSAT-6112 Milk Handling and Processing 3(2+1)

The course provides a biochemical foundation to understand the milk production, milking, milk handling, and composition of milk, including the chemistry, structure and function of its individual components. It will train the students from milking and collection at farm level, to intake at the diary plant, the processing steps, and the basic liquid milk products. After completing this course, students will better understand the basic components of milk science, including chemical and physical properties, processing, key ingredients, basic processing steps and safety considerations. They will identify how dairy science impacts and supports various aspects of the overall field of food science and what are trends in the dairy sector.

Contents (Theory)

1 Milk: Production, production statistics
2 Milk: importance, standards, composition, properties
3 Factors influencing raw milk quality
4 Milk handling: manual and machine milking, Farm cooling, collection, reception.
5 Analyses at different levels and transportation.
6 Milk Chemistry: major constituents, their properties and chemistry.
7 Milk processing: standardization, Homogenization
8 Milk Pasteurization and UHT
9 Milk packaging, storage, distribution.
10 Effect of storage and heat processing on milk quality.
11 Milk adulteration: adulterants, objectives, health effects.
12 Milk Microbiology.

Contents (Practical)

1 Milk collection and cooling practices, Milk sampling methods.
2 Physical and chemical analyses of raw milk.
3 Tests for adulterants.
4 Standardization and homogenization, Pasteurization and UHT processes.
5 Visit to milk processing plants

Recommended Texts

1 Nero, L. A., & De Carvalho, A. F. (Eds.). (2019). *Raw Milk: balance between hazards and benefits*. Cambridge: Academic Press.
2 Bylund, G. (2003). *Dairy processing handbook*. Sweden: Tetra Pak Processing Systems AB.

Suggested Readings

1 Goyal, M. R., & Chavan, R. S. (2018). *Technological interventions in dairy science: innovative approaches in processing, preservation, and analysis of milk products*. Florida: Apple Academic Press.
2 Park, Y. W., Haenlein, G. F. W., & Wendorff, W. L. (2017). *Handbook of Milk of Non-Bovine Mammals*. (2nd ed.) New York: John Wiley & Sons Ltd.

FSAT-6113 Introduction to Cereal Technology 3(2+1)

The course aims evaluating and predicting wheat flour properties, required new equipment and new techniques and these will be covered in depth. The versatility of wheat flour and its conversion into food is reviewed across a whole spectrum of products. There is a strong emphasis on the use of wheat flour for bread making but with consideration of applications in the manufacture of cakes, cookies, pastries, extruded foods, pasta and noodles. The development process and the benefits to consumers are also addressed. The course will focus on making students understand the basics of cereal science, get familiar with different cereals locally produced, the nutritional value of cereals and the importance of cereals for Pakistani population. The complete flour making procedures are integral part of this course. It hopes that by the end of this course students will have a complete knowledge about cereals and cereal products.

Contents (Theory)

1 Introduction to different Cereal grains and their importance for Production of different gains and utilization of cereals worldwide
2 Structure, composition and nutritional value of different cereal grains
3 Grain grades and grading criteria's of wheat
4 Grain Storage importance and methods of grain storage, Types of grain storage and role of temperature and moisture in grain storage
5 Types of milling and Dry milling process of wheat. Cleaning of wheat; methods of wheat cleaning prior to milling
6 Tempering and conditioning of wheat prior to milling, grinding process: types of grinding machines, roller flour milling, Sieving process: principles, types of sifters
7 Rice: Drying, milling, parboiling. Processing of rice and maize
8 Production of breakfast cereals and snack foods
9 Feed and industrial uses of cereals

Contents (Practical)

1 Grading of grains, Milling of cereal grain through different mills
2 Tests for flour quality assessment.
3 Visit to wheat, maize and rice processing industries

Recommended Texts

1 Kent, N. L., & Evers, A. D. (2017). *Kent's technology of cereals: an introduction for students of food science and agriculture*. Oxford: Pergamon Press.
2 Delcour, J. A., & Hoseney, R. C. (2010). *Principles of cereal science and technology*. Minnesota: American Association of Cereal Chemists Inc. St. Paul.

Suggested Readings

1 AACC. (2019). *Approved methods of American association of cereal chemists*. Minnesota: American Association of Cereal Chemists Inc, St. Paul.
2 Khetarpaul, N., Grewal, R. B., & Jood, S. (2005). *Bakery Science and cereal technology*. New Delhi: Daya Publishing.
3 Karel, K., & Joseph, G. P. (2000). *Handbook of cereal science and technology*. New York: Marcel Dekker.

FSAT-6114 **Food Biochemistry** **3(3+0)**

This is core course which enable the students to understand the basics of physico-chemical phenomenon occurring in food, food systems and products throughout cycle. The students understand to prevent and control all the chemical processes within food system to have desirable or undesirable outcomes. The Food Biochemistry gathering plans to enhance understanding of detailed composition of foods, especially food components that have beneficial effects on human health. The Food Biochemistry include utilization of modern chemical and biochemical analytical methods of food components and their reactions, model systems to study their reactions and efficient statistical tools for data analysis to get the maximum informative value. Biochemistry addresses fundamental questions: How is food converted into energy or body substance? How is genetic inheritance translated into phenotypically expressed properties? How do enzymes – the biological catalysts – differ in power, specificity and controllability from other catalysts? Can we meet human needs by manipulating the DNA of bacteria, plants and animals?

Contents

1 Water and its relation to food
2 Carbohydrates: structure and functions,
3 Classification, monosaccharide, disaccharides, polysaccharides,
4 Caramelisation
5 Proteins: Structure and functions,
6 Smino acids, peptides, chemical groups in proteins,
7 Covalent structure of protein, three dimensional structure of protein,
8 Protein denaturation and folding protein synthesis,
9 Maillard reaction,
10 Applications of functional properties
11 Lipids: Structure and functions,
12 Storage lipids, structural lipids,
13 Biological and lipid oxidation in foods,
14 Hydrogenation, rendering,
15 Frying and antioxidants uses
16 Enzymes: Function, kinetics,
17 Classification and nomenclature of enzymes, enzymatic reactions
18 Flavor compounds in foods

Recommended Texts

1 Nollet, L. M., Toldra, F., Benjakul, S., Paliyath, G., & Hui, Y. H. (2012). *Food biochemistry and food processing*. New Jersey: John Wiley & Sons.
2 Belitz, H. D., & Grosch, W. (2009). *Food Chemistry*. (4th ed.) Berlin: Springer-Verlag Berlin Heidelberg.

Suggested Readings

1 Coultate, T. P. (2016). *Food: the chemistry of its components.* (6th ed.) Cambridge: Royal Society of Chemistry.
2 Damodaran, S., & Parkin, K. L. (2017). *Fennema's food chemistry*. (5th ed.) London: CRC press.

FSAT-6115 **Sugar Technology** **3(2+1)**

This course is designed to familiarize the students with chemical and physical properties of sugar and to give concepts of sugar production technology, its quality and by products. Based on the chemical and physical properties of sucrose and the composition of sugar beet and sugar cane the individual process steps of sugar manufacture are described in this course. Sugar production involves two distinct operations; processing sugar cane or sugar beets into raw sugar, and processing the raw sugar into refined sugar. Cane and beet sugar extracts contain sucrose and undesirable amounts of polysaccharides, lignins, proteins, starches, gums, waxes, and other colloidal impurities that contribute colour and/or taste to the crystalline product and reduce product yield. The raw juice, therefore, is subjected to heating, liming addition and clarification to remove proteins and colloidal matter. Sugar technology focuses on the production, refinement and packaging of sugar from sugar cane and sugar beet.

Contents (Theory)

1 Sugar industry in Pakistan.
2 Sugarcane and sugar beet: production, quality.
3 Indigenous technology for small scale sugar production: gur, khund, shakar.
4 Raw sugar manufacturing
5 Unit operations – juice extraction, purification, heating, evaporation, crystallization, crystallization in motion.
6 Refining: affination, clarification,
7 Decolorisation, crystallization,
8 Centrifugation, drying.
9 Bagging, storage.
10 Factors affecting sugar processing.
11 Quality criteria: raw and refined sugar.
12 Specialty sugar products: brown or soft sugar, liquid sugar.
13 Sugar industry byproducts and their uses.

Contents (Practical)

1 Analysis of sugar cane, sugar beet for TSS, pH, fiber, ash and polarization.
2 Extraction and clarifications of raw juice.
3 Analysis of sugar and its intermediate products.
4 Inversion of sugar.
5 Visit to sugar industries

Recommended Texts

1 Meyer, J., Rein, P., Turner, P., & Mathias, K. (2013). *Good management practices for the cane sugar industry*. Berlin: Bartens Publisher.
2 Asadi, M. (2007). *Beet sugar handbook*. New York: John Wiley & Sons, Inc.

Suggested Readings

1 Panda, H. (2011). *The complete book on sugarcane processing and by products of molasses*. New Delhi: Asia Pacific Business Press Inc.
2 Delgado, A.V., & Casanova, C. A. (2001). *Sugar processing and by-products of the sugar industry*. Rome: Food and Agriculture Organization of the United Nations.
3 Chen, J. C. P. (2007). *Meade-Chen cane sugar handbook*. New York: John Wiley & Sons, Inc.

FSAT-6116 Poultry, Egg and Sea Food Technology 3(2+1)

This course provide knowledge about nutritional quality of poultry meat, egg and seafood, gives exposure to various forms of poultry meat, egg and seafood available for human consumption and also provides information about various processing and preservation techniques to be used for poultry meat, egg and sea foods. Moreover, quality testing and standards for poultry, egg and seafood products are also informed. Meat, Poultry, Fish, and Egg Extension - The principle interests of the extension program at this time are in the area of total utilization of flesh foods, particularly poultry and fish, animal welfare, and the sustainability of animal agriculture.

Contents (Theory)

1 Status of poultry industry in Pakistan
2 Primary poultry processing
3 Pre-slaughtering, slaughtering.
4 Secondary poultry processing
5 Preservation techniques
6 Quality assurance
7 Eggs: Identification, grading,
8 Composition, quality characteristics,
9 Handling, storage.
10 Egg processing: drying and freezing of whole, white, yolk.
11 Functional properties
12 Applications in food processing.
13 Quality control during processing.
14 Fish and shell fish: overview
15 Fish processing and preservation.
16 Processing of miscellaneous products.
17 Quality control and factory sanitation of sea foods

Contents (Practical)

1 Slaughtering and dressing of poultry.
2 Tests for freshness of poultry, eggs and seafood.
3 Preparation and preservation of poultry, egg and seafood products.
4 Quality evaluation for poultry meat, egg and seafood products.
5 Visit to processing plant

Recommended Texts

1 Mead, G. C. (2004). *Poultry meat processing and quality*. Cambridge: Woodhead Publishing Ltd., Abington.
2 Sahoo, J., & Chatli, M. K. (2015). *Textbook on meat, poultry and fish technology.* New Delhi: Daya Pub. House.

Suggested Readings

1 Isabel, G. L. (2010). *Handbook of poultry science and technology. Vol. 1: primary processing*. New Jersey: John Wiley and Sons Inc.
2 Isabel, G. L. (2010). *Handbook of poultry science and technology. Vol. 2: secondary processing.* New Jersey: John Wiley and Sons Inc.
3 Sim, J. S., Nakai, S., & Guenter, W. (2000). *Egg nutrition and biotechnology*. New York: CABI Publishing.

FSAT-6117 Baking Science and Technology 3 (2+1)

The course will focus on making students understand the basics of baking science, baking procedures and role of different ingredients in bakery products manufacturing. The complete bread making and other bakery products manufacturing procedures are integral part of this course. It hopes that by the end of this course students will have a complete knowledge about baked products. Students in baking programs learn everything from the ground up. From why certain flours act the way they do to how a twist of the wrist can change a flourish of frosting, students are exposed to everything they need to know to have a chance at succeeding in the world of pastry. Courses in the bakery science program focus on baking techniques, food safety, food microbiology and grain science. Course topics in the programs are: Baking flours, starches, spices, wheat flour, Blending methods, Bakery production, Chemical reactions and food borne illness, Baking equipment and facilities.

Contents (Theory)

1 Baking science and technology: Ingredients; flour, sweeteners, shortening, leavening agents
2 water, and yeast, oxidizing agents, salt, mold inhibitors
3 Dough improvers. Functional additives: emulsifiers, enzymes, antioxidants, eggs, milk and milk products
4 Bakery products: bread – Unit operations
5 Mixing, straight dough, sponge dough, rapid processing mechanical dough development,
6 Fermentation, dough transfer systems dividing, rounding and molding, panning
7 Proofing procedures and reactions during proofing.
8 Baking process: stages, baking reactions, thermal reactions
9 Bread cooling, packaging and storage. Bread spoilage; staling
10 Quality control in baking industry, Processing of other bakery products: biscuits cookies, crackers
11 Sourdough bread, nutritional value, types and methods of making sourdough bread

Contents (Practical)

1 Preparation of breads, pastry, biscuits, wafers and cakes
2 Effect of different ingredients on bakery products
3 Visit to different baking plants

Recommended Texts

1 Joshi, V. K. (2015). *Indigenous fermented foods of South Asia*. Cambridge: CRC press, Taylor and Francis Group.
2 Cauvain, S. P. (2012). *Bread making, improving quality*. Cambridge: CRC Press.
3 Khetarpaul, N., Grewal, R. B., & Jood, S. (2005). *Bakery science and cereal technology*. New Delhi: Daya Pub. House.

Suggested Readings

1 Edward, W. P. (2007). *The science of bakery products*. Cambridge: The Royal Society of Chemistry.
2 Hui, Y. H., Corke, H., Leyn, I. D., & Cross, N. (2006). *Bakery product science and technology*. London: Blackwell Pub. Co.

FSAT-6118 Post-Harvest Technology 3(2+1)

The course has been designed to give introductory understanding about the Post-Harvest Technology of fruits and vegetables. The students will learn about different principles and techniques of fruits and vegetables preservation. Course will train the students on postharvest strategies or technological implementation, such as temperature reduction, modification of the atmosphere, or chemical treatments, are applied. These serve to reduce respiration rates, retard ripening, decrease ethylene production, and consequently retard senescence, prevent dehydration, and extend the shelf-life thus preserving produce quality. These strategies imply that produce are submitted to abiotic stresses and they need to activate different metabolic pathways to cope with these stresses and reach homeostasis to avoid undesirable quality traits that limit produce shelf-life.

Contents (Theory)

1 Pre harvest and Post-harvest Factors Affecting Quality
2 Postharvest Handling Operations: Farm house operations, sorting and grading.
3 Methods of Precooling: transportation, precooling.
4 Post Harvest Treatments: Cleaning and washing, coating and waxing, heat treatment, irradiation, chemicals treatments, disinfection and decay control
5 Fruit Ripening: Changes during ripening, Harvesting and handling methods. Maturity assessment of different fruits and vegetables.
6 Ripening Process: Respiration, climacteric and non-climacteric patterns, pectic substances, ripening conditions. Postharvest physiology of fruits and vegetables.
7 Postharvest Treatments: Coatings, curing, vapor and hot water treatment, de-greening.
8 Storage: Refrigerated, CA, hypobaric, MAS. Packaging: Types, design, MAP, recycling.
9 Cold Chain: Packing house operations, transportation, safety and quality.

Contents (Practical)

1 Determining basis of grading and sorting of fruits and vegetables.
2 Changes in physical and chemical quality parameters of fruits during storage weight loss, acidity, TSS, firmness with penetro meter, color changes.
3 Effect of packaging materials on stored fruits and vegetables.

Recommended Texts

1 Kumar, A., Rajpurohit, V. S., & Kautish, S. (2019). *Modern techniques for agricultural disease management and crop yield prediction*. Pennsylvania: IGI Global.
2 Ron, W., & John J. G. (2017). *Postharvest: an introduction to the physiology and handling of fruit and vegetables*. (6th ed.) London: CABI.

Suggested Readings

1 Sharon, P. S., & Martha C. S. (2010). *Postharvest technology of horticultural crops*. Jaipur: Oxford Book Company, India.
2 Elhadi, M. Y. (2011). *Postharvest biology and technology of tropical and subtropical fruits-açai to citrus*. Vol. 2. New Delhi: Woodhead Publishing India Pvt. Ltd.

FSAT-6119 **Dairy Technology** **3(2+1)**

The course focuses on dairy products technology. It is science and engineering field that deals with the study of milk processing and its products. It is a part of food technology and processing industry that involves processing, packaging, distribution and transportation of various dairy products. Dairy industry is one of the industries which play a dynamic role in Pakistan's agro-based economy. Dairy farming includes breeding and care of milk yielding cattle and buffaloes, procuring milk and processing of milk into a variety of dairy products. Dairy processing involves handling of milk for its safe distribution or its conversion into different dairy products. After the milk has reached the plant, processing work begins and it is converted into a variety of dairy products. Dairy Technologists mainly deal with the technical and quality control aspects of the processing industry and also work to develop improved methods in processing, production preservation and utilization of milk and milk products.

Contents (Theory)

1 Milk Processing: Unit operations in milk processing
2 Cream separation, centrifugation.
3 Milk standardization and homogenization
4 Milk pasteurization
5 Milk sterilization and UHT.
6 Milk: aseptic packaging and storage
7 Chemistry, Production technology, Microbiology and Properties of Milk Products: Liquid milks, Evaporated, condensed and powder milks, butter, yogurt, ice cream and cheese,
8 Milk by-Products
9 Whey and its utilization.
10 Indigenous milk products.

Contents (Practical)

1 Sedimentation test, pH, acidity and, Lactometer reading.
2 Physico-chemical analysis of milk and milk products
3 Sensory evaluation and microbiological analysis of milk and milk products
4 Visit to commercial dairy farms and milk processing plants/industries.

Recommended Texts

1 Spreer, E. (2017). *Milk and dairy product technology*. New York: Routledge.
2 Walstra, P., Walstra, P., Wouters, J. T., & Geurts, T. J. (2005). *Dairy science and technology*. London: CRC press.

Suggested Readings

1 Goyal, M. R., & Chavan, R. S. (2018). *Technological interventions in dairy science: innovative approaches in processing, preservation, and analysis of milk products*. Florida: Apple Academic Press.
2 Park, Y. W., Haenlein, G. F. W., & Wendorff, W. L. (2017). *Handbook of milk of non-bovine mammals.* (2nd ed.) New Jersey: John Wiley & Sons Ltd.
3 EIRI. (2015). *Hand book of milk processing dairy products and packaging technology*. New Delhi: Engineers India Research Ins.

FSAT-6120 **Beverage Technology** **3(2+1)**

The course has been designed to give introductory understanding about the beverage technology. The students will learn about different principles and techniques of beverage manufacturing and preservation. Manufacturing of syrups, squashes and traditional beverages and chemical analysis of beverages will be performed. Course will lead to the study of food and beverage technology, application of food science to the selection, preservation, processing, packaging, distribution, and use of safe food and beverages. Food and beverage technology is a series of process starting with food research, product development, quality assurance and quality control and food regulation. Food and beverage technology is a careful, systematic study, investigation, and compilation of information about foods and their components.

Contents (Theory)

1 Beverages: classification.
2 Beverage industry in Pakistan.
3 Beverage ingredients
4 Water: sources, purification – need, methods. Sweeteners - sugars, artificial sweeteners.
5 Additives: colors, flavors, preservatives, acidulants, stabilizers and carbon dioxide.
6 Carbonated beverages: syrup room operations, carbonation, filling, capping, bottle washing.
7 Fruit based beverages: Fresh juices, ready to serve juice and juice concentrate, nectar, cordial, squash, syrup.
8 Traditional beverages. Synthetic and low calorie juices.
9 Fruit flavored juices, use and role of tea and coffee.

Contents (Practical)

1 Formulation and preparation of carbonated and non-carbonated beverages.
2 Preparation and preservation of fruit pulps and juices and their sensory evaluation
3 Storage study of prepared products under different conditions through taking laboratory tests (physical, chemical, sensory and microbiological examination) during whole storage life.
4 Use of low caloric sweeteners for the development of diet beverages.
5 Manufacture of syrups, squashes, traditional beverages and chemical analysis of beverages.
6 Visit to beverage plants.

Recommended Texts

1 Almeida, R. M., Abreu, R., & Perez-Lopez, J. A. (2018). Nascent entrepreneurship and sustainability on the beverage sector. In: *Nascent entrepreneurship and successful new venture creation*. Pennsylvania: IGI Global.
2 Hui, Y. H., & Evranuz, E. O. (Eds.). (2012). *Handbook of animal-based fermented food and beverage technology.* Vol. 1. Florida: CRC press.

Suggested Readings

1 Ashurst, P. R. (2005). *Chemistry and technology of soft drinks and fruit juices*. Oxford: Blackwell Pub. Co.
2 Steen, D. P. (2006). *Carbonated soft drinks - formulation and manufacture*. Oxford: Blackwell Publishers.

FSAT-6121 Food Product Development and Service Management 3(2+1)

The aim of this course is to provide the opportunity for students to integrate their training in food science and technology and related disciplines and gain experience with theory and practice of developing food products. Lectures and lab sessions will involve understanding and applying practices to develop food products with traditional and novel food ingredients and processes in the context of existing and projected national and international legal, regulatory, economic, environmental and social constraints. Nutritional and health implications relating to food products will also be considered. The course will also help prepare student for food service management positions in restaurants, hotels and hospitality sector.

Contents (Theory)

1 Food product development: Process, strategy, design, development, commercialization, evaluation
2 Key to new product's success and failure
3 Consumer behavior, food choices, sensory needs, consumer role. Preference Mapping and Food Product Development. Conducting trials, analyzing, recent developments.
4 Case Study of Consumer Oriented Food Product Development: Reduced calorie foods
5 Consumer trends and healthy eating, marketing and technological challenges, success factors
6 Case Study: Reduced calorie on the go beverages
7 The ethics of food production and consumption. Principles of menu development.
8 Food Storage: Preservation concepts, sanitary food handling procedures, elementary nutrition
9 Kitchen Equipment: Selection layout, purchasing
10 The fabrication of chicken, beef, lamb, and fish, Proper cuts and their uses, recognition of the quality of meat. Cake and Pastry: Design and decoration
11 Control for dining rooms, banquets (responsibilities of banquet server, roll call, table setting, serving and clearing, safety and sanitation) and catering events
12 Human Resource Management: Recruitment and selection, training and development, employee relations, principles of supervision, customer relations
13 Fundamentals of marketing in the hotel industry

Contents (Practical)

1 Food Product Development Projects: strategy, design, development, commercialization, launch and evaluation. Practical aspects and sensory evaluation techniques.
2 Production and Service of Food in Volume: Chinese dishes, salads, sandwiches, bakery goods, doughnuts, waffles and desserts.
3 Visit of restaurants and hotels.

Recommended Texts

1 Sunil, S. (2005). *Food and beverage services*. New Delhi: Akansha Publishing House.
2 Earle, M., & Earle, R. (2007). *Case studies in food product development.* Cambridge: Woodhead Publishing Ltd.

Suggested Readings

1 Diyush, B. N. P. (2007). *Food and beverage management*. New Delhi: SBS Publishers and Distributors Pvt. Ltd.
2 Bernard, D., Andrcw, L., & Sally, S. (2005). *Food and beverage management*. New Delhi: Elsevier Division of Reed Elsevier India Pvt. Ltd.

FSAT-6122 Technology of Oils and Fats 3(2+1)

This course will cover the general methods used to examine oils and fats for their physical properties and more basic analytical criteria, procedures to give detailed information on their quality criteria. This course provides the basic chemistry of fats and oils with focus in the understanding of relevance of their physicochemical and biochemical properties in their functions as ingredients in foods. Oil and fats are important parts of the human diet and more than 90% of the world production from vegetable, animal and marine sources is used as food or as ingredient in food products. World demand for dietary oils and fats is steadily increasing. Oils and fats serve as a rich source of dietary energy. They contain certain fatty acid components which are essential nutrients and their functional and textural characteristics contribute to the flavour and palatability of many natural and prepared foods. Modern advances in oils and fats technology and science of nutrition have led to the need for greater awareness of the composition and structure of dietary lipids and many new test methods and analytical procedure have been recently introduced.

Contents (Theory)

1 Physical and chemical characteristics of Oils and Fats
2 Oil Bearing Materials: Pre-treatment, storage.
3 Extraction Methods: Rendering, expression, solvent extraction.
4 Processing: Degumming, refining,
5 Bleaching, deodorization, fractionation,
6 Winterization, hydrogenation,
7 Interesterification, esterification,
8 Emulsification, stabilization.
9 Spoilage: Oxidative and hydrolytic rancidity chemistry,
10 Prevention use of antioxidants.
11 Manufacture of frying oils, margarine, mayonnaise.
12 Byproducts of fats and oils industry and their uses.

Contents (Practical)

1 Basics of lab work (Safety, hygiene, sanitation etc.).
2 Handling and storage of glass ware.
3 Solution preparation and standardization. Extraction of oils and fats.
4 Determination of Color, cold test, melting point, smoke point, specific gravity, solid fat index, refractive index, acid value, peroxide value, iodine value, saponification value.
5 Visit to oil and fat industries.

Recommended Texts

1 Hoffmann, G., & Taylor, S. L. (2013). *The chemistry and technology of edible oils and fats and their high fat products*. Amsterdam: Elsevier Science.
2 O'Brien, R. D. (2008). *Fats and oils: formulating and processing for applications.* (3rd ed.) Florida: CRC Press.

Suggested Readings

1 Bockisch, M. (2015). *Fats and oils handbook.* Amsterdam: Elsevier Science.
2 Talbot, G. (2015). *Specialty oils and fats in food and nutrition.* Cambridge: Woodhead Publishing.
3 Hernandez, E. M., & Kamal-Eldin, A. (2013). *Processing and nutrition of fats and oils*: New Jersey: John Wiley & Sons.

FSAT-6123 Confectionery and Snack Foods 2(2+0)

The Confectionery and Snack Food segment includes food products such as chocolates, candy bars, sweets, jellies, gums, hard and chew candies, through to snack foods such as potato chips, crisps, ready to eat nuts, trail mix, savory snacks, energy and granola bars. The confectionery industry is not a science-based industry: it is an industry that has been built on the confectioner's craft. Confectionery is normally divided into three classes: flour confectionery, chocolate confectionery, and sugar confectionery. The course is structured towards providing the basic knowledge and skill-set to run a successful confectionery production industry. It also offers basic knowledge in entrepreneurial skill concept that will help students to set up and manage a successful confectionery business. It teaches students the necessary recipe and process on Cakes and Muffins production, Biscuits production, Pies and Rolls production, Snacks production, Bread production, Ice Cream production and Beverage and Custard production.

Contents

1. Confectionery: Significance
2. Confectionery: Classification
3. Confectionery industries in Pakistan
4. Sugar confectionery: Ingredients and manufacturing of high boiled sweets, caramel, toffee, fudge and gums etc.
5. Sugar free confectionery: Need, ingredients, manufacture
6. Chewing gum technology
7. Chocolate confectionery
8. Snack Foods: History and status.
9. Manufacturing of potato, nuts,
10. Cereal, meat and fish based snack foods
11. Puffed and baked snacks
12. Seasonings: Ingredients, formulations, applications
13. Packaging of confectionery and snack foods
14. Quality control

Recommended Texts

1 Booth, G. R. (2012). *Snack food*. New York: Springer Science and Business Media Van Nostrand Reinhold.

2 Panda, H. (2009). *The complete technology on snack foods*. New Delhi: National Institute of Industrial Research.

Suggested Readings

1 Lusas, W., & Rooney, L. W. (2001). *Snack food Processing*. Lancaster: Technomic Pub. Co.

2 Edwards, W. P. (2000). *The science of sugar confectionery*. Cambridge: Royal Society of Chemistry Thomas Graham House Science Park.

FSAT-6124 **Meat Technology** **3(2+1)**

In this course student will learn about the overview of meat industry in Pakistan, different factors that influence the quality of meat as fresh and during processing. Students will also get knowledge about handling of these food items on scientific lines and will get information about the production of quality products, techniques that can be used to process and preserve the shelf-life of meat products. The supply shortage of livestock products in certain areas in developing countries is a consequence of the traditional marketing systems, where fresh, unprocessed meat is sold at meat markets a few hours after slaughter. Meat technology focuses on value adding to fresh meat and has a fully equipped small scale meat processing plant to manufacture fresh and cooked processed meat products, i.e. emulsions, smoked and cured products. Meat Technology was involved in research leading to the latest legislation on the inclusion of brine in frozen chicken. Our current focus is on the utilization of the fifth quarter (intestines, organs, blood) in processed products and the development of shelf stable meat products at environmental temperatures.

Contents (Theory)

1 Status of meat industry in Pakistan
2 Structure, composition and nutritive value of meat muscles
3 Slaughtering, Conversion of muscles to meat.
4 Meat quality, Meat inspection and grading, Meat spoilage, Meat tenderization, Aging.
5 Meat Preservation, Meat co-products
6 Non-meat ingredients
7 Processed meat products
8 Quality assurance and safety in meat industries

Contents (Practical)

1 Identification of meat cuts
2 Tests for freshness of meat. Meat grading and quality testing
3 Preservation of meat. Preparation of meat products.
4 Visit to abattoir and meat processing plants

Recommended Texts

1 Toldra, F. (2010). *Handbook of meat processing*. London: Wiley-Blackwell. A John Wiley & Sons, Inc., Publication.
2 Lawrie, A. A., & Ledward, D. A. (2006). *Lawrie's meat science*. Cambridge: Woodhead Publishing Limited.

Suggested Readings

1 Hui, Y. H. (2012). *Handbook of meat and meat processing*. Florida: CRC Press. Taylor & Francis Group.
2 Jhari, S., & Manish, K. C. (2015). *Text book on meat, poultry and fish technology*. New Delhi: Daya Publishing House.
3 Bekhit, A. A. (2017). *Advances in meat processing technology*. Florida: CRC Press. Taylor & Francis Group.

FSAT-6125 **Food Microbiology** **3(2+1)**

This course aims to provide instruction in the general principles of food microbiology. Hands on practical complimented with an industry-based project, give a real-world perspective to microbiological challenges faced by the food industry. The course covers the biology and epidemiology of food- and water-borne microorganisms of public health significance; the microbiology of food preservation and food commodities; principles and methods for the microbiological examination of foods and microbiological quality control. After the completion of the course the student will have knowledge about general concept of microbiology. Awareness and identification of important microorganisms in food and techniques employed for microbial analyses of foods and isolation and identification of microorganisms.

Contents (Theory)

1 Microbiology: introduction, historical background, branches. Significance of microorganisms in food, water and environment.
2 Microorganisms: cell structure, prokaryotes, eukaryotes. Characteristics of microorganisms: bacteria, yeasts, molds, viruses. Growth requirements: cultural, physical, chemical, macro- and micro-nutrients.
3 Culture media: types, applications. Microbial metabolism. Bacterial multiplication: growth curve, continuous culture. Microbial genetics: conjugation, transduction, transformation.
4 Food microbiology: introduction and scope. Morphological, cultural and physiological characteristics: molds, yeasts and yeast like fungi, bacteria.
5 Important microbial genera in foods: bacteria, moulds, yeasts, viruses - general, morphological, cultural and physiological characteristics. Factors affecting the growth and survival of microorganisms in food: intrinsic, extrinsic and implicit.
6 Contamination and spoilage of perishable, semi perishable and stable foods: sources, transmission, microorganisms.
7 Food microbiology and public health: food-borne infections: intoxications.
8 Microbiology in food sanitation

Contents (Practical)

1 Safety in microbiological laboratory.
2 Basic functions and handling of laboratory equipment. Use of microscope.
3 Sterilization and disinfection of glassware. Preparation of culture media. Staining of microorganisms and their structures.
4 Bacterial cultivation, growth measurement. Characteristics of bacterial colonies. Bacterial and fungal morphology. Identification and characterization of micro organisms
5 Enumeration of microorganisms in food samples

Recommended Texts

1 Frazier, W. C., & Westhoff, D. C. (2008). *Food microbiology*. New York: McGraw Hill Book Co.
2 Doyle, M. P., & Buchanan, R. L. (2013). *Food microbiology: fundamentals and frontiers*. New York: ASM Press.

Suggested Readings

1 Bhavbhuti, M. M., Kamal-Eldin, A., Robert, Z., & Iwanski. (2016). *Fermentation: effects on food properties*. London: CRC Press, Taylor and Francis Group.
2 Montville, T. J. (2017). *Food microbiology: an introduction*. (4th ed.) New York: ASM press.

BUSB-6124 Entrepreneurship and SME Management 3(3+0)

This course aims at helping students develop a positive, constructive and practical approach to: Entrepreneurship venture opportunities, innovations, change, fantasies, Environment of small business, sources and resolutions. Risk failure and new venture unit, feasibility of planning and concepts of planning, stages of growth model. The entrepreneur is defined as someone who has the ability and desire to establish, administer, and succeed in a startup venture along with risk entitled to it, to make profits. The best example of entrepreneurship is the starting of a new business venture. The entrepreneurs are often known as a source of new ideas or innovator, and bring new ideas in the market by replacing old with a new invention. This course is designed to help graduate in understanding the importance of new ventures at small scale. Important is to understand the difference between a usual business venture at small scale and entrepreneurship which is need of the modern times.

Contents

1. Introduction: entrepreneurial perspective,
2. Economics and entrepreneurship,
3. Process, ventures, practices and characteristics.
4. Entrepreneurship and new free enterprise: venture opportunities, innovations, Change, fantasies, environment of small business,
5. Sources and resolutions, corporate entrepreneurship, new venture unit of planning and concepts of planning,
6. Stages of growth model, responsibility of feasibility plan.
7. Product and services concepts and commercial opportunities (macro over view),
8. Products and technology, identification opportunities
9. Product development life cycle, product protection,
10. Trademark and patents, process of patents,
11. Validity of property rights and accessing government information
12. Human resources side of enterprise,
13. Infrastructure of services, types of service venture, success factors.
14. Marketing and new venture development, Marketing research for new ventures,
15. Marketing concepts, startup of marketing research, Market focused on organization, sources of market intelligence,
16. Competitive analysis and implications of market research
17. Marketing strategies and functions, Product concepts, 4 Ps.
18. Entrepreneurial team and business formation

Recommended Texts

1. Holt, D. H. (1992). *Entrepreneurship: new venture creation.* New Jersey: Prentice Hall.

Suggested Readings

1 Bolton, B. K., & Thompson, J. (2004). *Entrepreneurs: talent, temperament, technique*. (2nd ed.) New York: Routledge.

FSAT-6126 **Food Biotechnology** **3(2+1)**

This course is designed for students to understand the development of industrially important fermented food products. After the completion of the course the student will have knowledge about general concept of biotechnology and isolation and preservation of industrially important microorganisms. They also have comprehension about industrial fermentations, legal and social aspects of food biotechnology. While technology generally aims to create tools to empower man, biotechnology aims to change man himself, to better fit him to the world. Biotechnology is the application of advances made in the biological sciences, especially involving the science of genetics and its application.

Contents (Theory)

1 Biotechnology: introduction, history
2 Developments in metabolic and biochemical engineering: metabolites
3 Range of fermentation processes
4 Components of fermentation processes
5 Isolation and preservation of industrially important microorganisms.
6 Industrial fermentations: media, design and types of fermenters
7 Process variables in fermentation, recovery, purification of fermentation products
8 Production of organic acids, Enzymes, amino acids
9 Single cell proteins, carotenoids and fermented food products
10 GMO in food biotechnology
11 Legal and social aspects of food biotechnology

Contents (Practical)

1. Isolation of bacterial culture
2. Purification techniques for bacterial culture
3. Maintenance of bacterial cultures
4. Isolation of yeast culture
5. Purification techniques for yeast culture
6. Maintenance of yeast culture
7. Aerobic and anaerobic fermentation
8. Production of various fermented food products

Recommended Texts

1 El-Mansi, F. M. T., Bryee, C. F. A., Demain, A. L., & Allman, A. R. (2007). *Fermentation microbiology and biotechnology*. Florida: CRC Press, Taylor & Francis Group, Boca Raton.
2 Montel, D., & Ramesh, C. R. (2016). *Fermented foods, Part I: biochemistry and biotechnology*. (1st ed.) London: CRC Press, Taylor and Francis Group.

Suggested Readings

1 Otles, S. (2013). *Probiotics and prebiotics in food, nutrition and health*. London: CRC Press. Taylor and Francis Group.
2 Patra, J, K., Das, G., & Shin, H. S. (2018). *Microbial biotechnology: application in food and pharmacology*. Singapore: Springer.

FSAT-6127 **Food Quality Management** **3(3+0)**

The course is designed to give introductory understanding about the food quality management and sanitation. To introduce basic concepts of quality control and quality assurance, to give an overview of QC/QA in the food industry, to present some statistical quality control tools with applications in the food industry, and to cover up-to-date topics of QC/QA as they relate to food industry and government relations.

This course examines food processing systems and food quality management systems. Particular emphasis is on the principles of the various operations including pre-processing, food processing operations and post-processing, as well as on the application of Hazard Analysis Critical Control Point (HACCP) to food production with the aim of producing quality food that meets consumer expectations and food safety standards regulated by the authorities. By completing this course, students will appreciate the principles of food processing and food quality management. Small and medium sized food processing businesses all over the world increasingly have to consider the production of good quality products as essential to their survival. Consumers and buyers are becoming more aware of the importance of safe, high quality products.

Contents

1 Food quality management: history.
2 Food quality management: importance
3 Systems of food quality management
4 Good manufacturing practices (GMP):
5 Personal cleanliness, buildings and facilities,
6 Sanitary operations, sanitary facilities and controls, equipment and utensils,
7 Production and process control,
8 Warehousing and distribution, traceability and recall.
9 Hazard analysis and critical control points (HACCP) system: history, prerequisites, preliminary steps, principles.
10 Food Safety Management Systems (FSMS) – ISO22000:2005.
11 Codex Alimentarius Commission (CAC) guidelines for food quality management.
12 Halal audit and certification

Recommended Texts

1 Luning, P. A., & Marcelis, W. J. (2009). *Food quality management: technological and managerial principles and practices*. Wageningen: Academic Publishers.
2 Luning, P. A., Marcelis, W. J., & Jongen, W. M. (2002). *Food quality management: a techno-managerial approach*. Wageningen: Wageningen Pers.

Suggested Readings

1 Lelieveld, H. L. M., Mostert M. A., & Holah, J. (2005). *Handbook of hygiene control in the food industry*. Cambridge: Woodhead Publishing Ltd.
2 CAC. (2007). *Codex alimentarius commission procedural manual*. Rome: Codex Alimentarius Commission, Joint FAO/WHO Food Standards Programme.
3 ISO. (2005). *Food safety management systems requirements for an organization in the food chain*. Geneva: International Standards Organization, Switzerland.

FSAT-6128 Internship and Report Writing 4(0+4)

The Internship program allows Food Science students to gain practical experience in the workplace before receiving their undergraduate degrees. With employment opportunities increasing in the food processing sector, the industry has increased the demand for skilled professionals. Hence, there is a need of internships for undergraduate students to gain industrial experience and exposure to food processing industry. The students involved in various undergraduate courses of Food Technology are provided with opportunities to get industrial exposure either by their college/university or by their own. Students should get involved in summer trainings provided by various food industries across the country or long term internships (6 months) which provide them an opportunity to learn about the work culture of any industry and do some projects to gain exposure. Students can get involved for internships in R&D, Manufacturing, Quality Control, Sales & Marketing, Teaching and Consulting within the Government etc. The popular sector which can provide internships include Food Manufacturing & Processing (Grains, fruits, vegetables, fish, meat etc.); Bakery & Confectionery Industry; Beverage Industry; Dairy Industry; Poultry Industry; Breweries; FMCG; Pharma-Biotech; Agro-Biotech; Food Supplements and Nutraceuticals; Healthcare; Academia & Research Institutes; Food Packaging Industry; Food Retail.

Contents

1 Every student will undertake practical training in an approved food industry, research organization, food regulatory bodies and hospitals.
2 The student will maintain a daily diary duly signed by the industrial/internship supervisor.
3 At the end of the internship, the student will submit a written report.
4 He/she will be evaluated by a committee on the basis of his/her performance in the industry/research organization, final written report and oral presentation.

Recommended Texts

1 Awan, J. A. (2009). Scientific presentations. Faisalabad: Unitech Communications.

Suggested Readings

1 Murray, N., & Hughes, G. (2008). Writing up your university assignments and research projects: a practical handbook. London: McGraw-Hill Education.
2 Anderson, J., Durston, B. H., & Poole, M. (1992). Thesis and assignment writing. New Delhi: Wiley Eastern Ltd.

FSAT-6129 Introduction to Research and Scientific Writing 2(1+1)

This course will help to develop and sharpen academic and professional writing and presentation skills and strategies. Writing is a very important part of science; it is used to document and communicate ideas, activities and findings to others. Scientific writing can take many forms from a lab notebook to a project report, or from a paper in an academic journal to an article in a scientific magazine. This guide focuses on scientific writing for academic course work, much of which is devoted to describing and explaining. The aim of science is to generate new and reliable knowledge. If one only applies science, perhaps without doing own research, one should gather and apply state-of-the-art knowledge rather than outdated knowledge. Due to the aim of science, good writing is not a luxury, but an essential skill. It is essential not only for the dissemination of knowledge, but also for creating knowledge: During the writing process one is forced to be precise in all details. It is only during the writing process that gaps in the reasoning or lack of clarity become apparent.

Contents (Theory)

1 Types of scientific presentations
2 Collection of literature: printed and electronic sources
3 Managing literature.
4 How to initiate write up?
5 Writing scientific documents.
6 Synopsis and Thesis
7 Research proposal
8 Research and review articles
9 How to write references and citations
10 Internship report writing
11 Oral presentations

Contents (Practical)

1 Exercises in collecting literature from different sources on assigned topics
2 Organizing and analysis of collected material
3 Writing synopsis/proposal, short communication
4 Delivering oral presentations

Recommended Texts

1 Awan, J. A. (2009). *Scientific presentations*. Faisalabad: Unitech Communications.
2 Khalil, S. K., & Shah, P. (2007). *Scientific writing and presentation for crop sciences*. Islamabad: Higher Education Commission of Pakistan.

Suggested Readings

SCHEME OF STUDIES AND CURRICULUM

for

B. Sc. (Hons.) Home Economics

(4 Years Degree Program)

w.e.f. Fall Admissions 2021

INSTITUTE OF FOOD SCIENCE AND NUTRITION (IFSN)

UNIVERSITY OF SARGODHA, SARGODHA

PAKISTAN

B.Sc. (Hons.) Home Economics

- Eligibility: At least 45% marks in F.Sc. (Pre-Medical/Pre-Engineering) or A Level
- Duration: 04 Years Program (08 Semesters)
- Degree Requirements: 137 Credit Hours

Course Code	Course Title	Credit Hours
URCE-5102	Language Comprehension & Presentation Skills	3(3+0)
URCI-5109	Introduction to Information & Communication Technologies	3(2+1)
URCP-5106	Pakistan Studies	2(2+0)
HECO-5101	Introduction to Home Economics	3(3+0)
HECO-5102	Fundamentals of Food and Nutrition	3(2+1)
HECO-5103	Textiles and Clothing	3(2+1)
HECO-5104	Introduction to Art and Design	3(2+1)
	Total Credit Hours	**20(16+4)**
SEMESTER-II		
URCE-5103	Academic Writing	3(3+0)
URCI-5105	Islamic Studies	2(2+0)
ZOOL-6141 / MATH-5128	Introduction to Biology I (for Pre-Engineering students) / Mathematics (for Pre-Medical students)	3(3+0)
HECO-5105	Meal Management	3(2+1)
HECO-5106	Clothing and Consumer Education	3(2+1)
HECO-5107	Applied Art and Design	3(2+1)
HECO-5108	Life Span Development	3(2+1)
	Total Credit Hours	**20(16+4)**
SEMESTER-III		
STAT-5101	Introductory Statistics	3(3+0)
CHEM-6111	Biochemistry	4(3+1)
HECO-5109	Home Management and Housing	3(2+1)
HECO-5110	Family and Community Development	3(2+1)
HECO-5111	Family Economics	3(3+0)
HECO-5112	Global Food Issues	3 (3+0)
	Total Credit Hours	**19(16+3)**
SEMESTER-IV		
STAT-5102	Introduction to probability distribution	3(3+0)
HECO-5113	Applied Housing and Home Management	3(2+1)
HECO-5114	Special Children Education	3(3+0)
HECO-5115	Entrepreneurship Development	3(3+0)
HECO-5116	Health Care Promotion	3(3+0)
HECO-5117	Nutrition Policies and Programs	3(3+0)
	Total Credit Hours	**18(17+1)**

SEMESTER-V		
HECO-6118	Home Economics Education, Administration and Supervision	3(3+0)
Major Courses (Food and Nutrition)		
FANU-6101	Food Preservation	3(2+1)
FANU-6102	Experimental Foods	3(2+1)
FANU-6103	Fundamentals of Human Nutrition	3(3+0)
FANU-6104	Nutritional Education and Awareness	3(2+1)
Major Courses (Textiles and Clothing)		
TEXC-6101	Fundamentals of Garment Construction	3(2+1)
TEXC-6102	Pattern Making	3(1+2)
TEXC-6103	Fashion Designing and Illustrations	3(1+2)
TEXC-6104	Fiber Science	3(2+1)
Major Courses (Applied Art and Design)		
ARTD-6101	Early Ages of Art	3(3+0)
ARTD-6102	Art Education	3(2+1)
ARTD-6103	Drawings Techniques	3(1+2)
ARTD-6104	Commercial Art	3(2+1)
Major Courses (Human Development and Family Studies)		
HDFS-6101	Development from Prenatal to Infancy	3(3+0)
HDFS-6102	Childhood Care and Development	3(2+1)
HDFS-6103	Adolescent Development	3(2+1)
HDFS-6104	Adulthood and Aging	3(2+1)
Major Courses (Interior and Environmental Design)		
IDED-6101	Interior Space Planning-I	3(2+1)
IDED-6102	Fundamentals of Interior Architecture-I	3(2+1)
IDED-6103	Designing the Furniture	3(2+1)
IDED-6104	Interior Design Application OR Perspective Drawing/Studio	3(1+2)
	Total Credit Hours (for each major)	**15**
SEMESTER-VI		
HECO-6119	Methods of Research	3(3+0)
Major Courses (Food and Nutrition)		
FANU-6105	Physiological Aspects of Nutrition	3(3+0)
FANU-6106	Advanced Nutrition	3(2+1)
FANU-6107	Diateticts	3(2+1)
FSAT-6125	Food Microbiology	3(2+1)
Major Courses (Textiles and Clothing)		
TEXC-6105	Textiles Computer aided Design	3(1+2)_
TEXC-6106	Fiber Chemistry	3(2+1)
TEXC-6107	Textile Processing and Finishing	3(3+0)
TEXC-6108	Fundamentals of Drapping	3(1+2)
Major Courses (Applied Art and Design)		
ARTD-6105	History of Art	3(3+0)
ARTD-6106	Applied Art Education	3(2+1)
ARTD-6107	Home Art and Craft	3(1+2)
ARTD-6108	Fundamentals of Designing	3(1+2)

Major Courses (Human Development and Family Studies)		
HDFS-6105	Positive Psychology	3(2+1)
HDFS-6106	Early Childhood and Guidance	3(2+1)
HDFS-6107	Theories of Human Development	3(3+0)
HDFS-6108	Communication in Human and Family Relations	3(2+1)
Major Courses (Interior and Environmental Design)		
INED-6105	Interior Space Planning-II	3(2+1)
INED-6106	Fundamentals of Interior Architecture-II	3(2+1)
INED-6107	Designing for Soft Furnishing	3(2+1)
INED-6108	Interior Environment Physical Aspect	3(2+1)
	Total Credit Hours (for each major)	**15**
SEMESTER-VII		
HECO-6120	Internship (Hospital/Community/Institution)	6 (0+6)
Major Courses (Food and Nutrition)		
FANU-6108	Nutritional Management in Disasters	3(3+0)
FANU-6109	Institutional Management	3(2+1)
FANU-6110	Clinical and Therapeutic Nutrition	3(2+1)
FAST-5106	Food Safety and Laws	3 (3+0)
Major Courses (Textiles and Clothing)		
TEXC-6109	Dress designing through Draping	3(1+2)
TEXC-6110	Fiber Science	3(2+1)
TEXC-6111	Language of Fashion	3(3+0)
TEXC-6112	Textile Dyeing and Printing	3(2+1)
Major Courses (Applied Art and Design)		
ARTD-6109	Islamic Art	3(3+0)
ARTD-6110	Calligraphy	3(2+1)
ARTD-6111	The Craft of Hand Weaving	3(2+1)
ARTD-6112	Print Making	3(1+2)
Major Courses (Human Development and Family Studies)		
HDFS-6109	Abnormal Psychology	3(2+1)
HDFS-6110	Elementary Education and Administration	3(2+1)
HDFS-6111	Family Dynamics	3(2+1)
HDFS-6112	Gerontology: Social Aspects	3(2+1)
Major Courses (Interior and Environmental Design)		
INED-6109	Environmental Management	3(2+1)
INED-6110	Designing Functional Spaces for Special Needs	3(2+1)
INED-6111	Environmental Aesthetics	3(2+1)
INED-6112	Interior Design Project	3(0+3)
	Total Credit Hours (for each major)	**15**
SEMESTER-VIII		
HECO-6121	Research Project	6 (0+6)
Major Courses (Food and Nutrition)		
FANU-6111	Applied Nutrition	2 (0+2)
FANU-6112	Nutrition in Health and Prevention	2(2+0)
FANU-6113	Sports Nutrition	2(2+0)
FANU-6114	Food and the Allergic Reaction	3 (3+0)

Major Courses (Textiles and Clothing)		
TEXC-6113	Traditional Textiles of Pakistan	3(3+0)
TEXC-6114	Redesigning and Restoring of Textiles	3(1+2)
TEXC-6115	Textile Applications	3(3+0)
Major Courses (Applied Art and Design)		
ARTD-6113	Art Appreciation	3(2+1)
ARTD-6114	Painting	3(1+2)
ARTD-6115	Hand Built Pottery	3(1+2)
Major Courses (Human Development and Family Studies)		
HDFS-6113	Educational Psychology and Measurement Techniques	3(2+1)
HDFS-6114	Planning and Managing Human Services Programs	3(2+1)
HDFS-6115	Day Care Management and Administration	3(2+1)
Major Courses (Interior and Environmental Design)		
INED-6113	Advance Computer Applications for Interior Design.	3(1-2)
INED-6114	Interior Design Professional Practice Management	3(2+1)
INED-6115	Consumer Marketing Strategies	3(2+1)
	Total Credit Hours (for each major)	**15**
GRAND TOTAL CREDIT HOURS		**137**

URCE-5102 Language Comprehension & Presentation Skills 3(3+0)

The course aims at developing linguistic competence by focusing on basic language skills in integration to make the use of language in context. It also aims at developing students' skills in reading and reading comprehension of written texts in various contexts. The course also provides assistance in developing students' vocabulary building skills as well as their critical thinking skills. The contents of the course are designed on the basis of these language skills: listening skills, pronunciation skills, comprehension skills and presentation skills. The course provides practice in accurate pronunciation, stress and intonation patterns and critical listening skills for different contexts. The students require a grasp of English language to comprehend texts as organic whole, to interact with reasonable ease in structured situations, and to comprehend and construct academic discourse. The course objectives are to enhance students' language skill management capacity, to comprehend text(s) in context, to respond to language in context, and to write structured response(s).

Contents

1 Listening skills
2 Listening to isolated sentences and speech extracts
3 Managing listening and overcoming barriers to listening
4 Expressing opinions (debating current events) and oral synthesis of thoughts and ideas
5 Pronunciation skills
6 Recognizing phonemes, phonemic symbols and syllables, pronouncing words correctly
7 Understanding and practicing stress patterns and intonation patterns in simple sentences
8 Comprehension skills
9 Reading strategies, summarizing, sequencing, inferencing, comparing and contrasting
10 Drawing conclusions, self-questioning, problem-solving, relating background knowledge
11 Distinguishing between fact and opinion, finding the main idea, and supporting details
12 Text organizational patterns, investigating implied ideas, purpose and tone of the text
13 Critical reading, SQ3R method
14 Presentation skills, features of good presentations, different types of presentations
15 Different patterns of introducing a presentation, organizing arguments in a presentation
16 Tactics of maintaining interest of the audience, dealing with the questions of audience
17 Concluding a presentation, giving suggestions and recommendations

Recommended Texts

1 Mikulecky, B. S., & Jeffries, L. (2007). *Advanced reading power: Extensive reading, vocabulary building, comprehension skills, reading faster*. New York: Pearson.
2 Helgesen, M., & Brown, S. (2004). *Active listening: Building skills for understanding*. Cambridge: Cambridge University Press.

Suggested Readings

1 Roach, C. A., & Wyatt, N. (1988). *Successful listening*. New York: Harper & Row.
2 Horowitz, R., & Samuels, S. J. (1987). *Comprehending oral and written language*. San Diego: Academic Press.

URCI-5109 Introduction to Information & Communication Technologies 3 (2+1)

The course introduces students to information and communication technologies and their current applications in their respective areas. Objectives include basic understanding of computer software, hardware, and associated technologies. They can make use of technology to get maximum benefit related to their study domain. Students can learn how the Information and Communications systems can improve their work ability and productivity. How Internet technologies, E-Commerce applications and Mobile Computing can influence the businesses and workplace. At the end of semester students will get basic understanding of Computer Systems, Storage Devices, Operating systems, E-commerce, Data Networks, Databases, and associated technologies. They will also learn Microsoft Office tools that includes Word, Power Point, Excel. They will also learn Open office being used on other operating systems and platforms. Specific software's related to specialization areas are also part of course.. Course will also cover Computer Ethics and related Social media norms and cyber laws.

Contents

1. Introduction, Overview and its types.
2. Hardware: Computer Systems & Components, Storage Devices and Cloud Computing.
3. Software: Operating Systems, Programming and Application Software,
4. Introduction to Programming Language
5. Databases and Information Systems Networks
6. The Hierarchy of Data and Maintaining Data,
7. File Processing Versus Database Management Systems
8. Data Communication and Networks.
9. Physical Transmission Media & Wireless Transmission Media
10. Applications of smart phone and usage
11. The Internet, Browsers and Search Engines.
12. Websites Concepts, Mobile Computing and their applications.
13. Collaborative Computing and Social Networking
14. E-Commerce & Applications.
15. IT Security and other issues
16. Cyber Laws and Ethics of using Social media
17. Use of Microsoft Office tools (Word, Power Point, Excel), mobile apps or other similar tools depending on the operating system.
18. Other IT tools/software specific to field of study of the students if any

Recommended Texts

1. Vermaat, M. E. (2018). *Discovering computers: digital technology, data and devices.* Boston: Course Technology Press.

Suggested Readings

1. Timothy J. O'Leary & Linda I. (2017). *Computing essentials*, (26th ed.). San Francisco: McGraw Hill Higher Education.
2. Schneider, G. M., & Gersting, J. (2018). *Invitation to computer science*. Boston: Cengage Learning.

URCP-5106 **Pakistan Studies** **2(2+0)**

The course is designed to acquaint the students of BS Programs with the rationale of the creation of Pakistan. The students would be apprised of the emergence, growth and development of Muslim nationalism in South Asia and the struggle for freedom, which eventually led to the establishment of Pakistan. While highlighting the main objectives of national life, the course explains further the socio-economic, political and cultural aspects of Pakistan's endeavours to develop and progress in the contemporary world. For this purpose, the foreign policy objectives and Pakistan's foreign relations with neighbouring and other countries are also included. This curriculum has been developed to help students analyse the socio-political problems of Pakistan while highlighting various phases of its history before and after the partition and to develop a vision in them to become knowledgeable citizens of their homeland.

Contents

1. Contextualizing Pakistan Studies
2. Geography of Pakistan: Geo-Strategic Importance of Pakistan
3. Freedom Movement (1857-1947)
4. Pakistan Movement (1940-47)
5. Muslim Nationalism in South Asia
6. Two Nations Theory
7. Ideology of Pakistan
8. Initial Problems of Pakistan
9. Political and Constitutional Developments in Pakistan
10. Economy of Pakistan: Problems and Prospects
11. Society and Culture of Pakistan
12. Foreign Policy Objectives of Pakistan and Diplomatic Relations
13. Current and Contemporary Issues of Pakistan
14. Human Rights: Issues of Human Rights in Pakistan

Recommended Texts

1. Kazimi, M. R. (2007). *Pakistan studies.* Karachi: Oxford University Press.
2. Sheikh, J. A. (2004). *Pakistan's political economic and diplomatic dynamics.* Lahore: Kitabistan Paper Products.

Suggested Readings

1. Hayat, S. (2016). *Aspects of Pakistan movement.* Islamabad: National Institute of Historical and Cultural Research.
2. Kazimi, M. R (2009). *A concise history of Pakistan.* Karachi: Oxford University Press.
3. Talbot, I. (1998). *Pakistan: A modern history*. London: Hurst and Company.

HECO-5101 Introduction to Home Economics 3(3+0)

This course will enable the students to get familiarization about Pakistan creation and history.

Contents (Theory)

1. Nature of Home Economics
2. Aims and Objective of Home Economics
3. History of Home Economics.
4. Home Economics in Pakistan
5. Home Economics as a profession
6. Scope of Home Economics as a profession
7. Method of teaching with special books recommended to Home Economics.
8. Lecture. Demonstration 'Laboratory field trips Role playing'Group Discussion.
9. Role and Responsibilities of Home Economist towards family, Community and Profession.

Recommended Texts

1. Sarah Stage, Virginia B. (1997). Vincenti Rethinking Home Economics: Women and the History of a Profession; Cornell University Press.
2. Barbara McAlvayFerrar (1964). The history of home economics education in America and its implications for liberal education Michigan State University.
3. Stephanie Heatwole Cooney (1977). The first 50 years in service to home economics educators: A history of the Home Economics Education Association, 1927-1977; Home Economics Education Association
4. Rhea Shields, Rhea Shields PhD, Anna Williams Opportunities in Home Economics Careers; McGraw-Hill; 1 edition (2000).
5. Henrietta Christina Fleck, Top of Form; Fleck's Toward better teaching f home economics: 3rd Edition: 1980Macmillan; 3rd Edition (1980).

.

HECO-5102 Fundamentals of Food and Nutrition 3(2+1)

This course will enable the students to get familiarize with basics of human nutrition.

Contents (Theory)

1. Introduction: definitions, food, nutrients, diet, balanced diet, food groups, food guide pyramid, meal planning
2. Eating food: smell, taste, satiety. Water: functions, sources, regulation in body, dietary requirements, content in food.
3. Carbohydrates: types, role in body, dietary fiber, sweeteners, dietary requirements, content in food.
4. Fats and oils: types, functions, dietary requirements, content in food, fat substitutes. Proteins: amino acids, protein synthesis, classification, functions, quality of proteins, dietary requirements, content in foods.
5. Vitamins: classification, role in body, content in food. Mineral elements: types, requirements, sources, functions. Digestion: alimentary tract, digestive juices, secretions.
6. Absorption and metabolism of nutrients: carbohydrates, protein, lipids.
7. Nutrient and dietary deficiency disorders: malnutrition, obesity, coronary diseases, diabetes, lactose and gluten intolerance, dental caries – symptoms, causes, prevention.

Recommended Texts

1. Geissler, C. & Powers, H. (2010). Human nutrition. Churchill Livingstone, London, UK.
2. Awan, J.A. (2007). Elements of Food and Nutrition. Unitech Communications, Faisalabad- Pakistan.
3. Bamji, M.S., Rao, N.P. & Reddy, V. (2004). Textbook of Human Nutrition. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.
4. Eastwood, M. (2003). Principles of Human Nutrition. John Wiley & Sons, Inc., New York, USA.
5. Garrow, J.S., James, W.P.T. & Ralph, A. (2000). Human Nutrition and Dietetics. Churchill.

.

HECO-5103 Textiles and Clothing 3(2+1)

This course will enable the students to produce a concept of advancement in textile.

Contents (Theory)

1. Introduction to Textiles, Textile History
2. Textile Forecasting and Marketing
3. Textile Technology and Fiber Science
4. Textile Design
5. Yarn Processing
6. Dyeing Theory

Content (Practical)

1. Thermodynamic and kinetic concepts to understand how textiles accept and retain color

Recommended Texts

1. Jamila, & Brijbushan, B. (1995). The costumes and Textiles of India . Delhi India: Dob. Tava Porewala Sons and Co. Private Ltd.
2. Joyce, C. (2001). Textile Design. New York USA: Watson Cliphill Publishers.
3. Lewis, D. S et. (1989). Clothing Construction and Wardrobe Planning . New York: The Macmillan Company.
4. Liddell, L. (1991). Clothes and Your Appearance . South Holland: Good heart will-Cox Company .
5. Loing, R. (2002). Clothing Textile and Human Performance . New York. USA: Allyn and Balcon Pub. Co

.

HECO-5104 Introduction to Art and Design 3(2+1)

This course will enable the students to get understanding that application of art is important in developing awareness about design.

Contents (Theory)

1. Design. Definition of Design. The Designing process as a form of organization.
2. Factors involved in the making of a design.
3. The Analysis of the making of adesign. Elements of Design.
4. The Fundamental principles of Art.
5. Definition. Application to interior, clothing and painting.
6. Appreciation of Art: Cave Art. Indus valley Civilization

Content (Practical)

2. Two practical Exercises based on all the Elements and Principles of design.
3. Preparation of portfolio.

Recommended Texts

1. Art in Everyday Life by Harriet Goldstein (1960) , The Macmillan Company, NewYork.
2. Inside Today's Home by Luann Nissen, Ray Faulkner, and Sarah Faulkner (Jan 2, 1994), Holt, Rinehart and Winston,Alnc.
3. Art of Calligraphy by David Harris (2005), A Practical Guideto the Skills and Techniques, Dorling Kindersley.
4. Janson's History of Art: The Western Tradition(8th Edition)
5. Folk motifs of Pakistan - Unknown Binding (1990) by Mahrukh Yousuf, LokVirsa.

URCE-5103 **Academic Writing** **3 (3+0)**

Academic writing is a formal, structured and sophisticated writing to fulfill the requirements for a particular field of study. The course aims at providing understanding of writer's goal of writing (i.e. clear, organized and effective content) and to use that understanding and awareness for academic reading and writing. The objectives of the course are to make the students acquire and master the academic writing skills. The course would enable the students to develop argumentative writing techniques. The students would be able to the content logically to add specific details on the topics such as facts, examples and statistical or numerical values. The course will also provide insight to convey the knowledge and ideas in objective and persuasive manner. Furthermore, the course will also enhance the students' understanding of ethical considerations in writing academic assignments and topics including citation, plagiarism, formatting and referencing the sources as well as the technical aspects involved in referencing.

Contents

1 Academic vocabulary
2 Quoting, summarizing and paraphrasing texts
3 Process of academic writing
4 Developing argument
5 Rhetoric: persuasion and identification
6 Elements of rhetoric: Text, author, audience, purposes, setting
7 Sentence structure: Accuracy, variation, appropriateness, and conciseness
8 Appropriate use of active and passive voice
9 Paragraph and essay writing
10 Organization and structure of paragraph and essay
11 Logical reasoning
12 Transitional devices (word, phrase and expressions)
13 Development of ideas in writing
14 Styles of documentation (MLA and APA)
15 In-text citations
16 Plagiarism and strategies for avoiding it

Recommended Texts

1 Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks and skills* (3rd ed.). Ann Arbor: The University of Michigan Press.
2 Bailey, S. (2011). *Academic writing: A handbook for international students* (3rd ed.). New York: Routledge.

Suggested Readings

1 Craswell, G. (2004). *Writing for academic success*. London: SAGE.
2 Johnson-Sheehan, R. (2019). *Writing today*. Don Mills: Pearson.
3 Silvia, P. J. (2019). *How to write a lot: A practical guide to productive academic writing*. Washington: American Psychological Association.

URCI-5105 **Islamic Studies** **2(2+0)**

The course aims to provide basic information about Islamic studies, to enhance understanding of the students regarding Islamic civilization, to improve students skill to perform prayers and other worships, to enhance the skill of the students for understanding of issues related to faith and religious life.

Contents

1. Introduction to Quranic Studies: Basic concepts of Quran.
2. History of Quran.Uloom-ul–Quran.
3. Study of selected text of Holly Quran-I.
4. Verses of Surah Al-Baqra related to faith (VerseNo-284-286).
5. Verses of Surah Al-Hujrat related to Adab Al-Nabi (VerseNo-1-18).
6. Verses of Surah Al-Mumanoon related to characteristics of faithful (VerseNo-1-11). Verses of Surah al-Furqan related to social ethics (VerseNo.63-77). Verses of Surah Al-Inam related to ihkam (Verse No-152-154). Study of Selected Text of Holly Quran-II: Verses of Surah Al-Ihzab related to Adab al-Nabi (VerseNo.6,21,40,56,57,58).
7. Verses of Surah Al-Hashar (18,19,20) related to thinking, Day of Judgment.
8. Verses of Surah Al-Saf related to Tafakar,Tadabar (Verse No-1,14). Seerat of Holy Prophet (S.A.W)-I: Life of Muhammad Bin Abdullah (Before Prophet Hood).
9. Life of Holy Prophet (S.A.W) inMakkah. Important lessons derived from the life of Holy Prophet in Makkah. Seerat of Holy Prophet (S.A.W)-II: Life of Holy Prophet (S.A.W) inMadina. Important events of life Holy Prophet in Madina. Important lessons derived from the life of Holy Prophet in Madina. Introduction To Sunnah: Basic concepts ofHadith. History ofHadith.Kinds of Hadith.Uloomul Hadith.
10. Sunnah and Hadith. Legal position of Sunnah. Selected Study from text of Hadith. Introduction To Islamic Law and Jurisprudence: Basic concepts of Islamic Law andJurisprudence. History and importance of Islamic Law and Jurisprudence. Sources of Islamic Law andJurisprudence.Nature of differences in Islamic Law.
11. Islam and sectarianism. Islamic Culture and Civilization: Basic concepts of Islamic Culture and civilization. Historical development of Islamic Culture and civilization. Characteristics of Islamic Culture and civilization.
12. Islamic Culture and civilization and contemporary issues. Islam and Science: Basic concepts of Islam and Science. Contributions of Muslims in the development of Science. Quranic and Science. Islamic EconomicSystem: Basic concepts of Islamic economic system.
13. Means of distribution of wealth in Islamic economics. Islamic concept of Riba.Islamic ways of trade and commerce. Political System of IslamIslamic History: Period of Khlaft-E-Rashida. Period of Ummayyads. Period ofAbbasids.
14. Social System of Islam: Basic concepts of cocial system of Islam. Elements of family. Ethical values of Islam.

Recommended Texts

1. HameedUllahMuhammad, ―EmergenceofIslam‖,IRI,Islamabad
2. HameedUllah Muhammad, _Introduction to Islam
3. Hussain Hamid Hassan, ―An Introduction to the Study of Islamic Law‖leaf Publication Islamabad, Pakistan.
4. Ahmad, H. (1993). Principles of Islamic Jurisprudence. Islamic Research Institute, International Islamic University, Islamabad.
5. Mir, W. (1982). Muslim Jurisprudence and the Quranic Law of Crimes. Islamic Book Service.
6. Bhatia, H.S. (1989). Studies in Islamic Law, Religion and Society. Deep and Deep Publications, NewDelhi.
7. Dr. Muhammad Zia-ul-Haq, (2001). Introduction to Al Sharia Al-Islamia. Allama Iqbal Open University, Islamabad.

ZOOL-6141 Introduction to Biology I 3(3+0)

This subject aims to yield students with a sense of practical relevance of biology to everyday life. This will make students comprehend life by understanding some of the molecular processes that occur in and around cells, to make students cognizant of biologic phenomenon (nature, body, etc.) on an evolutionary, ecological, behavioral, physiologic, tissue, cellular, and molecular level. In this subject students will examine how life is organized into hierarchical levels; how living organisms use and produce energy; how life grows, develops, and reproduces; how life responds to the environment to maintain internal stability; and how life evolves and adapts to the environment. Moreover, it will also enable them to investigate the biological molecules, homeostasis in vertebrates, and the influence of hormones on coordination and control systems of animal body. Upon completion of this subject students will be have an enhanced knowledge and appreciation of the basics of growth and development plans of animals and can develop cogent and critical arguments based on the course material.

Contents

1. Introduction: Nature and scope of biology
2. Branches of biology
3. Relationship between biology and psychology
4. Biological molecules: Carbohydrates, Proteins, Fats, Nucleic acids, Water
5. The cell: Structure and function of cell
6. Cell organelles
7. Different types of cells
8. Homeostasis: Osmoregulation
9. Structure and functions of Nephron
10. Thermoregulation
11. Coordination and control: Structure and physiology of Neuron
12. Introduction to central and peripheral nervous system
13. Hormones
14. Basics of growth and development
15. Embryonic and post embryonic development

Recommended Texts

1. Michael, J., & Lenardo. (2013). *Immune Homeoststis: Methods and protocols*. New Jersey: Humama press.
2. Paradise, C. J., & Campbell, A. M. (2016). *Organismal Homeostasis*. New York: Momentum Press.

Suggested Readings

1. Lisa A. U., Michael L. C., Steven A. W., Peter V. M., Jane B. R., & Neil A. C. (2016). *Campbell biology.* (11th ed.) London: Pearson.
2. Cambell, N. A. Mitchell, l. G., & Reece, J. B. (2009). *Biology: Concepts and connections.* (6th ed.) San Francisco: Addison Wesley, Longman
3. Anna A. S., Richard B. P. (2019). *An Introduction to Conservation Biology* (2nd ed.) Oxford: Oxford University Press.

MATH-5128 **Mathematics** **3(3+0)**

To prepare the students, not majoring in mathematics, with the essential tools of algebra to apply the concepts and the techniques in their respective disciplines. Mathematics, as a study of patterns, both practical and abstract, involves analytical thought, logical reasoning, problem solving skills, and precise communication. Because of its power and versatility, mathematics has often been called the "Queen of the Sciences." There is no field of scientific inquiry that does not express itself through the language of mathematics. An undergraduate degree in mathematics provides an excellent foundation for students who are interested in pursuing an advanced degree in mathematics or in a related specialized profession. Mathematics can also provide an excellent foundation for students considering professional degrees in such allied fields such as Law, Business Administration, or Medicine. The kinds of analytical and logical thinking skills that one develops while studying mathematics are precisely the skills that recruiters look for in potential employees. Jobs involving significant mathematical background also consistently rank near the top of the list in annual career surveys.

Contents

1 Real Numbers
2 Relations and Functions
3 Inequalities
4 Quadratic Functions and Complex Numbers
1 Linear Equations and Quadratic Equations: Formation of Linear equation
2 Solving Linear equation involving one variable
3 Solution of Quadratic equation by factorization method
4 Solution of quadratic equation by square completion methods
5 Solution of quadratic equation by quadratic formula
5 Application of quadratic equation
6 Sequence and Series
7 Types of Sequences; A. P, A. M., G. P., H. P
8 Trigonometric Functions
9 Trigonometric Applications
10 Graph of Functions and Modelling
11 Limits and Continuity
12 Derivatives
13 Integration
14 Probability and Binomial Theorem.

Recommended Texts

1. Gantert, A. X. (2009). *Algebra 2 and trigonometry*. New York: AMCOS School Publication INC.
2. Kaufmann, J. E. (1994). *College algebra and trigonometry* (3th ed.) Boston: PWS-Kent Pub. Co.

Suggested Readings

1. Swokowski, E. W. (1993). *Fundamentals of algebra and trigonometry* (8th ed.) Boston: PWS-Kent Pub. Co.
2. Nauman, K. (2019). Basic mathematics-I: algebra and trigonometry (2nd ed.) Lahore: Al-Hassan Pub.
3. Anton, H. (1999). *Calculus: A new horizon* (6th ed.). New York: John Wiley.
4. Stewart, J. (2012). *Calculus* (7th ed.). Belmont: Brooks/Cole.

HECO-5105 Meal Management 3(2+1)

To develop skills to plan appropriate meals matching the nutritional needs of the family using available resources. To develop an understanding of market condition and important factors in selection of various food products .To create awareness about selection, care and use of table appointments in different table settings and service of meals.

Contents (Theory)

1. Importance and principles of meal planning for family and occasions.
2. Selection of various foods in relation to season and market conditions.
3. Selection, use and care of table appointments.
4. Study of different types of table settings, table manners and etiquettes

Contents (Practical)

1. Keeping a record of market prices (retail & wholesale).
2. Comparison of weight, volume and effect of cooking on colour, taste and texture of different foods.
3. Planning, preparation and service of meals for different occasions at different income levels.
4. Market visits for cost and quality and enforcement of food marketing regulations.

Recommended Texts

6. Bogert, D. J. (2001) Nutrition and Physical Fitness, W.B. Saunders Co. Philadelphia, London.
7. Kinder, F., Green, N. R. (1984). Meal Management, (5th Ed), MacMillan Publishing co., Inc.
8. Kneck, L. A. Menus, (1984), Analysis and Planning, (2nd Ed).
9. McWilliams, M. (2008). Fundamentals of Meal Management. (5th Ed).

HECO-5106 Clothing and Consumer Education 3(2+1)

These courses is designed for students to identify textile fibres, learn the production and performance characteristics of natural and manmade fibres, understand the importance of fabric designing and finishes and learn yarn manufacturing and production techniques.

Contents (Theory)

1. Introduction to Textiles and clothing. Attributes essential for quality clothing
2. Values, attitudes and behavior towards clothing, in the cultural milieu.
3. Consumer Requirements: Consumer rights and responsibilities
4. Consumer problems related to clothing
5. Textiles and accessories (bed linen, towels).Advertisements, different types of advertisements, advantages & disadvantages, Media of advertisement.
6. Different kind of labels. Characteristics of three basic weaves.
7. Plain, twill and satin, comparative properties of knitted and woven fabrics. Methods for care and storage of clothing.
8. Principles of storage such as cleanliness, neatness, orderliness and protection from wrinkling, dust, dampness & insects.
9. Daily, weekly and seasonal care of clothes.
10. Study of different types of table settings, table manners and etiquettes

Contents (Practical)

1. Portfolio based on theory

Recommended Texts

1. Jamila, & Brijbushan, B. (1995). The costumes and Textiles of India. Delhi India: Dob. Tava Porewala Sons and Co. Private Ltd.
2. Joyce,C.(2001).Textile Design.NewYork USA: Watson Cliphill Publishers.
3. Lewis, D. S et. (1989). Clothing Construction and Wardrobe Planning. New York: The Macmillan Company.
4. Liddell, L. (1991). Clothes and Your Appearance. South Holland: Good heart will-Cox Company.
5. Loing, R. (2002). Clothing Textile and Human Performance. New York. USA: Allyn and Balcon Pub. Co

HECO-5107 Applied Art and Design 3(2+1)

These courses is designed to prepare students for transfer programs and career opportunities.

Contents (Theory)

5. Principles and practical applications of art.

Contents (Practical)

1. Deisgn

Recommended Texts

1. Art in Everyday Life by Harriet Goldstein (Jan 1, 1960) , The Macmillan Company, New York.
2. Inside Today's Home by Luann Nissen, Ray Faulkner, and Sarah Faulkner (Jan 2, 1994), Holt, Rinehart and Winston, Alnc.
3. Art of Calligraphy by David Harris (Jun 20, 2005), A Practical Guide to the Skills and Techniques, Dorling Kindersley.
4. Janson's History of Art: The Western Tradition (8^{th} Edition) (MyArtsLab Series) by Penelope J. E. Davies, Walter B. Denny, Frima Fox Hofrichter, and Joseph F. Jacobs (Jan 13, 2010).
5. Gardner's Art Through the Ages: A Global History, Volume II (Gardner's Art Through the Ages: A Concise History) by Helen Gardner (Apr 14, 2008).
6. Living with Art Paperback (Oct. 13, 2009) by Mark Getlein McGraw Hill.
7. Forgotten Cities on the Indus Paperback (Oct. 17, 1996) by Michael Jansen, MaireMulloy, and Gunter Urban, Verlag Phillipp Von Zabern.
8. Folk motifs of Pakistan - Unknown Binding (1990) by Mahrukh Yousuf, LokVirsa.

HECO-5108 Life Span Development 3(2+1)

Contrast the various theoretical perspectives according to how they view major controversies and issues in developmental psychology.

Contents (Theory)

1. Explain the respective contributions of "nature" and "nurture" to human development, as well as their interactions

Contents (Practical)

1. Evaluate the advantages and disadvantages of the various techniques used to study human development.

Recommended Texts

1. Understand physical, cognitive, and socioemotional development across the lifespan.

STAT-5101 **Introductory Statistics** **3(3+0)**

The course aims to provide basic information of learning basics of Statistics and its application in sciences and research.

Contents

1. Definition and importance of statistics in agriculture.
2. Data different types of data and variables.
3. Classification and tabulation of data. Frequency, distribution, stem and leaf diagram.
4. Graphical representation of data Histogram, Frequency polygon, Frequency curve.
5. Measure of Central tendency.
6. Definition and calculation of Arithmetic mean.
7. Geometric mean, Harmonic mean, Median quintiles and Mode in grouped and ungrouped data.
8. Measure of dispersion. Definition and calculation of Range, quartile deviation, Mean deviation, Standard deviation and variance, coefficient of variation.
9. Frequency distribution. Stem and leaf diagram.
10. Various types of graphs. Mean: Geometric mean Harmonic Mean.
11. Median, Quartiles Deviation, Mean deviation. Standard deviation, Variance, Coefficient of variation. Skewness and kenosis

Recommended Texts

1. Muhammad, S., & Kamal, S. Introduction to Statistical Theory Part- I (Latest Edition).
2. Muhammad F., Statistical Methods and Data Analysis
3. Crawshaw J. & Chambers J. (1994). Concise Course in A. Level Statistic with world examples.
4. Dietrich-II, F., & Thomes, J.K. (1986). Basic Statistics an Inferential Approach 2nd Ed.

CHEM-6111 Biochemistry 4(3+1)

The course aims to acquaint knowledge about the nomenclature, structures and properties of chemical constituents and to grasp the knowledge about the energy yielding cycle like glycolysis, Kerbs cycle, β-oxidation etc.

Contents (Theory)

1. Introduction, scope and importance of biochemistry
2. Brief introduction of prokaryotic and eukaryotic cells
3. Bio-macromolecules: composition and organization
4. Energy and Principles of bioenergetics
5. Water: Properties of water, acid/base properties, dissociation of water and pH value, pH buffering capacity, transportation mechanisms across bio-membranes and osmosis
6. Proteins: Amino acids - structure, nomenclature, classification, Primary structure of proteins - peptide bond, sequencing, synthesis, Secondary structure - α-helices, β-sheets, Three dimensional structure of proteins, methods for protein structural determination - X-ray, NMR and homology modeling, tertiary and quaternary structures of proteins, protein denaturation
7. Methods for purifying and studying proteins; Enzymes: functions, mode of action, specificity and inhibition, classification and nomenclature, factorsaffecting enzymes activity
8. Introduction to carbohydrates (Glycobiology): biosynthesis, metabolism, glycolysis, Kerbs cycle, Mitochondrial electron transport chain and ATP synthesis
9. Lipids: introduction, lipogenesis, lipids and lipoproteins in relation to lipid storage diseases, sterol and steroids
10. Overview of nucleic acids.

Content (Practical)

1. Model visualization of prokaryotic and eukaryotic cells
2. Solution preparation
3. Preparation of different buffers and their pH adjustment
4. Activity of different enzymes like amylase in saliva
5. Enzyme purification
6. DNA extraction
7. Gel electrophoresis; Determination of amino acid profile using HPLC/Amino acid Analyzer
8. Energy estimation through Bomb Calorimeter.

Recommended Texts

1. Ahmad, M. (2000). Essentials of Medical Biochemistry, 7th Ed. Ilmi Book House, Urdu Bazar, Lahore.
2. Nelson, D.L. & Cox, M.M. (2013). Lehninger Principles of Biochemistry, 6thEd. W.H. Freeman & Co Ltd., New York, USA.
3. Rodwell, V.W., Bender D.A., Botham, K.M., Kennelly, P.J. & Weil, P.A. (2012). Harper‘s Illustrated Biochemistry, 30th Ed. The McGraw-Hill Education, New York, USA.

HECO-5109 Home Management and Housing 3(2+1)

Home décor and decoration.

Contents (Theory)

6. Definition and importance of housing
7. Review of housing needs. (basic human needs)
8. Review of housing conditions in Pakistan in urban and rural areas
9. Review of building materials. Woods, masonry, concrete, metal, glass and plastic.
10. Planning of the house; Primary considerations
11. Principle of the house planning.
12. Major elements of interior design structure
13. Floors and floors covering; Walls and walls finishing; Ceiling and ceiling finishing; Doors & Windows. Home furnishings, utensils, equipment and electrical appliances.
14. Selection care and maintenance of utensils, equipment and electrical appliances

Contents (Practical)

2. Living in home Management residence house for 2-3 weeks or Experiment
3. With One Work Simplification Project.
4. Evaluate some major electrical appliances being used in Pakistan homes in relation to care, design, function use and efficiency.

Recommended Texts

9. Katherine Salant (2001). The Brand-New House Book: Everything You Need to Know About Planning, Designing, and Building a Custom, Semi-Custom, or Production-Built House Three Rivers Press.
10. Fernando Pages Ruiz (2005).Building An Affordable House: A Smart Guide to High-Value, Low-Cost Construction: Taunton.
11. Patricia Poplar Wilson (1976). Household equipment: Selection & management Houghton Mifflin.
12. Carolyn L. Garrison (1982). Modern Household Equipment; Prentice Hall College Div.

HECO-5110 Family and Community Development 3(2+1)

To understand the individual and family development dynamics within families, and interaction between the families and larger social context. To gain the thorough understanding of community development combined with the practical skills necessary to work effectively in development work.

Contents (Theory)

1. Sociology of The Family and community
2. Family and community as social institutions
3. Review of latest research in this field.
4. The Family: Functions and types of family, Change in family institution.
5. Introduction To Community: Meaning, definition and explanation of community, Functions and Types of communities in urban/rural areas, social change.
6. Community Development: Meaning and principles and Methods of community development.

Contents (Practical)

1. Minor project of community development (to be carried out in the immediate community).
2. Major project of community development (to be carried out in coordination with government and non-government organization).
3. A detailed written report of the above projects.

Recommended Texts

1. Rubin and Rubin (2007). Community Organizing and Development. 4th Ed. Allyn& Bacon.
2. Brown, J. B. (2007) Building Powerful Community Organizations: A Personal Guide To Creating Groups That Can Solve Problems and Change the World. Allyn& Bacon.
3. Phillips and Pittman (2009). An Introduction to Community Development. Routledge.
4. Community (Cambridge Studies in Population, Economy and Society in Past Time); Cambridge University Press; New Edition (2002).
5. Dr. Mazhar U. Kazi (2002). Family & Social Obligations in Islam; Cambridge University Press.

HECO-5111 Family Economics 3(3+0)

The initial purpose of this course will be to look at how decisions are made within the family, as out come of bargaining between its members, and how the consequences of family decisions extend beyond family.

Contents (Theory)

15. Introduction: Malthus and Economic-Demographic Equilibrium
16. Household Production and the Allocation of Time.
17. Economics of Fertility.
18. Economics of Fertility and Investments in Children in Developing Countries.
19. Economics of Marriage.
20. The Link Between Marriage and Fertility. Altruism in the Family.
21. Bargaining Models and Intra-Family Allocations. Age Structure, Intergenerational Transfers, and Social Security

Recommended Texts

1. Gary Becker (1991), A treatise on the family, Harvard.
2. Tim Dyson (2010): Population and development: the demographic transition. Zed Books.
3. Mark Rosenzweig and Oded Stark (ed, 1997), Handbook of Population and Family Economics,
4. Elsevier.
5. Jess Benhabib et al (ed, 2011), Handbook of Social Economics, Elsevier.

HECO-5112 Global Food Issues 3(3+0)

The course aims to acquaint knowledge about global food issues having impact on food and nutrition security. To understand the role of global organizations in food production, consumption and trade and to study the impact of climate change and other threats on global food availability

Contents

1 World food situation
2 Food and nutrition security
3 The green revolution
4 Worldwide post-harvest losses
5 Global malnutrition: protein energy malnutrition and hidden hunger
6 Overweight and obesity; Worldwide food price fluctuations
7 Importance of per capita earning, consumption and purchase power
8 Irrational food consumption behavior; Contribution of cereals, legumes, roots, tubers and animal products
9 World food policy
10 WTO‘s trade regulations
11 Food bioterrorism
12 International food laws: European and American
13 Potentials of modern biotechnology to combat food insecurity
14 Genetically modified foods
15 Organic, Kosher and Halal Foods
16 Millennium development goals to sustainable development goals
17 Global Trends.
18 Climate change.

Recommended Texts

1. Barbosa-Canovas, G. V., Mortimer, A., Lineback, D., Spiess, W., Buckle, K., & Colonna, P. (Eds.). (2009). *Global issues in food science and technology*. Academic Press.
2. Barrientos, S., & Dolan, C. (2006). Transformation of global food: opportunities and challenges for fair and ethical trade. *Ethical sourcing in the global food system*, 1-33.

Suggested Readings

1 Hanjra, M. A. (2013). *Global food security: emerging issues and economic implications*. Nova Science Publishers.
2 Oosterveer, P. (2007). Global governance of food production and consumption: issues and challenges.
3 Phoenix, L. E., & Walter, L. (2009). *Critical Food Issues: Problems and State-of-the-Art Solutions Worldwide*. ABC-CLIO.

STAT-5102 Introduction to Probability Distribution 3(3+0)

The course aims at application of statistical designs.

Contents (Theory)

1. Sampling probability and non-probability sampling.
2. Simple random sampling stratified random sampling systematic sampling error
3. Sampling distribution of mean and difference between two means.
4. Interference Theory: Estimation and testing of hypothesis. Type I and type II error.
5. Testing of hypothesis about mean and difference between two means using Z test and T test, Paired T test.
6. Test of association of attributes using X2 (chi-square) Testing hypothesis about variance.

Content (Practical)

1. Sampling random sampling.
2. Stratified random sampling.
3. Sampling distribution of mean.
4. Testing of hypotheses regarding population mean.
5. Testing of hypotheses about the difference between population means.
6. Chi square test.
7. Testing of Correlation Coefficient.
8. Fitting of simple linear regression.
9. One-way ANOVA.
10. Two-way ANOVA.

Recommended Texts

1. Muhammad, S., & Kamal, S. Introduction to Statistical Theory Part-II (Latest Edition)
2. Muhammad F. Statistical Methods and Data Analysis
3. Steal R.G.D. & Tarrie, J.H. (1980). Principles and Procedures of Statistics A Bio-meterial approach, 2nd Edition
4. Gomez, K.A. & Gomez, A.A.. (1980). Statistical Procedures for Agricultural Research 2nd Edition

HECO-5113 Applied Housing and Home Management 3(2+1)

To develop understanding of issues relevant to home management and enhance skills for managing house and homes.

Contents (Theory)

1. Management; Definition of Management; Management Process; Motivations for Management. Decision Making
2. Importance; Relationship to Home Management. Family Life Cycle, Size and Composition.
3. Resources; Definition, Types; Scarcity and Inter-Relationship of Resources; Management of Specific Resources.
4. Management of Income; Types of Income; Saving Importance and Methods. Management of Time And Energy
5. Concept of Management Applied to Time and Energy
6. Guides to Time Management and Time Planning; Ways of Controlling Energy and Fatigue; Work Simplification in Relation to Making Task. Kitchen and Storage
7. Type of Kitchen; Principle of Storage; Importance of Functional Storage.

Contents (Practical)

8. Designing an ideal house plan on given area.
9. Making time and activity plan for oneself. Make money budget for a group of five of six members of Low Income and Middle Income Families.

Contents (Practical)

1. Model visualization of prokaryotic and eukaryotic cells
2. Solution preparation
3. Preparation of different buffers and their pH adjustment; Activity of different enzymes like amylase in saliva
4. Enzyme purification
5. DNA extraction; Gel electrophoresis
6. Determination of amino acid profile using HPLC/Amino acid analyzer; Energy estimation through Bomb Calorimeter.

Recommended Texts

1. Irma Hannah Gross, Management for Modern Families Prentice Hall College Div; 4th Edition (1980).
2. PaulenaNickell, Jean Muir Dorsey, Ann Rice, Management in Family Living; John Wiley & Sons Inc; 5th Rev Edition (1976).
3. Thomas J. A. (2007). Jones, Professional Management of Housekeeping Operations Wiley; 5th Edition.

HECO-5114 Special Children Education 3(3+0)

The students will be able to provide counseling service for people with personal problems great or small. They will be able to advice and guide on career planning, financial matter etc.

Contents (Theory)

12. Concept and the process of Guidance and Counseling.
13. Objectives of Guidance. Principles of Guidance.Area of Guidance.Personal Guidance.Vocational Guidance.
14. Social guidance. Activities of Guidance Program.Orientation
15. Science.Educational and vocational service.Testing service.Counseling Service.Placement service.
16. Follow-up service

Contents (Practical)

17. Internship in a clinical setting

Recommended Texts

1. Fathom, C., (2005) Good counseling in Psychology London: Sage Publication.
2. Kocchar, S.K, (2005) Guidance in College New Delhi: Steliming Publications
3. Mendoza, E. (2003). Guidance and counseling today'. (1st Ed.). Quezon City. Rex Printing Company..

HECO-5115 Entrepreneurship Development 3(3+0)

Upon successful completion of this course, the student will be able to: Assess the reciprocal relationship between certain business practices and the elements and forces that drive our free market economic system. Evaluate strategies for identifying, resolving and avoiding legal and ethical dilemmas in the business environment. Analyze the entrepreneurial process for identifying and exploiting potential business opportunities.

Contents (Theory)

1. Introduction. Understanding entrepreneurship.The entrepreneurial profile.Traits of successful entrepreneurs.
2. Timing and funding availability.Common myths about entrepreneurs.Development of business concept.
3. Why business planning is important. Analyzing the project.Defining product.Dissecting the product.
4. The product life cycle.New uses or images for old products.Branding.Researching the industry and the market. Market research defined. Defining industry.Describing the industry.
5. Regional market feasibility study.Strategic planning.Entry strategies. Exit strategies. Valuation methods.
6. Becoming an entrepreneur.History and future projections' web demographics. Benefits and limitations of going On-line.
7. Building a business plan for E-commerce.E-models.Customer relationship management.
8. Security and marketing.E-commerce challenges and concerns

Contents (Practical)

1. Research/report writing and presentations on building a business plan and implementation prospects

Recommended Texts

4. Paul Burns and Jim Dew Hurst: Small Business and Entrepreneurship Publisher: Palgrave Macmillan Published: 23 Nov 2006.
5. Peter F. Drucker: Innovation and Entrepreneurship Peter F. Drucker
6. Publisher: Harper Paperbacks Published: May 9, 2006
7. The Young Entrepreneur's Guide to Starting and Running a Business by Steve Mariotti

HECO-5116 **Health Care Promotion** **3(3+0)**

To develop understanding of issues relevant to Management of institutions and enhance skills for Management of institutions.

Contents (Theory)

1. Educational Institutions: Concept of school/college organization, meaning, scope and principles Organization of School, College and Community partnership.
2. Basic elements of management; Process of management in educational institutions; Resource Management in Educational Institutions
3. Human Resources; Physical Resources; Financial Resources; Information and learning resources (library, AV Aids and instructional resources)
4. Policies Of Educational Institutions; Rules regarding appointment, leaves, pay and allowances; Efficiency and Discipline rules
5. Records of Educational Institutions; Attendance Register; Leave Register
6. Stock Register; Cash Register (fee, different kind of funds); Personal files of teachers and other staff; Other academic record (students result, staff meetings et). Health Care Institutions (Hospitals, clinics, Healthcare Centres).

Recommended Texts

1. K. B. Everard, Geoff Morris, Ian Wilson Effective School Management; Paul Chapman Educational Publishing; 4th Edition (2004).
2. Edmund T. Emmer, Carolyn M. Evertson, Murray E. Worsham:
3. Classroom Management for Middle and High School Teachers (7th Edition); Allyn& Bacon; 7th Edition (2005).
4. Richard L. Miller, Earl S. Swensson : Hospital and Healthcare Facility Design; Allyn& Bacon; 7th Edition (2005).
5. Liz Haggard: Healing the Hospital Environment: Design, Maintenance and Management of Healthcare Premises; Taylor & Francis; 1st Edition (1999).
6. Thomas J. A. Jones Professional Management of Housekeeping Operations Wiley; 5th Edition (2007).

HECO-5117 Nutrition Policies and Programs 3(3+0)

The course aims to familiarize with global and local nutrition policies and programs in the domain of public health nutrition, to prevent and control specific micronutrient deficiencies through diet based approaches among the vulnerable and to promote appropriate diets and healthy lifestyles and access, analyze and monitor nutrition situations.

.

Contents

1. History and importance of nutrition intervention planning
2. World declaration on nutrition
3. Nutrition development partners; Policy guidelines
4. Community nutrition programs: national and international, supplementary feeding programs
5. Food fortification, supplementation and diet diversification
6. School feeding programs: interventions and impacts
7. Improving household food security; Protecting consumers through improved food quality and safety; Preventing and managing infectious diseases
8. Promoting breast feeding
9. Caring for socio-economically deprived and vulnerable
10. Preventing and controlling specific micronutrient deficiencies
11. Promoting appropriate diets and healthy lifestyle
12. Improving health care; Five years plan for Pakistan (Nutrition)
13. Nutrition intervention: counselling for change
14. SUN movement; One health concept; National nutrition programs: food & nutrition program, Tawana Pakistan, school health program
15. Developing effective food and nutrition policies and programs.

Recommended Texts

1. Edelstein, S. 2011. Nutrition in Public Health: A Handbook for Developing Programs and Services. 3rd Ed. Jones & Bartlett Learning, Sudbury, M.A, USA.
2. IFPRI. 2016. Taking Actions: Progress and Challenges in Implementing Nutrition Policies and Programs. International Food Policy Research Institute, Washington, DC, USA.
3. Nnakwe, N.E. 2009. Community Nutrition: Planning Health Promotion and Disease Prevention. Jones and Bartlett Learning International, London, UK.

1. Semba, R.D. & M.W. Bloem. 2008. Nutrition and Health in Developing Countries. 2nd Ed. Humana Press, New York, USA.

Suggested Readings

1. Spark, A. 2007. Nutrition in Public Health: Principles, Policies and Practice. CRC Press, Taylor & Francis Group, Boca Raton, FL,USA

HECO-6118 Home Economics Education, Administration and Supervision 3(3+0)

There are many teaching opportunities within the field of home economics. Teachers of home economics usually instruct at the secondary school level. Opportunities could also be found within community colleges or vocational schools. Read more about this profession here.

Contents (Theory)

18. An overview of the individual in educational administration, i.e., as strategic leader, organizational leader, instructional leader and policy/community leader.
19. Opportunities for personal assessment are provided as students explore critical educational issues).

Contents (Practical)

2. Test Taking Skills. The Testing Situation

Recommended Texts

1. Home economic education
2. Introduction to the teaching of home economic

FANU-6101 **Food Preservation** **3(2+1)**

Learning basics of preservation.

Contents (Theory)

20. Low Temperature Preservation.Refrigeration: Methods and equipment.Cold storage: requirements, insulation, air circulation, humidity,
21. Refrigeration load, controlled atmospheric storage.Freezing: Theory, Methods, Equipment and Changes in foods.Evaporation and Dehydration
22. Evaporation concentration and Condensation, Principles, Equipment, Applications.
23. Drying: Principles, Equipment, Types of driers.Dehydration: Applications, Dehydrated products vegetables, fruits and milk.Use of Chemical Additives: Contaminants, Adulterants, Additives.
24. Food Additives: Classification, Criteria for selection, GRAS additives, Permissible limits, Food safety, E-numbers. Preservation by Fermentation Technology: Principles, Objectives, types alcoholic, Acetic and lactic fermentations.
25. Fermented Foods: Bread, Wine, Vinegar, Yoghurt, Sausages, Pickles.
26. Food Irradiation: Principles, Applications, Equipment, Safety aspect, Effect on food properties, Detection methods.

Contents (Practical)

3. Cold storage of fruits and vegetables.
4. Freezing of fruits and vegetables.
5. Dehydration of fruits and vegetables.
6. Use of chemicals in preservation of food products.
7. Evaluation of bottled, frozen and dehydrated products

Recommended Texts

1. Brennan, J. G. (2006). Food Processing Handbook. Wiley-VCH
2. Verlag GmbH and Co. KGaA, Weinheim, Germany.
3. Rahman, M. S. (2007). Handbook of food preservation. CRC Press, Taylor and Francis Group, Boca Raton, Florida, USA.
4. Awan, J. A. and Rehman, S. U. (2009). Food preservation manual.
5. Unitech Communications, Faisalabad.
6. Potter, N. N., and Hotchkiss, J. H. (2012). Food Science. 5th Ed.
7. Springer Science and Business Media.

FANU-6102 **Experimental Foods** **3(2+1)**

This course is aimed at emphasizing the relationships between chemical and physical properties, basic formulas and procedures are included in the appendix

Contents (Theory)

1. Your blood type predicts how you should eat. GMOs hurt human health.
2. Organic is always better for your body.

Contents (Practical)

1. Number of dimensions, Controlled experiments. Sugar with Benedict's solution. Protein with Biuret solution. Fat with Sudan III stain. Vitamin C with Vitamin C Reagent.

Recommended Texts

8. Experimental Food Science
9. Food Experiments
10. The Food Chemistry
11. Experimental Food Labor

FANU-6103 Fundamentals of Human Nutrition 3(3+0)

The course aims to familiarize with the role of macro and micronutrients in human nutrition, to understand the absorption, digestion and metabolism of nutrients in the human, and to abreast knowledge about the health disorders due to consumption of non-optimal quantities of the nutrients

Contents

1. Introduction: food, nutrients, nutrition, malnutrition - global and local scenario, diet, balanced diet, food groups, foundations of healthy diet, meal planning
2. Water: functions, regulation in body, dietary requirements, electrolytes and acid-base balance
3. Carbohydrates: types, role in body, dietary fiber, bulk and alternative sweeteners, recommended intake and energy value
4. Fats and oils: types, functions, recommendations concerning fat intake, fat substitutes; Proteins: amino acids, protein synthesis and degradation, classification, functions, quality of proteins, dietary requirements
5. Vitamins: classification, types, sources, role in body; Mineral elements: types, requirements, sources, role in body
6. Digestion: alimentary tract, digestive juices, secretions; Absorption and metabolism of nutrients: carbohydrates, protein, lipids; Nutrient and dietary deficiency disorders and special nutrient requirements.

Recommended Texts

1. Awan, J.A. (2011). Elements of Food and Nutrition. Unitech Communications, Faisalabad, Pakistan
2. Bamji, M.S., Krishnaswamy, K. & Brahmam, G.N.V. (2009). Textbook of Human Nutrition. 3rd Ed. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India
3. Eastwood, M. (2003). Principles of Human Nutrition. 2nd Ed. John Wiley & Sons, Inc., New York, USA
4. Geissler, C. & Powers, H. (2011). Human Nutrition. 12th Ed. Churchill Livingstone, London, UK

FANU-6104 Nutritional Education and Awareness 3(2+1)

The course aims to learn the techniques of creating awareness about health issues in masses, to acquire information about different modes of communication and their effective use, to understand the ethical responsibilities for dissemination of knowledge.

Contents (Theory)

1. Nutrition education: introduction, history, need, competencies and skills, framework, training needs, new development
2. Nutrition education programs: scope and challenges of educating people about eating well
3. Biological influences, cultural and social preferences
4. Education and communication strategies for different groups and settings
5. Evaluation of nutrition education programs
6. Family and psychological factors
7. Expectancy-value theories of motivation, social and cognitive theory
8. Behavior change as a process, phases of change
9. Addressing multiple and overlapping influences on behavior
10. A logical model approach for planning a framework of nutrition education
11. Understanding communication model, preparing/organizing oral presentations, delivering oral presentation, delivering nutrition education workshops, types of supporting visual aids, nutrition mass media communication campaigns, social marketing
12. Ethics in nutrition education, conflicts, participating process in community coalition
13. Non-government and public health organizations and their current programs

Contents (Practical)

1. Nutritional counseling
2. Program designing for specific diseases like anemia, neural tube defects, rickets, etc.
3. Surveys and seminars in different educational institutions
4. Individual presentations by students on different nutrition topics
5. Visits of public places for nutrition awareness
6. Independent student projects.

Recommended Texts

1. Contento, I.R. (2007). Nutrition Education: Linking Research, Theory and Practice. Jones and Bartlett Publishers, Ontario, Canada.
2. FAO. (1997). Nutrition Education for the Public: Discussion Papers of the FAO Expert Consultation. Food and Agriculture Organization of the United Nations, Rome, Italy.
3. Semba, A.D. & Bloem, M.W. (2008). Nutrition and Health in Developing Countries, 2nd Ed. Humana Press, New York, USA.
4. Walter, W. (2013). Nutritional Epidemiology, 3rd Ed. Oxford University Press, New York, USA.

TEXC-6101 Fundamentals of Garment Construction 3(2+1)

This course is aimed at to provides basic skills and information regarding sewing, pressing and constructing a basic garments. To familiarize the students with the use and control of sewing machine.

Contents (Theory)

1. Preparation of paper pattern and method of stitching the garment.
2. T-Shirt & Polo T-Shirt- Preparation of paper pattern and method of stitching the garment
3. Track suit & Ladies Top. Preparation of paper pattern and method of stitching the garment.
4. Developing the designed garment.

Contents (Practical)

1. M.S.WORD : Print a document, use office Assistant
2. Insert a word art object, Add auto shapes,
3. Insert a picture from the Clip Art Gallery, Insert Bullets and Numbers. Wearable D.I.Y.
4. Measurements. Patterns, Fabrics, and Basic Construction.

Recommended Texts

1. Nora, A., Kelly A. The Burda Style Sewing Handbook by Sew U Home Stretch: The Built by Wendy Guide to Sewing Knit Fabrics by Wendy Mullin

TEXC-6102 Pattern Making 3(2+1)

This course is aimed at understanding the principles of pattern making by applying on different types of figures. Manipulation of darts and pleats. To make students understand the Importance of basic bodice block and sleeves.

Contents (Theory)

1. Introduction to pattern making. Measuring Techniques of the body; Equipment for measuring. Abbreviations and Symbols
2. Measurement chart for:-Women, Men, and Children. Drafting the body foundation: The body foundation; Equipment for drafting.
3. The body foundation pattern; Using the body foundation.
4. Bodice darts and bodices:-Darts, their shapes and positioning; Bodices block. Sleeves:-Measurement chart for sleeve patterns; The sleeve foundation pattern; Short sleeves; Three quarter length sleeve; long sleeve; Styles involving bodice and sleeve:-Saddler shoulder
5. Drop shoulder, Cuff Basic Pajama trouser foundation Crotch line garments:-Crotch line chart; Block; Foundation block for Panties; Foundation block for trousers.
6. Types of figures: Figure differences: Neck size; Shoulder line position.

Content (Practical)

1. Preparation of 6 patterns for the following groups:
    a. Woman,
    b. Children
    c. Man
    d. Stitch any one garments from the prepared patterns. Portfolio based on practical work.

Contents (Practical)

1. M.S.WORD : Print a document, use office Assistant
2. Insert a word art object, Add auto shapes,
3. Insert a picture from the Clip Art Gallery, Insert Bullets and Numbers. Wearable D.I.Y.
4. Measurements. Patterns, Fabrics, and Basic Construction.

Recommended Texts

1. Rosen S. A (2003). Comprehensive reference for Fashions design (2003) Prentice Hall. USA.
2. Armstrong H. J. (2005). Patternmaking for Fashion Design (February 10, 2005) the
3. Prentice Hall, 4 Edition USA. Donald H. McCunn, Robin Lew, (1977) Design Enterprises of San Francisco.
4. Norma R. Hollen, Carolyn J. Kundel, Pattern Making by the Flat the Pattern Method (1998), Edition. Prentice Hall. USA.
5. Gross L. How to Draft Basic Patterns (1991) Fairchild the Books& Visuals 4 Edition. USA.

TEXC-6103 Fashion Designing and Illustrations 3(2+1)

This course is designed to enhance the creativity of the students in implementing their skills in fashion designing. It enables students to manipulate darts and pleats in fashion apparel.

Contents (Theory)

1. Figure drawing. Construction of figure using block form.
2. Proportions of ideal figure.Fleshing out the figure.
3. Movement in the figure.Dressing of the figure.Designing with different necklines, darts, yokes and gores.
4. Designing Dresses with pleats. Designing different types of sleeves, collars, coats and jackets, trousers and pants of different lengths.
5. Designing through source of inspiration

Content (Practical)

2. Portfolio based on practical work.
3. Research board. Mood board.
4. Color board. Profile board.
5. Development sheets of six informal and formal dresses. Presentation sheets of two informal and formal dresses

Recommended Texts

1. Fashion Illustration Flat Drawing.
2. Estel, V. (2008). Essential Fashion Illustration, Color + Medium. Rockport Publishers.
3. Lafuente, M. (2007). Essential Fashion Illustration. Poses, Rockport.
4. Maite, L. (2008). Fashion Illustration Techniques. Taschen. Martin, D. (2008). The Big Book of Fashion Illustration. Batsford

TEXC-6104 **Fiber Science** **3(2+1)**

This course is about to develop three-dimensional design ideas through draping of muslin on a body form. Evaluation of existing garments and/or sketches to determine appropriate draping techniques needed to develop design. Develop sensitivity for fabric characteristics in order to recognize the possibilities and limitations of different textures for garment design. Develop a means for creative expression through the acquisition of skills needed to drape and produce original garment designs. Construct and use proper techniques to construct apparel first and production sample garments from draped muslin patterns. Use suitable hand construction and sewing techniques in assembling representative samples. Practice fit alteration and fitting techniques. Create presentations using Microsoft PowerPoint and effective visual and oral communication to present garment designs, spec sheets, cost sheet,

Contents (Theory)

1. Fibre Technology (Wool and Other Animal Fibres). Introduction to Fibre Spinning.Cotton Ginning and Baling.Production and Properties of Man-Made Fibres.
2. .

Content (Practical)

1. Textile Testing and Quality Control. Total Quality Control and Quality Assurance.Cotton Fibre Technology.
2. Textile Raw Material. Yarn Manufacturing. Dyeing / Processing.

Recommended Texts

1. Steven B. Warner. (2012). Fiber Science. 1st Edition, USA

ARTD-6102 **Art Education** **3(2+1)**

This course is designed for students to develop teaching skills based on the philosophy of Art Education. This course will enable students to learn to prepare lesson plans in art subjects for school age children in view of their abilities.

Contents (Theory)

1. Philosophy of art. The meaning of Art Education.
2. Free expression in art or play.
3. Personality Development.
4. Assimilation and Projection.
5. The importance of creativity and its prospects in education.Importance of Art for creativity

Content (Practical)

6. Students to observe and evaluate the art work of school age children.
7. As a student teacher, observe the art work of students at schools. Assess the suitability of art techniques, processes, media and material usage by children

Recommended Texts

1. Barnes, R. (2002). Teaching art to young children 4-9 years. (3rdEd.). Biddies Ltd. Guild Ford and King‘s Lynn. U.K.
2. Forsyth, L., Jolliffe, A. & Steven, D. (1999). Delivering a course,practical strategies for their, lecturers and trainers. (2nd Ed). Stylus Publications Inc.USA.
3. Freedman, K. (2003) Teaching visual culture curriculum,aesthetics and social life of art. Teacher‘s College, Columbia University.USA.
4. Freedman, K. &Hernandz, F. (1998). Curriculum culture and art education, comparative perspective. State University of New York.USA.
5. Reuther, B. M. &Fogler, D.E. (2001), Art curriculum activities kit. New Jersey: Parker Publishing Co.
6. Sharma, O.P. (1994), Art in ar. New Delhi: Abhinau Publications, India.
7. Chapman, Laura H, ―Approaches to Art in Education Published by Harcourt Brace Jovanovich 1978 digitized on 9 April, 2008.
8. Lowenfeld, Victor/Brittain, W.Lambert, Creative and Mental Growth. The Macmillan Company 866 Third Avenue, New York New York 1002 digitized on 2nd October, 2009.
9. Getlein, Mark. Gilbert‘s Living with Art. 2002 6th Edition. The McGraw Hill Company Inc. New York.
10. BerssonRobbert. Responding to Art. Form Content and Context 2004. McGraw Hill Company Inc. New York.
11. Read, Herbert. Staff, H. Read; The meaning of art published by Faber & Faber 2004.
12. Chapman Laura H. (1978) Approaches to Art & Education published by Harcourt Brace Jovanovich

ARTD-6103 **Drawings Techniques** **3(2+1)**

This course is designed to learn visual composition, color, shape, as well as a mixture of representational and expressive techniques including the four mediums consisting of drawing with oil pastels, printmaking, collage, and painting.

Contents (Theory)

1. Drawing is a form of visual art in which a person uses various drawing instruments to mark paper or another two-dimensional medium.
2. Instruments include graphite pencils, pen and ink, various kinds of paints, inked brushes, wax colored, pencils, crayons, charcoal, chalk, pastels, various kinds of erasers, markers, styluses, and various metals (such as silverpoint).
3. A drawing instrument releases a small amount of material onto a surface, leaving a visible mark.
4. The most common support for drawing is paper, although other materials, such as cardboard, plastic, leather, canvas, and board, may be used.
5. Temporary drawings may be made on a blackboard or whiteboard or indeed almost anything

Content (Practical)

8. Starting with pencil, charcoal, ink, and colored pencils, the book progresses to instruction in pastel and sanguine chalks, watercolors, gouache

Recommended Texts

1. Drawing technique
2. Shading technique
3. Keys to drawing Jovanovich 1978 digitized on 9 April, 2008.

ARTD-6104 **Commercial Art** **3(2+1)**

This course will enable students to create images to make products and publications unique and attractive. Students will develop skills and techniques by working on project based assignments allowing them to develop extensive portfolios and gain work related experience.

Contents (Theory)

1. Introduction to graphic design. Introduction to typography.
2. Text, color and display typographies.
3. Designing of logo, letterhead, greeting cards, posters, book covers, illustration and advertisement.

Content (Practical)

1. Preparation of portfolio constituting designing of logo, letterhead, greeting cards, poster, signs and exhibits using assorted typography medium

Recommended Texts

1. Garden. B. (2004). Opportunities In Commercial Art & Graphic Design Careers. The McGraw- Hill Companies, Printed in the USA.
2. Harris, D. (2005). Art of Calligraphy- A Practical Guide to skills and techniques. 2005. Doling Kinders Publishers.
3. Fiell, Charlotte & Peter; Contemporary Graphic Design, (2008). Taschen Publishers Wiedemann, Julius & Taborda, Felipe (editors); Latin American Graphic Design, 2008, Taschen Publishers.
4. Fredrick, E. Giesecke, M. A. Spencer, H.C., (2009). The Jhon Thomas; Modern Graphic Communication 4. Ed. Prentice Hall Publishers.
5. Lupton. E, & Philips J.C. (2008). Graphic the New Basics. Princeton Architectural Press, 37 East Seventh Street New York.

FANU-6105 **Advanced Nutrition** **3(2+1)**

This course is aimed at To develop advanced understanding of the role of nutrients in prevention of malnutrition. To study the process of digestion, absorption and metabolism. To understand the significance of nutrition in life cycle.

Contents (Theory)

1. Advance study of macronutrients, micronutrients and water.Digestion, absorption, and metabolism of various nutrients and their interaction.
2. Nutrition in life cycle
3. Pre and post natal; infancy, adolescence, elderly.
4. Methods of assessment of Nutritional Status.
5. A brief study of current food related health issues, organic foods and eating disorders.

Contents (Practical)

5. Planning and delivery of nutrition education on nutritional problems of Pakistan.
6. Assessment of nutritional status Anthropometry
7. Biochemical, Clinical and Dietary and comparison with standards.
8. Calculation of energy and protein requirement for self and for the family.
9. Practical note book.

Recommended Texts

2. Ahmad. M. (2009). Essentials of Medical Bio-chemistry, (8th Ed)... Vol.1 &11. Merit Publishers, Multan, Pakistan.
3. Berbanier C. D and Zempleni L. (2009). Advanced Nutrition: Macronutrients, micronutrients and Metabolism. CRC Press. Taylor and Francis Group. Boca. Raton FL, USA.
4. Ellie. W, Kathyran P and Rolfes SR. (2008). Understanding Normal and Clinical Nutrition, (8th Ed). Thomson Wads Worth. UK.
5. Krause, M. V. Nutrition and Diet Therapy (Latest Ed.). Philadelphia: W.B. Saunders Co.
6. Mclead and Taylor, Foundation of Nutrition (Latest Ed.). New York: Mac Millin Publishing Co.

FANU-6107 **Dietetics** **3(2+1)**

The course aims to understand the discipline of dietetics and its role in human well being, to familiarize with the foundations of healthy diets and their role in disease prevention and management, to acquaint hands-on training for calorie calculation and menu planning using food composition table and databases and to assess BMI and energy expenditures in relation to overweight and obesity.

Contents (Theory)

1. Dietetics: definitions, history, importance
2. Dietitian: role in food service and clinical practice, responsibilities in multidisciplinary team, code of ethics
3. Foundations of healthy diet
4. Dietary Reference Intakes, Recommended Dietary Allowance, Food Guide Pyramid and allied approaches, Dietary Guidelines, Exchange system and menu planning
5. Energy expenditure and basal metabolism
6. Body mass index
7. Role of diet in disease conditions
8. Diet therapy and its principles
9. Food selection and factors affecting its acceptance
10. Nutrient density; Alternative patterns of food consumption
11. Nutritional counseling in clinical practice. Critical diet assessment
12. Nutrition and diet clinics.

Contents (Practical)

1. Interpretation of food guide pyramid, My Pyramid, My plate, Eat well Plate
2. Energy value of different foods: carbohydrates, fats, proteins
3. Calculating energy requirements
4. BMI in relation to obesity and overweight, energy and calorie requirements
5. Balanced diet and menu planning using exchange lists, food composition tables & data bases
6. Food intake analysis: Dietary Recall, Food Frequency
7. Questionnaires, Food Surveys

Recommended Texts

1. Mahan, L.K., Escott-Stump, S., & Raymond, J.L. (2012). Krause's Food, Nutrition & Diet Therapy, 13th Ed. Elsevier Saunders, St. Louis, Missouri, USA.
2. Mudambi, S.R. & Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition & Diet Therapy, 5thed. New Age International Pvt. Ltd. Publishers, New Delhi.
3. Punekar, M. & D'Souza, J. (2010). Handbook of Applied Nutrition, Diet therapy and Diet Management. SBS Publishers & Distributors Pvt. Ltd., New Delhi.
4. Rawat, S. (2015). Applied Nutrition. Random Publication, New Delhi.
5. Schlenker, E. & Gilbert, J.A. (2015). Williams' Essentials of Nutrition and Diet Therapy, 11th Ed. Elsevier/Mosby Inc., Louis, Missouri.
6. Singh, J. (2008). Handbook of Nutrition and Dietetics. Lotus Press, India.

FSAT-6125 Food Microbiology 3(2+1)

The course aims to identify various types of microorganisms on the basis of morphological, cultural and physiological characteristics, to grasp knowledge about the microbial contamination of foods and factors affecting the growth of microorganisms and to familiarize students about food borne infections, intoxications and role of probiotics in our daily life.

.

Contents (Theory)

1. Food microbiology: introduction and scope
2. Important microbial genera in foods: bacteria, mold, yeast and yeast like fungi, viruses - general, morphological, cultural and physiological characteristics
3. Factors affecting the growth and survival of microorganisms in food: intrinsic, extrinsic and implicit
4. Contamination and spoilage of perishable, semi perishable and stable foods: sources, transmission, microorganisms
5. Food microbiology and public health: food-borne infections: intoxications
6. Microbiological risk assessment
7. Microbiology in food sanitation: food sanitizers and pathogen reduction - a case study
8. Food fermentation; Probiotics in human health

Contents (Practical)

1. Isolation, identification and characterization of microorganisms: morphology, biochemical;
2. Enumeration of microorganisms in food and water samples (total count, viable count, MPN)
3. Examination of foods for pathogenic organisms (*Escherichia coli*, Coliform, *Salmonella* and *Listeria* monocytogenes)
4. Preparation of fermented and probiotic enriched food products.

Recommended Texts

1. Adams, M.R. & Moss, M.O. (2006). Food Microbiology. The Royal Society of Chemistry, Cambridge, UK.
2. Adams, M.R., Moss, M.O., & McClure, P. (2016). Food Microbiology, 4th Ed. Royal Society of Chemistry, Cambridge, UK.
3. Brown, M. & Stringer, M. (2002). Microbiological risk assessment in food processing. Woodhead Publishing Ltd. Cambridge, UK.
4. Frazier, W.C., Westhoff, D.C. & Vanitha. K.N. (2013). Food Microbiology, 5th Ed. McGraw Hill Book Co., New York, USA.
5. Montville, T.J., Mathews, K.R., & Kniel, K.E. (2012). Food microbiology: an introduction, 3rd Ed. ASM Press, Washington DC, USA.
6. Ray, B. & Bhunia, A. (2013). Fundamentals of Food microbiology, 5th Ed. CRC Press, Taylor & Francis Group, Boca Raton, FL,USA.

FANU-6108 Nutritional Management in Disasters 3(3+0)

This course is about Nutrition management in natural and man-made disasters.

Contents (Theory)

1. Introduction to disasters, general strategies before, during and after disasters.
2. Role of national and international relief organizations.
3. Nutrition and Health Policies related to short- Mid- and Long- term strategies and caring for vulnerable groups.
4. Nutrition rehabilitation during disasters, water and sanitation, availability of relief goods and health inspection facilities.
5. Nutritional consequences of disasters, Diseases and malnutrition: Types, nature and severity, mobile feeding units.
6. Emergency Nutrition: counseling in hospitals and health units ,food and nutrition priorities, types and nature of food supplies, feeding units at institutions.

Recommended Texts

1. Pan American Health Organization. A guide to emergency health management after disasters
2. WHO Tech report. Prevention and treatment of severe malnutrition in times of disaster (vol. 45).
3. Frankenburg, F.R. (2009) Vitamin discoveries and disasters: History, science and controversies. (1st Ed) Praeger Pub.
4. Suskind R.M., & Tontisirin, K. (2001) Nutrition, Immunity and Infection in infants and children. Vol 45 Lippincot's Williams and Wilkins.
5. Whitney, E.N., & Sizer, F. (2006) Nutrition concept and controversies. 10 Edition. www.wadsworth.com
6. Briggs, J., Maguire, P., Sherman, P., Davis, B. (2007). Barrett A, Mahon J, and Doucette J. (2007). Final report on development of an emergency food products, product and packaging specifications, shelf life study and drop test synopsis. USAID. USA.

FANU-6109 Institutional Management 3(2+1)

This course is about To learn the management and institutional principles implemented by organizations offering food services. To practice menu planning for different occasions and institutions/ organizations.

Contents (Theory)

1. Meal planning in Institutions and menu planning for different income levels.
2. Types and organization of food services.
3. Organization of Food Services. Management of canteens, hostels, hospitals, nursery schools, homes with paying guests and other establishments

Content (Practical)

3. Practice in Menu Planning: Menus for three days may be planned for a hospital, canteen, nursery school and hostel.
4. Nutritive value of menu and price should be worked out for each case. Developing standardized qu
5. antity recipes. Common recipes of meat.
6. Common recipes of vegetables. (Fresh vegetable pulses and legumes). Common cereal recipes. Common desserts.
7. Field trips: Four to six trips to different types of institutions. (Report on trip will be recorded in the file). Offices and Government hostels. College/School hostels.
8. Bakeries. Hospitals. College, University and other Cafeterias etc.

Recommended Texts

7. Robert, G. H (1996) Food preparation for Hotels, restaurants and cafeterias 2nd Edition Macmillan Co.
8. Kotscerar, L H & Tarvel, M E. (2001) Food Service layout and equipment planning 2nd Edition Milton and Roy Co
9. West B. B. Wood, C. & Harger V.F. (1992) Food service in institutions. 3 Ed. John Wiley and Sons New York.
10. West B.B. Fowler S.F. (1982) Food in fifty. 2nd Ed. John Willey Sons New York.
11. Smith E.E. (1999). A hand book on Quantity food management. Burgees Pub Co; Minnesota, USA

.

FANU-6110 Clinical and Therapeutic Nutrition 3(2+1)

This course is about Introduces the student into the concepts of an intermediate study of nutritional therapy of disease. Evidence based practice in prevention and nutritional management of diseases.
.

Contents (Theory)

4. Food as medicine is not new, but how many of us really understand how to use food and nutrition not only to boost the body's natural ability to heal but also for preventative and complementary therapy.
5. Therapeutic nutrition is the provision of nutrients to maintain and/ or restore optimal nutrition and health. Many conditions may require nutrition therapy for improved outcomes such as coeliac disease

Content (Practical)

9. Identification of carbohydrates (Qualitative Tests). Identification of proteins (Qualitative Tests).To study general properties of the enzyme Urease & Achromatic time of salivary amylase.
10. Estimation of glucose in urine by Benedict's methods.Urine analysis - normal & abnormal constituents of urine.
11. Blood glucose estimation. Renal Function test

Recommended Texts

2. Foods and Dietary Supplements in the Prevention and Treatment of Disease in Older Adults by Ronald Ross
3. Handbook of Clinical Nutrition and Aging by Connie Watkins Bales (Editor); Christine S. Ritchie (Editor)
4. Clinical Nutrition by Leah Coles

FSAT-5106 **Food Safety and Laws** **3 (3+0)**

The course aims to teach food safety as a scientific discipline describing handling, preparation, and storage of food in ways that prevent food-borne illness. Food can transmit pathogens which can result in the illness or death of the person or other animals. Objective of course is to give concepts of food safety and risk assessments and to provide knowledge about of food safety systems and food laws. The quality and safety of food is an important task, not only for the food industry. The issue of quality and safety of food is highly vital for each person. The way we eat affects our health, working capacity, quality of life, and the health and life of future generations. Food contamination can occur at any stage in the supply chain, and the primary responsibility for ensuring safety lies on food producers. Nevertheless, in many cases, incidents related to foodborne diseases are the result of non-compliance with the rules for handling food at home, catering, and marketing.

Contents

1 What is Food Safety?
2 Characterization of food hazards, biological, chemical and physical
3 Hazards from natural origin
4 Hazards produced during food processing, storage and preparation
5 Hazards associated with nutrient fortification
6 Food Safety systems, GMP, TQM
7 HACCP
8 Pakistan Standards and Quality Control Authority
9 Pure Food Rules
10 Punjab Food Authority
11 International Organization for Standardization
12 National Standard for Drinking Water Quality
13 Food labeling
14 Concept of Halal, Islamic food laws and regulations
15 Consumer laws in Pakistan
16 The World Trade Organization (WTO)
17 Codex Alimentarius.

Recommended Texts

1 Rai, V. R., & Bai, J. A. (2017). *Food safety and protection*. London: CRC Press, Taylor & Francis Group.
2 Gabriela, S., & Kiran, P. (2016). *International food law and policy*. Switzerland: Springer International Publishing.
3 Awan, J. A., & Anjum, F. M. (2010). *Food toxicology*. Faisalabad: Unitech Communications.

Suggested Readings

1 Schmidt, R. H., & Rodrick, G. E. (2003). *Food safety handbook*. New York: Wiley-Interscience, A John Wiley & Sons Publications.
2 PSQCA. (2010). *Standards for different food items*. Karachi: Pakistan Standards and Quality Control Authority.

ARTS-6112 **Print Making** **3(1+2)**

This course is Focus of this course is to enhance the creativity of students in the area of drawing and painting with different mediums. Further, this course focuses on printing using assorted material, media and surface.

Contents (Theory)

1. Painting in Acrylic and oils. Still Life, Landscape, Figure, using the given media,Printing. Wood Cut. Other Creative printing Techniques.

Content (Practical)

1. Prepare portfolio of art work

Recommended Texts

1. Simmons Seymour and Winer Marc S. A.; Drawing: The Creative Process (A Spectrum book) - Hardcover (1978) by Prentice Hall, Inc.
2. Camp Jeffery and Hockney David; Draw: How to Master the Art (1994).
3. A quantum Book. The Great Masters. 2004 Quantum Publishing Ltd. 6 Blunded Street London, N 7 9 BH.
4. A quantum Book; Techniques of the Great Masters of Art, (2000), Grange Books Plc. The Grange Kingsnorth Industrialist Estate Hoo, Near Rocheter, Kent ME3 9 N D.
5. Smagula, Howard J.; Creative Drawing (2002), Lawrenc King Publishing Limited.

INED-6111 Designing Functional Spaces for Special Needs 3(2+1)

Including significance of interior environments for people with special needs. Introducing the concepts of ergonomics in regards to interior design elements. Developing skill to design special activity areas for specialized needs.

Contents (Theory)

6. Functionally designed spaces for people with special needs in homes and at work places.
7. Ergonomics: Definition and Explanation.
8. Historical background of Ergonomics.
9. Physical Ergonomics and significance of functional space requirements..

Content (Practical)

1. Research activity based on functional space planning for people with special needs.

Recommended Texts

1. Kroemer, K, H. E , Kroemer, H, B. & Kroemer, K, E. (1993). Ergonomics: How to Design for Ease and Efficiency. Practice Hall.
2. Maureen Mittion, Courtney Nystuen (2007). Residential Interior Design: A guide to Planning Space. John Wiley & sons, Canada.
3. Robert, S. Bridger (2003). (3rd Ed) Introduction to Ergonomics. Taylor & Francis, New York.
4. Salk. S. (2010) Room for Children Stylish spaces for sleep and play. Rizzoli
5. Spencer. C. (2006). Children and their environments: Learning, Using and Designing Spaces Cambridge University Press.

INED-6113 Interior Design Project 3(3+0)

Importing knowledge in the students about furniture designing and applying that knowledge from a theoretical and practical point of view. Making students understand the importance of the principles of Ergonomics and its relationship with human body. Helping students learn and analyze the issues which are central in design management and understanding the role of furniture in creating market demand and shaping consumer behavior.

Contents (Theory)

1. Analysis of furniture items from theoretical and practical aspects. Creation of furniture items through the use of: Conception of an idea, execution through full scale drawing. Actual construction of two projects keeping the rules of ergonomics up front.
2. Renovation, redesigning and restoring of an article. Creating a product focusing mainly on aesthetic as well as functional aspects.

Content (Practical)

2. Research activity based on functional space planning for people with special needs.

Recommended Texts

1. Benning R. R. (2004). (2nd Ed.) Furniture marketing from product Development to Distribution Fairchild Publishers
2. Chaiara, D. J. &Panero, J. &Zelink, M. (2001). Time Saver Standard for Housing and Residential Development. McGraw-Hill inc. Us.
3. Miller, Judith. (2005). Furniture, World Styles from Classical to Contemporary. DK Adult Publisher, Amazon.com.
4. Postel J. (2007). Furniture Design. Pile John. Wiley & Sons.

TEXC-6109 Dress Designing through Draping 3(2+1)

This course is about Develop three-dimensional design ideas through draping of muslin on a body form. Evaluation of existing garments and/or sketches to determine appropriate draping techniques needed to develop design. To develop sensitivity for fabric characteristics in order to recognize the possibilities and limitations of different textures for garment design. Develop a means for creative expression through the acquisition of skills needed to drape and produce original garment designs. Construct and use proper techniques to construct apparel first and production sample garments from draped muslin patterns. Use suitable hand construction and sewing techniques in assembling representative samples. Practice fit alteration and fitting techniques. Create presentations using Microsoft PowerPoint and effective visual and oral communication to present garment designs, spec sheets, cost sheet

Contents (Theory)

3. Apparel design through basic draping techniques, problem solving and interaction of fabric.
4. .

Content (Practical)

1. Analysis of fit and design.

TEXC-6110 **Fiber Science** **3(2+1)**

This course is about to develop three-dimensional design ideas through draping of muslin on a body form. Evaluation of existing garments and/or sketches to determine appropriate draping techniques needed to develop design. Develop sensitivity for fabric characteristics in order to recognize the possibilities and limitations of different textures for garment design. Develop a means for creative expression through the acquisition of skills needed to drape and produce original garment designs. Construct and use proper techniques to construct apparel first and production sample garments from draped muslin patterns. Use suitable hand construction and sewing techniques in assembling representative samples. Practice fit alteration and fitting techniques. Create presentations using Microsoft PowerPoint and effective visual and oral communication to present garment designs, spec sheets, cost sheet,

Contents (Theory)

5. Fibre Technology (Wool and Other Animal Fibres). Introduction to Fibre Spinning.Cotton Ginning and Baling.Production and Properties of Man-Made Fibres.
6. .

Content (Practical)

12. Textile Testing and Quality Control. Total Quality Control and Quality Assurance.Cotton Fibre Technology.
13. Textile Raw Material. Yarn Manufacturing. Dyeing / Processing.

Recommended Texts

5. Steven B. Warner. (2012). Fiber Science. 1st Edition, USA

TEXC-6111 **Language of Fashion** **3(3+0)**

Students will learn about the language of fashion.

Contents (Theory)

1. Clothing History. Systems and Structures. Fashion Debates and Interpretations

Recommended Texts

1. Blair Sheila S. (2008). IslamicCalligraphy, Paperback edition 2008, Edinburgh University Press Limited
2. Safadi, Yasin Hamid; Islamic Calligraphy, (1979) Publisher. Shambhala, digitized on 26 Jan, 2010.

ARTD-6109 **Islamic Art** **3(3+0)**

The course is designed to teach Islamic art and culture and increase its appreciation among students.

Contents (Theory)

1. Islamic Art. Ummayads. Abbasids. Islamic Art in Persia. Ilkhanids.Taimurids.Muslim Art in the Sub Continent. Mughal.
2. Contemporary Art in Pakistan.
3. Islamic Calligraphy.
4. Development of Islamic Calligraphy.
5. Origins of Arabic Script. Cursive and Angular Script Styles.
6. Contributions of Ibn-e-Muqla&Ibn-e-Bawwab.Calligraphy in Pakistan

Content (Practical)

14. Preparation of portfolio of calligraphic work.

Recommended Texts

1. Blair Sheila and Bloom Jonathan M.; The Art and Architecture of Islam, 1250-1800 (The Yale University Press Pelican History) (Sep 25,), Yale: University Press.
2. Bloom Jonathan and Blair Sheila S.; Islamic Arts (Art & Ideas) (Apr 24, 1997). New York: Phaidon Press Inc.
3. Khan A. N. and Wheeler R. E. Mortimer; Islamic Architecture in South Asia: Pakistan-India-Bangl. : Oxford University Press. (USA 2003).
4. Ettinghausen Richard, Grabar Oleg, and Jenkins-Madina Marilyn; Islamic Art and Architecture 650-1250 (2003) Oxford University Press.
5. Islamic Art and Architecture: From Isfahan To The TajMahal; Thames & Hudson (04/11/2002).
   Rice David Talbot; Islamic Art (Jan, 1975). The Yale University Press

ARTD-6110 **Calligraphy** **3(2+1)**

Calligraphy aims to promote and revive an endangered art form through a formal teaching programme. The programme will enable students to develop an understanding of South Asian, Middle Eastern and Islamic Calligraphy in terms of its concepts, history, evolution, aesthetic origins, and structure and technique. To stimulate an intelligent, critical and dynamic awareness of the philosophy and techniques of classical Calligraphy as well as its practice in the contemporary context.To rediscover and recreate the link between a meaningful theory and practice of Calligraphy. To produce Calligraphers for the future, whose practice is based on critical understanding and rigorous training, with the purpose of engendering a rediscovery of this highly acknowledged art form, and shaping and developing the cultural sensibilities of the people in the twenty first century.

Contents (Theory)

1. History of Calligraphy. Rules and principles of Calligraphy.Seminars.Tutorials.Readings: Makhzan-e-Khatati, Nisab-e-Khatati, Aijaz-e-Khatati, Pearls of Calligraphy, Wonders of Calligraphy. Quranic Art and Illumination

Content (Practical)

2. *Introduction to Calligraphic Scripts (Nastalique, Thulus, Naskh and Kufic). Illumination (Tezhib) with Calligraphy.Marbling (lbru).Workshops in Fresco Painting and other painting techniques.Drawing.*

Recommended Texts

1. Brush Writing: Calligraphy Techniques for Beginners by RyokushuKuiseko.
2. Creative Lettering: Techniques & Tips from Top Artists by Jenny Doh

ARTD-6111 The Craft of Hand Weaving 3(2+1)

This course is designed to teach history of weaving. Various weaving techniques taught as a craft will help to keep this craft alive and developing.

Contents (Theory)

History of weaving:The great centers in Italy: 13th century. Renaissance (Lucca, Florence, France, Venice).The Baroque and Rococo in France.Types of Hand Looms.Primitive loom.Draw loom. Horizontal Loom.Types of weaves.Plain weave.T will weave. Over short weave.Combination weaves. Tapestry and its designing

Content (Practical)

3. *Preparation of portfolio (one art piece of size 8‖x10‖ or 10‖to 12‖) One tapestry designed and woven*
4. .

Recommended Texts

6. Cox, D. and Warrcu, B. Creative Hands John Wiley and Sons, New York 1999.
7. Gertrude, G.G. Advertised in Weaving, Thas A. Bennet C. Inc. Publishers Peoria, Illinois. 1959.
8. Berta, F. Designing and drafting for Hand Weavers a division of Macmillan Publishing Company Inc. New York. Collier Macmillan Publishers, London 197
9. Crankshaw, William P.; Weaving, Published by Pitman 1924, digitized on Nov 6, 2010.
10. Held, Shirley A.; Weaving a handbook for Fiber Craftsmen, 1973 publisher: Holt, Rinehart and Winston.
11. Balow Alfred; The History and Principles of Weaving by hand and by power, published by Read Books 2010

HDFS-6109 **Abnormal Psychology** **3(2+1)**

The students will be able to focus on the causes, consequences and treatment of maladaptive behavior. Explore historical views and current perspectives of abnormal behavior.Emphasis major diagnostic categories and criteria, individual and social factor of maladaptive behavior and type of therapyDescribe the primary objective of abnormal psychology, including description, exploration, prediction and control of abnormal behavior.

Contents (Theory)

1. The psychoanalyticperspective, the trait perspective, The Humanistic perspective, The Social Cognitive Perspective.
2. The different sources of Behavior - personality trait VS. situational influence, Social Influence and Group Behavior, Social comparison; conformity; compliance, Group Dynamics Group influence; individual performance/Group problem solving / Social roles.
3. Psychological Disorders,
4. Models of Abnormal Behavior, Neurosis, Psychosis, Personality Disorders:
5. Dissociative Disorders, Affective Disorders. Therapies: The psychological therapy, The Biomedical therapy.

Recommended Texts

12. Lefton L. A. (1997) Psychology, 6th Ed, USA: Allyn and Bacon.
13. Corner, R. J. (2009) Abnormal psychology, Worth Publishers.
14. Carr, A. (2001) Abnormal; Psychology, Psychology press.
15. Mangal S. K. (2008) Abnormal psychology, Sterling Publisher

HDFS-6110 Elementary Education and Administration 3(2+1)

School administrators. Principals. Education training developer.

Contents (Theory)

1. School law. Instruction supervision.School leadership.
2. School community relations.
3. Personnel administration

.

Recommended Texts

1. Introduction to Educational Administration: Standards, Theories, and Practice By Douglas J. Fiore Routledge, 2013 (2nd edition)
2. The Art of School Leadership By Thomas R. Hoerr Association for Supervision and Curriculum Development, 2005
3. Connecting Leadership with Learning: A Framework for Reflection, Planning, and Action By Michael A. Copland; Michael S. Knapp Association for Supervision and Curriculum Development, 2006

HDFS-6111 **Family Dynamics** **3(2+1)**

It includes instruction in dimensions of marriage and changing role of women.Family decisions and responsibilities, parenting decisions and responsibilities.Management of family systems in today‘s society.

Contents (Theory)

1. Social change, Dynamics of family interaction. Conceptual analysis of family interaction patterns, Family decisions and responsibilities.
2. Theories and strategies for helping families deal with crises. Dimensions of marriage,
3. Changing roles of women,
4. Families in crisis, parenting in crisis, aging in the family.
5. Management of family systems

.

Recommended Texts

1. Mueller (1993). Family dynamics and children at risk: a study of how social and economic conditions in low-income families affect children. Amherst H. Wilder Foundation, Wilder Research Centre.
2. Turner, L.H. and West, R. L. (2006). The family communication sourcebook. University of California. USA.
3. Crawford, C. J. (2010). The Power of Love: Improving Family Dynamics. Create Space. USA.
4. Crawford, C. (2003). Embracing the family: achieving a loving balance in family dynamics. Cyntomedia Corp., Sterling House Publisher, 2003.S

HDFS-6112 Gerontology: Social Aspects 3(2+1)

Present and explain sociological characteristics of older persons.Show the significance of certain variations in aging based on different lifestyles and life opportunities. Be familiar with some studies in gerontology, in Pakistani perspective.

Contents (Theory)

1. Social Analysis of Aging I: The Family. Social Analysis of Aging II:
2. Gender; Retirement Part I—Styles and Lifestyles
3. Widowhood. Social Analysis of Aging III: Retirement Part II—Planning, Work, and Leisure. Social Analysis of Aging I
4. Rural vs. Urban, Ethnicity, Class. Statistical Aspects: Population Aging Issues, Statistics and Research.

Recommended Texts

6. Gibson, J. W. (2006). The Dynamics of Aging Families: A Handbook for Adult Children. Cambio Press, USA.
7. Morgan, L. and Kunkel, S. (2001). Aging: The Social Context (2nd Edition), Pine Forge Press.
8. Kaye, L.W. (2005). Perspectives on Productive Aging: Social Work with the New Aged. NASW Press. USA.

INED-6110 **Environmental Management** **3(3+0)**

To develop understanding of issues relevant to Environmental mgt and enhance skills for Environmental mgt.

Contents (Theory)

1. An introduction to environmental management; Definition and scope; Relation of environment and management;
2. Responsibilities of public, private and social sector. Population, growth and urbanization; Man in his ecological settings; Growth in population and urbanization; Population, growth and its effect on environment.
3. Environmental degradation; Concept of technology and environment; Land pollution, causes and remedies; Air and water pollution, causes and remedies; Destruction of forest and its effect on environment;
4. Waste disposal.
5. Environmental aesthetics; Definition and scope; Aesthetic qualities of environment; Ways and means to work towards environmental aesthetics
6. .Environment and management; Scope of management and environment.
7. Health and environment; Socio-psychological effects of environment

Recommended Texts

1. Barrow, C. J. (1999) Environmental Management: Principles and Practice Routledge; Edition
2. Michael Brower, WarrenLeon The Consumer's Guide to Effective Environmental Choices:
   Practical Advice from the Union of Concerned Scientists Three Rivers Press; Edition (1999) Elective

INED-6111 Designing Functional Spaces for Special Needs 3(1+2)

Including significance of interior environments for people with special needs. Introducing the concepts of ergonomics in regards to interior design elements. Developing skill to design special activity areas for specialized needs.

Contents (Theory)

1. Functionally designed spaces for people with special needs in homes and at work places.
2. Ergonomics: Definition and Explanation.
3. Historical background of Ergonomics.
4. Physical Ergonomics and significance of functional space requirements..

Content (Practical)

3. Research activity based on functional space planning for people with special needs.

Recommended Texts

1. Kroemer, K, H. E, Kroemer, H, B. & Kroemer, K, E. (1993). Ergonomics: How to Design for Ease and Efficiency. Practice Hall.
2. Maureen Mittion, Courtney Nystuen (2007). Residential Interior Design: A guide to Planning Space. John Wiley & sons, Canada.
3. Robert, S. Bridger (2003). (3rd Ed) Introduction to Ergonomics. Taylor & Francis, New York.
4. Salk. S. (2010) Room for Children Stylish spaces for sleep and play. Rizzoli
5. Spencer. C. (2006). Children and their environments: Learning, Using and Designing Spaces Cambridge University Press.

INED-6112 Environmental Aesthetics 3(2+1)

Introducing the historical context of environmental aesthetics. Developing aesthetics appreciation of interior environments. Developing strategies to control visual pollution.

Contents (Theory)

1. Introduction to environmental aesthetics. Theoretical framework for environmental aesthetics.
2. Aesthetics and buildings (building in relation to natural setting).Architectural experience with building.

Content (Practical)

1. Evaluation of building aesthetics (project base). Portfolio.

.

Recommended Texts

1. Berleant. Arnold. 2005. Aesthetics and Environment Variations on a theme, Ashgate Publishing Limited England.
2. Brady. E. (2003). Aesthetics of the NaturalEnvironment. Edinburgh University Press.
3. Carison. A (2009). Nature and Landscape: An Introduction to Environment. Columbia University Press.
4. EnvirPorteons. D. J. 2000. Environmental aesthetics. Amazon.com
5. Hill. R. 1999. Design & their consequences. Amazon.com
6. Nasar. L. 1992. Environmental Aesthetics, theory, Research and Application Cambridge University Press.
7. Winchip. M. Susan. 2007. Sustainable Design for Interior environments. Fairchild Books & visuals Publishers

INED-6113 **Interior Design Project** **3(0+3)**

Importing knowledge in the students about furniture designing and applying that knowledge from a theoretical and practical point of view.Making students understand the importance of the principles of Ergonomics and its relationship with human body.

Content (Practical)

1. *Analysis of furniture items from theoretical and practical aspects.*
2. *Creation of furniture items through the use of: Conception of an idea, execution through full scale drawing. Actual construction of two projects keeping the rules of ergonomics up front.*
3. *Renovation, redesigning and restoring of an article.*
4. *Creating a product focusing mainly on aesthetic as well as functional aspects.*
5. *Feasibility Report*

.

Recommended Texts

3. Benning R. R. (2004). (2nd Ed.) Furniture marketing from product Development to Distribution Fairchild Publishers.
4. Chaiara, D. J. &Panero, J. &Zelink, M. (2001). Time Saver Standard for Housing and Residential Development. McGraw-Hill inc. Us.
5. Miller, Judith. (2005). Furniture, World Styles from Classical to Contemporary. DK Adult Publisher, Amazon.com.
6. Postel J. (2007). Furniture Design. Pile John. Wiley & Sons

.

HECO-6121 Research Project 6(0+6)

This course will help to develop and sharpen research and presentation skills and strategies.

Contents (Practical)

1 Exercises in collecting literature from different sources on assigned topics
2 Conducting short research projects on assigned topics
3 Organizing and analysis of collected material
4 Writing synopsis/proposal, short communication
5 Delivering oral presentations

Recommended Texts

1 Awan, J. A. (2009). *Scientific presentations*. Faisalabad: Unitech Communications.
2 Khalil, S. K., & Shah, P. (2007). *Scientific writing and presentation for crop sciences*. Islamabad: Higher Education Commission of Pakistan.

Suggested Readings

1 Murray, N., & Hughes, G. (2008). *Writing up your university assignments and research projects: a practical handbook.* London: McGraw-Hill Education.
2 Anderson, J., Durston, B. H., & Poole, M. (1992). *Thesis and assignment writing*. New Delhi: Wiley Eastern Ltd.

FANU-6111 **Applied Nutrition** **2(0+2)**

To study the current nutrition issues with special reference to Pakistan.

Contents (Theory)

1. Food and Population: World population perspective with special reference to Pakistan. Social, economic and environmental factors.
2. Application of methods of nutritional assessment.
3. Planning of nutritional surveys.
4. Nutrition Intervention Strategies and Planning of Nutrition Programs

Content (Practical)

6. *Literature Review report*

Recommended Texts

1. Clinando, M. A. (1999) Nutrition and the world food crisis. MacMillan Pub. Co.
2. Insel, P and Turner, R.E (2002) Nutrition update ADA Jones and Bartlett Pub.
3. Gibson R. S. (2005). Principles of Nutritional Assessment 2nd Ed. Oxford University Press Inc. Meddision Avenue, New York, USA.
4. Shibamoto T and Bjehdanes L. (2009). Introduction to
5. Food Toxicology. 2nd Ed Academic Press. London, UK
6. Omaya ST. (2004). Food and Nutritional Toxicology. CRC Press, Boca Raton London, New York, USA.

FANU-6114 Food and the Allergic Reaction 3(3+0)

The course aims to acquire an in-depth understanding of toxicology related to food and health, to understand various types of toxins from plant, animal and plant origins as well induced by extraneous chemicals and to familiarize with food allergens, their health implications and management

Contents

1. Toxicology: introduction, dose-response, absorption, translocation, storage, excretion
2. Natural toxins of plant origin: goitrogens, cyanogenic glycosides, favism, lathyrogens, lecitins (hemagglutinins), mutagens in natural plant, caffeine, flavonoids and some others
3. Natural toxins of animal origin: animal liver, marineanimals
4. Toxicity by extraneous chemicals: agricultural chemicals, food processing, packaging, additives, adulterants
5. Toxicity from water
6. Microbial toxins:mycotoxins– molds, mushrooms
7. Bacterial food intoxication; Bacterial food infection
8. Food allergies: introduction, incidence of food allergy, food allergens of protein families, animal origin and plant origin
9. Adverse allergic reaction, diagnosis, prevention, legislation and labeling, allergen management, food intolerances, emergency treatment of food-induced allergic reactions.

Recommended Texts

1. Awan, J.A. & F.M. Anjum. (2010). Food Toxicology. Unitech Communications, Faisalabad, Pakistan.
2. Coutts, J. & R. Fielder. (2009). Management of Food Allergens. John Wiley & Sons Ltd., Chichester, West Sussex, UK.
3. Jedrychowski, L. & Wichers, H.J. (2009). Chemical and Biological Properties of Food Allergens. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.

1. Metcalfe, D., H.A. Sampson, R.A. Simon & Lack, G. (2014). Food Allergy: Adverse Reaction to Foods and Food Additives, 5th Ed. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.

Suggested Readings

1. Shibamoto, T & Bjeldanes, L. (2009). Introduction to Food Toxicology, 2nd Ed. Academic Press, London.

FANU-6113 **Sports Nutrition** **2(2+0)**

The course aims to study the principles of sports nutrition. To develop understanding of healthy nutrition practices in sports nutrition.

Contents (Theory)

1. Introduction to sports nutrition.
2. Goals of nutritional fitness.
3. Nutrition Principles and requirements applied to Fitness & Sports.
4. Stress Management and Physical Fitness.
5. Sports and supplements. Types and uses. Use & Misuse.
6. Eating Disorders in Sports.
7. Healthy Physical Activities and Safe Weight Management. Post exercise meal.

Recommended Texts

1. Brown S. F. (2002) Essentials of Sports Nutrition. 2nd Ed. Willey Co.
2. Wildman, R. Miller, B. (2004). Sports & Fitness Nutrition. Ward Worth.
3. Williams, M. H. (2002) Nutrition for Health, Fitness & Sports. 6th Ed. McGraw Hill.

ARTD-6113 Art Appreciation 3(2+1)

The course aims to design to educate students to analyze a work of art and be able to place it in historical context. To understand that the work of art are the products of a creative, intelligent and skillful human beings who were nurtured in a specific historical and cultural milieu, hence to know enough about art periods, to recognize specific styles to make an informed aesthetic judgments.
.

Contents (Theory)

1. Early Medieval. Romanesque art Gothic Renaissance.

Recommended Texts

1. Janson's History of Art: The Western Tradition (8th Edition) (MyArtsLab Series) by Penelope J.E.
2. A quantum Book. The Great Masters. 2004 Quantum Publishing Ltd. 6 Blunded Street, London, N 7 9 BH.
3. Gardner‘s; Art through the Ages; A Global History, Vol-I & II, 11th Ed. Harcourt College Publishers 2001.
4. Gardner, Helan; Art through the Ages; A Concise History, 2008, Harcourt College Publishers 2001.

.

ARTD-6115 **Hand Built Pottery** **3(2+1)**

This course is designed to learn about the traditional techniques of pottery making such as hand-building, wheel, slip casting, glazing and firing.

Contents (Theory)

1. Types of Clay: Methods of preparing Clay. Techniques of Decorations.
2. Techniques of Glazing.
3. Basic Firing Techniques to turn Clay into Ceramics

Contents (Practical)

1. Make a pottery piece

Recommended Texts

1. Mills Mavreen; ―Surface Design for Ceramics‖. Publisher Lark Books (July 1. 2008) 144 pgs.
2. Quinn Anthony; ―Ceramics Design Course: Principles, Practice & Techniques: A complete course for Ceramicist‖. Publisher: Barron
3. Educational Series (Oct1, 2007) 144 pgs.
4. ―Hand built Pottery Techniques Revealed‖: The secrets of hand building shown in unique cutaway Photography. Publisher: Barron‘s Educational Series, First Edition (Nov18, 2005). 160 Pgs.
5. Barsoum M. W; Fundamental of Ceramics, Pub: 2003, Institute of Physics.
6. Speight Charlotte F. Toki John.; Hand in Clay, Publisher: McGraw- Hill, 2003.
7. Pierson Stacey; Chinese Ceramics., Victoria and Albert Museum, Pub V&A, 2009.
8. Cusentino Peter; the Encyclopedia of Pottery Techniques. A Comprehensive Visual Guide to Traditional & Contemporary Techniques, Publisher: Sterling Publishing, 2002. Pg192.
9. Rahaman M. N.; Ceramics Processing... Publisher: CRC/ Taylor & Francis, 2007. pg 473.
10. Mills Maureen; Surface Design For Ceramics. A Lark Ceramics Book. Publisher: Sterling Publishing Company, Inc; 2008. 144pgs.
11. Quinn. A, ―Ceramic Design Course.‖ 2007, Published By Barron‘s Educational Series, Inc, New York.
12. Minogue. C, ―Slab- built Ceramics.‖ 2008, published by The Crowood Press Ltd. Rambury, Marlborough Wiltshire SN8 2HR.

.

HDFS-6113 Educational Psychology and Measurement Techniques 3(2+1)

This course is designed to promote and maintain high standards of professional education and training within the specialty, and to expand appropriate scientific and scholarly knowledge and the pursuit of scientific affairs; to increase effective and efficient conduct of professional affairs, including the practice of psychology within the schools, among other settings, and collaboration/cooperation with individuals, groups, and organizations in the shared realization of Division objectives. Demonstrate knowledge of effective educational practices and the skills necessary to deliver psychological services in school settings.

Contents (Theory)

1. Educational Psychology: An Introduction and Contribution of educational psychology. Contribution of School of Psychology in Education:
2. Structuralism, Functionalism, Behaviorism, Psychoanalysis, and Gestalt School of Psychology. Educational Implications of Developmental Theories
3. Piaget, Erickson, Vygtosky, and Kohlberg.
4. Theories of Learning: Meaning of learning, Implication of learning for teachers, Motivation and class room learning: Definition and importance of motivation.
5. Types of motivation Function of motivation.
6. Intelligence and class room learning: Definition and types of intelligence.
7. Theories of Intelligence, Multifactor theory (two factor theory, Guilford‘s theory), Measuring intelligence (Binet‘s intelligence scale, Waschler‘s intelligence scale).
8. Types of Clay: Methods of preparing Clay. Techniques of Decorations.
9. Techniques of Glazing.
10. Basic Firing Techniques to turn Clay into Ceramics

Contents (Practical)

1. Learning to administer any two of the following 16 P. F, S. P. M., Weschler, TAT. Collecting evidences through audio visual aids to confirm the theories Planning Curriculum for various grades.

Recommended Texts

1. Berryman, J.C. (2003). Development Psychology and You, Londer Blackwell Publishers, 2nd Ed..
2. Woolfolk, A. E. (2007). Educational Psychology, 4th Edition, Prentice hall, U.K.
3. Thorndike, E. L. (2007). Educational Psychology. (7th Ed.). Prentice hall, U.K.
4. Winne, P. H. (2006). Handbook of educational psychology.
   Sharma, P. (2007).Educational Psychology. New Dehli.APH publishing Corporation

HDFS-6115 Day Care Management and Administration 3(2+1)

This course is designed to learn and understand the fundamentals of this important Child Day Care Management. To comprehend all aspects of child day care management from business start-up to administrative management.

Contents (Theory)

1. Child Day Care Management: An Introduction; The Role of the Child Care Worker; Interacting with Child Care Workers;
2. Fostering Self- Esteem and Showing Approval; Changes in Children
3. 12 Months to 10 Years; Financial Statements and the Business Plan. Administration of Programmes for Young Children
4. Schools and Programs; The Programmme and Environment of Planning; Setting Programme Goals; Planning for Infants and Toddlers and Preschool-Age Children
5. Communication Styles and Listening Skills;Sharing Unpleasant Information with Parents.
6. Planning and Staff Decision Making; Staff Selection; Personnel Policies; Staff Supervision and Training; Student Teachers/Volunteers.
7. Management Issues; Budget Management; Maintenance, Health, and Safety; Food and Nutrition Services; Including Families and the Community
8. Maintaining the Quality of Child Care; Computerized Center Administration. Planning for Profit in Your Child Care Business; Setting Your Professional Goals
9. Contracts and Policies; Rates, Fees, and Collection; Financial Determination; Marketing Strategies.

Contents (Practical)

2. Your Child Care Business Plan: develop and report..

Recommended Texts

1. Jack, G. H. (2004). The Business of Child Care: Management and st Financial Strategies. Edition. Wadsworth Publishing. USA.
2. Sciarra, D. J. Dorsey, A. G., & Lynch, E. (2009). Developing and Administering a Child Care and Education Program. 7th Ed. Wadsworth Publishing; USA.
3. Gonzalez-Mena, J. (2004). Diversity in Early Care and Education th Programs: Honoring Differences. 4. Ed. McGraw-Hill Humanities/Social Sciences/Languages.

SCHEME OF STUDIES AND CURRICULUM

for

B. Sc. (Hons). Human Nutrition and Dietetics (HND)

(4 Years Degree Program)

w.e.f. Fall Admissions 2021

INSTITUTE OF FOOD SCIENCE AND NUTRITION (IFSN) UNIVERSITY OF SARGODHA, SARGODHA

B.Sc. (Hons.) Human Nutrition and Dietetics

Eligibility: At least 45% marks in F.Sc. (Pre-Medical/Pre-Engineering) or A Level
Duration: 04 Years Program (08 Semesters)
Degree Requirements: 138 Credit Hours

Course Code	Course Title	Credit Hours
	SEMESTER-I	
URCE-5102	Language Comprehension & Presentation Skills	3(3+0)
URCI-5109	Introduction to Information & Communication Technologies	3(2+1)
URCP-5106	Pakistan Studies	2(2+0)
ZOOL-6141 / MATH-5128	Introduction to Biology I (for Pre-Engineering students) / Mathematics (for Pre-Medical students)	3(3+0)
FSAT-5101	Introduction to Food Science and Technology	3(2+1)
HNAD-5101	Fundamentals of Human Nutrition	3(3+0)
HNAD-5102	Metabolism of Basic Nutrients	3(3+0)
	Total Credit Hours	**20(18+2)**
	SEMESTER-II	
URCE-5103	Academic Writing	3(3+0)
URCI-5105	Islamic Studies	2(2+0)
HNAD-5103	Human Anatomy	3(2+1)
HNAD-5104	Human Physiology-I	3(2+1)
HNAD-5105	Macronutrients in Human Nutrition	3(3+0)
FSAT-5106	Food Safety and Laws	3(3+0)
	Total Credit Hours	**17(15+2)**
	SEMESTER-III	
STAT-5101	Introductory Statistics	3(3+0)
HNAD-5106	Human Physiology-II	3(2+1)
CHEM-6111	Biochemistry	4(3-1)
HNAD-5107	Micronutrients in Human Nutrition	3(3+0)
HNAD-5108	Food and the Allergic Reaction	3(3+0)
FSAT-6125	Food Microbiology	3(2+1)
	Total Credit Hours	**19(16+3)**
	SEMESTER-IV	
STAT-5102	Introduction to probability distribution	3(3+0)
HNAD-5109	General Pathology	3(2+1)
FSAT-6121	Food Product Development and Service Management	3(1+2)
HNAD-5110	Assessment of Nutritional Status	3(1+2)
HNAD-5111	Nutrition and Drug Laws	3(3+0)
HNAD-5112	Nutrition in Emergencies	3(3+0)
	Total Credit Hours	**18(15+3)**
	SEMESTER-V	
FSAT-6111	Food Analysis and Sensory Evaluation	3(0+3)
HNAD-6113	Dietetics-I	3(2+1)
HNAD-6114	Fundamentals of Industrial Nutrition	3(2+1)
HNAD-6115	Global Food Issues	3(3+0)
HNAD-6116	Nutritional Education and Awareness	3(2+1)

HNAD-6117	Nutrition Through Social Protection	3(3+0)
	Total Credit Hours	**18 (12+6)**
	SEMESTER-VI	
HNAD-6118	Dietetics-II	3(2+1)
HNAD-6119	Drug-Nutrient Interactions	3(3+0)
HNAD-6120	Preventive Nutrition	3(3+0)
HNAD-6121	Functional Foods and Nutraceutical	3(3+0)
HNAD-6122	Research Methods and Scientific Writing in Nutrition	3(1+2)
HNAD-6123	Infant and Young Child Feeding	3(2+1)
	Total Credit Hours	**18 (14+4)**
	SEMESTER-VII	
HNAD-6124	Clinical Biochemistry	3(3+0)
HNAD-6125	Nutrition Policies and Programs	3(3+0)
HNAD-6126	Meal Planning and Management	3(3+0)
HNAD-6127	Dietetics-III	3(2+1)
HNAD-6128	Nutritional Practices in Clinical Care	3(2+1)
HNAD-6129	Nutrition and Psychology	3(3+0)
Total Credit Hours		**18(13+5)**
	SEMESTER-VIII	
HNAD-6130	Internship and Report Writing	10 (0+10)
	Total Credit Hours	**10 (0+10)**
	Grand Total Credit Hours	**138 (104+34)**

URCE-5102 Language Comprehension & Presentation Skills 3(3+0)

The course aims at developing linguistic competence by focusing on basic language skills in integration to make the use of language in context. It also aims at developing students' skills in reading and reading comprehension of written texts in various contexts. The course also provides assistance in developing students' vocabulary building skills as well as their critical thinking skills. The contents of the course are designed on the basis of these language skills: listening skills, pronunciation skills, comprehension skills and presentation skills. The course provides practice in accurate pronunciation, stress and intonation patterns and critical listening skills for different contexts. The students require a grasp of English language to comprehend texts as organic whole, to interact with reasonable ease in structured situations, and to comprehend and construct academic discourse. The course objectives are to enhance students' language skill management capacity, to comprehend text(s) in context, to respond to language in context, and to write structured response(s).

Contents

1 Listening skills
2 Listening to isolated sentences and speech extracts
3 Managing listening and overcoming barriers to listening
4 Expressing opinions (debating current events) and oral synthesis of thoughts and ideas
5 Pronunciation skills
6 Recognizing phonemes, phonemic symbols and syllables, pronouncing words correctly
7 Understanding and practicing stress patterns and intonation patterns in simple sentences
8 Comprehension skills
9 Reading strategies, summarizing, sequencing, inferencing, comparing and contrasting
10 Drawing conclusions, self-questioning, problem-solving, relating background knowledge
11 Distinguishing between fact and opinion, finding the main idea, and supporting details
12 Text organizational patterns, investigating implied ideas, purpose and tone of the text
13 Critical reading, SQ3R method
14 Presentation skills, features of good presentations, different types of presentations
15 Different patterns of introducing a presentation, organizing arguments in a presentation
16 Tactics of maintaining interest of the audience, dealing with the questions of audience
17 Concluding a presentation, giving suggestions and recommendations

Recommended Texts

1 Mikulecky, B. S., & Jeffries, L. (2007). *Advanced reading power: Extensive reading, vocabulary building, comprehension skills, reading faster*. New York: Pearson.
2 Helgesen, M., & Brown, S. (2004). *Active listening: Building skills for understanding*. Cambridge: Cambridge University Press.

Suggested Readings

1 Roach, C. A., & Wyatt, N. (1988). *Successful listening*. New York: Harper & Row.
2 Horowitz, R., & Samuels, S. J. (1987). *Comprehending oral and written language*. San Diego: Academic Press.

URCI-5109 Introduction to Information & Communication Technologies 3 (2+1)

The course introduces students to information and communication technologies and their current applications in their respective areas. Objectives include basic understanding of computer software, hardware, and associated technologies. They can make use of technology to get maximum benefit related to their study domain. Students can learn how the Information and Communications systems can improve their work ability and productivity. How Internet technologies, E-Commerce applications and Mobile Computing can influence the businesses and workplace. At the end of semester students will get basic understanding of Computer Systems, Storage Devices, Operating systems, E-commerce, Data Networks, Databases, and associated technologies. They will also learn Microsoft Office tools that includes Word, Power Point, Excel. They will also learn Open office being used on other operating systems and platforms. Specific software's related to specialization areas are also part of course. Course will also cover Computer Ethics and related Social media norms and cyber laws.

Contents

1. Introduction, Overview and its types.
2. Hardware: Computer Systems & Components, Storage Devices and Cloud Computing.
3. Software: Operating Systems, Programming and Application Software,
4. Introduction to Programming Language
5. Databases and Information Systems Networks
6. The Hierarchy of Data and Maintaining Data,
7. File Processing Versus Database Management Systems
8. Data Communication and Networks.
9. Physical Transmission Media & Wireless Transmission Media
10. Applications of smart phone and usage
11. The Internet, Browsers and Search Engines.
12. Websites Concepts, Mobile Computing and their applications.
13. Collaborative Computing and Social Networking
14. E-Commerce & Applications.
15. IT Security and other issues
16. Cyber Laws and Ethics of using Social media
17. Use of Microsoft Office tools (Word, Power Point, Excel), mobile apps or other similar tools depending on the operating system.
18. Other IT tools/software specific to field of study of the students if any

Recommended Texts

1. Vermaat, M. E. (2018). *Discovering computers: digital technology, data and devices.* Boston: Course Technology Press.

Suggested Readings

1. Timothy J. O'Leary & Linda I. (2017). *Computing essentials*, (26th ed.). San Francisco: McGraw Hill Higher Education.
2. Schneider, G. M., & Gersting, J. (2018). *Invitation to computer science*. Boston: Cengage Learning.

URCP-5106 Pakistan Studies 2(2+0)

The course is designed to acquaint the students of BS Programs with the rationale of the creation of Pakistan. The students would be apprised of the emergence, growth and development of Muslim nationalism in South Asia and the struggle for freedom, which eventually led to the establishment of Pakistan. While highlighting the main objectives of national life, the course explains further the socio-economic, political and cultural aspects of Pakistan's endeavours to develop and progress in the contemporary world. For this purpose, the foreign policy objectives and Pakistan's foreign relations with neighbouring and other countries are also included. This curriculum has been developed to help students analyse the socio-political problems of Pakistan while highlighting various phases of its history before and after the partition and to develop a vision in them to become knowledgeable citizens of their homeland.

Contents

1. Contextualizing Pakistan Studies
2. Geography of Pakistan: Geo-Strategic Importance of Pakistan
3. Freedom Movement (1857-1947)
4. Pakistan Movement (1940-47)
5. Muslim Nationalism in South Asia
6. Two Nations Theory
7. Ideology of Pakistan
8. Initial Problems of Pakistan
9. Political and Constitutional Developments in Pakistan
10. Economy of Pakistan: Problems and Prospects
11. Society and Culture of Pakistan
12. Foreign Policy Objectives of Pakistan and Diplomatic Relations
13. Current and Contemporary Issues of Pakistan
14. Human Rights: Issues of Human Rights in Pakistan

Recommended Texts

1. Kazimi, M. R. (2007). *Pakistan studies.* Karachi: Oxford University Press.
2. Sheikh, J. A. (2004). *Pakistan's political economic and diplomatic dynamics.* Lahore: Kitabistan Paper Products.

Suggested Readings

1. Hayat, S. (2016). *Aspects of Pakistan movement.* Islamabad: National Institute of Historical and Cultural Research.
2. Kazimi, M. R (2009). *A concise history of Pakistan.* Karachi: Oxford University Press.
3. Talbot, I. (1998). *Pakistan: A modern history*. London: Hurst and Company.

ZOOL-6141 Introduction to Biology I 3(3+0)

This subject aims to yield students with a sense of practical relevance of biology to everyday life. This will make students comprehend life by understanding some of the molecular processes that occur in and around cells, to make students cognizant of biologic phenomenon (nature, body, etc.) on an evolutionary, ecological, behavioral, physiologic, tissue, cellular, and molecular level. In this subject students will examine how life is organized into hierarchical levels; how living organisms use and produce energy; how life grows, develops, and reproduces; how life responds to the environment to maintain internal stability; and how life evolves and adapts to the environment. Moreover, it will also enable them to investigate the biological molecules, homeostasis in vertebrates, and the influence of hormones on coordination and control systems of animal body. Upon completion of this subject students will be have an enhanced knowledge and appreciation of the basics of growth and development plans of animals and can develop cogent and critical arguments based on the course material.

Contents

1. Introduction: Nature and scope of biology
2. Branches of biology
3. Relationship between biology and psychology
4. Biological molecules: Carbohydrates, Proteins, Fats, Nucleic acids, Water
5. The cell: Structure and function of cell
6. Cell organelles
7. Different types of cells
8. Homeostasis: Osmoregulation
9. Structure and functions of Nephron
10. Thermoregulation
11. Coordination and control: Structure and physiology of Neuron
12. Introduction to central and peripheral nervous system
13. Hormones
14. Basics of growth and development
15. Embryonic and post embryonic development

Recommended Texts

1. Michael, J., & Lenardo. (2013). *Immune Homeoststis: Methods and protocols*. New Jersey: Humama press.
2. Paradise, C. J., & Campbell, A. M. (2016). *Organismal Homeostasis*. New York: Momentum Press.

Suggested Readings

1. Lisa A. U., Michael L. C., Steven A. W., Peter V. M., Jane B. R., & Neil A. C. (2016). *Campbell biology.* (11th ed.) London: Pearson.
2. Cambell, N. A. Mitchell, l. G., & Reece, J. B. (2009). *Biology: Concepts and connections.* (6th ed.) San Francisco: Addison Wesley, Longman
3. Anna A. S., Richard B. P. (2019). *An Introduction to Conservation Biology* (2nd ed.) Oxford: Oxford University Press.

MATH-5128 **Mathematics** **3(3+0)**

To prepare the students, not majoring in mathematics, with the essential tools of algebra to apply the concepts and the techniques in their respective disciplines. Mathematics, as a study of patterns, both practical and abstract, involves analytical thought, logical reasoning, problem solving skills, and precise communication. Because of its power and versatility, mathematics has often been called the "Queen of the Sciences." There is no field of scientific inquiry that does not express itself through the language of mathematics. An undergraduate degree in mathematics provides an excellent foundation for students who are interested in pursuing an advanced degree in mathematics or in a related specialized profession. Mathematics can also provide an excellent foundation for students considering professional degrees in such allied fields such as Law, Business Administration, or Medicine. The kinds of analytical and logical thinking skills that one develops while studying mathematics are precisely the skills that recruiters look for in potential employees. Jobs involving significant mathematical background also consistently rank near the top of the list in annual career surveys.

Contents

1 Real Numbers
2 Relations and Functions
3 Inequalities
4 Quadratic Functions and Complex Numbers
1 Linear Equations and Quadratic Equations: Formation of Linear equation
2 Solving Linear equation involving one variable
3 Solution of Quadratic equation by factorization method
4 Solution of quadratic equation by square completion methods
5 Solution of quadratic equation by quadratic formula
5 Application of quadratic equation
6 Sequence and Series
7 Types of Sequences; A. P, A. M., G. P., H. P
8 Trigonometric Functions
9 Trigonometric Applications
10 Graph of Functions and Modelling
11 Limits and Continuity
12 Derivatives
13 Integration
14 Probability and Binomial Theorem.

Recommended Texts

1. Gantert, A. X. (2009). *Algebra 2 and trigonometry*. New York: AMCOS School Publication INC.
2. Kaufmann, J. E. (1994). *College algebra and trigonometry* (3th ed.) Boston: PWS-Kent Pub. Co.

Suggested Readings

1. Swokowski, E. W. (1993). *Fundamentals of algebra and trigonometry* (8th ed.) Boston: PWS-Kent Pub. Co.
2. Nauman, K. (2019). Basic mathematics-I: algebra and trigonometry (2nd ed.) Lahore: Al-Hassan Pub.
3. Anton, H. (1999). *Calculus: A new horizon* (6th ed.). New York: John Wiley.
4. Stewart, J. (2012). *Calculus* (7th ed.). Belmont: Brooks/Cole.

FSAT-5101 Introduction to Food Science and Technology 3 (2+1)

This is an introductory course which enables the students to understand the basics of food science and technology. Students will explore and gain an understanding into the history of Food Science and the factors that have shaped Food Science in Pakistan, the organizations involved in Food manufacturing, food regulatory processes, Food composition, its classification depending on sources, consumption pattern and basic analysis of food components. The course is the study of the physical, biological, and chemical makeup of food; the causes of food deterioration; and the concepts underlying food processing. Food scientists and technologists apply scientific disciplines including chemistry, engineering, microbiology, and nutrition to the study of food to improve the safety, nutrition, wholesomeness and availability of food. Depending on their area of specialization, food scientists may develop ways to process, preserve, package, and/or store food according to industry and government specifications and regulations. It could involve enhancing the taste, making it last longer, making sure it's safe to eat, or even boosting its nutritional content.

Contents (Theory)

1 Introduction to food science, food technology, relationship with other disciplines
2 Career opportunities.
3 Significance of food science and technology
4 Food industry: history, developments
5 Important food industries in Pakistan
6 Food sources: plants, animals and marine
7 Food constituents and their functions: water, carbohydrates, lipids, proteins, vitamins, minerals.
8 Classification of foods on the basis of perishability and pH
9 Food spoilage agents: enzymes, microorganisms, pests, physical factors
10 Principles of food preservation
11 Prevention or delay of autolysis, microorganisms and pests

Contents (Practical)

1 Use of basic food laboratory equipment.
2 Estimation of Moisture, Fat, Protein, Carbohydrates, Fiber and Ash content in food samples.
3 Determination of soluble solids, total solids, pH, Acidity, total sugars, Specific gravity and Refractive index.

Recommended Texts

1 Awan, J. A. (2018). *Food science and technology*. Faisalabad: Unitech Communications.
2 Robert, L. S., Ramirez, A. O., & Clarke, A. D. (2015). *Introducing food science*. (2nd ed.) Florida: CRC Press.

Suggested Readings

1 Stewart, G. F., & Amerine, M. A. (2012). *Introduction to food science and technology*. Amsterdam: Elsevier.
2 Potter, N. N., & Hotchkiss, J. H. (2012). *Food science*. Berlin: Springer Science & Business Media.

HNAD-5101 Fundamentals of Human Nutrition 3(3+0)

The course aims to familiarize with the role of macro and micronutrients in human nutrition, to understand the absorption, digestion and metabolism of nutrients in the human, and to abreast knowledge about the health disorders due to consumption of non-optimal quantities of the nutrients

Contents

1. Introduction: food, nutrients, nutrition, malnutrition - global and local scenario, diet, balanced diet, food groups, foundations of healthy diet, meal planning
2. Water: functions, regulation in body, dietary requirements, electrolytes and acid-base balance
3. Carbohydrates: types, role in body, dietary fiber, bulk and alternative sweeteners, recommended intake and energy value
4. Fats and oils: types, functions, recommendations concerning fat intake, fat substitutes; Proteins: amino acids, protein synthesis and degradation, classification, functions, quality of proteins, dietary requirements
5. Vitamins: classification, types, sources, role in body; Mineral elements: types, requirements, sources, role in body
6. Digestion: alimentary tract, digestive juices, secretions; Absorption and metabolism of nutrients: carbohydrates, protein, lipids; Nutrient and dietary deficiency disorders and special nutrient requirements.

Recommended Texts

1. Awan, J.A. (2011). Elements of Food and Nutrition. Unitech Communications, Faisalabad, Pakistan
2. Bamji, M.S., Krishnaswamy, K. & Brahmam, G.N.V. (2009). Textbook of Human Nutrition. 3rd Ed. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India
3. Eastwood, M. (2003). Principles of Human Nutrition. 2nd Ed. John Wiley & Sons, Inc., New York, USA
4. Geissler, C. & Powers, H. (2011). Human Nutrition. 12th Ed. Churchill Livingstone, London, UK

HNAD-5102 Metabolism of Basic Nutrients 3(3+0)

The course aims to understand the metabolic roles of carbohydrates, fats, proteins, vitamins and minerals, to generalize the way in which nutrients are processed through major metabolic fates in order to perform various energetic and structural functions in the body, to establish the role of enzymes and hormones in metabolism of nutrients.

Contents (Theory)

7. Metabolic pathways: objectives, chemical reactions, enzymes, co-enzymes and prosthetic groups, metabolic pathways
8. Role of ATP in metabolism: objectives, functions, phosphorylation of ADP to ATP
9. Digestion and absorption: gastrointestinal tract, digestion and absorption of carbohydrates, fats and proteins
10. Absorption of vitamins and minerals
11. Metabolism of carbohydrates and fats
12. Protein nutrition and metabolism
13. Nitrogen balance and protein requirements
14. Protein synthesis and metabolism of amino acids
15. Integration and control of metabolism: pattern of metabolic regulation, intracellular regulation of enzyme activity, responses to fast acting hormone by covalent modification of enzyme proteins, slow acting hormones, changes in enzymes synthesis.

Recommended Texts

1. Bender, D.A. (2014). Introduction to Nutrition and Metabolism, 5th ed. CRC Press, Taylor & Francis, Boca Raton, FL, USA.
2. Davidson, S., Passmore, R., & Eastwood, M.A. (1986). Human Nutrition and Dietetics. Churchill Livingstone, New York, U.S.A.
3. Gropper, S.S. & Smith, J.L. (2013). Advanced Nutrition and Human Metabolism, 6th Ed. Wadsworth Cengage Learning, Belmont, CA, USA.
4. Kohlmeier, M. (2015). Nutrient Metabolism: Structures, Functions, and Genes, 2nd Ed. Academic Press, San Diego, CA, USA.
5. Lanham-New, S.A., Macdonald, I.A. & Roche, H.M. (2011). Nutrition and Metabolism, 2nd Ed. Blackwell Publishing, Jones & Wiley Sons Ltd., Chester, West Sussex, UK.
6. Whitney, E.N. & Rolfes, S.R. (2016). Understanding Nutrition, 14th ed. Cengage Learning, Belmont, CA, USA.

URCE-5103 **Academic Writing** **3 (3+0)**

Academic writing is a formal, structured and sophisticated writing to fulfill the requirements for a particular field of study. The course aims at providing understanding of writer's goal of writing (i.e. clear, organized and effective content) and to use that understanding and awareness for academic reading and writing. The objectives of the course are to make the students acquire and master the academic writing skills. The course would enable the students to develop argumentative writing techniques. The students would be able to the content logically to add specific details on the topics such as facts, examples and statistical or numerical values. The course will also provide insight to convey the knowledge and ideas in objective and persuasive manner. Furthermore, the course will also enhance the students' understanding of ethical considerations in writing academic assignments and topics including citation, plagiarism, formatting and referencing the sources as well as the technical aspects involved in referencing.

Contents

1 Academic vocabulary
2 Quoting, summarizing and paraphrasing texts
3 Process of academic writing
4 Developing argument
5 Rhetoric: persuasion and identification
6 Elements of rhetoric: Text, author, audience, purposes, setting
7 Sentence structure: Accuracy, variation, appropriateness, and conciseness
8 Appropriate use of active and passive voice
9 Paragraph and essay writing
10 Organization and structure of paragraph and essay
11 Logical reasoning
12 Transitional devices (word, phrase and expressions)
13 Development of ideas in writing
14 Styles of documentation (MLA and APA)
15 In-text citations
16 Plagiarism and strategies for avoiding it

Recommended Texts

1 Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks and skills* (3rd ed.). Ann Arbor: The University of Michigan Press.
2 Bailey, S. (2011). *Academic writing: A handbook for international students* (3rd ed.). New York: Routledge.

Suggested Readings

1 Craswell, G. (2004). *Writing for academic success*. London: SAGE.
2 Johnson-Sheehan, R. (2019). *Writing today*. Don Mills: Pearson.
3 Silvia, P. J. (2019). *How to write a lot: A practical guide to productive academic writing*. Washington: American Psychological Association.

URCI-5105 **Islamic Studies** **2(2+0)**

The course aims to provide basic information about Islamic studies, to enhance understanding of the students regarding Islamic civilization, to improve students skill to perform prayers and other worships, to enhance the skill of the students for understanding of issues related to faith and religious life.

Contents

1. Introduction to Quranic Studies: Basic concepts of Quran.
2. History of Quran.Uloom-ul–Quran.
3. Study of selected text of Holly Quran-I.
4. Verses of Surah Al-Baqra related to faith (VerseNo-284-286).
5. Verses of Surah Al-Hujrat related to Adab Al-Nabi (VerseNo-1-18).
6. Verses of Surah Al-Mumanoon related to characteristics of faithful (VerseNo-1-11). Verses of Surah al-Furqan related to social ethics (VerseNo.63-77). Verses of Surah Al-Inam related to ihkam (Verse No-152-154). Study of Selected Text of Holly Quran-II: Verses of Surah Al-Ihzab related to Adab al-Nabi (VerseNo.6,21,40,56,57,58).
7. Verses of Surah Al-Hashar (18,19,20) related to thinking, Day of Judgment.
8. Verses of Surah Al-Saf related to Tafakar,Tadabar (Verse No-1,14). Seerat of Holy Prophet (S.A.W)-I: Life of Muhammad Bin Abdullah (Before Prophet Hood).
9. Life of Holy Prophet (S.A.W) inMakkah. Important lessons derived from the life of Holy Prophet in Makkah. Seerat of Holy Prophet (S.A.W)-II: Life of Holy Prophet (S.A.W) inMadina. Important events of life Holy Prophet in Madina. Important lessons derived from the life of Holy Prophet in Madina. Introduction To Sunnah: Basic concepts ofHadith. History ofHadith.Kinds of Hadith.Uloomul Hadith.
10. Sunnah and Hadith. Legal position of Sunnah. Selected Study from text of Hadith. Introduction To Islamic Law and Jurisprudence: Basic concepts of Islamic Law andJurisprudence. History and importance of Islamic Law and Jurisprudence. Sources of Islamic Law andJurisprudence.Nature of differences in Islamic Law.
11. Islam and sectarianism. Islamic Culture and Civilization: Basic concepts of Islamic Culture and civilization. Historical development of Islamic Culture and civilization. Characteristics of Islamic Culture and civilization.
12. Islamic Culture and civilization and contemporary issues. Islam and Science: Basic concepts of Islam and Science. Contributions of Muslims in the development of Science. Quranic and Science. Islamic EconomicSystem: Basic concepts of Islamic economic system.
13. Means of distribution of wealth in Islamic economics. Islamic concept of Riba.Islamic ways of trade and commerce. Political System of Islam: Basic concepts of Islamic political system. Islamic concept of sovereignty.Basic institutions of Govt. inIslam. Islamic History: Period of Khlaft-E-Rashida. Period of Ummayyads. Period ofAbbasids.
14. Social System of Islam: Basic concepts of cocial system of Islam. Elements of family. Ethical values of Islam.

Recommended Texts

1. HameedUllahMuhammad, ―EmergenceofIslam‖,IRI,Islamabad
2. HameedUllahMuhammad, ―Muslim Conduct of State‖
3. HameedUllah Muhammad, _Introduction to Islam
4. Hussain Hamid Hassan, ―An Introduction to the Study of Islamic Law‖leaf Publication Islamabad, Pakistan.
5. Ahmad, H. (1993). Principles of Islamic Jurisprudence. Islamic Research Institute, International Islamic University, Islamabad.
6. Mir, W. (1982). Muslim Jurisprudence and the Quranic Law of Crimes. Islamic Book Service.
7. Bhatia, H.S. (1989). Studies in Islamic Law, Religion and Society. Deep and Deep Publications, NewDelhi.
8. Dr. Muhammad Zia-ul-Haq, (2001). Introduction to Al Sharia Al-Islamia. Allama Iqbal Open University, Islamabad.

HNAD-5103 **Human Anatomy** **3(2+1)**

The course aims to acquaint knowledge about structural components of body. To know about histology and blood composition for the identification of diseases

Contents (Theory):

1. Introduction
2. Grass anatomy
3. Histology
4. Terminology: bones and joints, muscles, cartilage, body structure, tissue, cell, organs
5. Digestive system: oral cavity, stomach, small & large intestine
6. Urinary system/ excretory: kidneys, ureter, bladder, urethra
7. Cardio-vascular system: heart and Pericardium, Arteries system, venous system / Major arteries and veins
8. Respiratory system: Upper respiratory-Pharynx, Larynx, Trachea sinuses; Lower respiratory-Bronchus, Lungs, Diaphragm
9. Reproduction system: Male-Testis, Spermatic cord, Penis, Prostate, Bulbourethral gland/ other glands; Female: Ovaries, Fallopian tubes, Uterus, Vagina, Vulva, Breast
10. Endocrinology: Pituitary, Thyroid, Parathyroid, Thymus, Adrenal, Renal, super renal
11. Lymphatic system: Lymph, Lymph vessel, lymph node
12. Nervous system: Brain, Spinal cord, Cranel nerves, Brachial plexus, Sciatic nerve
13. Sensory organs: Eyes, Ears, Taste buds, Smell, Touch.

Contents (Practical)

1. Four primary tissues of body - Epithelium tissues
2. Introduction, types, epithelial glands - endocrine and exocrine, connective tissues: loose connective tissue, collagenous, elastic and reticular fiber
3. T-cell of loose cartilage (fibroblast, fat cell, plasma cell, macrophages, mast cell)
4. Blood: leukocytes, WBC, RBC and Platelets
5. Cartilageanditstypes; Muscle and its types; Histologyin: GIT, respiratory, urinary systems, breast, uterus. Microscopy and preparation of histological slides.

Recommended Texts

1. Agur, A. M., & Dalley, A. F. (2009). *Grant's atlas of anatomy*. Lippincott Williams & Wilkins.
2. Coulter, D. (2004). Anatomy of hatha yoga: A manual for students, teachers, and practitioners. Motilal Banarsidass Publ..

Suggested Readings

1. Tortora, G. J., & Petti, K. (2002). *Principles of human anatomy*. John Wiley & Sons.

HNAD-5104 Human Physiology-I 3(2+1)

The course aims to familiarize about the functions of different body organs and to understand risk parameters related to assessment and prognosis of different diseases.

Contents (Theory):

1. Introduction to human physiology
2. Organization level and cell physiology
3. Digestive system: oral cavity, salivary glands, teeth, tongue; oesophagus, pharynx, larynx, stomach, small intestine, large intestine, accessory glands associated with GIT (liver, gallbladder and pancreas)
4. Urinary system: introduction, functions of kidney and nephron, Glomerular filtration, tubular reabsorption, tubular secretion, urine excretion and plasma clearance, fluid and acid base balance
5. Cardiovascular system: functions of heart and blood vessels, electrical activity of heart, mechanical events of heart, cardiac output and its control.

Contents (Practical)

1. Blood grouping
2. Hb estimation; Counting of blood cells; complete blood count (CBC)
3. Electrolyte estimation; Hydration test
4. Determination of coagulation time, blood pressure, pulse recording
5. Heart activity – electrocardiography; Test for saliva
6. Respiratory movement, maximum breathing capacity, pulmonary function test
7. Intestinal motility; Renal function tests and urine analysis

Recommended Texts

3. Higgins, V. (2006). Human physiology: the basis of medicine.
4. Guyton A.C. and J.E. Hall. 2006. Textbook of Medical Physiology. 11th Ed. J.F. Kennedy Blvd., Philadelphia, USA.
5. Rahman, Z.U., B. Aslam, Khan, J.A. and T. Khaliq. 2007. Manual of Physiology-II. 2nd Ed. MAS Computers, Faisalabad, Pakistan.

Suggested Readings

1. Tortora, G. J., & Derrickson, B. H. (2018). Principles of anatomy and physiology. John Wiley & Sons.

HNAD-5105 Macronutrients in Human Nutrition 3(3+0)

- The course aims to abreast knowledge about the normal nutrient metabolism in healthy human and to understand interactions between the intake, absorption, transport, processing, storage, catabolism and excretion of nutrients and the regulation of metabolic homeostasis in the intact organism

Contents

1. Carbohydrates: nature, structures; Classification and functions of carbohydrates: monosaccharaides, disaccharides, oligosaccharides, polysaccharides
2. Digestion and absorption of carbohydrates: glycolytic pathway, glycolysis, glycogenesis, glycogen catabolism, tricarboxylic acid cycle and pentose phosphate pathway
3. Biosynthesis of carbohydrates: gluconeogenesis; Regulation of carbohydrate metabolism pathways; CHO metabolism in diabetes
4. Proteins: structural features, characteristics, functions; Amino acids: biosynthesis and degradation, food sources (on the basis of their functions in human body)
5. Digestion and absorption; Metabolic fates of amino acids: deamination, transamination, Urea cycle, Ketogenic amino acids, Glucogenic amino acids, Protein metabolism in liver and kidney diseases, Protein energy malnutrition
6. Lipids-nature, classification; Fatty acids: saturated, unsaturated, polysaturated, glycerol, cholesterol, sterol; Lipoprotein systems (blood lipids)
7. Fats biosynthesis: lipids, phospholipids and sphingolipids; Lipid biosynthesis: cholesterol, sterol; Lipid oxidation; Essential fatty acids: sources, health benefits; Adipose tissues
8. Digestion, absorption, metabolism and transportation of lipids; Oxidation of fatty acids(beta oxidation)
9. Ketone bodies

Recommended Texts

1. Berdanier, C.D. & J. Zempleni. 2009. Advances Nutrition: Macronutrients, Micronutrients and Metabolism. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.

2. Byrd-Bredbenner, C., G. Moe, D. Beshgetoor & J. Berning. 2015. Wardlaw‘s Perspectives in Nutrition. 10th Ed. McGraw-Hill Education, Columbus, OH, USA.

3. David L.N., A.L. Lehninger & M.M. Cox. 2013. Lehninger Principles of Biochemistry. 6th Ed. W.H.Freeman and Company, New York.

Suggested Readings

1. Gropper, S.S. & Smith JL. 2013. Advanced Nutrition and Human Metabolism. 6th Ed. Cengage Learning, Belmont, CA, USA

FSAT-5106 **Food Safety and Laws** **3 (3+0)**

The course aims to teach food safety as a scientific discipline describing handling, preparation, and storage of food in ways that prevent food-borne illness. Food can transmit pathogens which can result in the illness or death of the person or other animals. Objective of course is to give concepts of food safety and risk assessments and to provide knowledge about of food safety systems and food laws. The quality and safety of food is an important task, not only for the food industry. The issue of quality and safety of food is highly vital for each person. The way we eat affects our health, working capacity, quality of life, and the health and life of future generations. Food contamination can occur at any stage in the supply chain, and the primary responsibility for ensuring safety lies on food producers. Nevertheless, in many cases, incidents related to foodborne diseases are the result of non-compliance with the rules for handling food at home, catering, and marketing.

Contents

1 What is Food Safety?
2 Characterization of food hazards, biological, chemical and physical
3 Hazards from natural origin
4 Hazards produced during food processing, storage and preparation
5 Hazards associated with nutrient fortification
6 Food Safety systems, GMP, TQM
7 HACCP
8 Pakistan Standards and Quality Control Authority
9 Pure Food Rules
10 Punjab Food Authority
11 International Organization for Standardization
12 National Standard for Drinking Water Quality
13 Food labeling
14 Concept of Halal, Islamic food laws and regulations
15 Consumer laws in Pakistan
16 The World Trade Organization (WTO)
17 Codex Alimentarius.

Recommended Texts

1 Rai, V. R., & Bai, J. A. (2017). *Food safety and protection*. London: CRC Press, Taylor & Francis Group.
2 Gabriela, S., & Kiran, P. (2016). *International food law and policy*. Switzerland: Springer International Publishing.
3 Awan, J. A., & Anjum, F. M. (2010). *Food toxicology*. Faisalabad: Unitech Communications.

Suggested Readings

1 Schmidt, R. H., & Rodrick, G. E. (2003). *Food safety handbook*. New York: Wiley-Interscience, A John Wiley & Sons Publications.
2 PSQCA. (2010). *Standards for different food items*. Karachi: Pakistan Standards and Quality Control Authority.

STAT-5101 **Introductory Statistics** **3(3+0)**

The course aims to provide basic information of learning basics of Statistics and its application in sciences and research.

Contents

1. Definition and importance of statistics in agriculture.
2. Data different types of data and variables.
3. Classification and tabulation of data. Frequency, distribution, stem and leaf diagram.
4. Graphical representation of data Histogram, Frequency polygon, Frequency curve.
5. Measure of Central tendency.
6. Definition and calculation of Arithmetic mean.
7. Geometric mean, Harmonic mean, Median quintiles and Mode in grouped and ungrouped data.
8. Measure of dispersion. Definition and calculation of Range, quartile deviation, Mean deviation, Standard deviation and variance, coefficient of variation.
9. Frequency distribution. Stem and leaf diagram.
10. Various types of graphs. Mean: Geometric mean Harmonic Mean.
11. Median, Quartiles Deviation, Mean deviation. Standard deviation, Variance, Coefficient of variation. Skewness and kenosis

Recommended Texts

1. Muhammad, S., & Kamal, S. Introduction to Statistical Theory Part- I (Latest Edition).
2. Muhammad F., Statistical Methods and Data Analysis
3. Crawshaw J. & Chambers J. (1994). Concise Course in A. Level Statistic with world examples.
4. Dietrich-II, F., & Thomes, J.K. (1986). Basic Statistics an Inferential Approach 2nd Ed.

HNAD-5106 Human Physiology-II 3(2+1)

- The course aims to understand the functions of respiratory, endocrine, nervous, immune and reproductive systems and to acquaint knowledge about hormonal and neural interactions on metabolism.

.

Contents

1. Respiratory system: respiratory mechanics, gas transport and exchange mechanisms, control of respiration, respiratory capacities and volumes, non-respiratory functions of lungs
2. Immune system and lymphatic system: body defense system and regulation
3. Endocrinology and reproduction: reproductive physiology, role of hormones in spermatogenesis, menstrual cycles and pregnancy, energy balance and temperature regulation
4. Nervous system: principles of neuronal and hormonal communication systems, functional organization of nervous system, central, peripheral and autonomic nervous system, action potentials, types of neurotransmitters and their role in pathophysiological integration in body
5. Musculoskeletal system: principles of neuromuscular physiology.

Recommended Texts

1. Brar, R.S., H.S. Sandhu & A. Singh. (2002). Veterinary Clinical Diagnosis by Laboratory Methods. Kalyani Publishers Ludhiana, New Delhi, India.
2. Gillian, P. & C.D. Richards. (2006). Human Physiology: The Basis of Medicine, 3rd Ed. Oxford University Press, London.
3. Guyton A.C. & J.E. Hall. (2006). Textbook of Medical Physiology, 11th Ed. J.F. Kennedy Blvd., Philadelphia, USA.
4. Rahman, Z.U., B. Aslam, J.A. Khan & T. Khaliq. (2007). Manual of Physiology- I&II, 2nd Ed. MAS Computers, Faisalabad, Pakistan.

Suggested Readings

1. Tortora, G.J. (2008). Principles of Anatomy and Physiology, 12th Ed. John Wiley & Sons, Inc., New York, USA.

CHEM-6111 Biochemistry 4(3+1)

The course aims to acquaint knowledge about the nomenclature, structures and properties of chemical constituents and to grasp the knowledge about the energy yielding cycle like glycolysis, Kerbs cycle, β-oxidation etc.

Contents (Theory)

1. Introduction, scope and importance of biochemistry
2. Brief introduction of prokaryotic and eukaryotic cells
3. Bio-macromolecules: composition and organization
4. Energy and Principles of bioenergetics
5. Water: Properties of water, acid/base properties, dissociation of water and pH value, pH buffering capacity, transportation mechanisms across bio-membranes and osmosis
6. Proteins: Amino acids - structure, nomenclature, classification, Primary structure of proteins - peptide bond, sequencing, synthesis, Secondary structure - α-helices, β-sheets, Three dimensional structure of proteins, methods for protein structural determination - X-ray, NMR and homology modeling, tertiary and quaternary structures of proteins, protein denaturation
7. Methods for purifying and studying proteins; Enzymes: functions, mode of action, specificity and inhibition, classification and nomenclature, factorsaffecting enzymes activity
8. Introduction to carbohydrates (Glycobiology): biosynthesis, metabolism, glycolysis, Kerbs cycle, Mitochondrial electron transport chain and ATP synthesis
9. Lipids: introduction, lipogenesis, lipids and lipoproteins in relation to lipid storage diseases, sterol and steroids
10. Overview of nucleic acids.

Content (Practical)

1. Model visualization of prokaryotic and eukaryotic cells
2. Solution preparation
3. Preparation of different buffers and their pH adjustment
4. Activity of different enzymes like amylase in saliva
5. Enzyme purification
6. DNA extraction
7. Gel electrophoresis; Determination of amino acid profile using HPLC/Amino acid Analyzer
8. Energy estimation through Bomb Calorimeter.

Recommended Texts

1. Ahmad, M. (2000). Essentials of Medical Biochemistry, 7th Ed. Ilmi Book House, Urdu Bazar, Lahore.
2. Nelson, D.L. & Cox, M.M. (2013). Lehninger Principles of Biochemistry, 6thEd. W.H. Freeman & Co Ltd., New York, USA.
3. Rodwell, V.W., Bender D.A., Botham, K.M., Kennelly, P.J. & Weil, P.A. (2012). Harper's Illustrated Biochemistry, 30th Ed. The McGraw-Hill Education, New York, USA.

HNAD-5107 Micronutrients in Human Nutrition 3(3+0)

The course aims to understand the functional roles of vitamins and minerals in human nutrition with special reference to metabolism and to familiarize with the deficiency symptoms and health disorders associated with improper intake of vitamins andminerals, and to analyze losses of micronutrients during food processing.

Contents

1. Vitamins: nomenclature, history, development of the vitamins concept.
2. Fat and water soluble vitamins: sources, chemistry, absorption, transport and storage, metabolism, function, deficiency, bioassay, interaction with other nutrients, recommended daily allowances and toxicities
3. Diagnosis, treatments and prevention of vitamin deficiencies in human
4. Stability of vitamins under different storage conditions
5. Vitamin like compounds
6. Losses of vitamin during food processing
7. Minerals: types, history and developments of the minerals concept
8. Criteria of essentiality of minerals and their classification
9. Minerals distribution in human body
10. Macro- and micro- minerals: dietary sources, absorption, metabolism, metabolic function, deficiency symptoms and disorders, recommended daily allowances, diagnosis, treatments and prevention of mineral deficiencies in human
11. Water and electrolytes.

Recommended Texts

1. Allen, L. (2006). Guidelines on Food Fortification with Micronutrients. World Health Organization, Geneva, Switzerland.

2. Bender, D.A. (2009). Nutritional Biochemistry of Vitamins, ^{2th} Ed. Cambridge University Press, Cambridge, UK.

3. DiSilvestro, R.A. (2004). Handbook of Minerals as Nutritional Supplements. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.

Suggested Readings

1. Gropper, S.S., & Smith, J.K. (2012). Advanced Nutrition and Human Metabolism, 6thEd. Wadsworth Cengage Learning, Belmont, CA, USA.

HNAD-5108 Food and the Allergic Reaction 3(3+0)

The course aims to acquire an in-depth understanding of toxicology related to food and health, to understand various types of toxins from plant, animal and plant origins as well induced by extraneous chemicals and to familiarize with food allergens, their health implications and management

Contents

1. Toxicology: introduction, dose-response, absorption, translocation, storage, excretion
2. Natural toxins of plant origin: goitrogens, cyanogenic glycosides, favism, lathyrogens, lecitins (hemagglutinins), mutagens in natural plant, caffeine, flavonoids and some others
3. Natural toxins of animal origin: animal liver, marineanimals
4. Toxicity by extraneous chemicals: agricultural chemicals, food processing, packaging, additives, adulterants
5. Toxicity from water
6. Microbial toxins:mycotoxins– molds, mushrooms
7. Bacterial food intoxication; Bacterial food infection
8. Food allergies: introduction, incidence of food allergy, food allergens of protein families, animal origin and plant origin
9. Adverse allergic reaction, diagnosis, prevention, legislation and labeling, allergen management, food intolerances, emergency treatment of food-induced allergic reactions.

Recommended Texts

1. Awan, J.A. & F.M. Anjum. (2010). Food Toxicology. Unitech Communications, Faisalabad, Pakistan.
2. Coutts, J. & R. Fielder. (2009). Management of Food Allergens. John Wiley & Sons Ltd., Chichester, West Sussex, UK.
3. Jedrychowski, L. & Wichers, H.J. (2009). Chemical and Biological Properties of Food Allergens. CRC Press, Taylor & Francis Group, Boca Raton, FL, USA.
4. Metcalfe, D., H.A. Sampson, R.A. Simon & Lack, G. (2014). Food Allergy: Adverse Reaction to Foods and Food Additives, 5th Ed. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.

Suggested Readings

1. Shibamoto, T & Bjeldanes, L. (2009). Introduction to Food Toxicology, 2nd Ed. Academic Press, London.

FSAT-6125 Food Microbiology 3(2+1)

The course aims to identify various types of microorganisms on the basis of morphological, cultural and physiological characteristics, to grasp knowledge about the microbial contamination of foods and factors affecting the growth of microorganisms and to familiarize students about food borne infections, intoxications and role of probiotics in our daily life.

.

Contents (Theory)

1. Food microbiology: introduction and scope
2. Important microbial genera in foods: bacteria, mold, yeast and yeast like fungi, viruses - general, morphological, cultural and physiological characteristics
3. Factors affecting the growth and survival of microorganisms in food: intrinsic, extrinsic and implicit
4. Contamination and spoilage of perishable, semi perishable and stable foods: sources, transmission, microorganisms
5. Food microbiology and public health: food-borne infections: intoxications
6. Microbiological risk assessment
7. Microbiology in food sanitation: food sanitizers and pathogen reduction - a case study
8. Food fermentation; Probiotics in human health

Contents (Practical)

1. Isolation, identification and characterization of microorganisms: morphology, biochemical;
2. Enumeration of microorganisms in food and water samples (total count, viable count, MPN)
3. Examination of foods for pathogenic organisms (*Escherichia coli*, Coliform, *Salmonella* and *Listeria* monocytogenes)
4. Preparation of fermented and probiotic enriched food products.

Recommended Texts

1. Adams, M.R. & Moss, M.O. (2006). Food Microbiology. The Royal Society of Chemistry, Cambridge, UK.
2. Adams, M.R., Moss, M.O., & McClure, P. (2016). Food Microbiology, 4th Ed. Royal Society of Chemistry, Cambridge, UK.
3. Brown, M. & Stringer, M. (2002). Microbiological risk assessment in food processing. Woodhead Publishing Ltd. Cambridge, UK.
4. Frazier, W.C., Westhoff, D.C. & Vanitha. K.N. (2013). Food Microbiology, 5th Ed. McGraw Hill Book Co., New York, USA.
5. Montville, T.J., Mathews, K.R., & Kniel, K.E. (2012). Food microbiology: an introduction, 3rd Ed. ASM Press, Washington DC, USA.
6. Ray, B. & Bhunia, A. (2013). Fundamentals of Food microbiology, 5th Ed. CRC Press, Taylor & Francis Group, Boca Raton, FL,USA.

STAT-5102 Introduction to Probability Distribution 3(3+0)

The course aims at application of statistical designs.

Contents (Theory)

1. Sampling probability and non-probability sampling.
2. Simple random sampling stratified random sampling systematic sampling error
3. Sampling distribution of mean and difference between two means.
4. Interference Theory: Estimation and testing of hypothesis. Type I and type II error.
5. Testing of hypothesis about mean and difference between two means using Z test and T test, Paired T test.
6. Test of association of attributes using X2 (chi-square) Testing hypothesis about variance.

Content (Practical)

1. Sampling random sampling.
2. Stratified random sampling.
3. Sampling distribution of mean.
4. Testing of hypotheses regarding population mean.
5. Testing of hypotheses about the difference between population means.
6. Chi square test.
7. Testing of Correlation Coefficient.
8. Fitting of simple linear regression.
9. One-way ANOVA.
10. Two-way ANOVA.

Recommended Texts

1. Muhammad, S., & Kamal, S. Introduction to Statistical Theory Part-II (Latest Edition)
2. Muhammad F. Statistical Methods and Data Analysis
3. Steal R.G.D. & Tarrie, J.H. (1980). Principles and Procedures of Statistics A Bio-meterial approach, 2nd Edition
4. Gomez, K.A. & Gomez, A.A. (1980). Statistical Procedures for Agricultural Research 2nd Edition

HNAD-5109 General Pathology 3(2+1)

The course aims to understand the basic terminologies in different pathological states and to elaborate the cell injuries, necrosis, their types and practical applications of pathology.

Contents (Theory)

1. Scope of pathology and concept of diseases
2. Definition and terminology
3. Ischemia, Hypoxia, Necrosis, Infarction, Atrophy, Hypertrophy, Hyperplasia, Metaplasia
4. Plasia, Anaplasia; Response of body to injury and infection, growth disturbance, circulatory disturbances
5. Wound healing and repair, neoplasia, fever, disturbance of mineral deposits and pigmentation, anaemia, diarrhoea, burn injury, infectious diseases, hypertension, acute & chronic inflammation, immunity, allergy, hypersensitivity, ulcer (peptic, duodenal)
6. Leukemia or blood cancer, environmental and nutritional diseases
7. Diagnosis and treatment of Cancer in general, fate, survival and prognosis with tumor.

Contents (Practical)

1. Selection, collection, preservation and dispatch of morbid material for laboratory examination
2. Study of pathological slides of various pathological conditions
3. Demonstration of blood sampling; Basic concepts of anemia
4. Demonstration of routine urinalysis, fecal examination and skin scraping
5. Blood smears, staining and examination; Hematology report interpretation, basic concepts of contents and interpretation of pathology report (serum enzymes and other markers of disease).

Recommended Texts

1. Carton, J. (2012). Oxford Handbook of Clinical Pathology, 1st Ed. Oxford University Press, New York, U.S.A.
2. Kierszenbaum, A.L. & L. Tres, L. (2015). Histology and Cell Biology: Introduction to Pathology, 4th Ed. Elsevier Sunders, Philadelphia, PA, USA.
3. Kumar, V., A.K. Abbas, N. Fausto, & Aster, J.C. (2015). Robbins and Cotran Pathologic Basis of Disease, 9th Ed. Saunders Elsevier, USA.
4. McPhee, S.J. & Ganong, W.F. (2014). Pathophysiology of Disease: An Introduction to Clinical Medicine, 7th Ed. McGraw-Hill Education, Bew York, USA.

FSAT-6121 Food Product Development and Service Management 3(1+2)

The course aims to describe the key milestones of food service industry, to relate the current trends in food service operations and evolution through the business lifecycle, to explain the art underlying menu development and method for recipe standardization, to understand the planning considerations vital for creating a successful food service operation.

Contents (Theory)

1. Food service management: introduction; position, manage and leverage a successful food service operation, The compilation of management practices: tools and techniques, essential approaches. Food service industry: history, segmentation and managerial implication, menu planning and development, recipe standardization, costing and analysis, food supply chain management, distribution channels, supplier selection, purchasing, equipment selection, forecasting, storage management, product inventory management, human resource management, customer services, marketing
2. Food safety: GMP, HACCP. Food product development: process, strategy, design, development, commercialization, evaluation. Key to new product success and failure. Consumer in food product development: consumer behavior, food choices, sensory needs consumer role.
3. Preference mapping and food product development: conducting trials, analyzing, recent developments. Case study of consumer-oriented food product development: reduced-calorie foods - Consumer trends and healthy eating, marketing and technological challenges, success factors. Case study: reduced-calorie on-the-go beverages. The ethics of food production and consumption.
4. Principles of menu development. Food storage: preservation concepts, sanitary food handling procedures, elementary nutrition. Kitchen equipment: selection layout, purchasing. The fabrication of chicken, beef, lamb, and fish, Proper cuts and their uses , recognition of the quality of meat.
5. Cake and pastry: design and decoration. Control for dining rooms, banquets (responsibilities of banquet server, roll call, table setting, serving and clearing, safety and sanitation) and catering events. Human resource management: recruitment and selection, training and development, employee relations, principles of supervision, customer relations, Fundamentals of marketing in the hotel industry.

Contents (Practical)

1. Food product development projects - strategy, design, development, commercialization, launch and evaluation
2. Practical aspects and sensory evaluation techniques
3. Chemical and instrumental quality analysis
4. Production and service of food in volume: Chinese dishes, salads, sandwiches, bakery goods, doughnuts, waffles and desserts. Evaluation of items prepared in class
5. Visit of hotels.

Recommended Texts

1. Barron, C.W., T. Power and D.R. Reynolds. 2012. Introduction to Management in the Hospitality Industry, 10th Ed. John Wiley Sons Inc., Hoboken, New Jersey,USA.
2. Reynolds, D.R. 2014. Foodservice Management Fundamentals. John Wiley Sons Inc., Hoboken, New Jersey, USA.
3. Reynolds, D.R. and K.W. McClusky. 2014. Study Guide to Accompany Foodservice Management Fundamentals. John Wiley Sons Inc., Hoboken, New Jersey, USA.
4. Dennis Lillicaep, John Cousins and Robert Smith 1998. Food and Beverage Services, Great Britiain for Hodder and Stoughton Education, London

HNAD-5110 Assessment of Nutritional Status 3(1+2)

The course aims to impart hands-on training in nutritional assessment techniques to diagnose health problems, to understand and apply dietary guidelines for standard nutrientintake and to select an appropriate method for measuring dietary needs of hospitalizedpatients.

Contents (Theory)

1. Nutritional assessment systems: nutrition surveys, nutrition surveillance, nutrition screening. Nutritional assessment methods: anthropometrics, biochemical, clinical, dietary
2. Measuring food consumption at national level: food balance sheets, total diet consumptions. Food consumption at the household levels: food account, household food records, household 24-hour food record.
3. Measuring food consumption at individual levels: 24-hour recall, repeated 24-hour recall, weighed food records, diet history, food frequency questionnaire.
4. Selecting an appropriate method: determining the mean nutrient intake, calculating the population at risk, ranking individuals by food and nutrient intake.

Contents (Practical)

1. Practicing methods of nutritional assessment (ABCD of Nutritional assessment)
2. Comparison of the data with references values for drawing conclusions

Recommended Texts

1. Driskell, J.A. & Wolinsky, I. (2011). Nutritional Assessment of Athletes, 2ndEd. CRC Press, Taylor & Francis Group, New York, USA.

2. Gibson, R.S. (2005). Principles of Nutrition Assessment. Oxford University Press Inc., New York, USA.

3. Lee, R.D. & Nieman, D.C. (2012). Nutritional Assessment, 6thed. The McGraw Hill Companies Inc., New York, USA.

Suggested Readings

1. McGuire, M. & Beerman, K.A. (2011). Nutritional Sciences: From Fundamentals to Food. Cengage Learning, Belmont, CA, USA.

HNAD-5111 Nutrition and Drug Laws 3(3+0)

The course aims to get know how about the existing food and drug laws prevailing in the country, to understand duties and authorities of food safety officers and drug inspectors, to familiarize with food and drug laws enforcement agencies in Pakistan.

Contents

12. Punjab Pure Food Rules 2011: legal terms and definitions from the food industry
13. Rules for food additives, categories, permissible limits; Food packaging: rules, criteria for packaging material, labelling requirements
14. Duties and responsibilities of public analysts and food safety officer
15. The Drug Regulatory Authority of Pakistan Act,2012; DRAP Alternative Medicines and Health Products Enlistment Rules 2014
16. Halal food dietary laws. Consumer protections laws in Pakistan
17. The Punjab Consumer Protection Rules 2009; The Punjab Consumer Protection Act 2005
18. The Pakistan Hotels and Restaurants Act, 1976; The Punjab Food Authority Act 2011
19. The Pakistan Halal Authority Act 2015; Pakistan National Accreditation Council
20. Punjab Halal Development Agency; Pakistan Standards and Quality Control Authority (PSQCA)
21. Role of electronic and print media in public awareness and empowerment.

Recommended Texts

1. GOP. (2005). The Punjab Consumer Protection Act 2005. Government of the Punjab, Lahore, Pakistan.
2. GOP. (2011). Punjab Pure Food Rules 2011. Health Department, Government of the Punjab, Lahore, Pakistan.
3. GOP. (2012). Drug Regulatory Authority of Pakistan Act, 2012 The Drug Regulatory Authority of Pakistan, Government of the Pakistan Islamabad.
4. GOP. (2015). Pakistan Halal Authority Act, 2015. Minister for Science and Technology, Government of the Pakistan, Islamabad.
5. Independent topics for readings.

HNAD-5112 Nutrition in Emergencies 3(3+0)

The course aims to get know how about the existing food and drug laws prevailing in the country, to understand duties and authorities of food safety officers and drug inspectors, to familiarize with food and drug laws enforcement agencies in Pakistan.

Contents

1. Introduction and concepts: understanding malnutrition, micronutrient malnutrition, causes of malnutrition
2. Nutrition needs assessment and analysis: individual and population assessment, health assessment and the link with nutrition, food security assessment and the link with nutrition, nutrition information and surveillance systems
3. Interventions to prevent and treat malnutrition: general food distribution, supplementary feeding, therapeutic care, micronutrient interventions, health and livelihood interventions, infant and young child feeding, HIV and AIDS nutrition
4. Nutrition information, education and communication
5. Monitoring and evaluation, standards and accountability
6. Role of national and international agencies
7. UNHCR, WFP, NDMA (National disaster management authority), Civil defense
8. Hygiene and sanitation
9. Emergency foods

Recommended Texts

9. ENN (Emergency Nutrition Network). 2011. The harmonized training package (HTP): resource material for training on nutrition in emergencies, version 2. Nutrition Works, Emergency Nutrition Network, Global Nutrition Cluster. Oxford, U.K.
10. FAO. 2005. Protecting and Promoting Good Nutrition in Crisis and Recovery: Resource Guide. Food and Agriculture Organization of the United Nations, Rome, Italy.
11. SC (Save the Children Fund UK). 2004. Emergency nutrition assessment: guidelines for field workers. Save the Children, Westport, U.K.
12. WHO (World Health Organization). 2000. The management of nutrition in major emergencies. World Health Organization, Geneva, Switzerland.

FSAT-6111 Food Analysis and Sensory Evaluation 3(0+3)

The course aims to highlight the significance of food analysis in product development and overall quality, to comprehend commonly employed types of analysis for product characterization, and to prepare and standardize commonly used lab solutions.

Contents (Theory)

1. Food analysis: significance
2. Sampling: techniques, preparation, preservation
3. Physical properties and analysis of foods and food products: appearance, texture, specific gravity, refractive index, rheology
4. Chemical analysis: significance
5. Proximate analysis: moisture, ash, proteins, lipids, carbohydrates, fiber, NFE, acidity, pH, sugars, mineral elements, vitamins – significance, methods
6. Chromatography: paper, thin layer
7. Spectroscopy: atomic emission, atomic absorption
8. Sensory evaluation of foods: attributes, difference and preference tests, consumer acceptance
9. Overview of the commonly employed statistical methods.

Contents (Practical)

1. Lab safety requirements
2. Preparation and standardization of laboratory solutions
3. Sampling; Determination of specific gravity, refractive index, moisture, ash, crude protein, crude fat, crude fiber, NFE, pH and acidity
4. Estimation of vitamin C
5. Determination of mineral elements through flame photometer and atomic absorption spectrophotometer
6. Paper and thin layer chromatography
7. Identification of toxins by TLC
8. Sensory evaluation of foods

Recommended Texts

1. AOAC. (2016). Official Methods of Analysis of AOAC International, 20th Ed. Association of Official Analytical Chemists, Arlington, USA.
2. Awan, J.A. & Rehman, S.U. (2015). Food Analysis Manual. Unitech Communications, Faisalabad, Pakistan.
3. Cruz, R.M.S., Khmelinskii, I. & Vieira, M. (2014). Methods in Food Analysis. CRC Press. Taylor & Francis Group, Boca Raton, F.L, USA.
4. Pomeranz, Y. & Meloan, C.E. (2000). Food Analysis: Theory and Practice, 3rd Ed. Chapman & Hall, New York, USA.
5. Winton, A. & Winton, K.B. (2006). Techniques of Food Analysis. Agrobios Publishing Co., Jodhpur, India.

HNAD-6113 Dietetics-I 3(2+1)

The course aims to understand the discipline of dietetics and its role in human well being, to familiarize with the foundations of healthy diets and their role in disease prevention and management, to acquaint hands-on training for calorie calculation and menu planning using food composition table and databases and to assess BMI and energy expenditures in relation to overweight and obesity.

Contents (Theory)

1. Dietetics: definitions, history, importance
2. Dietitian: role in food service and clinical practice, responsibilities in multidisciplinary team, code of ethics
3. Foundations of healthy diet
4. Dietary Reference Intakes, Recommended Dietary Allowance, Food Guide Pyramid and allied approaches, Dietary Guidelines, Exchange system and menu planning
5. Energy expenditure and basal metabolism
6. Body mass index
7. Role of diet in disease conditions
8. Diet therapy and its principles
9. Food selection and factors affecting its acceptance
10. Nutrient density; Alternative patterns of food consumption
11. Nutritional counseling in clinical practice. Critical diet assessment
12. Nutrition and diet clinics.

Contents (Practical)

1. Interpretation of food guide pyramid, My Pyramid, My plate, Eat well Plate
2. Energy value of different foods: carbohydrates, fats, proteins
3. Calculating energy requirements
4. BMI in relation to obesity and overweight, energy and calorie requirements
5. Balanced diet and menu planning using exchange lists, food composition tables & data bases
6. Food intake analysis: Dietary Recall, Food Frequency
7. Questionnaires, Food Surveys

Recommended Texts

1. Mahan, L.K., Escott-Stump, S., & Raymond, J.L. (2012). Krause's Food, Nutrition & Diet Therapy, 13th Ed. Elsevier Saunders, St. Louis, Missouri, USA.
2. Mudambi, S.R. & Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition & Diet Therapy, 5thed. New Age International Pvt. Ltd. Publishers, New Delhi.
3. Punekar, M. & D'Souza, J. (2010). Handbook of Applied Nutrition, Diet therapy and Diet Management. SBS Publishers & Distributors Pvt. Ltd., New Delhi.
4. Rawat, S. (2015). Applied Nutrition. Random Publication, New Delhi.
5. Schlenker, E. & Gilbert, J.A. (2015). Williams' Essentials of Nutrition and Diet Therapy, 11th Ed. Elsevier/Mosby Inc., Louis, Missouri.
6. Singh, J. (2008). Handbook of Nutrition and Dietetics. Lotus Press, India.

.

HNAD-6114 Fundamentals of Industrial Nutrition 3(2+1)

The course aims to identify the current trends in the use of dietary supplement and analysis of their global market, to demonstrate the impact of dietary supplements on health and disease prevention, to discuss safety issues and global legislations on food supplements.

Contents (Theory)

1. An overview of dietary supplements and their market
2. Forms of food supplements
3. Vitamins and mineral supplements
4. Essential fatty acids
5. Enzymes as supplements
6. Natural products and extracts
7. Probiotics and prebiotics in Health
8. Fish oil supplements
9. Non-essential nutrients as dietary supplements
10. Caffeine in food and dietary supplements
11. Medicinal plants as food supplements
12. Codex Alimentarius standards for food supplements
13. Safety of vitamins and minerals added to foods
14. Implications of mega doses
15. Global legislation on food supplements
16. DRAP Alternative Medicines and Health Products Enlistment Rules 2014

Recommended Texts

1. Caballero, B. (2009). Guide to Nutritional Supplements. Elsevier Ltd., Oxford, UK.
2. Ottaway, P.B. (2008). Food Fortification and Supplementation: Technological, Safety and Regulatory Aspects. Woodhead Publishing Limited, Cambridge, England.
3. Pray, L., Yaktine, A.L. & Pankevich, D. (2014). Caffeine in Food and Dietary Supplements. The National Academes Press, Washington, DC, USA.
4. Ransley, J.K., Donnelly, J.K. & Read, N.W. (2001). Food and Nutritional Supplements: Their Role in Health and Disease. Springer-Verlag Berlin Heidelberg, Germany.
5. Webb, G.P. (2011). Dietary Supplements and Functional Foods, 2nd Ed. Blackwell Publishing Ltd., Oxford, UK.

HNAD-6115 Global Food Issues 3(3+0)

The course aims to acquaint knowledge about global food issues having impact on food and nutrition security. To understand the role of global organizations in food production, consumption and trade and to study the impact of climate change and other threats on global food availability

Contents

1 World food situation
2 Food and nutrition security
3 The green revolution
4 Worldwide post-harvest losses
5 Global malnutrition: protein energy malnutrition and hidden hunger
6 Overweight and obesity; Worldwide food price fluctuations
7 Importance of per capita earning, consumption and purchase power
8 Irrational food consumption behavior; Contribution of cereals, legumes, roots, tubers and animal products
9 World food policy
10 WTO‘s trade regulations
11 Food bioterrorism
12 International food laws: European and American
13 Potentials of modern biotechnology to combat food insecurity
14 Genetically modified foods
15 Organic, Kosher and Halal Foods
16 Millennium development goals to sustainable development goals
17 Global Trends.
18 Climate change.

Recommended Texts

1. Barbosa-Canovas, G. V., Mortimer, A., Lineback, D., Spiess, W., Buckle, K., & Colonna, P. (Eds.). (2009). *Global issues in food science and technology*. Academic Press.
2. Barrientos, S., & Dolan, C. (2006). Transformation of global food: opportunities and challenges for fair and ethical trade. *Ethical sourcing in the global food system*, 1-33.

Suggested Readings

2 Hanjra, M. A. (2013). *Global food security: emerging issues and economic implications*. Nova Science Publishers.
3 Oosterveer, P. (2007). Global governance of food production and consumption: issues and challenges.
Phoenix, L. E., & Walter, L. (2009). *Critical Food Issues: Problems and State-of-the-Art Solutions Worldwide*. ABC-CLIO.

HNAD-6116 Nutritional Education and Awareness 3(2+1)

The course aims to learn the techniques of creating awareness about health issues in masses, to acquire information about different modes of communication and their effective use, to understand the ethical responsibilities for dissemination of knowledge.

Contents (Theory)

1. Nutrition education: introduction, history, need, competencies and skills, framework, training needs, new development
2. Nutrition education programs: scope and challenges of educating people about eating well
3. Biological influences, cultural and social preferences
4. Education and communication strategies for different groups and settings
5. Evaluation of nutrition education programs
6. Family and psychological factors
7. Expectancy-value theories of motivation, social and cognitive theory
8. Behavior change as a process, phases of change
9. Addressing multiple and overlapping influences on behavior
10. A logical model approach for planning a framework of nutrition education
11. Understanding communication model, preparing/organizing oral presentations, delivering oral presentation, delivering nutrition education workshops, types of supporting visual aids, nutrition mass media communication campaigns, social marketing
12. Ethics in nutrition education, conflicts, participating process in community coalition
13. Non-government and public health organizations and their current programs

Contents (Practical)

1. Nutritional counseling
2. Program designing for specific diseases like anemia, neural tube defects, rickets, etc.
3. Surveys and seminars in different educational institutions
4. Individual presentations by students on different nutrition topics
5. Visits of public places for nutrition awareness
6. Independent student projects.

Recommended Texts

1. Contento, I.R. (2007). Nutrition Education: Linking Research, Theory and Practice. Jones and Bartlett Publishers, Ontario, Canada.
2. FAO. (1997). Nutrition Education for the Public: Discussion Papers of the FAO Expert Consultation. Food and Agriculture Organization of the United Nations, Rome, Italy.
3. Semba, A.D. & Bloem, M.W. (2008). Nutrition and Health in Developing Countries, 2nd Ed. Humana Press, New York, USA.
4. Walter, W. (2013). Nutritional Epidemiology, 3rd Ed. Oxford University Press, New York, USA.

HNAD-6117 Nutrition through Social Protection 3(3+0)

The course aims to acquaint knowledge about the role of social protection programs in poverty alleviation and overall welfare of the society, to understand the role of social protection programs in provision of financial support for scaling up nutrition, to identify the development partners and various social protection and scale up nutrition programs.

Contents (Theory)

1. Food insecurity and vulnerability
2. Food and social class differences
3. Food society and environment
4. Introduction to sociology of nutrition
5. Food and nutrition in culturally diverse societies
6. Social change and rural development
7. Women empowerment and nutrition
8. Food choices and their determinants
9. Behavior change
10. Social construction and eating disorders
11. Challenges to combat malnutrition
12. Nutrition-sensitive and nutrition-specific interventions
13. Economic opportunities among the poor
14. Nutrition and gender sensitive policies and strategies of social protection sector
15. Social assistance, income generation, risk reduction and risk management
16. Current social protection programs in the public and private sector
17. Community development projects
18. Medical social services projects
19. Role of social welfare/ protection sector to scale-up nutrition
20. Impact of individual financial assistance programs
21. Backyard poultry farming and backyard kitchen gardening
22. Social protection strategies in Pakistan and South Asia
23. Social safety nets for vulnerable group; Role of various development partners, (such as NGOs, INGOs, Asian Development bank, World Bank, USAID, and DFID) in social protection and scaling up nutritional status

Recommended Texts

1. FAO. (2015). Improving Nutrition through Multi-sectoral Approaches. Food and Agriculture Organization of the United Nations, Rome, Italy.
2. FAO. (2015). Nutrition and Social Protection. Food and Agriculture Organization of the United Nations, Rome Italy.
3. IFPRI. (2016). Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030. International Food Policy Research Institute, Washington, DC, USA.
4. World Bank, UNICEF, WFP, USAID, ADB and Government of Pakistan Reports

HNAD-6118 Dietetics-II 3(2+1)

The course aims to comprehend the principles of diet therapy and therapeutic nutrition, to understand the role of dietary management in various health disorders related to upper and lower gastrointestinal tract, hepatic, pancreas and coronary heart diseases, to acquaint hands-on training for the dietary modification of normal diets aligned with various health disorders and to prepare pre- and post-operative diets.

Contents (Theory)

1. Introduction to diet therapy
2. Principles of diet therapy and therapeutic nutrition
3. Therapeutic modifications of normal diets
4. Dietary management in various health disorders (objective, physiology, food choices, diet plans)
5. Diet in the diseases of the upper gastrointestinal tract – mouth, dental disease, pharynx, esophagitis; hiatal hernia; gastritis; peptic ulcer
6. Diet in the diseases of the lower gastrointestinal tract - constipation, diarrhea, mal-absorption syndrome, lactose Intolerance, celiac disease, inflammatory bowel disease, Crohn‘s disease, ulcerative colitis, irritable bowel syndrome, diverticular disease, gastric surgery, dumping syndrome, small bowel resections, short bowel syndromes, blind loop syndrome, ileostomy or colostomy
7. Diet in the diseases of liver and accessory organs - hepatitis, hepatic steatosis, non- alcoholic hepatic steatosis, alcoholic liver disease, cirrhosis, hepatic encephalopathy; cholelithiasis, cholecystitis, cholangitis
8. Pancreatitis
9. Nutrition education and primary health care camp

Contents (Practical)

1. Steps in nutrition care
2. Types of diets: regular diet, clear liquid diet, full liquid diet, soft diet, bland diet
3. Dietary modification for texture, energy, nutrients and fluids
4. Planning of energy modified diets: high calorie diet, restricted calorie diet, high fiber diet, low residue diet, modified carbohydrates diet, moderate carbohydrate diet, modified fat diet, restricted fats diet
5. Planning and preparation of diets for various pathological conditions
6. Nutrition in surgical conditions: pre-operative and post- operative diets
7. Enteral and parenteral feeding; Hospital visits and nutrition camps

Recommended Texts

1. Mahan, L.K., Escott-Stump, S., & Raymond, J.L. (2012). Krause's Food, Nutrition & Diet Therapy, 13th Ed. Elsevier Saunders, St. Louis, Missouri, USA.
2. Mudambi, S.R. & Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition & Diet Therapy, 5thEd. New Age International Pvt. Ltd. Publishers, New Delhi.
3. Punekar, M. & D‘Souza, J. (2010). Handbook of Applied Nutrition, Diet therapy and Diet Management. SBS Publishers & Distributors Pvt. Ltd., New Delhi.
4. Rawat, S. 2015. Applied Nutrition. Random Publication, New Delhi.
5. Schlenker, E. & Gilbert, J.A. (2015). Williams' Essentials of Nutrition and Diet Therapy, 11th Ed. Elsevier/Mosby Inc., Louis, Missouri.
6. Singh, J. (2008). Handbook of Nutrition and Dietetics. Lotus Press, India.

HNAD-6119 **Drug-Nutrient Interactions** **3(3+0)**

The course aims to raise the awareness of potential drug-nutrient interactions and influence on clinical outcomes, to understand complex underlying mechanisms responsible for drug-nutrient interactions, to identify factors that can promote drug-nutrient interactions and contribute to nutrition and/or therapeutic failure, to integrate knowledge of pharmacology, nutrient-nutrient and drug-nutrient interactions into the nutrition care process.

Contents (Theory)

1. Basic definitions and concepts
2. Role of nutrition therapy in pharmacotherapy
3. Pharmacologic aspects of food and drug interactions
4. Routes of drug administration
5. Pharmacodynamics
6. Pharmacokinetics, absorption, distribution, metabolism, elimination
7. Effects of food on drug therapy, drug absorption, drug distribution, drug metabolism and drug excretion
8. Effects of drugs on food and nutrition, nutrient absorption, metabolism and excretion
9. Effects of drugs on the nutritional status of patients e.g. taste, smell and type of intake
10. Enteral feeding: drug/nutrient interaction
11. Gastrointestinal effects, appetite changes; Nutrient assessment of drug-nutrient interactions
12. Dietary counselling for the prevention of food drug interactions.

Recommended Texts

1. Boullata, J.I. & Armenti, V.T. (2010). Handbook of Drug-Nutrient Interactions, 2nd Ed. Humana Press, New York, USA.
2. Mahan, L.K. & Escott-Stump, S. (2007). Krause's Food & Nutrition Therapy. Elsevier – Health Sciences Division. Philadelphia, USA.
3. McCabe-Sellers, B., Frankel, E.H. & Wolfe, J.J. (2003). Handbook of Food-Drug Interactions, CRC Press, Taylor & Francis Group, Boca Raton, FL., USA.
4. Nelms, M.N. & Sucher, K.P. (2016). Nutrition Therapy and Pathophysiology, 3rd Ed. Cengage Learning, Belmont, CA, USA.

HNAD-6120 Preventive Nutrition 3(3+0)

The course aims to acquaint knowledge about the preventive nutrition with special reference to historical perspective, public health benefits, ethnic and socioeconomic issues and its role throughout the lifecycle, to understand the role of dietary components in the prevention and management of various health disorders.

Contents (Theory)

1. Preventive nutrition: a historical perspective, public health benefits, ethnic and socioeconomic issues, nutrition in the age of polypharmacy, preventive nutrition throughout the life cycle
2. Cancer prevention: upper GIT cancer, prostate cancer, dietary supplements and cancer risks, soy and cancer prevention, micronutrients as intermediate biomarkers in chemotherapy
3. Cardiovascular disease prevention: omega-3 fatty acids from fish and plants, cardiovascular effects of trans fatty acids, antioxidants and B-vitamins and atherosclerosis, Prevention and nutritional management - TLC dietary patterns, AHA dietary patterns, DASH dietary patterns, weight reduction, increased dietary fiber, Omega-3 fatty acids, soy proteins, fruits and vegetables as antioxidant role, reduce dietary cholesterol
4. Diabetes and obesity: role of nutrition in pathophysiology, prevention and treatment, Adipokines, nutrition and obesity, obesity and insulin resistance in childhood and adolescence, obesity and chronic disease, meal replacement products and fat substitutes, prevention and treatment (dietary changes, calories restricted diet and other dietary regimens, exercise, behavioural modification)
5. Growth, Immunity and Infection: Role of long chain fatty acids, polyunsaturated fatty acids and autoimmune diseases
6. Prevention and treatment for hypertension: weight reduction, adaptation of DASH diet, nutrition education for behavioural modification
7. Bone density: Osteoarthritis - role of nutrition and dietary supplements, calcium requirement during treatment of osteoporosis, Prevention and treatment - adequate calcium intake, adequate vitamin D intake, avoidance of excess phosphorous, lifestyle dietary modifications, exercise
8. Role of dietary fiber in preventing diseases (colon cancer, diabetes, constipation, diverticular disease, obesity, cardiovasculardiseases)
9. Health claims for foods and dietary supplements, micronutrient and immunity in older people.

Recommended Texts

1. Bendich, A. & Deckelbaum, R.J. (2001). Primary and Secondary Preventive Nutrition. Springer Science+Business Media, New York, USA.
2. Bendich, A. & Deckelbaum, R.J. (2010). Preventive Nutrition: The Comprehensive Guide for Health Professional, 4th Ed. Humana Press, New York, USA.
3. Coulston, A.M. & Boushey, C.J. (2008). Nutrition in the Prevention and Treatment of Diseases, 2nd Ed. Academic Press, Elsevier Inc., San Diego, CA,USA.
4. Gerber, J.M. (2007). Handbook of Preventive and Therapeutic Nutrition. Aspen Publications, Silver Spring, MD, USA.
5. Thomson, C. (1996). Preventive and Therapeutic Nutrition Handbook. Chapman & Hall, UK.

HNAD-6121 Functional Foods and Nutraceutical 3(3+0)

The course aims to find out sources of Functional foods and Nutraceutical and their impact on nutrition and health, to familiarize with the standards and regulations used globally regarding regulatory issues and usage of functional foods, and to assess international trade and marketability of functional foods.

Contents (Theory)

1. Functional foods and Nutraceutical: past, present, future and health claims; functional foods and their impact on nutrition and health - obesity, diabetes, cardiovascular diseases, hypertension and cancer
2. Functional ingredients and bioactive molecules
3. Isoflavins, lycopene, polyphenols, dietary fiber, omega-3 & -6 fatty acids, conjugated linoleic acid, antioxidants, prebiotic and probiotic
4. Functional foods from different food groups: cereals, dairy, meat, fruits and vegetables
5. Regulatory systems governing the production and distribution of functional food - national and international
6. Standard and regulations of various agencies: FDA, EC, FAO/WHO, Health Canada; Guidelines for the assessment of functional foods
7. Marketing and regulatory issues
8. Conventional and emerging food processing technologies for functional food production
9. Toxicological and safety aspects of functional foods
10. Asian functional foods
11. Functional foods in international market and growth in Pakistan.

Recommended Texts

1. FAO (Food and Agriculture Organization of the United Nations). (2007). Report on Functional Foods. Food and Agriculture Organization of the United Nations, Rome, Italy.
2. Shi, J., Ho, C.T., & Shahidi, F. (2005). Asian Functional Foods. Marcel Dekker/CRC Press, New York, U.S.A.
3. Shi, J., Mazza, G., & Maguer, M.L. (2002). Functional Foods: Biochemical and Processing Aspects, Vol. 2. CRC Press, Traylor & Francis Group, Boca Raton, New York, USA.
4. Wildman, R.E.C. (2006). Handbook of Nutraceuticals and Functional Foods, 2nd Ed. CRC Press, Traylor & Francis Group, Boca Raton, New York, USA.

HNAD-6122 Research Methods and Scientific Writing in Nutrition 3(1+2)

The course aims to apply tools and skills required to understand published research, to identify the types of methods best suited for investigating different types of problems and questions, to get hands-on training of writing successful research proposals for thesis and projects, and to abreast ethical consideration in research and publications.

Contents (Theory)

1. Research methods in nutrition
2. Introduction, objectives, types of research: basic and applied, quantitative and qualitative, clinical and diagnostic
3. Types of sampling: probability and non-probability
4. Collection of literature: printed and electronic sources, managing literature
5. Methods of data collection
6. Writing scientific documents: synopsis, research proposal, articles, references, internship report
7. Research designs: observational studies, cross-sectional, case-control, cohort (prospective, retrospective, time-series)
8. Experimental studies: observational studies, clinical studies
9. Experimental data analysis: incidence/ prevalence rate
10. Research ethics.
11. Types of scientific presentations. Collection of literature: printed and electronic sources.
12. Managing literature. Initiating writeup. Writing scientific documents: synopsis, research proposal, articles, references, internship report.
13. Oral presentations

Contents (Practical)

1. Exercises in collecting literature from different sources on assigned topics.
2. Organizing and analysis of collected material.
3. Writing synopsis/proposal, short communication
4. Delivering oral presentation.

Recommended Texts

1. Awan, J.A. (2015). Scientific Presentations. Unitech Communications, Faisalabad, Pakistan.
2. Lovegrove, J.A., Hodson, L., Sharma, S., & Lanham-New, S.A. (2015). Nutrition Research Methodologies. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.
3. Lowe, M. (2007). Beginning Research: A Guide for Foundation Degree Students, 1st ed. Routedge Publications, New York, USA.
4. Starks, T.P. (2006). Trends in Nutrition Research. Nova Science Publishers, Inc., New York, USA.
5. Walliman, N. (2005). Your Research Project, A Step by Step Guide for The First-time Researcher, 2nd ed. Sage Publications, Thousand Oaks, CA, USA.
6. Awan, J.A. (2009). Scientific presentations. Unitech Communications, Faisalabad, Pakistan.
7. Khalil, S.K. & Shah, P. (2007). Scientific writing and presentation for crop sciences. Higher Education Commission, Islamabad, Pakistan.
8. Anderson, J., Durston, B.H., & Poole, M. (1992). Thesis and assignment writing. Wiley Eastern Ltd., New Delhi, India.

HNAD-6123 Infant and Young Child Feeding 3(2+1)

The course aims to identify problems affecting infant and young child feeding and provide a framework of essential interventions, to create an environment that will enable mothers, families and other caregivers to implement optimal feeding practices.

Contents (Theory)

1. Infant young child feeding: introduction, global strategy, importance of breastfeeding, local and international scenario, breastfeeding working
2. Breastfeeding practices: assessing a breastfeed, taking a feeding history, common breastfeeding difficulties, expressed breast milk
3. Breastfeeding counselling: listening and learning, building confidence and giving support, counselling for infant feeding decisions, counselling cards tools
4. Complementary feeding practices: importance, cup-feeding and hygienic preparation of food, replacement feeding in the first 6 months, foods to fill energy and micronutrients gap, quantity and frequency of feeding, feeding techniques, food demonstration
5. Breastfeeding related topics: growth charts, maternal illnesses and breast feeding, breast conditions, health care practices, International code of marketing of breast milk substitutes, checking understanding and arranging follow-up, feeding during illness and low-birth-weight babies; Feeding guidelines of various global agencies – WHO etc.
6. Complex challenges to implementing the global strategy for infant and young child feeding.

Contents (Practical)

1. Breastfeeding counseling
2. Preparation of indigenous complementary foods
3. Therapeutic foods
4. Infant formulas for various needs
5. Growth monitoring: APGAR (Appearance, Pulse rate, Grimace, Activity and Respiration) score, Growth charts.
6. Visits of hospitals and day care centers.

Recommended Texts

1. Behan, E. (2008). The baby Food Bible – A Complete Guide to Feeding Your Child from Infancy On, 1st Ed. Random House Publishing Group, New York, USA.
2. Dykes, F. & Moran, V.H. (2009). Infant and Young Child Feeding: Challenges to Implementing a Global Strategy. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.
3. Samour, P.Q. & King, K. (2010). Pediatric Nutrition, 4th Ed. Jones & Bartlett Learning, Mississauga, Canada.
4. WHO. (2003). Global Strategy for Infant and Young Child Feeding. World Health Organization, Geneva, Switzerland.
5. WHO/UNICEF/GOP (World Health Organization/United Nation‘s Children Fund/Government of Pakistan). (2008). Infant and young child feeding counselling: an integrated course. Nutrition Wing, Ministry of Health, Government of the Pakistan, Islamabad

HNAD-6124 Clinical Biochemistry 3(3+0)

The course aims to understand the role and requirements of clinical laboratory and how chemical and biochemical analysis are applied to the study of disease, to discuss the function, structure, laboratory investigation and diseases of the different body systems and to correlate laboratory findings in clinical samples with various pathological processes.

Contents (Theory)

1. Clinical laboratory: organization and management, safety, good lab practices, quality control and assurance, reference range and normal values, laboratory data processing
2. Handling and processing of clinical samples
3. Effect of storage on composition of samples
4. Commonly used instruments in clinical laboratory: Microscope, Minilab apparatus, X-ray, ECG, MRI, ELISA reader, CT scan etc.
5. Symptomlogy and case histories of various diseases. Forensic science, Molecular basis of diagnosis.

Contents (Practical)

1. Blood sampling techniques
2. Complete blood picture (CBP) like Hb, PCV, ESR, TLC, DLC, bleeding time, clotting time, prothrombin time and blood groups
3. Pregnancy test
4. Liver function tests
5. Kidney function test
6. Cardiac enzymes
7. Lipid profile, total proteins,albumin and serum minerals
8. Urine analysis for bile pigments, protein, urea, pH, ketone bodies, sugars, creatinine, pus cells, RBCs and uric acid
9. Sero-diagnosis of infectious diseases
10. Visit to clinical laboratory/concerned organization.

Recommended Texts

1. Ahmed, N. (2011). Clinical Biochemistry. Oxford University Press, Oxford,UK.
2. Bain, B.J., Bates, I., Laffanand, M.A, Lewis, S.M. (2012). Practical Haematology, 11thEd. Churchill Livingstone, Elsevier Ltd., New York, USA.
3. Burtis, C., Ashwood, E., & Burns, D. (2006). Tietz Text Book of Clinical Chemistry and Molecular Diagnostics, 4th Ed. Elsevier Saunders Company, Philadelphia, USA.
4. Chawala, R. (2014). Practical Clinical Biochemistry: Methods and Interpretations, 4thEd. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi, India.
5. Devlin, T. M. (2005). Textbook of biochemistry with clinical correlations, 6thed. Wiley- Liss, Inc., U.S.A.

HNAD-6125 Nutrition Policies and Programs 3(3+0)

The course aims to familiarize with global and local nutrition policies and programs in the domain of public health nutrition, to prevent and control specific micronutrient deficiencies through diet based approaches among the vulnerable and to promote appropriate diets and healthy lifestyles and access, analyze and monitor nutrition situations.

.

Contents

1. History and importance of nutrition intervention planning
2. World declaration on nutrition
3. Nutrition development partners; Policy guidelines
4. Community nutrition programs: national and international, supplementary feeding programs
5. Food fortification, supplementation and diet diversification
6. School feeding programs: interventions and impacts
7. Improving household food security; Protecting consumers through improved food quality and safety; Preventing and managing infectious diseases
8. Promoting breast feeding
9. Caring for socio-economically deprived and vulnerable
10. Preventing and controlling specific micronutrient deficiencies
11. Promoting appropriate diets and healthy lifestyle
12. Improving health care; Five years plan for Pakistan (Nutrition)
13. Nutrition intervention: counselling for change
14. SUN movement; One health concept; National nutrition programs: food & nutrition program, Tawana Pakistan, school health program
15. Developing effective food and nutrition policies and programs.

Recommended Texts

1. Edelstein, S. 2011. Nutrition in Public Health: A Handbook for Developing Programs and Services. 3rd Ed. Jones & Bartlett Learning, Sudbury, M.A, USA.
2. IFPRI. 2016. Taking Actions: Progress and Challenges in Implementing Nutrition Policies and Programs. International Food Policy Research Institute, Washington, DC, USA.
3. Nnakwe, N.E. 2009. Community Nutrition: Planning Health Promotion and Disease Prevention. Jones and Bartlett Learning International, London, UK.
4. Semba, R.D. & M.W. Bloem. 2008. Nutrition and Health in Developing Countries. 2nd Ed. Humana Press, New York, USA.

Suggested Readings

1. Spark, A. 2007. Nutrition in Public Health: Principles, Policies and Practice. CRC Press, Taylor & Francis Group, Boca Raton, FL,USA

HNAD-6126 Meal Planning and Management 3(3+0)

The course aims to understand the importance of meal planning and its role in everyday life, to apply the principles of meal planning in the planning of balanced and appropriate meals keeping in mind the nutritional requirements, family budget and food requirements choices of different age groups, to identify market trends and conditions while purchasing food keeping in mind food costs and quality.

Contents (Theory)

1. Importance and principles of meal planning for family and occasions
2. Nutritional value of meal
3. Family meal budgeting
4. Rules for good menu planning
5. Menu planning for families
6. Selection of various foods in relation to season and market conditions
7. Composition and storage of food
8. Selection, use and care of table appointments
9. Study of different types of table settings, table manners and etiquettes
10. Kitchen safety and settings
11. Basics of food hygiene and sanitation
12. Food labeling; Menus for schools, geriatric and healthcare centers.

Contents (Practical)

1. Survey and record keeping of market prices (retail & wholesale)
2. Types of foods available in the market from different food groups. e.g. retail cuts of meat and types of milk
3. Comparison of weight, volume and effect of cooking on color, taste and texture of different foods
4. Planning, preparation and service of meals for different occasions at different income levels
5. Understanding food labels; Market visits for cost and quality and food marketing regulations. Food service visits (Restaurants, School, Colleges, and Hospitals).

Recommended Texts

1. Brown, A. (2015). Understanding Food Principles & Preparation, 5th Ed. Cengage Learning, Belmont, CA, USA.

2. McWilliams, M. (2012). Fundamentals of Meal Management, 5thEd.Dorling Kindersley India Pvt. Ltd., New Delhi, India.

3. Narvaez-Soriano, S. (2004). A Guide to Meal Management and Table Services. Rex Book Store, Manilla, Philippine.

Suggested Readings

1. Sethi, M. (2008). Institutional Food Management. New Age International Pvt. Ltd. New Delhi, India.

HNAD-6127 Dietetics-III 3(2+1)

The course aims to understand the role of nutrition and dietetics in managing disease and preventing complications, to get hands-on training for the dietary modification of normal diets aligned with various health disorders, to comprehend the role of nutrition education and policies towards nutrition security.

.

Contents (Theory)

1. Diet based regimen to improve the public health
2. Diet supplementation for diseased patients
3. Malabsorption and mineral deficiency
4. Health diets and lifestyles
5. Preventing diet related diseases
6. Nutritional implications of various diets
7. Managing disease and avoiding complications through diet diversification
8. Dietary management in various health disorders (objective, physiology, food choices, diet plans): obesity, leanness and underweight; coronary heart disease: dyslipidemia, hypertension, ischemic heart disease, heart failure; fevers and infections; diabetes mellitus; diseases of respiratory system: cystic fibrosis, asthma; rheumatic diseases: rheumatoid arthritis, osteoarthritis & gout; inborn errors of metabolism
9. Phenylketonuria, Maple syrup urine disease, galactosemia, glycogen storage disease; renal diseases; burn; surgical conditions; bacterial overgrowth; infections
10. AIDS; food allergy; protein energy malnutrition; micronutrient deficiencies
11. Policy principles for promotion of healthy diets
12. Incorporating nutrition objectives into development policies
13. Strategic actions and for promoting healthy diets
14. Drawing up of nutrition education programs
15. Role of specialist in dietetics and diseases.

Contents (Practical)

1. Planning of modified diet: consistent carbohydrate diet, moderate carbohydrate diet
2. Modified proteins diet: high protein diet, restricted protein diet
3. Modified fats diet: restricted fats diet
4. Modified micronutrients diet
5. Controlled sodium, potassium and phosphorus diet
6. Dietary management in various health disorders
7. Hospital visits and nutrition camps.

Recommended Texts

1. Mahan, L.K., Escott-Stump, S., & Raymond, J.L. (2012). Krause's Food, Nutrition & Diet Therapy, 13th Ed. Elsevier Saunders, St. Louis, Missouri, USA.
2. Mudambi, S.R. & Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition & Diet Therapy, 5thed. New Age International Pvt. Ltd. Publishers, New Delhi.
3. Punekar, M. & D'Souza, J. (2010). Handbook of Applied Nutrition, Diet therapy and Diet Management. SBS Publishers & Distributors Pvt. Ltd., New Delhi.
4. Rawat, S. (2015). Applied Nutrition. Random Publication, New Delhi.
5. Schlenker, E. & Gilbert, J.A. (2015). Williams' Essentials of Nutrition and Diet Therapy, 11th Ed. Elsevier/Mosby Inc., Louis, Missouri.
6. Singh, J. (2008). Handbook of Nutrition and Dietetics. Lotus Press, India.

HNAD-6128 Nutritional Practices in Clinical Care 3(2+1)

The course aims to understand and create a patient-centered nutrition care plan based on sound nutrition principles, scientific evidence and biomedical reasoning, to assess various physiological conditions and prepare diet plans accordingly, to acquaint hands on training in the field of enteral and parenteral nutrition.

.

Contents (Theory)

1. Importance of clinical care nutrition support; Nutritional screening and assessment
2. The therapeutic process, stress of the therapeutic encounter, focus of care, phases of the care process
3. Quality patient care and collaborative roles of nutritionists and nurses
4. Modified diets for various physiological needs
5. Enteral nutritional: composition, nutritional prescription (dose), strategies to optimize delivery and minimize risks, pediatric enteral feeding
6. Total parenteral nutrition; composition, intravenous nutritional prescription (dose) for specific conditions
7. Percutaneous endoscopic gastrostomy and radiologically inserted gastrostomy
8. Complications in enteral and parenteral nutrition
9. Nutritional therapy in diseases of infancy and childhood; Drug-nutrient interactions: drug effects on food and nutrients, food effects on drug absorption, food effects on drug
10. Dietary supplements.

Contents (Practical)

1. Nutritional assessment of patients: selection, nutritional requirements
2. Tube feeding: types, feeding equipment, preparation and application of enteral/naso-gastric diets, monitoring the tube-fed patient
3. Total parenteral nutrition: basic rules, techniques, prescription, preparation of total parenteral solution
4. Preparation of pre-and postoperative diets; Case studies and logbooks; Hospital visits.

Recommended Texts

1. Block, A.S., Maillet, J., Howell, W.H., Winkler, M.F. (2007). Issues and Choices in Clinical Nutrition Practice. Lippincott Williams & Wilkins, Philadelphia, PA, USA.
2. Katsilambros, N., Dimosthenopoulos, C., Kontogianni, M.D., Manglara, E., & Poulia, K.A. (2010). Clinical Nutrition in Practice, 1st Ed. Wiley-Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.
3. Katz, D.L. (2008). Nutrition in Clinical Practice, 2nd Ed. Lippincott Williams & Wilkins, Philadelphia, PA, USA.
4. Rolandelli, R.H., Bankhead, R., Boullate, J. I., & Compher, C.W. (2005). Clinical Nutrition; Enteral and Tube Feeding. 4th Ed. Elasvier Sauders Publishers, USA.
5. Rolfes, S.R., Pinna, K., & Whitney, E. (2015). Understanding Normal and Clinical Nutrition, 10th ed. Thomson and Wadsworth Publishers, USA.

HNAD-6129 Nutrition and Psychology 3(3+0)

The course aims to understand psychology, its types and importance innutrition, to abreast the impact of psychological influences on appetite and attitude behavior relationship

Contents (Theory)

1. Psychology: introduction, types, classification
2. Psychology and nutrition adherence
3. Attitude and eating patterns and the field of cognitive psychology
4. Perception, visualization and eating patterns, errors in perception process
5. Eating disorders: diagnosis, assessment and treatment
6. Face perception; Conceptual model of food choice
7. Psychological influences on appetite
8. Process over the life course, integration of biological, social, cultural and psychological influences on food choice
9. Understanding behavior: sensation, sense organs/special organs, attention and concentration, memory and its stages, methods for improvement, types and theories of thinking, cognition and levels of cognition, problem solving and decision making strategies, attitude behavior relationship
10. Measurement issues, indirect effects of attitude on behavior
11. The theory of reason education; Additional variables within the theory of planned behavior
12. Personality and intelligence; Stress management.

Recommended Texts

1. Blackman, M.C. & Kvaska, C.A. (2011). Nutrition Psychology: Improving Dietary Adherence. Jones and Bartlett Learning Publishers, Ontario, Canada.
2. Booth, D.A. (1994). The Psychology of Nutrition. Taylor & Francis Inc., Bristol, PA, USA.
3. Elmes, D.G., Kantowitz, B.H., & Roediger, H.L. Research Methods in Psychology, 9th Ed. Wadsworth Cengage Learning, Belmont, CA, USA.
4. Jane O. (2010). The Psychology of Eating: From Healthy to Disorders Behavior, 2nd Ed. Wiley Blackwell, John Wiley & Sons Ltd., Chichester, West Sussex, UK.

HNAD-6130 Internship and Report Writing 10(0+10)

On completion of the degree program the students should have provided evidence of being able to: understand and demonstrate coherent and detailed subject knowledge and professional competencies innutrition work effectively in an appropriate workplace environment in either the hospital, health care system, food industry (Nutraceutical/Food Supplements) or other professions related to nutrition deploy accurately standard techniques of analysis and enquiry innutrition demonstrate a conceptual understanding which enables the development and sustaining of argument; describe and comment on particular aspects of recent research and/or scholarship; appreciate the uncertainty, ambiguity and limitations of knowledge innutrition. Make appropriate use of scholarly reviews and primary sources; apply their knowledge and understanding in order to initiate and carry out an extended piece of work or project conform to professional boundaries and norms where applicable

Contents (Theory & Practical)

The students will have had the opportunity to acquire, as defined in the modules (theoretical & practical) specified for the program: the transferable/key/generic skills necessary for employment related to nutrition the ability to exercise of initiative and personal responsibility the ability to identify objectives, and negotiate the strategy and tactics to be employed working within a team the ability to deploy decision making skills in complex and unpredictable situations the ability to communicate information, ideas, problems and solutions in a variety of ways to a variety of audiences the ability to undertake appropriate further training of a professional or equivalent nature

Assessment

Achievement of the students will be assessed by a variety of methods in accordance with the learning outcomes of the modules specified for the program and will include:

- Effective written and verbal communication of the essential features of nutrition as involved in the placement
- Demonstrating the ability to apply a broad range of aspects of nutrition in the workplace
- Work that draws on a wide variety of material
- The ability to evaluate and criticize received opinion
- Evidence of an ability to conduct independent, in depth enquiry within subject areas of nutrition
- Completing work that is typically both evaluative and creative demonstrating an ability to carry out independent study using distance learning material

Readings

- The required books/literatures/materials will be suggested by the internship management

M.Sc. (Hons.) Food and Nutrition

Eligibility: The candidate must have passed any one of the following degree with at least 2.0 CGPA

- BSc (Hons) Food Science and Technology
- BSc (Hons) Agriculture (Major: Food Technology)
- BSc (Hons) Food Science and Nutrition
- MSc Food and Nutrition/Community Health and Nutrition/Human Nutrition
- BS / BSc (Hons) Home Economics (Major: Food and Nutrition)
- BS / BSc (Hons) Food and Nutrition/Human Nutrition/Clinical Nutrition/Nutrition & Dietetics
- BS / BSc (Hons) Human Nutrition and Dietetics
- Graduation in Medical Sciences (HEC approved degrees; MBBS, BHMS, BEMS) or BS / BSc (Hons) Nursing (4 years degree program after Fsc Pre-Medical) (Subject to take deficiency courses as per requirement)

Duration: 02 Years Program (04 Semesters)

Degree Requirements: 30 Credit Hours (24 Credit Hours course work + 06 Credit Hours Dissertation)

Major Courses

Course Code	Course Title	Credit Hours
FANU-7101	Physiology and Biochemistry of Human Nutrition	3(3+0)
FANU-7102	Advanced Human Physiology (Compulsory)	3(3+0)
FANU-7103	Analytical Techniques in Food and Nutrition	3(0+3)
FANU-7104	Dietetics and Applied Nutrition (Compulsory)	3(2+1)
FANU-7105	Research Methods in Food and Nutrition	3(3+0)
FANU-7106	Metabolism of Bioactive Nutrients	3(3+0)
FANU-7107	Sociology of Food and Nutrition	3(3+0)
FANU-7108	Institutional Management and Nutrition	3(2+1)
FANU-7109	Seminar-I (Compulsory)	1(1+0)
FANU-7110	Special Problem (Compulsory)	1(1+0)

Minor/Allied Course

STAT-7151	Statistical Methods for Agricultural Research-I (Compulsory)	3(3+0)

1. Major courses may be offered during M. Sc. (Hons.) Food and Nutrition degree program depending upon the availability of faculty and resources.
2. Other Minor/Allied courses can be taken (as per requirement) from the following departments/subjects to be offered by the respective departments in running semester/s:

- Chemistry / Biochemistry
- Agricultural Sciences
- Biological Sciences
- Animal Sciences
- Pharmacy
- Medical / Allied Health Sciences
- Biotechnology
- Business Management

3. A student will have to complete 2/3rd credit hours from the Major courses and 1/3rd credit hours from the Minor/Allied courses.

FANU-7101 Physiology and Biochemistry of Human Nutrition 3(3+0)

The physiology of cell and organism is determined by heredity and the environment. Human nutrition, constitutes a major form of environmental exposure, and the individual nutrients and their overall composition induce different mechanisms at the cellular and organism level, influencing physiology and chemical pathways. Nutrition therefore has a great impact for the development of life style diseases such as obesity, diabetes and atherosclerosis. The progression of pathological conditions can be observed through changes in cellular signaling and function, with consequences for several physiological properties. This course will provide students an introduction to subjects like biochemistry, molecular biology, and cell biology, physiology in connection with human nutritional biochemistry and physiology. Focusing on areas like metabolism that involve and are affected by nutrients and their composition in the diet. Students will also learn about the background of lifestyle diseases, and the effects of contaminants. The aim of the course is to train the students to independently evaluate the effects of nutrients at a cell biological and physiological level and evaluate this in a broader scientific context relating to health and disease.

Contents

1. Cell biology: structure, functions
2. Physiology of digestive, circulatory, excretory, Respiratory, nervous, endocrine, lymphatic and reproductive systems in relation to nutrition.
3. Blood components and functions.
4. Fluid: electrolytes, and acid base balance and imbalance.
5. Thermoregulation during pregnancy and lactation.
6. Biochemistry of energy yielding pathways and their integration.
7. Biochemistry of obesity, hepatitis, cancer, ageing and AIDS
8. Vital signs determination
9. ABO blood grouping and complete blood count
10. Urine chemistry
11. Determination pH of blood, urine and saliva
12. Liver, renal, gastric and thyroid functions tests and lipid profile
13. Serum electrolytes investigations.

Recommended Texts

1. Stipanuk, M. H., & Caudill, M. A. (2018). *Biochemical, physiological, and molecular aspects of human nutrition*. Amsterdam: Elsevier health sciences.
2. Bourne, G. (Ed.) (2012). *Biochemistry and physiology of nutrition*. Amsterdam: Elsevier.
3. Chatterjea, M. N., & Shinde, R. (2011). *Textbook of medical biochemistry*. London: JP Medical Ltd.

Suggested Readings

1. Hoehn, K., & Marieb, E. N. (2007). *Human anatomy & physiology*. California: Benjamin Cummings.
2. Hall, J. E. (2015). *Guyton and hall textbook of medical physiology.* Amsterdam: Elsevier Health Sciences.

FANU-7102 **Advanced Human Physiology** **3(3+0)**

This course Provides a study of human physiology for students entering health-oriented fields. Emphasizes the study of the function of cells, the nervous, muscular, circulatory, respiratory, urinary, digestive and endocrine systems, and their homeostatic mechanisms and system interaction. Focuses laboratory exercises on clinically relevant measurement of human function. It also provides an advanced study of physiology at the cellular level with an emphasis on the three integrative systems: the nervous, the endocrine systems and the immune system. It will explore how cellular integration and cellular interaction are able to generate complex cognitive functions such as the control and maintenance of homeostasis, and the balance between health and disease. This subject will draw most of its information from current research literature in the main and emerging fields of muscle, tendon, bone and cardiovascular research.

Contents

1. Cell Physiology: Functional organization levels, Homeostasis, Cell membrane and its functions, organelles and their functions, Nucleus, DNA and gene regulation
2. Nerve and Muscle: Structure and function of neuron, Synaptic transmission, skeletal, smooth and cardiac muscle contraction, neuromuscular junction and transmission.
3. Cardiovascular System: Functions of cardiac muscle, Conducting system of the Heart, ECG: recording and interpretation, Blood pressure and its regulation, Cardiac output and its control
4. Respiratory System: Structure and functions of respiratory tract, Mechanics of breathing, Lung volumes and capacities, Diffusion of gases across the alveolar membrane. Mechanism of transport of oxygen and carbon dioxide in blood, nervous and chemical regulation of respiration.
5. Blood: Composition and functions, Plasma proteins, Erythropoiesis and red blood cell functions, Anemia and its different types, White blood cells, platelets, Hemostasis and different types of antibodies and immunity.
6. Skin and body temperature regulation and sport physiology
7. Nervous System: Type and function of sensory receptors, Function of the spinal cord and ascending tracts, Reflex action and reflexes, Motor pathways, Cerebellum and brain stem, Functions of the thalamus, hypothalamus and limbic system, Production and functions of CSF.
8. GIT and Hepatobilliary System: Structure and Function, control of gastrointestinal motility and secretion, mastication, swallowing: mechanism and control, Functions, motility and secretions of stomach, small intestine, large intestine, Functions of liver and its role in digestion through the production of bile and endocrine & exocrine pancreas with its role in digestion
9. Endocrinology: Classification, mechanism of action, Functions of the hormones secreted by the pituitary gland, hypothalamus, the thyroid gland, the parathyroid gland, adrenal cortex and medulla, and control of blood sugar& physiology of growth
10. Body Fluids and Kidney: GFR and its regulation, formation of urine, mechanism of concentration and dilution of urine, Water and electrolyte balance with reference to the kidney, Role of the kidney in blood pressure regulation, Hormonal functions of the kidney and acid base balance.

Recommended Texts

1. Ganong, W. F. (2019). *Review of medical physiology*. (26th ed.) New York: Mc-Graw Hill.
2. Guyton, A. C. (2015). *Text book of medical physiology*. (13th ed.) Philadelphia: National Book foundation, Sinders Co.

Suggested Readings

1. Sherwood, L. (2016). *Human physiology*: *from cells to systems.* (9th ed.) Boston: Cengage Learning.
2. Bruce, M. K., & Bruce, A. S. (2017). *Berne & Levy physiology.* (17th ed.) Amsterdam: Elsevier.

FANU-7103 Analytical Techniques in Food and Nutrition 3(0+3)

The course aims to familiarize students with the principles and techniques of food analysis by using physical, chemical and biological methods. The principles of food testing and certification as well as practices in nutrition labelling of food products will also be introduced. Another objective of this subject is to develop students' abilities to apply their knowledge and skills acquired to solve real-world problems associated with food analysis and food labelling. This course provides an introduction to the theory and practice of the analysis of food composition and characteristics. Analytes of nutritional, functional, safety and regulatory importance will be measured. Techniques and instrumentation used for the analysis of foods including spectroscopy, chromatography, and titration will be examined. Selection of the appropriate method for analytes and food systems will be discussed. Students will be familiarized with resources relevant to the field, and assignments will address critical thinking, written and oral communication skills. To provide knowledge and skills in the applications, principles and practices of the analysis of foods for purposes of trade, compliance, quality assurance, authentication, complaint investigation, nutritional attributes and scientific research. Become knowledgeable of food components and characteristics and techniques available for their analysis. Be able to choose appropriate methods for the analyte and/or food system of interest and interpret analytical data including use of common calculations, and resources relevant to food analysis.

Contents (Practical)

1. Principles, applications and interpretations of proximate analyses.
2. Bomb Calorimetry.
3. Flame photometry.
4. Chromatography.
5. Spectroscopy.
6. Electrophoresis.
7. Hematology
8. Serology analyzer
9. Serum Electrolytes
10. Urine Chemistry Analyzer

Recommended Texts

1. AOAC. (2006). *The official methods of analysis of AOAC international.* Maryland: The Association of Official Analytical Chemist.
2. Nielson, S. S. (2017). *Food analysis laboratory manual*. New York: Chips Ltd.
3. James, C. S. (Ed.) (2013). *Analytical chemistry of foods*. Berlin: Springer Science & Business Media.

Suggested Readings

1. Pico, Y. (Ed.) (2012). *Chemical analysis of food: techniques and applications*. Massachusetts: Academic Press.
2. Pare, J. R. J., & Belanger, J. M. (Eds.) (1997). *Instrumental methods in food analysis.* Vol. 18. Amsterdam: Elsevier.
3. Boyer, R. (2009). *Modern experimental biochemistry*. New Delhi: Pearson Education.

FANU-7104 Dietetics and Applied Nutrition 3(2+1)

The aim of the course is to provide scientific training that encompasses all aspects of the nutritional and food sciences and, at the same time, to develop the skills and attitudes required for working in the broad field of applied nutrition. Apply professional guidelines to a practice scenario. Use the nutrition care process to make decisions, to identify nutrition-related problems, and determine and evaluate nutrition interventions. To produce postgraduates in the field of dietetics and nutrition recognized for their practical and public health skills. To acquaint postgraduates with advanced clinical nutrition, understand the basis of nutritional status assessment, biochemical basis of nutrition, nutrition related disorders, and the role of nutrition in therapeutic diets. The course also aims at teaching skills of menu planning for quality and quantity preparation and management of resources. The students also learn about new and expanding areas of research in the field of dietetics and nutrition and acquire necessary research oriented skills. Integrate scientific information and research into practice scenarios. Develop and deliver information, products, and services to individuals, groups, and populations.

Contents (Theory)

1. Nutritional and health status assessment: ABCDE of nutrition
2. Medical history and clinical examination,
3. Biomarkers interpretations.
4. Conventional and modern approaches for diet therapy and nutritional science.
5. Nutritional programs and strategies for high risk population.
6. Dietary calculations and food values.
7. Nutrition medicines and complementary therapies
8. Nutrition interventions.
9. Nutrition care plan: standard and modified diets for nutrition related disorders and diseases

Contents (Practical)

1. Training at diet department of hospital / health care setting and monitoring the patients to study their nutritional problems and devising nutrition plan

Recommended Texts

1. Rolfes, S. R., Pinna, K., & Whitney, E. N. (2020). *Understanding normal and clinical nutrition*. Boston: Cengage learning.
2. Webster-Gandy, J., Madden, A., & Holdsworth, M. (2011). *Oxford handbook of nutrition and dietetics.* Oxford: OUP Oxford.
3. Gibson, R. S. (2005). *Principles of nutritional assessment*. Oxford: Oxford university press.
4. Gibson, R. S. (1993). *Nutritional assessment: a laboratory manual*. Oxford: Oxford university press.

Suggested Readings

1. Hickson, M., & Smith, S. (2018). *Advanced nutrition and dietetics in nutrition support*. London: John Wiley & Sons, Incorporated.
2. Thaker, A., & Barton, A. (2012). *Multicultural handbook of food, nutrition and dietetics*. London: John Wiley & Sons.
3. Winterfeldt, E. A., Bogle, M. L., & Ebro, L. L. (2013). *Nutrition & dietetics: practice and future Trends.* Massachusetts: Jones & Bartlett Publishers.

FANU-7105 Research Methods in Food and Nutrition 3(3+0)

This course includes the presentation and application of knowledge and skills in the process of conducting research in nutrition. It focuses on the development of critical analysis skills in the areas of study design, statistical analysis, organization and presentation of data and the presentation of the final report in the context of research. Analyze and discuss the components of the investigative process such as development of the research question, review of the published scientific literature, formulation of the objectives and/or hypothesis, selection of the proper study design including the population to be sampled, collection and analysis of data (methods for), and presentation of the final report. Use scientific literature databases to search for research studies and reports related. Compare and contrast various study designs and statistical analysis for qualitative and quantitative study designs used in nutrition research. Value the importance of ethical conduct in all areas of research, specifically in the methods and study design for studies in nutrition with human or animal subjects. Demonstrate skills of statistical analysis for qualitative and quantitative data using computerized statistical software. Apply basic skills to interpret statistical analysis from studies within the field of food and nutrition.

Contents

1. Characteristics and types of research
2. Methods, areas and objectives of research,
3. Problem identification,
4. Research ethics
5. Standardized measurement and sampling techniques
6. Research proposal / project
7. Discussion of research: interpretation,
8. Logics, evidences of imagination,
9. Drawing conclusions and recommendations.
10. Research thesis: reports and articles for publication.
11. Use of computer programs: software applicable to nutritional data, SPSS, Excel.

Recommended Texts

1. Toldra, F. (Ed.) (2019). *Advances in food and nutrition research,* Vol. 87. London: Academic Press.
2. Krebs, L. J. (2015). *Nutrition research methodologies*. New York: John Wiley & Sons.
3. Awan, J. A. 2009. *Scientific presentation*. Faisalabad: Unitech Communication.

Suggested Readings

1. Chrzan, J., & Brett, J. (Eds.) (2017). *Research methods for anthropological studies of food and nutrition,* Vol. 1. Oxford: Berghahn Books.
2. Pounis, G. (Ed.) (2018). *Analysis in nutrition research: principles of statistical methodology and interpretation of the results*. London: Academic Press.
3. Macbeth, H. M., & MacClancy, J. (Eds.) (2004). *Researching food habits: methods and problems,* Vol. 5. Oxford: Berghahn books.

FANU-7106 Metabolism of Bioactive Nutrients 3(3+0)

Provides students with knowledge of nutrition biochemistry and the role of nutrients in human metabolism with emphasis on essential amino acids, essential fatty acids, vitamins, minerals, and selected bioactive substances. Describe the processes involved in anabolic and catabolic reactions. List and describe the steps necessary for carbohydrate, lipid, and protein metabolism and explain the processes that regulate glucose levels during the absorptive and post absorptive states, how metabolism is essential to maintaining body temperature (thermoregulation) and summarize the importance of vitamins and minerals in the diet. After completing the course the students should be able to describe then physiological function and metabolism of the macronutrients, explain the energy metabolism and evaluate variations in energy demands due to physical activity level, age and gender as well as physiological and health status. Describe the essential micronutrients; their physiological functions, bioavailability, mechanisms of absorption, metabolism, excretion and storage, food sources and relationship to the maintenance of health and designate causes and symptoms of malnutrition and define possible causes. Describe the nutrient recommendations, the rationale for them and their application areas.

Contents

1. Chemistry and metabolism: carbohydrates, proteins and lipids.
2. Dietary sources: uses in the body and dietary requirements.
3. Energy yielding nutrients
4. Body energy balance.
5. Prostaglandins
6. Plasma proteins
7. Immunoglobulin and enzymes: chemistry and functions.
8. Biological oxidation
9. Glycemic index of foods.
10. Nutritive and biological value of protein
11. Net protein utilization
12. Protein efficiency ratio
13. Protein energy malnutrition.
14. Quality and bioavailability of macronutrients
15. Inadequate intake and its health impacts.

Recommended Texts

1. Kohlmeier, M. (2015). *Nutrient metabolism: structures, functions, and genes*. Cambridge: Academic Press.
2. Brody, T. (1998). *Nutritional biochemistry*. New York: Elsevier.
3. Linder, M. C. (1991). *Nutritional biochemistry and metabolism: with clinical applications*. New York: Elsevier.

Suggested Readings

1. Bender, D. A. (2003). *Nutritional biochemistry of the vitamins*. Cambridge: Cambridge university press.
2. Bender, D. (2002). *An introduction to nutrition and metabolism*. Florida: CRC Press.

FANU-7107 Sociology of Food and Nutrition 3(3+0)

This course introduces students to the cultural, ethical and social dimensions of human nutrition in a variety of local and international contexts. Students explore different cultures and the associated social and environmental factors that impact on their understanding of food, diet and eating. Students will learn to analyze and evaluate a variety of diets and culturally based dietary medicine systems from a physiological perspective taking into consideration both current research and cultural aspects of food use. This subject provides the underpinnings of cultural competency and essential context when constructing dietary interventions in later nutritional medicine and clinical practicum subjects. Aims to provide students with a sociological understanding of the social context of food and nutrition. Students examine the production, distribution and consumption of food to understand 'why we eat the way we do'. Demonstrate an understanding of theories, research methods and debates in food sociology, be familiar with the process of critical appraisal of relevant literature and critically analyze and discuss a refereed journal article in written and oral form relevant to food sociology. Construct an evidence table on a specific topic relevant to food sociology and communicate understanding of theories and debates in food sociology in essay form.

Contents

1. World hunger.
2. Food, society & the environment.
3. Future food: the politics of functional foods and health claims.
4. Setting the menu: dietary guidelines, corporate interests and nutrition policy.
5. Food & social class differences.
6. Food, humans & other animals.
7. Nutrition in culturally diverse societies.
8. Food and aging.
9. The social construction and eating disorders.

Recommended Texts

1. McIntosh, W. A. (2013). *Sociologies of food and nutrition.* Berlin: Springer Science & Business Media.
2. Germov, J., & Williams, L. (2008). *A sociology of food & nutrition: the social appetite*. Oxford: Oxford University Press.
3. Beardsworth, A., & Keil, T. (2002). *Sociology on the menu: An invitation to the study of food and society*. New York: Routledge.

Suggested Readings

1. Gronow, J. (2002). *The sociology of taste.* New York: Routledge
2. Hartog, A. P., Staveren, W. A., & Brouwer, I. D. (2006). *Food habits and consumption in developing countries. Manual for field studies*. Wageningen: Wageningen Academic Publishers.

FANU-7108 Institutional Management and Nutrition 3(2+1)

Plan menus to accommodate the nutritional, dietary and medical needs, cultural and religious requirements, and personal preferences of clients; Supervise and evaluate the handling, preparation and service of food to ensure compliance with relevant legislation, organization policies, and procedures and industry best practices for health, safety, sanitation, quality assurance and client satisfaction; Provide for the nutritional needs of diverse clients in health care settings in collaboration with or under the direction of members of the inter-professional health care team; Comply with and support others to work in accordance with industry, organization and legal standards for professional and ethical conduct; Apply relevant local, national and global trends, emerging technologies, and changes to legislation to enhance work performance and support management decisions; Deliver customer service that anticipates, meets or exceeds individual expectations and is consistent with organization standards and objectives; Participate in the hiring, coaching, training, scheduling, supervision and performance evaluation of department staff in accordance with human resources, labor relations, workplace health and safety, and industry best practices;

Contents (Theory)

1. Introduction to medical food service.
2. Managerial role and management functions.
3. Communication, decision making and time management.
4. Subsystem for menu planning.
5. Subsystem for equipment planning and care.
6. Subsystem for food purchasing,
7. Subsystem for food production, distribution and service.
8. Subsystem for personal management.
9. Subsystem for financial management.

Contents (Practical)

1. Pilot projects and visits to food service units of university, hospitals, hotels and catering points.

Recommended Texts

1. Cross, M., & MacDonald, B. (2009). *Nutrition in institutions*. Chichester: Wiley-Blackwell.
2. Wood, G., Brewster, C., & Brookes, M. (2014). *Human resource management and the institutional perspective*. New York: Routledge.
3. Sethi, M. (2008). *Institutional food management*. New Delhi: New Age International.
4. Sethi, M. (1995*). Catering management: an integrated approach*. New Delhi: New Age International.

Suggested Readings

1. Davis, B., Lockwood, A., Alcott, P., & Pantelidis, I. S. (2018). *Food and beverage management*. New York: Routledge.
2. Ryan, C. (1980). *An introduction to hotel and catering economics*. London: Thorne Pub.
3. Wood, R. C. (1997). *Working in hotels and catering*. New Delhi: International Thomson Business Press.

FANU-7109 **Seminar –I** **1(1+0)**

The seminar is intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to submit written documentation supporting that seminar. A seminar is a form of academic instruction, either at an academic institution or offered by a commercial or professional organization. It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to participate. Seminars provide a chance to interact with experts from the specific field. Discussing about the relevant topics of the particular subject, students tend to learn about the latest information and new skills related to the concerned subject. Seminars are important and beneficial for those who have difficulty learning in a typical classroom setting where reading and writing are required. There is often a sense of friendship associated with seminar attendance, because everyone is attending with a like interest in learning about a subject important to them. Attending a seminar has numerous benefits, including improving communication skills, gaining expert knowledge, networking with others and renewing motivation and confidence.

Contents

1. The respective supervisor will assign the topic and the seminar evaluation committee will evaluate for result.

FANU-7110 **Special Problem** **1(1+0)**

The special problem is intended to instruct students on proper techniques for scientific research and methodologies. The students are expected to prepare directed assignment and collect information and material related to current research interest. Special problem means an assignment that is expected to be temporary and is designated as a special assignment by the academic supervisor in its sole discretion. The main purpose of special problem is to increase the learning capabilities of students. The more we use our brains, the more they develop. Students learn a lot more when they read or practice something by themselves. Similarly, the purpose of assignments is to increase the practical skills of students. The main objectives of special problem assigned to students are: to enhance the knowledge of a subject, helps to develop writing skills and to enhance time management and organizing skills. It enhances your planning and organizing skills: The special problem make you do your work by prioritizing the needs and time frames. It helps you in completing all your tasks very peacefully instead of creating any panic. Special problem writing work gives students a lot of scopes to improve themselves.

Contents

1. The respective supervisor will assign the topic and evaluate for result.

STAT-7151 Statistical Methods for Agricultural Research-I 3(3+0)

This course designed for MSc (Hons)/MPhil programs of agriculture sciences. This course provides the applied statistics background for survey and experimental work in Agriculture. Case studies and critical examples are used to work through commonly experienced research problems (from sampling designs to the ethical consideration) and to explain how they may be approached, solved or prevented with statistical means. The importance of statistical science in agriculture is obvious, where the collection, analysis and interpretation of numerical data are concerned. Statistical principles apply in all areas of experimental work and they have a very important role in agricultural experiments. Statistics plays an important role in experimentation. While many scientific problems could be solved by different statistical procedures. Furthermore, some statistical softwares knowledge will be provided to the students to improve their analytical skills. These activities are further supports the student's research.

Contents

1. Importance of Statistics in agriculture research.
2. Selection of statistical tools based on scale of measurements.
3. Analysis of Count and Frequency data.
4. Measures of central tendency and dispersion.
5. Some concepts of hypothesis testing. T, Z, Chi-square and F tests. Contingency Tables.
6. Diversity Indices.
7. Concept of ANOVA and its types.
8. Correlation Analysis: Simple correlation, multiple correlation, and Partial correlation.
9. Regression Analysis: Simple and multiple regression.
10. Generalized linear models: logistic regression, Poisson regression, Gamma regression, Inverse Gaussian regression.
11. Non-linear regression.
12. Dose Response Curves.

Recommended Texts

1. Montgomery, D. C. (2017). *Design and analysis of experiments* (9th ed). New York: John Wiley & Sons.
2. Rao, G. N. (2007). *Statistics for agricultural sciences* (2nd ed). Devon: BS Publication.

Suggested Readings

1. Lawal, B. (2014). *Applied statistical methods in agriculture, health and life sciences*. Berlin: Springer.
2. Sahu, P. K. (2016). *Applied statistics for agriculture, veterinary, fishery, dairy and allied fields*. Berlin: Springer.
3. Gbur, E. E., Stroup, W. W., McCarter, K. S., Durham, S., Young, L. J., Christman, M., West, M., & Kramer, M. (2012). *Analysis of generalized linear mixed models in the agricultural and natural resources sciences*. Wisconsin-Madison: Soil Science Society of America.

M.Sc. (Hons.) Food Science and Technology

Eligibility: The candidate must have passed any one of the following degree with at least 2.0 CGPA

- BSc (Hons) Food Science and Technology
- BSc (Hons) Agriculture (Major: Food Technology)
- BSc (Hons) Food Science and Nutrition (Major: Food Science and Technology)
- BSc (Hons) Dairy Technology (Subject to take deficiency courses as per requirement)

Duration: 02 Years Program (04 Semesters)
Degree Requirements: 30 Credit Hours (24 Credit Hours course work + 06 Credit Hours Dissertation)

Major Courses

Course Code	Course Title	Credit Hours
FSAT-7101	Food Quality Assurance Management (Compulsory)	3(3+0)
FSAT-7102	Food Additives	3(3+0)
FSAT-7103	Dairy Processing-I	3(2+1)
FSAT-7104	Meat Science	3(2+1)
FSAT-7105	Post Harvest Management	3(3+0)
FSAT-7106	Food Industrial Waste Management	3(3+0)
FSAT-7107	Food Packaging	3(2+1)
FSAT-7108	Baking Science and Technology	3(2+1)
FSAT-7109	Food Enzymology	3(3+0)
FSAT-7110	Starch Chemistry and Technology	3(3+0)
FSAT-7111	Physical Properties of Food	3(2+1)
FSAT-7112	Milling of Cereals	3(2+1)
FSAT-7113	Food Toxicology	3(3+0)
FSAT-7114	Chemistry of Edible Oils and Fats	3(2+1)
FSAT-7115	Seminar-I (Compulsory)	1(1+0)
FSAT-7116	Special Problem (Compulsory)	1(1+0)

Minor/Allied Course

STAT-7151	Statistical Methods for Agricultural Research-I (Compulsory)	3(3+0)

1. Major courses may be offered during M. Sc. (Hons.) Food Science and Technology degree program depending upon the availability of faculty and resources.
2. Other Minor/Allied courses can be taken (as per requirement) from the following departments/subjects to be offered by the respective departments in running semester/s:

- Chemistry / Biochemistry
- Agricultural Sciences
- Biological Sciences
- Animal Sciences
- Pharmacy
- Biotechnology
- Business Management

3. A student will have to complete 2/3rd credit hours from the Major courses and 1/3rd credit hours from the Minor/Allied courses.

FSAT-7101 Food Quality Assurance Management 3(3+0)

The aim of this course is to enable the students how to manage and assure the food quality. The quality management combines commitment, discipline and a growing effort by everyone involved in the production process and fundamental techniques of management and administration, with the goal of continuously improving all processes. For that, the industries need to be structured organizationally, establish policies and quality programs, measure customers' satisfaction and even use more quality tools and methodologies. Specifically for the food industry, also involves the knowledge and application of techniques and programs for product safety. This course includes various guidelines to achieve an efficient management of quality at each operational level and in every functional area of the organization and industry.

Content

1. Codex Alimentarius: Format of commodity standards.
2. Quality assurance: theoretical and practical considerations
3. Description of different systems: GMP, TQM, HACCP, ISO – 9000, 9001 and 22000 series.
4. Verification, certification and validation. WHIMS.
5. Biosecurity programs.
6. Philosophical approaches to quality assurance: Deming's, Juran's, Corsby's etc.
7. Statistical quality control techniques.
8. Sanitation and hygiene in quality assurance.
9. Quality Assurance tools
10. Instrument calibration, production line check record, laboratory analysis record.
11. Incoming material inspections,
12. certificate of analysis, training manuals and programmes
13. Internal and external audits.

Recommended texts

1. Luning, P. A., & Marcelis, W. J. (2009). *Food quality management: technological and managerial principles and practices*. Wageningen: Academic Publishers.
2. Bourlakis, M. A., & Weightman, P. W. (Eds.). (2004). *Food supply chain management*. New Jersey: Blackwell Publishers.

Suggested readings

1. Clute, M. (2008). *Food industry quality control systems*. Texas: Culinary and Hospitality Industry Publication Services.
2. Evans, J.R. (2005). *Total quality: management, organization and strategy*. New York: Westport Pub. Co.
3. Luning, P. A., Marcelis, W. J., & Jongen, W. M. (2002). *Food quality management: a techno-managerial approach*. Wageningen: Wageningen Pers.

FSAT-7102 **Food Additives** **3(3+0)**

Food additives are utilized in the preparation and processing of almost all types of food in order to give favorable attributes to the food, we eat. One of the most important developments in the food industry is the use of food additives for improving the functional properties, nutritive value, shelf life and aesthetic value of processed food products. To improve the quality of commercial food products through utilization of food additives, it is critical to have better understanding of the physical and chemical interaction of additives with the food components. The discussion of the food additives would not only provide some general knowledge of these substances, but also facilitates in better understanding of their various aspects.

Contents

1. Food additives purpose of application in food
2. Regulatory status, generally recognized as safe (GRAS)
3. Mode of action, stability & interaction with food components
4. Metabolism & carcinogenic effect, recommended doses
5. Application techniques in food, benefits & risks
6. Consumers attitude towards food additives.
7. Types of food additives: antimicrobial agents
8. Nutritional additives – vitamins and minerals
9. Antibiotics
10. Coloring agents
11. Flavoring & flavor enhancers
12. Sugar and fat substitutes
13. Acids and bases
14. Humectants, thickening agents, gel builders, stabilizers, anti-caking agents
15. Emulsifiers and sequestrants.
16. Recommended analysis techniques of various food additives in food.

Recommended texts

1. Branen, A. L., Davidson, R. M., Salminen, S., & Thorngate, J. H. (2001). *Food additives*. New York: Marcel Dekker, Inc, Madison Avenue.
2. Butt, M. S., Anjum, F. M., & Asghar, A. (2010). *Food additives: A comprehensive treatise*. Faisalabad: University of Agriculture Press.

Suggested readings

1. Michael, D., John, N. S., & Branen, A. L. (2005). *Antimicrobials in foods*. Taylor & Francis Group.
2. Anonymous. (2004). *Food chemicals codex*. Washington: Committee on Food Chemicals Codex Food and Nutrition Board, Institute of Medicine, The National Academies Press.
3. Karunaratne, D. N. (2017). *Food additives*. London: Intech Open.

FSAT-7103 Dairy Processing-I 3(2+1)

Milk is a valuable nutritious food that has a short shelf-life and requires careful handling. Milk is highly perishable because it is an excellent medium for the growth of microorganisms – particularly bacterial pathogens – that can cause spoilage and diseases in consumers. Milk processing allows the preservation of milk for days, weeks or months and helps to reduce food-borne illness. This course enables the students to understand milk constituents and milk and milk products behavior under different processing conditions. Students will be well aware of dairy industry cleaning and hygiene. They have knowledge about all unit operations involved in the preparation of non fermented dairy products and packaging material used in the dairy products. It is also helpful to understand and development of industrially important non fermented dairy food products.

Contents (Theory)

1. Physical, chemical and functional properties of milk constituents: lactose, lipids, proteins, minerals, vitamins and enzymes.
2. Milk microbiology: Sources of contamination, pathogens, spoilage organism and control.
3. Classification and composition of non-fermented dairy products.
4. Milk processing: Plant hygiene and cleaning, cream separation, standardization, bactofugation, membrane filtrations, homogenization, pasteurization, ultra pasteurization,
5. UHT treatments,
6. Evaporation,
7. Drying
8. Condensing,
9. Freezing
10. Membrane fractionation.
11. Heat induced changes in milk and milk products.
12. Milk packaging: Types of packaging and their effect on milk quality.

Contents (Practical)

1. Sampling techniques: Raw milk, processed milk. Production of pasteurized milk, ice-cream, dried milk powder and flavored milk.
2. Quality assurance and safety tests: operational, laboratory equipment, raw material, control measures.
3. Sensory and physio-chemical evaluation of pasteurized milk, UHT milk, condensed milk, dried milk powders and ice cream.
4. Microbial examination of milk and milk products: Total viable count, yeast and mold, somatic cells, coliform, Escherichia coli, Salmonella.

Recommended texts

1. Antonio, L. N., & Fernandes, D. C. (2018). *Raw milk: balance between hazards and benefits*. (1st ed.) New York: Academic Press. Elsevier Science and Technology Books.
2. Walstra, P., Wouters, J. T. M., & Guerts, T. J. (2006). *Dairy science and technology*. (2nd ed.) Florida: CRC Press, Boca Raton.

Suggested readings

1. Deeth, H. C., & Lewis, M. J. (2017). *High temperature processing of milk and milk products*. New York: John Wiley & Sons.
2. Tsakalidou, E., & Papadimitriou, K. (2016). *Non-bovine milk and milk products*. New York: Elsevier Science and Technology Books.

FSAT-7104 **Meat Science** **3(2+1)**

Meat holds an important position in human diet. Although protein form this source has lower biological value than egg albumin, it is an exclusive source of heme iron and vitamins and minerals. Fat content and fatty acid profile from this source are a constant matter of concern. Meat science is a discipline that requires a complete understanding of antemortem and postmortem factors, which affect the ultimate consumer product. This is a major course for students of post-graduate programs and planned to provide knowledge about different processing and preservation techniques used in the food industry for meat and meat products. This course provides knowledge about chemistry of the conversion of muscles into meat and also about safety and quality of meat products.

Contents (Theory)

1. Meat: Types, chemical and biochemical aspects Muscle.
2. Muscle proteins, intramuscular fat, muscle function in vivo, post-mortem glycolysis, onset of rigor mortis.
3. Factors reflected in specialized muscle function and constitution: Species, bread, sex, age, anatomical location of muscles and myofibrils.
4. Conversion of muscle to meat: pre-slaughtering handling, moisture loss, glycogen loss, stunning and bleeding, dressing and cutting.
5. Ageing of meat: Protein denaturation, proteolysis and other chemical changes.
6. Meat spoilage: Endogenous and exogenous infections.
7. Factors affecting the growth of meal spoilage microorganisms.
8. Use of Bacteriocins against meat borne pathogens.
9. Propleylaxis: Hygiene, biological control, antibiotics, ionizing radiations.

Contents (Practical)

1. Determination of chemical composition of red meat.
2. Protein profile of various meats.
3. Determination of minerals, vitamins, fatty acids and toxins.

Recommended texts

1. Karry, J., & Ledward, D. (2007). *Meat processing: improving quality*. Cambridge: Woodhead Publishing Ltd.
2. Warriss, P. (2010). *Meat science: an introductory text*. Cambridge: Woodhead Publishing Ltd.

Suggested Readings

1. Toldra, F. (2012). *Handbook of meat processing*. London: Wiley-Blackwell Publishing.
2. McCarthy, D. B. (2017). *Meat and meat processing*. New York: Nova Science.
3. Nollet, L. M. L., & Toldra, F. (2010). *Advanced technologies for meat processing*. Florida: CRC Press, Taylor & Francis Group, Boca Raton.

FSAT-7105 **Post Harvest Management** **3 (3+0)**

Fruits and vegetables play a significant role in human nutrition, especially as sources of vitamins, minerals, dietary fibre, and antioxidants. Increased consumption of a variety of fruits and vegetables on a daily basis is highly recommended because of associated health benefits, which include reduced risk of some forms of cancer, heart disease, stroke, and other chronic diseases. Both quantitative and qualitative losses occur in horticultural commodities between harvest and consumption. Post-harvest losses vary greatly across commodity types. Reduction of post-harvest losses can increase food availability to the growing world population. The course has been designed to give understanding about the Post Harvest Technology of fruits and vegetables, grains and legumes. The students will learn about different principles and techniques of preservation and processing of fruits and vegetables and grains and legumes

Contents

1. Fruits and vegetables: Structure, composition, Physiology and biochemistry.
2. Methods of harvesting, losses during harvesting, handling, transportation, packaging and storage.
3. Water losses, respiration activity.
4. Mechanical injuries.
5. Storage methods and types.
6. Grains and legumes: Harvesting, threshing and grading systems.
7. Deterioration during storage causes, loss assessment, control, mycotoxins.
8. Commodity treatments
9. Packaging.
10. Storage atmosphere role of temperate and humidity.
11. Different storage methods controlled atmosphere (CA) and modified atmosphere (MA).
12. Modified atmosphere packaging (MAP).
13. Role of temperature and humidity in storage
14. Methods of packaging and types of packaging.

Recommended texts

1 Kumar, A., Rajpurohit, V. S., & Kautish, S. (2019). *Modern techniques for agricultural disease management and crop yield prediction*. Pennsylvania: IGI Global.

2 Gonzalez-Estrada, R., Blancas-Benítez, F., Velazquez-Estrada, R. M., Montano-Leyva, B., Ramos-Guerrero, A., Aguirre-Guitron, L., & Del Angel-Cruz, J. A. (2019). *Modern fruit industry*. London: Intech Open.

Suggested readings

1. Maureen, M. (2010). *Postharvest technology for leafy vegetables a project report*. Taiwan: AVRDC - The World Vegetable Center.
2. Sharon, P. S., & Martha C. S. (2010). *Postharvest technology of horticultural crops*. Jaipur: Oxford Book Company, India.
3. Elhadi, M. Y. (2011). *Postharvest biology and technology of tropical and subtropical fruits - açai to citrus.* Vol. 2. New Delhi: Woodhead Publishing India Pvt. Ltd.

FSAT-7106 Food Industrial Waste Management 3 (3+0)

During handling and processing of food, different types of waste originated which cause disposal and environmental issues. Common methods to use food waste include animal feed, biogas production and composting. However, these waste materials are rich in bioactive compounds whose separation and utilization improve the food and ultimately health of consumer. The primary objective of research in this area is to convert byproducts of food processing operations to usable materials. This course helps to understand the green technologies to minimize the industrial waste and efficient utilization of waste produced during various food handling operation. Different experiments are under way to develop practical methods of converting fruit and vegetable processing wastes into fuels, chemicals, biological, and food ingredients.

Contents

1. Food industrial wastes: types;
2. Sources and characteristics of food processing wastes.
3. Waste disposal and physical, chemical and biological treatments.
4. BOD
5. COD
6. Bio processing in food waste treatment.
7. Management of waste by products:
8. Sugar, fruits and vegetable,
9. Meat, fish, oil and fat,
10. Dairy and cereals.
11. Recovery of materials from effluents by different systems.
12. Utilization of food industry wastes.

Recommended texts

1. Lawrence, K.W., & Wang, M. U. S. (1992). *Hand book of industrial waste treatment*. New York: Harcep Dekker, Inc.
2. Ioannis, S. A. (2008). *Waste management for the food industries*. Massachusetts: Academic Press, Elsevier Corporate Drive.

Suggested readings

1. Lawrance, K. W., Yung, T. H., & Nazih, K. S. (2010). *Handbook of advanced industrial and hazardous wastes treatment*. Florida: CRC Press, Taylor & Francis Group.
2. Riley, G. L. (2016). *Food waste: practices, management and challenges*. New York: Nova Science Pub Inc.
3. Galanakis, C. M. (2015). *Food waste recovery: processing technologies and industrial techniques*. New York: Elsevier Academic Press.

FSAT-7107 **Food Packaging** **3(2+1)**

Food packaging is considered as a combination of art, science and technology that is used in the transportation and selling of foods. The primary role of packaging is to protect food products from the outside environment and from damage by abrasion, to contain the food, and to provide consumers with information about ingredients and nutrition. The main requirement of food packaging is to maintain the safety, wholesomeness and quality of food. This course has been designed to give understanding about the food packaging type, material, labeling. The students will learn about requirements and basics of food packaging for different types of food and selection of suitable material for packaging of particular food.

Contents (Theory)

1. Introduction to Food Packaging,
2. Types of packaging materials.
3. Shelf life of foods.
4. Aseptic Packaging of foods.
5. Packaging of microwaveable foods.
6. Active and Intelligent Packaging.
7. Modified atmosphere packaging.
8. Packaging of flesh foods.
9. Packaging of horticultural products.
10. Packaging of dairy products.
11. Packaging of cereals, snack foods and confectionary.
12. Packaging of beverages.
13. Packaging of ready to eat foods.
14. Labels and labeling.
15. Test Procedures for packaging materials and packaged products.
16. Safety and legislative aspects of food Packaging

Contents (Practical)

1. Selection of packaging material for specific foods,
2. Study of shelf life of different foods in various packaging materials, comparison of different packaging.
3. Materials for quality, migration of hazardous chemicals from packaging material to foods.
4. Package integrity checks.
5. Testing of packaging materials and packages.

Recommended texts

1 Robertson, G. L. (2016). *Food packaging: principles and practice*. London: CRC press.
2 Lee, D. S., Yam, K. M., & Piergiovanni L. (2008). *Food packaging science and technology*. London: CRC Press, Taylor & Francis Group.

Suggested readings

1. Katan, L. L. (Ed.). (1996). *Migration from food contact materials*. London: Blackie Academic & Professional.
2. Ahvenainen, R. (Ed.). (2003). *Novel food packaging techniques*. Amsterdam: Elsevier.

FSAT-7108 Baking Science and Technology 3(2+1)

Baking is a method of preparing food that uses dry heat, normally in oven. The most common baked item is bread. Heat is gradually transferred form the surface of cakes, cookies and breads to the center and transforms batters and dough into baked goods. The course will focus on making students understand the basics of baking science, baking procedures and role of different ingredients in bakery products manufacturing. The complete bread making and other bakery products manufacturing procedures are integral part of this course. It hopes that by the end of this course students will have a complete knowledge about baked products.

Contents (Theory)

1. Wheat flour: components and functions.
2. Shortenings: Types, functions, sources and mechanisms.
3. Yeast: Types, functions, factors influencing fermentation and other minor ingredients.
4. Bread types and formulations. Bread making processes, Mixing and dough processing
5. Baking process: Stages, baking reactions,
6. Bread packaging and storage. Bread spoilage and staling, factors and control measures.
7. Biscuits, cookies, and crackers: Ingredients and their functions, wheat flour, chlorine treatment of flour, granulation, shortening, sweeteners.
8. Types of leavening agents.
9. Preparation of biscuit dough. Biscuit baking, heat transfer mechanism, changes during baking.
10. Cooling, packaging and storage.
11. Cakes: Varieties, ingredients and functions. Wafers: Ingredients and functions:
12. Miscellaneous products: Flat bread technology. Frozen dough products, pizza. Pastry, doughnut and Muffins

Contents (Practical)

1. Bread baking: effects of water absorption and dough mixing time
2. Variations in fermentation and proofing time.
3. Effects of shortenings, emulsifier, amylases and sweeteners on bread.
4. Comparison of various dough making procedures. Preparation and evaluation of flat breads i.e. chapattis and naans etc.
5. Visit of processing plant. Biscuits and cakes: Preparation and sensory evaluation of variety breads, cakes, cookies and wafers, pastry and cake icing.
6. Preparation of wafers, pizza and doughnuts.
7. Baking powder preparation by using different ingredients..

Recommended texts

1. Joshi, V. K. (2015). *Indigenous fermented foods of South Asia*. London: CRC press, Taylor and Francis Group.
2. Figoni, P. (2011). *How baking works*. (3rd ed.). New Jersey: John Wiley & Sons.

Suggested readings

1. Hui, Y. H., Corke, H., Leyn, I. D., & Cross, N. (2006). *Bakery product science and technology*. London: Blackwell Pub. Co.
2. Khetarpaul, N., Grewal, R. B., & Jood, S. (2005). *Bakery science and cereal technology*. New Delhi: Daya Pub. House.
3. Cauvain, S. P. (2003). *Bread making, improving quality*. Cambridge: CRC Press.

FSAT-7109 **Food Enzymology** **3(3+0)**

Enzyme, a substance that acts as a catalyst in living organisms, regulating the rate at which chemical reactions proceed without itself being altered in the process. The integration of enzymes in food processes is a well-established approach, but research efforts are consistently being made as to make this application of biological agents more effective and/or diversified. Enzymes are used in baking, beverages and brewing, dairy, dietary supplements as well as fats and oils. The course has been designed to give basic understanding about the enzymes and their applications in food systems. The students will learn about requirements and procedures for application of enzymes in food product development, sources, production, isolation and purification of enzymes.

Contents

1. Enzymes: Nomenclature
2. Classification of enzymes.
3. Enzyme classes:
4. Proteases, amylases,
5. Cellulases, tranasferases,
6. Hydrolases, isomerases,
7. Lipases, redox enzymes.
8. Natural Sources of enzymes.
9. Enzyme kinetics and inhibition.
10. Enzyme immobilization and methods
11. Enzyme reactions.
12. Analysis of enzyme activity.
13. Separation, purification and assay of enzymes.
14. Enzyme supplementations
15. Regulation for enzyme supplementations
16. Therapeutic enzyme
17. Application of enzymes:
18. Baking, brewing, starch hydrolysis,
19. Dairy, beverages, fruit juice processing, meat, fat and others

Recommended texts

1. Whitaker, J. R. (2018). *Principles of enzymology for the food sciences*. New York: Routledge.
2. Whitaker, J. R., Voragen, A. G. J., & Wong, D. W. S. (2003). *Handbook of food enzymology*. New York: Marcel Dekker, Inc.

Suggested readings

1. Mathewson, P. R. (1998). *Enzymes*. USA: Minnesota: American Association of Cereal Chemists, Inc.
2. Whitehurst, J., & Law, B. A. (2002). *Enzymes in food technology*. Florida: CRC Press.
3. Whitaker, J. R. (1993). *Principles of enzymology for the food sciences.* Florida: CRC Press.

FSAT-7110 Starch Chemistry and Technology 3(3+0)

Starch is a polymeric carbohydrate consisting of numerous glucose units joined by glycosidic bonds. This polysaccharide is produced by most green plants as energy storage. It is the most common carbohydrate in human diet and is contained in large amounts in staple foods like potatoes, maize, rice, cassava as well as wheat. In food processing industry, food starches are used as thickeners and stabilizers in foods. In this course, the students would be able to acquire knowledge of Starch sources, its structure and functionality. Familiarise the students with starch properties and application of starch as an ingredients in the manufacturing of variety of food products along with the nutritional value of starch and its impact on human health.

Contents

1. Starch: Structure
2. Functionality of starch.
3. Sources: Cereal, root and tuber starches.
4. Starch properties: Physical, functional & thermal properties, viscoamylography, gelatinization, starch swelling.
5. Starch pastes, retro gradation and starch films.
6. Modification: Pregelatinization, acid modification, oxidation, cross linking, acetylation, esterification.
7. Multiple and genetic modifications.
8. Applications; as an ingredient, in product development.
9. Starch and health.
10. Physical performance
11. Nutritional fractions
12. Resistant starches.

Recommended texts

1. Bertolini, A. C. (2009). *Starches characterizations, properties and application*. Florida: CRC Press.
2. Eliasson, A. C. (2004). *Starch in food; structure, function and application*. Cambridge: Woodhead Pub., Ltd.

Suggested readings

1 Thomas, D. J., & Atwell, W. A. (1999). *Starches*. Minnesota: American Association of Cereal Chemists, Inc., St. Paul.

2 Geirwyr, S. J. (1995). *Analytical chemistry of food*. Glasgow: Chapman and Hall.

3 Eliasson, A. C. (2004). *Starch in food: structure, function and application*. Florida: CRC Press.

FSAT-7111 **Physical Properties of Food** **3(2+1)**

The objective of the course is to understand the rheological, thermal and electromagnetic properties of foods and their measurement in multiple horticulture products. Physical properties of food are aspects such as colour, structure, texture, rheology and interfacial properties, and composition. Understanding the physical properties of foods is important as they are used in process design, product and process optimization, product development, food quality control and food process modeling. Various food processing technologies can potentially alter the physical properties of food constituents and cause desirable or sometimes not so desirable changes in the nutritional profile, texture, color, taste, aroma, appearance, and other quality attributes. Therefore, it is important to investigate the physical and the impacted chemical properties of foods to gain insights into how they affect the quality attributes.

Contents (Theory)

1. Physical properties of foods: Relation to other food properties.
2. Optical, thermal, electrical, mechanical properties
3. Physical properties and texture of muscle foods,
4. Measurement of physical properties of muscle foods,
5. Properties of horticultural products
6. Properties of baked foods
7. Rheology of emulsions and dispersions
8. Behavior of colloids
9. Evaluation of rheological properties.
10. Rheological properties of cereals
11. Rheological properties of proteins and carbohydrates.
12. Application in cereal industry.
13. Electron microscopy: Principles, scanning, transition.
14. Calorimetry: Physical properties of colors,
15. Physiological basis of colors,
16. Calorimetry.

Contents (Practical)

1. Determination of viscosities, Specific gravity of oils, organic solvents and solutions.
2. Determination of conductivities of different foods. Use of colorimeters and spectrophotometers for determination of optical properties of foods.
3. Measurement of food textures and rheological properties

Recommended texts

1. Sahin, S., & Sumnu, S. G. (2006). *Physical properties of foods*. Berlin: Springer Science & Business Media.
2. Arana, I. (2012). *Physical properties of foods; novel measurement techniques and applications.* Florida: CRC press.

Suggested readings

1. Ibarz, A., & Barbosa-Canovas, G. V. (2014). *Introduction to food process engineering*. Florida: CRC Press.
2. Heldman, D. R., Lund, D. B., & Sabliov, C. (Eds.) (2018). *Handbook of food engineering*. Florida: CRC press.
3. Walstra, P. (2003). *Physical chemistry of foods*. New York: Marcel Dekkar Inc.

FSAT-7112 **Milling of Cereals** **3(2+1)**

Cereal processing is complex. The principal procedure is milling-that is, the grinding of the grain so that it can be easily cooked and rendered into an attractive food stuff. Cereals usually are not eaten raw, but different kinds of milling (dry and wet) are employed, depending on the cereal itself and on the eating customs of consumer. In this course, the students would be able to acquire knowledge of wheat milling and types of flour mills. Familiarise the students with operation of flour mill and grinding process. This course also deals with the wheat storage and separation techniques of impurities prior to wheat milling. Recent developments in wheat milling technologies is also a part of this course.

Contents (Theory)

1. Wheat milling: Types of mills, handling, storage, blending, cleaning, tempering and conditioning.
2. Wheat impurities separation: Principles, methods and equipment.
3. Grinding process: Types of grinding machines, different extraction rates of flour. Operations of roller mill.
4. Grinding systems: Break, reduction and tailings.
5. Sieving process: Principles and types of sifters. Purification process.
6. Flour handling and storage.
7. Mill‘s wheat-cleaning system.
8. Air classification and fine grinding.
9. Whole wheat products.
10. Milling of soft and durum wheat.
11. Wet milling of corn: Production of starch, oil, gluten.
12. Milling of rice.
13. Recent developments in commercial milling.

Contents (Practical)

1. Test weight and kernel hardness measurement.
2. Effect of tempering time and moisture content on flour yield.
3. Experimental milling. Flour mill stream analysis: color, moisture, protein, ash, pH and particle size.
4. Flour performance test; farinograph, mixograph and amylograph.
5. Gluten washing tests, alkaline water retention capacity, pelshenke value and SDS sedimentation test.

Recommended texts

1. NIR. (2017). *Handbook on drying, milling and production of cereal foods*. (2nd ed.) New Delhi: Asia Pacific Business Press.
2. Ponser, E. S., & Hibbs, A. N. (2005). *Wheat flour milling*. Minnesota: American Association of Cereal Chemists.

Suggested readings

1. AACC. (2019). *Approved methods of American Association of Cereal Chemists*. Minnesota: American Association of Cereal Chemists Inc, St. Paul.
2. Khan, K., & Shewry, P. R. (2009). *Wheat: chemistry and technology*. Minnesota: American Association of Cereal Chemists Inc., St. Paul.
3. Awika, J., Piironem, V., & Bean, S. (2012). *Advances in cereal science: implications to food processing and health promotion.* New York: American Chemical Society.

FSAT-7113 **Food Toxicology** **3 (3+0)**

Food toxicology is concerned with assessing the injurious effects on living systems of chemicals present in foods. The chemical agents can be man-made (e.g., pesticide residues, food additives, contaminants originating with processing machinery, or packaging materials) or of natural origin (e.g., microbial, animal or plant toxins). They can, also be generated in the course of preparing, processing, and preserving foods (e.g., mutagens and carcinogens). It is important that students of food science as well as environmental toxicology are familiar with the basic chemical and biological aspects of the injurious substances present in foods. In this course, students would be able learn the toxicity caused by various foods and processing techniques as well as packaging and storage. The aim and objective of the course is to make the students learn about the toxicity of food products and processing.

Contents

1. Food toxicology: Overview
2. Intrinsic and extraneous toxins.
3. Principles, types, branches.
4. Toxicity: curve, factors influencing potency
5. Margin of safety
6. Factors influencing toxicity.
7. Dose-response relationship
8. Manifestation of organ toxicity.
9. Measurement of toxicants and toxicity.
10. Toxicokinetics: carcinogenesis, mutagenesis, teratogensis
11. Chemical carcinogenesis:
12. Initiation, promotion, progression, angiogenesis.
13. Manifestation of organ toxicity.
14. Toxicants in the body:
15. Absorption, distribution,
16. Translocation, biotransformation, excretion.
17. Detoxification mechanisms.
18. Wholesomeness of processed foods: heat processed foods
19. Wholesomeness of processed foods: irradiated foods
20. Wholesomeness of processed foods: genetically modified foods.

Recommended texts

1. Awan, J. A., & Anjum, F. M. (2010). *Food toxicology*. Faisalabad: Unitech Communications.
2. Helferich, W., & Winter, C. K. (2000). *Food toxicology*. Cambridge: Woodhead Publishing Ltd.

Suggested readings

1. Sharma, P. D. (1997). *Toxicology*. Meerut: Rastogi Pub. Co., India
2. Shibamoto, T., Taylor S., & Bjeldanes, L. (1993). *Introduction to food toxicology*. London: Academic Press.
3. Lu, F. C., & Kacew, S. (2002). *Lu's basic toxicology*. (4th ed.) New York: Taylor and Frances Inc.

FSAT-7114 Chemistry of Edible Oils and Fats 3(2+1)

Oils and fats have similar composition, but oils are liquid at room temperature and fats are partially solid. They both contain esters derived from propane-1,2,3-triol (glycerol) and carboxylic acids, known as triglycerides. In the body, fats provide a concentrated energy source and are broken down and modified to supply the carboxylic acids necessary for health. Fats also act as carriers for the vitamins A, D, E and K. The fatty acids found in natural fats are generally straight chain compounds and can be saturated or unsaturated. Present course is designed to acquaint the student about various chemical and physical properties of oils and fats, their classification, extraction methods, refining, hardening, trans esterification and the effects of chemical interactions on properties of the oil and fats

Contents (Theory)

1. Introduction, history of triglyceride analysis, triglycerides types, nomenclature and possible applications.
2. Extraction, isolation and fatty acid analysis (Methyl ester preparation, column, identification of peaks, quantization etc.).
3. Preparation of chemical derivation reactions at double bond (hydrogenation, permanganate oxidation, ozonization, bromination, mercurationetc) reactions at ester linkages, hydroxy, epoxy and keto groups, silver ion adsorption chromatography,
4. TLC
5. Column chromatography and application
6. GLC
7. Fractional crystallization.
8. Distribution theories of fatty acid in natural triglyceride mixtures.

Contents (Practical)

1. Extraction of lipids, isolation of triglycerides by column chromatography, Florisil/ salicylic acids, TLC.
2. Fatty acid analysis by GLC
3. Methyl ester preparation.
4. Catalytic hydrogenation, permagnate oxidation, ozonization, epoxidation, bromination etc.
5. Silver ion adsorption chromatography.

Recommended texts

1. Akoh, C. C., & Min, D. B. (Eds.) (2008). *Food lipids; chemistry, nutrition and biotechnology*. New York: CRC Press.
2. AOCS. (1998). *Official methods and recommended practices of AOCS*. (5th ed.) Illinions: American Oil Chemists Society.

Suggested readings

1. Nilelsen, S. S. (1994). *Introduction to the chemical analysis of foods*. London: Jones and Bartlett Pub. Inc.
2. NIIR BOARD. (1990). *Modern technology of oil, fats and its derivatives*. New Delhi: Asia Pacific Business Press Inc.
3. Perkins, E. G. (1993). *Analysis of fats, oils and derivatives*. Champaign: AOCS Press.

FSAT-7115 **Seminar-I** **1(1+0)**

The seminar is intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to submit written documentation supporting that seminar. A seminar is a form of academic instruction, either at an academic institution or offered by a commercial or professional organization. It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to participate. Seminars provide a chance to interact with experts from the specific field. Discussing about the relevant topics of the particular subject, students tend to learn about the latest information and new skills related to the concerned subject. Seminars are important and beneficial for those who have difficulty learning in a typical classroom setting where reading and writing are required. There is often a sense of friendship associated with seminar attendance, because everyone is attending with a like interest in learning about a subject important to them. Attending a seminar has numerous benefits, including improving communication skills, gaining expert knowledge, networking with others and renewing motivation and confidence.

Contents

1. The respective supervisor will assign the topic and the seminar evaluation committee will evaluate for result.

FSAT-7116 **Special Problem** **1(1+0)**

The special problem is intended to instruct students on proper techniques for scientific research and methodologies. The students are expected to prepare directed assignment and collect information and material related to current research interest. Special problem means an assignment that is expected to be temporary and is designated as a special assignment by the academic supervisor in its sole discretion. The main purpose of special problem is to increase the learning capabilities of students. The more we use our brains, the more they develop. Students learn a lot more when they read or practice something by themselves. Similarly, the purpose of assignments is to increase the practical skills of students. The main objectives of special problem assigned to students are: to enhance the knowledge of a subject, helps to develop writing skills and to enhance time management and organizing skills. It enhances your planning and organizing skills: The special problem make you do your work by prioritizing the needs and time frames. It helps you in completing all your tasks very peacefully instead of creating any panic. Special problem writing work gives students a lot of scopes to improve themselves.

Contents

1. The respective supervisor will assign the topic and evaluate for result.

STAT-7151 Statistical Methods for Agricultural Research-I 3(3+0)

This course designed for MSc (Hons)/MPhil programs of agriculture sciences. This course provides the applied statistics background for survey and experimental work in Agriculture. Case studies and critical examples are used to work through commonly experienced research problems (from sampling designs to the ethical consideration) and to explain how they may be approached, solved or prevented with statistical means. The importance of statistical science in agriculture is obvious, where the collection, analysis and interpretation of numerical data are concerned. Statistical principles apply in all areas of experimental work and they have a very important role in agricultural experiments. Statistics plays an important role in experimentation. While many scientific problems could be solved by different statistical procedures. Furthermore, some statistical softwares knowledge will be provided to the students to improve their analytical skills. These activities are further supports the student's research.

Contents

1. Importance of Statistics in agriculture research.
2. Selection of statistical tools based on scale of measurements.
3. Analysis of Count and Frequency data.
4. Measures of central tendency and dispersion.
5. Some concepts of hypothesis testing. T, Z, Chi-square and F tests. Contingency Tables.
6. Diversity Indices.
7. Concept of ANOVA and its types.
8. Correlation Analysis: Simple correlation, multiple correlation, and Partial correlation.
9. Regression Analysis: Simple and multiple regression.
10. Generalized linear models: logistic regression, Poisson regression, Gamma regression, Inverse Gaussian regression.
11. Non-linear regression.
12. Dose Response Curves.

Recommended Texts

1. Montgomery, D. C. (2017). *Design and analysis of experiments* (9th ed). New York: John Wiley & Sons.
2. Rao, G. N. (2007). *Statistics for agricultural sciences* (2nd ed). Devon: BS Publication.

Suggested Readings

1. Lawal, B. (2014). *Applied statistical methods in agriculture, health and life sciences*. Berlin: Springer.
2. Sahu, P. K. (2016). *Applied statistics for agriculture, veterinary, fishery, dairy and allied fields*. Berlin: Springer.
3. Gbur, E. E., Stroup, W. W., McCarter, K. S., Durham, S., Young, L. J., Christman, M., West, M., & Kramer, M. (2012). *Analysis of generalized linear mixed models in the agricultural and natural resources sciences*. Wisconsin-Madison: Soil Science Society of America.

PhD Food Science and Technology

Eligibility: The candidate must have passed any one of the following degree with at least 3.0 CGPA

- MS / MSc (Hons) Food Science and Technology
- MSc (Hons) Food Technology
- MSc (Hons) Dairy Technology (Subject to take deficiency courses as per requirement)

Duration: 03-05 Years Program (06-10 Semesters)
Degree Requirements: 18 Credit Hours course work + Dissertation

Major Courses

Course Code	Course Title	Credit Hours
FSAT-8101	Recent Advances in Food Science and Technology (Compulsory)	3(3+0)
FSAT-8102	Advanced Food Chemistry	3(2+1)
FSAT-8103	Industrial Processing Technology of Edible Oils and Fats Products	3(2+1)
FSAT-8104	Advanced Food Biotechnology	3(2+1)
FSAT-8105	Dairy Processing-II	3(2+1)
FSAT-8106	Technology of Processed Meat	3(2+1)
FSAT-8107	Advanced Food Microbiology	3(2+1)
FSAT-8108	Advanced Beverage Technology	3(2+1)
FSAT-8109	Seminar-I (Compulsory)	1(1+0)
FSAT-8110	Seminar-II (Compulsory)	1(1+0)
FSAT-8111	Special Problem (Compulsory)	1(1+0)

Minor/Allied Course

STAT-8131	Statistical Methods for Agricultural Research-II (Compulsory)	3(3+0)

1. Major courses may be offered during PhD Food Science and Technology degree program depending upon the availability of faculty and resources.
2. Other Minor/Allied courses can be taken (as per requirement) from the following departments/subjects to be offered by the respective departments in running semester/s:

- Chemistry / Biochemistry
- Agricultural Sciences
- Biological Sciences
- Animal Sciences
- Pharmacy
- Biotechnology
- Business Management

3. A student will have to complete 2/3rd credit hours from the Major courses and 1/3rd credit hours from the Minor/Allied courses.

FSAT-8101 Recent Advances in Food Science and Technology 3(3+0)

This course is advance level course offered to Ph. D Food Science and Technology students. The course will focus on making students understand the recent advances taking place in the field of food science and technology worldwide. Recent advances in the major fields of food sciences like dairy, meat, baking; cereals will be discussed in this course. This course will also deals with the latest food analysis techniques and latest food safety and nutritional issues will come under discussion. Most important part of this course is the discussion about recent news in the field food science and technology across the world.

Contents

1. Functional foods
2. Genetically modified foods
3. Organic foods: Safety, nutrition, legislation.
4. Emerging technologies: Fats and oils, cereals, dairy, beverage, fruits and vegetables and meat industry.
5. Emerging food safety issues.
6. Supercritical fluid extraction,
7. Biofortification,
8. Nanotechnology: concept and applications,
9. Novel ideas in food packaging,
10. High pressure processing, OHMIC heating,
11. Membrane processing.
12. Extrusion technology.
13. Modern quality standards like ISO-22000.
14. New tools in food analysis: HPLC, electrophoresis, FTIR,
15. Mass spectrometry and coupling techniques like GC-MS, LC-MS.
16. Recent news in food science and technology.

Recommended texts

1. Jia, J., Liu, D., & Haile, M. (2019). *Advances in food processing technology*. Singapore: Springer Nature.
2. Visakh, P. M., Laura, B. I., & Ribotta, P. D. (2013). *Advances in food science and nutrition*, Vol. 2. New Jersey: Wiley Pub. Co Hoboken.

Suggested readings

1. Otles, S. (2009). *Handbook of food analysis instruments*. New York: CRC Press.
2. Sun, D. W. (2005). *Emerging technologies for food processing*. New York: Elsevier Academic Press.
3. Haghi, A. K. (2012). *Advances in food science and technology*. New York: Nova Science Publishers.

FSAT-8102 **Advanced Food Chemistry** **3(2+1)**

The course will deal with the chemistry of the principal components of foods, their properties and interactions, and the changes that occur during processing, storage, and utilization. Emphasis will be on evidence derived from original research literature, interpretation of research findings, and problem solving based on the scientific principles of food chemistry. The objectives of this course are to provide an understanding of the chemical function and properties of major food components, to provide an understanding of the chemical interactions of food components and their effects on sensory and nutritional quality, functional properties, and safety of foods, to provide an understanding of the chemical basis of food preservation and the effects of processing and storage on food quality, to familiarize the student with common analytical and experimental methods used in the study of the major food components and to examine the basis of food chemistry-related issues in food safety, regulation and current events.

Contents (Theory)

1. Carbohydrates: Nomenclature, classification, structure.
2. Sugars: properties, functions in food, structural and functional changes during processing.
3. Polysaccharides: Starch - structure, properties, gelatinization, retrogradation.
4. Cellulose/Pectins/Gums - structure, properties, industrial uses.
5. Proteins: Amino acids - structure, Classification and functional properties of proteins.
6. Denaturation. Lipids: Classification, reactions of industrial importance, hydrogenation, halogenation, saponification, trans-esterifications.
7. Rancidity: Oxidative and hydrolytic. Vitamins: Structure, sources, functions.
8. Sensitivity to processing conditions.
9. Flavors and aroma compounds: Carbonyl compounds, phenols, alcohol, esters, terpenes and their interactions with other food constituents, synthetic and natural aroma compounds.
10. Food Contaminants: Toxic trace elements, Toxic compounds of microbial origin, Pesticides, Veterinary medicines and feed additives,
11. Polychlorinated biphenyls.

Contents (Practical)

1. Isolation and extraction of different food components.
2. Titrametric determination of sugars, vitamin C, Iodine etc.
3. Separation of natural food colors.
4. Extraction of pectin from fruit waste.
5. Estimation of starch, cholesterol, total dietary fiber, glucose, pigments etc.

Recommended texts

1. Belitz, H. D., Groschm, W., & Schieberle, P. (2009). *Food chemistry*. Heidelberg: Springer Verlag.
2. Damodaran, S., Parkin, K. L., & Fennema, O. R. (2008). *Fennema's food chemistry*. Florida: CRC Press, Taylor & Francis Group, Boca Raton.

Suggested readings

1. Velisek, J. (2014). *The chemistry of food*. New York: John Wiley & Sons Inc.
2. Cheung, P. C. K., & Mehta, B. M. (2015). *Handbook of food chemistry*. Heidelberg: Springer-Verlag GmbH Berlin.

FSAT-8103 Industrial Processing Technology of Edible Oils and Fats Products 3(2+1)

This course is designed to address the technical aspects of oils and fats industry to students. Most fats and oils used in the foods industry are refined, bleached, and deodorized to remove contaminants and make them palatable and shelf stable. The main methods for extraction of edible oil from oilseeds are solvent extraction and mechanical pressing. The method of extraction will depend on the amount of oil present in the seed and on the volumes and yields of oil produced. Once the oil is separated and extracted from the seed it is susceptible to several chemical changes, some of them are undesired and others are part of the refining processing steps. Examples of these include: hydrolysis, oxidation, saponification, hydrogenation, and inter-esterification.

Contents (Theory)

1. Edible oils and fats; natural sources.
2. Oil extraction: Rendering process, mechanical expression, solvent extraction.
3. Production of hydrogenated oils.
4. Refining, bleaching hydrogenation and deodorization operations.
5. Specifications of vegetable ghee.
6. Production of salad and cooking oils
7. Margarine and butter
8. Food dressings, toppings, coatings and shortenings.
9. Production and characterization of specialty oils
10. Quality control in oils and fats processing.

Contents (Practical)

1. Oil extraction
2. Refining and bleaching
3. Hydrogenation and deodorization.
4. Preparation of different fat products: butter, margarine, dressings, toppings etc.
5. Visits to various oil processing plants and quality control laboratories.

Recommended texts

1. Fereidoon, S. (Ed). (2005). *Edible oil and fat products: application technology*, Vol. 4. New Jersey: John Wiley and Sons.
2. Hamm, W., & Hamilton, R. J. (2000). *Edible oil processing*. Florida: CRC Press, Boca Raton.

Suggested readings

1. Lawson, H. (1995). *Food oils and fats: technology, utilization and nutrition*. New York: Chapman and Hall.
2. O'Brein, R. D. (2004). *Fats and oils. formulating and processing for applications* (2nd ed.). London: CRC Press.
3. Hernandez, E. M., & Eldin, A. K. (2013). *Processing and nutrition of fats and oils*. New Jersey: IFT Press. Wiley Blackwell.

FSAT-8104 Advanced Food Biotechnology 3(2+1)

The course will deliver advanced knowledge on the principles of food fermentation and enzyme technology. Specific processes related to food raw materials and food bioprocessing will be described. The course will describe benefits that food biotechnology can bring during food manufacturing. It will be helpful for students to understand the development in industrially important fermented food products. Student will have knowledge about recent trends in food biotechnology. This course also enables the students to comprehend culturing techniques and preservation of industrially important microorganisms. They also have comprehension about industrial fermentations including bacteria, molds and yeast based fermented food products. Students will also be well aware of legal and social aspects of food biotechnology.

Contents (Theory)

1. Food Biotechnology: Introduction, importance, recent advances and trends, techniques and applications.
2. Fermentation: Types, equipment.
3. Factors affecting the fermentation
4. Control of fermentation conditions.
5. Fermentation kinetics, stoichiometry, bioreactors.
6. Solid state bioprocessing and transformation.
7. Yeast based products: Alcoholic beverages, industrial alcohols, baker yeast, bread and related products.
8. Bacteria based fermented products, dairy, meat and fish, vegetable, vinegar and organic acids, bacterial biomass.
9. Mold based products.
10. Other microbial based products: Enzymes, sweeteners, flavors, amino acids and vitamins.
11. Food Safety: Safety evaluation of novel food products, genetically modified foods.

Contents (Practical)

1. Isolation, purification and maintenance of yeast and bacterial cultures
2. Aerobic and anaerobic fermentation.
3. Production of various fermented food products.
4. Production of metabolites and enzymes
5. Enzymes purification.

Recommended texts

1. Rai, R. (2016). *Advances in food biotechnology*. London: Wiley-Blackwell.
2. Capuccino, J. G., & Sherman, N. (1996). *Microbiology and laboratory manual*. New York: The Benjamin Cummings Pub. Co.

Suggested readings

1. Venema, K., & Carmo, A. P. (2015). *Probiotics and prebiotics: current research and future trends*. Norfolk: Caister academic press.
2. Ray , R. C., & Didier, M. (2017). *Fermented foods, Part II: technological interventions*. Florida: CRC Press, Talor and Francis Group.
3. Lee, B. H. (2015). *Fundamentals of food biotechnology*. New Jersey: Wiley Blackwell Publishers.

FSAT-8105 **Dairy Processing-II** **3(2+1)**

The course is designed for students to learn the main advanced dairy technologies applied to milk processing. Developing a critical analysis concerning the innovative dairy technologies from a legal point of view. The course provides the student with useful tools for the evaluation of the effect of advanced dairy technologies on end products. The course also provides the student with useful tools for the evaluation of the effect of processing on the functionality and the technological properties of dairy products. This course enables the students to understand about production, microbiological aspects, physical, chemical defects and economic importance of fermented milk products. Students will be well aware of probiotics, prebiotics. They have knowledge about all unit operations involved in the preparation of fermented dairy products and packaging material used in the dairy products. It is also helpful to understand and development of industrially important fermented dairy food products.

Contents (Theory)

1. Fermented milk products: production and economic importance.
2. Microbiology of raw and processed milk.
3. Starter cultures and incubation temperatures, schematic ways of fabrications and processing technologies used for yoghurt, butter, kefir, acidophilus milk and cheese production.
4. Compositional and physico-chemical changes occur in milk during manufacturing of fermented dairy products. Rheological parameters,
5. Microstructural properties and organoleptic scores of products.
6. Chemistry of fermentation and flavor development.
7. Physical defects, causes and remedies in fermented products.
8. Microbiological hazards and pattern of spoilage.
9. Factors affecting shelf life of milk and milk products.
10. Utilization of by products for standardisation: native casein micelles, whey and butter milk.
11. Packaging of fermented products.

Contents (Practical)

1. Preparation of fermented milk products: yoghurt, cheese, butter and therapeutic milk.
2. Compositional, physico-chemical, microbial.
3. Microstructural, rheological and sensory evaluation of fermented milk product.
4. Identification of defects in cheese and yoghurt and their solutions like whey separation.

Recommended texts

1. Puniya, A. K. (2015). *Fermented milk and dairy products*. (1st ed.) Florida: CRC Press, Taylor and Francis Group.
2. Montel, D., & Ramesh, C. R. (2016). *Fermented foods*, *Part I: biochemistry and biotechnology.* (1st ed.) London: CRC Press, Taylor and Francis Group.

Suggested readings

1. Osman, E., & Bozoglu, T. F. (2016). *Food microbiology: principles into practice*. New Jersey: John Wiley & Sons, Ltd.
2. Barbaros, O., & Gulsun, A. E. (2014). *Dairy microbiology and biochemistry: recent developments*. London: CRC Press, Taylor and Francis Group.
3. Ray, R. C., & Didier, M. (2017). *Fermented foods, Part II: technological interventions.* (1st ed.) London: CRC Press, Taylor and Francis Group.

FSAT-8106 Technology of Processed Meat 3(2+1)

This course is planned to provide knowledge about different technologies for processing of meat into meat products with product safety and quality and to familiarize the students with various operations adopted for meat preparation. This course also introduce the students with various treatments given to meat for the preparation of safe and quality meat products and utilization of various by-products obtained during processing of meat. The objectives are to familiarize the students with basic principles and technological procedures of meat processing, provide the students with an insight on the meat industry history and origin, familiarize the students with fundamental procedures in curing and smoking meats and provide students with food safety procedures for meat and meat products. After completing the course, students will be able to understand the principles and concepts of processing meat and meat products, the principles of harvesting beef, sheep, and goat for human consumption and safe handling of meat.

Contents (Theory)

1. Meat: Handling,
2. Transportation and storage.
3. Curing of meat: Curing ingredients
4. Curing of meat: methods.
5. Meat smoking: Purpose, production, deposition of smoke on meats,
6. Methods of smoking, liquid smoke preparation and its application.
7. Meat cookery & cooked meat products.
8. Meat cooking: Sausages, classification, fermented meat products, sausage formulations, casings, extruders & additives.
9. Herbs, spices & condiments in processed meats.
10. Types of cured & smoked meats.
11. Reduced &low fat meat products.
12. Canned meat formulations, restructured meat products: procedures, raw materials & formulations.
13. Development of functional meat products.
14. Cold storage, food freezing of meat.
15. Quality control and sanitation. Sensory analysis of meat
16. New developments in decontaminating raw meat.

Contents (Practical)

1. Local meat products and cookery: Beef stews, chili, sausages, meat balls with gravy, sliced dried beef, potted meat, smoked meat & other meat products, restructured meat products.
2. Visits to the meat industries.

Recommended texts

1. Singh, V. P. (2015). *Principles of meat technology.* (2nd ed.) New Delhi: NIPA Publishers.
2. El-Din, A., & Bekhit, A. (2017). *Advances in meat processing technology*. London: CRC Press.

Suggested readings

1. Karry, J., & Ledward, D. (2007). *Meat processing: improving quality*. Cambridge: Woodhead Publishing Ltd.
2. Hui, Y. H. (2012). *Handbook of meat and meat processing*. London: CRC Press.
3. McCarthy, D. B. (2017). *Meat and meat processing*. New York: Nova Science.

FSAT-8107 Advanced Food Microbiology 3(2+1)

This course is about the recent advances in the field of food microbiology. This course is helpful for the students to apply recent techniques for the identification and isolation of industrially important microbes. This course aims to provide advance information regarding principles of food microbiology. Hands on practical complimented with an industry-based project, give a real-world perspective to microbiological challenges faced by the food industry. The course covers the biology and epidemiology of food- and water-borne microorganisms of public health significance; the microbiology of food preservation and food commodities; principles and methods for the microbiological examination of foods and microbiological quality control. After the completion of the course the student will have knowledge about general concept of microbiology. Awareness and identification of important microorganisms in food and techniques employed for microbial analyses of foods and isolation and identification of microorganisms.

Contents (Theory)

1. Food microbiology: Advances and trends.
2. Physiology and biochemistry of food borne micro-organisms,
3. Microbial metabolism and genetics.
4. Culture Types: Collection and maintenance.
5. Detection of microorganisms in foods: Principles and techniques,
6. Rapid methods vs. conventional methods,
7. Estimation of microbial toxins, metabolites,
8. Inhibitory substances and pathogens.
9. Differentiation of bacterial strains by electrophoretic protein profiles.
10. Probiotic and proteolytic properties of different bacteria.
11. Isolation and titration of bacteriophages.
12. Traditional and current approaches to microbial food safety and quality.
13. Genetically modified microorganisms.

Contents (Practical)

1. Microbial techniques
2. detection of microorganism in food samples
3. Detection of automated rapid and conventional methods for microbial toxins, metabolites, inhibitory substances, pathogens and bacteriophages through HPLC, GC and other techniques.
4. Electrophoretic protein profiles of bacteria.

Recommended texts

1. Wolf-Hall, C., & Nganje, W. (2017). *Microbial food safety: a food systems approach*. Boston: CABI.
2. Ray, B., & Bhunia, A. (2014). *Fundamental food microbiology*. (5th ed.) Florida: CRC press.

Suggested readings

1. Shen, C., & Zhang, Y. (2017). *Food microbiology laboratory for the food science student: a practical approach.* Berlin: Springer International Publishing.
2. Montville, T. J. (2017). *Food microbiology: an introduction*. (4th ed.) New York: ASM press.
3. Banwart, G. J. (2012). *Basic food microbiology*. New York: Chapman and Hall. International Thomson Publishing.

FSAT-8108 Advanced Beverage Technology 3(2+1)

A beverage is a liquid intended for human consumption. Common types of drinks include plain drinking water, milk, coffee, tea, juice and soft drinks. The preparation of include a number of different steps, some prior to transport, others immediately prior to consumption. Keeping in view the importance of beverage in human life, this course has been designed to give understanding about the beverage principles and techniques of beverage manufacturing and preservation. Manufacturing of syrups, squashes and traditional beverages and chemical analysis of beverages will be performed

Contents (Theory)

1. Overview of beverage industry.
2. Water treatment plants: To study the water purification systems.
3. Bottle washing plants: Operations and inspection, detergents used in bottle washing.
4. Plant sanitation: CIP systems for beverage plants
5. cleaning and disinfection
6. Packaging materials: (glass bottles, pet bottles, metal cans, tetra-pack,
7. Plastic containers; container closures (plastic, aluminum and metal closures).
8. Raw material handling and storage: Syrup room operation, pasteurization, sterilization, stabilizers and emulsifiers.
9. Filling systems: Premix, post mix, three stage processes.
10. Composition and formulation of carbonated and non-carbonated beverages: Carbon dioxide and carbonation.
11. Trouble shooting in beverage industry: spoilage detection and control, physical, chemical and microbiological spoilage.
12. Shelf life of beverages: factors affecting shelf life.

Contents (Practical)

1. Production and sensory evaluation of different instant and powdered mixes/drinks, fermented, still, carbonated and non- carbonated beverages.
2. Storage study of such prepared products under different conditions through taking laboratory tests (physical, chemical, sensory and microbiological examination) during whole storage life.

Recommended texts

1. Almeida, R. M., Abreu, R., & Perez-Lopez, J. A. (2018). Nascent entrepreneurship and sustainability on the beverage sector. In: *Nascent entrepreneurship and successful new venture creation*. Pennsylvania: IGI Global.
2. Bordenave, N., & Ferruzzi, M. G. (Eds.) (2018). *Functional foods and beverages: in vitro assessment of nutritional, sensory, and safety properties*. New Jersey: John Wiley & Sons.

Suggested readings

1. Hui, Y. H., & Evranuz, E. O. (Eds.) (2012). *Handbook of animal-based fermented food and beverage technology,* Vol. 1. London: CRC press.
2. Steen, D. P. (2006). *Carbonated soft drinks formulation and manufacture*. Oxford: Blackwell Publishers.
3. David, P. S., & Philip, R. A. (Eds.) (2006). *Carbonated soft drinks: formulation and manufacture*. Oxford: Blackwell Publishing Ltd.

FSAT-8109 **Seminar-I** **1(1+0)**

The seminar is intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to submit written documentation supporting that seminar. A seminar is a form of academic instruction, either at an academic institution or offered by a commercial or professional organization. It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to participate. Seminars provide a chance to interact with experts from the specific field. Discussing about the relevant topics of the particular subject, students tend to learn about the latest information and new skills related to the concerned subject. Seminars are important and beneficial for those who have difficulty learning in a typical classroom setting where reading and writing are required. There is often a sense of friendship associated with seminar attendance, because everyone is attending with a like interest in learning about a subject important to them. Attending a seminar has numerous benefits, including improving communication skills, gaining expert knowledge, networking with others and renewing motivation and confidence.

Contents

1. The respective supervisor will assign the topic and the seminar evaluation committee will evaluate for result.

FSAT-8110 **Seminar-II** **1(1+0)**

The seminar is intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to submit written documentation supporting that seminar. A seminar is a form of academic instruction, either at an academic institution or offered by a commercial or professional organization. It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to participate. Seminars provide a chance to interact with experts from the specific field. Discussing about the relevant topics of the particular subject, students tend to learn about the latest information and new skills related to the concerned subject. Seminars are important and beneficial for those who have difficulty learning in a typical classroom setting where reading and writing are required. There is often a sense of friendship associated with seminar attendance, because everyone is attending with a like interest in learning about a subject important to them. Attending a seminar has numerous benefits, including improving communication skills, gaining expert knowledge, networking with others and renewing motivation and confidence.

Contents

2. The respective supervisor will assign the topic and the seminar evaluation committee will evaluate for result.

FSAT-8111 **Special Problem** **1(1+0)**

The special problem is intended to instruct students on proper techniques for scientific research and methodologies. The students are expected to prepare directed assignment and collect information and material related to current research interest. Special problem means an assignment that is expected to be temporary and is designated as a special assignment by the academic supervisor in its sole discretion. The main purpose of special problem is to increase the learning capabilities of students. The more we use our brains, the more they develop. Students learn a lot more when they read or practice something by themselves. Similarly, the purpose of assignments is to increase the practical skills of students. The main objectives of special problem assigned to students are: to enhance the knowledge of a subject, helps to develop writing skills and to enhance time management and organizing skills. It enhances your planning and organizing skills: The special problem make you do your work by prioritizing the needs and time frames. It helps you in completing all your tasks very peacefully instead of creating any panic. Special problem writing work gives students a lot of scopes to improve themselves.

Contents

1. The respective supervisor will assign the topic and evaluate for result.

STAT-8131 Statistical Methods for Agricultural Research-II 3(3+0)

This course designed for PhD programs in agriculture sciences. Modern agricultural production is characterized by some particularities and many different activities. So, it arises different problems and different nature of agricultural materials data which require different approaches to the use of statistical methods. Statistics is a discipline which mainly deals with data quantifications. Even in the case of nonnumerical data, statistical methods use transformations to change nonnumerical data to numerical data, with the aim of achieving some level of quantification to make conclusions about the matter of interest. Many data in agriculture are of numerical character which are accompanied with the existence of the variability of data. Statistics can be used as a tool for agricultural research. For these reasons "statistics can, however, help the research worker to design his experiments and to evaluate objectively the resulting numerical data". So this course is mainly focus on advanced design of experiment tools which will be helpful to find out the factors of output related to agriculture experiments. Moreover, students will also learn some statistical softwares like Minitab, R, Design Expert etc. to analyze their experimental data. The knowledge of statistical software will improve the computational and analytical skills of the students.

Contents

1. Basic principles of experimental design.
2. Layout analysis of CRD, RCBD, Latin Square Designs.
3. Estimation of Missing Observations in RCBD and Latin Square Design.
4. BIBD, PBIBD, Split plot Designs and its variations.
5. Multiple comparison tests.
6. Effect of violation of assumptions of underlying ANOVA.
7. Factorial Experiments, 2^n, 3^n… P^n.
8. Mixed levels factorial experiments.
9. Confounding and its types. Fractional replication. Application and construction of contrasts.
10. Response surface methodology.
11. Introduction of multivariate analysis.
12. Principle component analysis
13. Factor analysis
14. Cluster Analysis
15. Correspondence analysis.

Recommended Texts

1. Muhammad, F. (2000). *Statistical methods and data analysis*. Lahore: Ilmi Kitab Khana.
2. Montgomery, D. C. (2017). *Design and analysis of experiments.* (9^{th} ed.) New York: John Wiley & Sons.

Suggested Readings

1. Box, G. E. P., & Hunter, J. S. (1978). *Statistics for experimenters.* New York: John Wiley & Sons.
2. Dillon, W. R., & Goldstein, M. (1984). *Multivariate analysis: methods and applications.* New York: John Wiley & Sons.
3. Cox, D. R. (2000). *The theory of the design of experiments*. New York: Chapman and Hall.

PhD Food and Nutrition

Eligibility: The candidate must have passed any one of the following degree with at least 3.0 CGPA

- MS / MSc (Hons) Food and Nutrition / Human Nutrition
- MS / MSc (Hons) Food Technology
- MS / MSc (Hons) Food Science and Technology
- MS / MSc (Hons) Human Nutrition and Dietetics
- MS / MSc (Hons) Community Health and Nutrition/Dietetics

Duration: 03-05 Years Program (06-10 Semesters)
Degree Requirements: 18 Credit Hours course work + Dissertation

Major Courses

Course Code	Course Title	Credit Hours
FANU-8101	Recent Advances in Food and Nutrition (Compulsory)	3(3+0)
FANU-8102	Public Health and Nutrition	3(3+0)
FANU-8103	Life Cycle Nutrition	3(3+0)
FANU-8104	Design Concepts in Nutrition Epidemiology	3(3+0)
FANU-8105	Nutritional Counseling and Education Methods	3(2+1)
FANU-8106	Applied Nutrigenomics	3(3+0)
FANU-8107	Nutritional Antagonism	3(3+0)
FANU-8108	Sports and Exercise Nutrition	3(2+1)
FANU-8109	Computer Application in Food and Nutrition	3(1+2)
FANU-8110	Seminar-I (Compulsory)	1(1+0)
FANU-8111	Seminar-II (Compulsory)	1(1+0)
FANU-8112	Special Problem (Compulsory)	1(1+0)

Minor/Allied Course

STAT-8131	Statistical Methods for Agricultural Research-II (Compulsory)	3(3+0)

1. Major courses may be offered during PhD Food and Nutrition degree program depending upon the availability of faculty and resources.
2. Other Minor/Allied courses can be taken (as per requirement) from the following departments/subjects to be offered by the respective departments in running semester/s:

- Chemistry / Biochemistry
- Agricultural Sciences
- Biological Sciences
- Animal Sciences
- Pharmacy
- Medical / Allied Health Sciences
- Biotechnology
- Business Management

3. A student will have to complete 2/3rd credit hours from the Major courses and 1/3rd credit hours from the Minor/Allied courses.

FANU-8101 Recent Advances in Food and Nutrition 3(3+0)

The objective of this course is to provide students with an opportunity for in-depth consideration of areas of public health nutrition which are of particular significance but are not covered adequately in other courses. This is advance level course offered to Ph. D Food and Nutrition students. The course will focus on making students understand the recent advances taking place in the field of food science and nutrition worldwide. Recent advances in the major fields of nutrition will be discussed in this course. This course will also deals with the latest food and nutrition application techniques and latest food safety and nutritional issues will come under discussion. Most important part of this course is the discussion about recent news in the field food and nutrition across the world.

Contents

1. Recent issues
2. Problems
3. Latest and Novel Researches
4. Developments and techniques about Food and Nutrition.

Recommended Texts

1. Toldra, F. (Ed.) (2019). *Advances in food and nutrition research,* Vol. 87. London: Academic Press.
2. Henry, J. (2014). *Advances in food and nutrition research,* Vol. 71. London: Academic Press.

Suggested Readings

1. Internet sources, latest research and review articles and publications.

FANU-8102 **Public Health and Nutrition** **3(3+0)**

This course develops students' understanding of public health nutrition with a focus placed on the importance of building a sustainable, nutritious and healthy food supply for all. Health inequities, as explained by the social determinants of health, and their impact on nutritional health and well-being are covered in detail. Consideration is given to factors which influence consumer food choices, dietary habits and food consumption patterns including social, cultural and environmental factors. An overview of the different types of food systems as well as historical events. Students are introduced to major nutrition and health policies which underpin intervention programs and initiatives aiming to promote healthy eating behaviors in consumers and/or healthy food production in food industry. Consolidate and extend knowledge and skills in public health nutrition, critically analyze factors which impact on food choices and eating patterns, demonstrating a broad understanding of how these impact on the nutritional health of individuals and populations, investigate food systems and critically examine the development of sustainable and healthy food supplies, translate and apply current food and nutrition policies and initiatives to real-world contexts and extend communication skills to present clear, coherent expositions of knowledge and ideas both collaboratively and independently.

Contents

1. Health and health promotion: 'theory', models and approaches.
2. Health, disease and illness: the voice of authority.
3. Health
4. Social indicators and the quality of life.
5. Social capital for all.
6. Reasoned action: more theory than evidence. Risky behavior: judging the odds.
7. Individual and the society.
8. Human perspectives in health promotion.
9. Case studies of health promotion in Pakistan

Recommended Texts

1. Buttriss, J. L., Welch, A. A., Kearney, J. M., & Lanham-New, S. A. (2017). *Public health nutrition*. London: John Wiley & Sons,
2. Spark, A., Dinour, L. M., & Obenchain, J. (2015). *Nutrition in public health: principles, policies, and practice*. London: CRC Press.
3. Vir, S. C. (Ed.) (2011). *Public health nutrition in developing countries*. Cambridge: Woodhead Publishing Limited.

Suggested Readings

1. Hughes, R. (2010). *Practical public health nutrition*. London: John Wiley & Sons.
2. Lawrence, M., & Worsley, T. (2007). *Public health nutrition*. New York: McGraw-Hill Education.

FANU-8103 **Life Cycle Nutrition** **3(3+0)**

It involves the study of special nutritional needs, physiology, and health concerns of pregnant and lactating women, infants, children, adolescents, and older adults. Course include readings, activities, and site placements that highlight the relationship of nutrition to physical and psychological growth, development and aging. The nutritional foundations necessary for human growth, development, reproduction, health and well-being in each stage of the human life cycle. The life stages covered are preconception, pregnancy and lactation, infancy, childhood, adolescence, adulthood, and old age. Recommendations and consequences for health and disease will be addressed for each life cycle stage. The students will be able to relate foods and nutrients to the biological requirements of humans at different stages of the life cycle, generate resources to summarize and communicate nutritional information compiled from official recommendations and scientific sources, explain, compare and contrast the nutritional requirements of humans during different stages of the life cycle, relate the nutrition-related concerns specific to each stage of the human life cycle to consequences for health and disease, explain and reflect upon the consequences of physical, biochemical, physiological, social and psychological factors impacting nutritional intake and status during each stage of the human life cycle.

Contents

1. Nutrition: basics, introduction,
2. Nutrition: conditions and interventions.
3. Preconception nutrition.
4. Nutrition during pregnancy and lactation,
5. Infant, toddler and preschooler nutrition.
6. Child and pre-adolescent nutrition
7. Adolescent nutrition
8. Adult nutrition
9. The elderly nutrition, nutrients intake of adults.

Recommended Texts

1. Bernstein, M., & McMahon, K. (2017). *Nutrition across life stages*. Massachusetts: Jones & Bartlett Learning.
2. Brown, J. E. (2016). *Nutrition through the life cycle*. Boston: Cengage Learning.
3. Sharlin, J., & Edelstein, S. (2010). *Essentials of life cycle nutrition*. Massachusetts: Jones & Bartlett Publishers.

Suggested Readings

1. Croxford, S., Itsiopoulos, C., Forsyth, A., & Belski, R. (2015). *Food and nutrition throughout life: a comprehensive overview of food and nutrition in all stages of life.* Crows Nest: Allen & Unwin.
2. Brown, L. S. (2010). *Life cycle nutrition: an evidence-based approach. nutrition requirements during pregnancy*. Massachusetts: Jones and Bartlett Publishers.

FANU-8104 Design Concepts in Nutrition Epidemiology 3(3+0)

The course will provide an introduction to the methodological issues involved in the design, conduct, analysis and interpretation of studies investigating the relationship between nutritional status, diet and disease. Emphasis will be placed on issues such as intra individual variation, measurement of error, misclassification, correlated variables, population homogeneity, and the use of group versus individual data. The selection and use of dietary and nutritional status assessment methods appropriate for different study designs will be covered, and some experience in their use and interpretation will be provided. The impact of methodological issues, and of the type of study design, on interpretation and conclusions from research in nutrition epidemiology will be emphasized. The students will be able to apply a conceptual framework for choosing appropriate indicators of nutritional status for different research and programmatic applications, identify key methodological issues when assessing dietary intake, biochemical and anthropometric indicators, and the implications of those issues for assessing nutrition disease relationships and apply statistical methods for evaluating indicators of nutritional status, for choosing among candidate indicators and for assessing biases in nutrition-disease relationships.

Contents

1. Introduction to nutritional epidemiological studies.
2. Ecological studies.
3. Cross-sectional studies, cohort studies.
4. Case-control studies.
5. Experimental studies.
6. Socio-demographic and psycho-social variables. Anthropometric measures.
7. Gene-nutrient interactions in nutritional epidemiology

Recommended Texts

1. Johansson, G. (2014). *Nutritional epidemiology: dietary assessments: use, design concepts, biological markers, pitfalls and validation*. Halmstad: Halmstad University Press.
2. Rothman, K. J., Greenland, S., & Lash, T. L. (2008). *Modern epidemiology,* Vol. 3. Philadelphia: Wolters Kluwer Health, Lippincott Williams & Wilkins.
3. Margetts, B. M., & Nelson, M. (Eds.) (1997). *Design concepts in nutritional epidemiology*. Oxford: OUP Oxford.

Suggested Readings

1. Willett, W. (2012). *Nutritional epidemiology*. Oxford: Oxford University Press.
2. Woodward, M. (2013). *Epidemiology: study design and data analysis*. New York: Chapman and Hall.

FANU-8105 Nutritional Counselling and Education Methods 3(2+1)

This course aims at introducing students to the theories and skills necessary to design and implement nutrition education programs. It shows how nutrition education can facilitate dietary changes in a group of people. It introduces students to nutrition education basics, definition, history, aims field and challenges; the science of nutrition, its application in health education process and nutrition education definition, rationale, impact, role of health educator and nutrition services, and nutritional population problems. Also it discusses nutrition education methods, approaches in nutrition counselling and nutrition education challenges. The students will be able to identify basic elements of communication to influence behaviour, describe nutrition education and health education processes, compare between the role of a health educator and nutrition education specialist and identify the behavioural theories, and how it's important to build theoretical educational program; explain how a health educator can help a client with nutritional problems related to certain health conditions, describe nutrition education and health education processes, explain theories of nutrition education and develop communication skills; identify personal habits and choices that promote well-being.

Contents (Theory)

1. Nutritional counseling and clinical practice, resources and dietary guidelines.
2. Different tools to follow up study: group discussion and motivation in food selection and preparation.
3. Diet counseling for reducing risk of diseases: cancer, obesity, diabetes, cardiovascular diseases and bone diseases.
4. Counseling for the prevention of major disabilities: antioxidants, supplements and micronutrients.
5. Counseling for functional and nutraceutical foods in relation to diseases.
6. Counseling in outpatient wards in local hospitals.
7. Simulation techniques for counseling in selected settings.

Contents (Practical)

1. Producing diet plans and fact sheets.
2. Using food to manage health: obesity, diabetes, cardiovascular diseases, and bone and liver diseases, cancer.
3. Model diet plan: use of calorie calculators, charts. Case studies.

Recommended Texts

1. Bauer, K. D., Liou, D., & Sokolik, C. (2015). *Nutrition counseling and education skill development*. Toronto: Nelson Education.
2. Holli, B. (2012). *Nutrition counseling and education skills for dietetics professionals*. Philadelphia: Lippincott Williams & Wilkins.
3. Snetselaar, L. G. (2009). *Nutrition counseling skills for the nutrition care process*. Massachusetts: Jones & Bartlett Learning.

Suggested Readings

1. Snetselaar, L. (2006). *Nutritional counseling for lifestyle change*. Florida: CRC Press.
2. Contento, I. R. (2008). *Nutrition education: linking research, theory, and practice*. New Delhi: Asia Pacific Pub.

FANU-8106 **Applied Nutrigenomics** **3(3+0)**

This course provides an in depth coverage of the applications of genomics technologies, focusing on the relevant examples of complex diseases relating to nutrition such as obesity, diabetes or metabolic syndrome, inherited inborn disease, cancer, neurodevelopment, and neurodegenerative diseases. The students will be trained to dissect complex scientific problems in nutritional research into smaller feasible subprojects that can be studied efficiently with genomics tools. In addition, the impact of sensitizing genotypes for the understanding of complex diseases, the design of dietary intervention studies for nutrigenomics applications, the concept of challenge tests and early biomarkers, the impact of bioinformatics and data mining and potential future application such as personalized nutrition will be addressed. Students taking this course are expected to learn about etiology, pathophysiology, and treatment of micronutrient related human genetic disorders; interactions of micronutrients with human disease states; influence of genetic variation on nutritional requirement; role of genetics in human nutrient metabolism and regulation of genetics on cellular and molecular metabolism.

Contents

1. Overview of nutrigenomics
2. Control of gene transcription
3. Bioactive food components
4. Interaction of molecules with genes. Genomic screening
5. Control of gene expression (beginner level)
6. DNA microarrays
7. Bioinformatics and databases
8. Genome annotation/gene prediction
9. DNA motifs (predication and discovery).
10. Overview of disease and nutrition
11. Inflammation and associated target genes
12. Obesity and associated target genes
13. Diabetes and associated target genes
14. CVD and associated target genes
15. Cancer and associated target genes
16. Osteoporosis and associated target genes.
17. Target validation
18. Models of transcriptional activation; Fruit fly models, Zebra-fish models, Mouse models.

Recommended Texts

1. Simopoulos, A. P. (2020). *Impact of nutrigenetics and nutrigenomics on society. In: principles of nutrigenetics and nutrigenomics*. London: Academic Press.
2. Ferguson, L. R. (2016). *Nutrigenomics and nutrigenetics in functional foods and personalized nutrition*. New York: CRC Press.

Suggested Readings

1. Mine, Y., Miyashita, K., & Shahidi, F. (2009). *Nutrigenomics and proteomics in health and disease. food factors and gene interactions.* New York: John Wiley & Sons.
2. Simopoulos, A. P., & Ordovas, J. M. (2004). *Nutrigenetics and nutrigenomics,* Vol. 93. Basel: Karger Medical and Scientific Publishers.

FANU-8107 **Nutritional Antagonism** **3(3+0)**

The course is about the nutritional antagonism. The aim and objective of the course is to learn about the factors and causes of antagonism. Also deals with the fundamental mechanisms that influence such synergistic or antagonistic. Students should be able to distinguish between antagonists and synergistic, understand factors and causes of antagonist and associate the malnutrition and nutritional antagonism. Toxicology studies the body's response to drugs, foods, and toxic substances. Fundamentals of pharmacology and mechanisms of action are examined for acute and chronic exposure derived from environmental, dietary, occupational and pharmaceutical sources. Emphasis is placed on information literacy to support problem-based and evidence-based learning. Basic principles of food and nutritional toxicology with emphasis on food components and food toxins including absorption, metabolism and excretion of xenobiotics, allergenic and toxic constituents, role of diet and nutrients in mutagenesis and carcinogenesis.

Contents

1. Antagonist and synergetic overview.
2. Nutrition of water.
3. Physical inactivity. Antagonistic factors and causes.
4. Food additives as nutritional antagonists.
5. Food contaminants, toxins, pollutants and drugs as nutritional antagonists.
6. Cosmetics and antagonism. Malnutrition and nutritional antagonism.
7. Food to drugs interactions. Food to food interactions.

Recommended Texts

1. Friedman, M. (2012). *Nutritional and toxicological aspects of food safety,* Vol. 177. Berlin: Springer Science & Business Media.
2. Hathcock, J. (Ed.) (2013). *Nutritional toxicology,* Vol. 2. Amsterdam: Elsevier.
3. Omaye, S. T. (2004). *Food and nutritional toxicology*. London: CRC press.

Suggested Readings

1. Kotsonis, F. N., & Mackey, M. A. (2002). *Nutritional toxicology*. London: CRC Press.
2. Hathcock, J. (Ed.) (2012). *Nutrition and drug interrelations*. Amsterdam: Elsevier.

FANU-8108 Sports and Exercise Nutrition 3(2+1)

The course covers the key principles of sports nutrition and exercise physiology, including the latest research papers, and aims to develop the ability to apply critical awareness to topics across the broad remit of sports nutrition, from measurement of exercise performance to the assessment of mental performance. The course aims to stimulate an enquiring, analytical and practical approach to understanding and providing nutritional support for participants in a wide range of sports and exercise. By the end of their course of study, the successful student will have clear knowledge of key concepts in sports nutrition and exercise physiology; knowledge and experience of different methods of assessing relevant parameters of nutrition, health and fitness relating to diet and performance.

Contents (Theory)

1. Sports and exercise physiology, Muscles in exercise, Muscle metabolic systems in exercise and Effect of exercise on muscles and muscle performance, Metabolism in exercise, Energy and exercise and Locomotive sports
2. Cardiovascular system in exercise, regulation of blood flow during exercise, Cardiovascular adjustment during exercise blood gases and exercises, Respiratory adjustment during exercise and Cardiac output and ventilation: relation to the metabolic demand of exercise, Body heat in exercise, Body fluid regulation during exercise, Salts regulation during exercise
3. Neuronal regulation during exercise, Chemical regulation during exercise, Hormonal control of exercise, Muscle fatigue and hypertrophy, Exercise training, Adaptation to exercise training, Adaptation to aerobic and anaerobic training
4. Physiological of health and fitness, Effect on heart diseases and old age on athlete performance
5. Sex consideration during exercise, Environmental influence on performance, Exercise in hot and cold weather, Exercise at altitude, optimizing performance, Body composition and nutrition in sport.

Contents (Practical)

1. Recording of body temperature, pulse and heartbeat, blood pressure and respiration rate before during and after exercise, Recording respiratory movement, volume and capacities
2. Electrocardiography before, during and after exercise, Myography before, during and after exercise determination of basil metabolic rate (BMR) at normal and at different physiological states
3. Thyroxine, triiodothyronine during growth and at different physiological and environmental condition and determination of glycerol and cholesterol
4. Bioassay procedures of estrogens, androgens, corticosteroids and other hormones, Estimation of blood volume and plasma

Recommended Texts

1. Greenwood, M., Cooke, M. B., Ziegenfuss, T., L., & McArdle, W. D. (2019). *Sports and exercise nutrition.* New York: Wolters Kluwer Law & Business
2. Belski, R., Forsyth, A., & Mantzioris, E. (2019). *Nutrition for sport, exercise and performance: a practical guide for students, sports enthusiasts and professionals*. Crows Nest: Allen & Unwin.

Suggested Readings

1. Kang, J. (2018). *Nutrition and metabolism in sports, exercise and health*. New York: Routledge.
2. Daries, H. (2012). *Nutrition for sport and exercise: a practical guide*. New Jersey: John Wiley & Sons.

FANU-8109 Computer Application in Food and Nutrition 3(1+2)

The course will enable the students in application of various software like of MS Excel to solve the problems of related to food and nutrition including chemical kinetics in food processing; Microbial distraction in thermal processing of food; Statistical quality control; Sensory evaluation of food; Mechanical transport of liquid food; Solving simultaneous equations in designing multiple effect evaporators while using matrix algebra available in excel, Familiarization with the application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants, stating from the receiving of raw material up to the storage & dispatch of finished product and Basic Introduction to computer aided manufacturing: Application of computers in instrumentation and control of food machinery inventory control, process control etc. Furthermore, use of software for demographics, body composition, anthropometrics, energetics, dietary history and DRIs. The nutritional health status assessment, nutrition care plan, nutrition counselling and education will be carried out through computer and apps along with record keeping.

Contents (Theory)

1. Introduction to network and internet.
2. Computer applications.
3. Report writing using computer.
4. Developments of data collection forms.
5. Data base applications.
6. Use of internet in R& D.
7. Special tasks of computers in food and nutrition.

Contents (Practical)

1. EXCELL, SPSS & Other nutritional software application for NHS & diet planning and therapy.

Recommended Texts

1. Orta, J. (2018). *Computer applications in nutrition & dietetics: an annotated bibliography*. Abingdon: Routledge.
2. Jones, J. M. (2005). *Nutritional screening and assessment tools*. New York: Nova Publishers.
3. Hoover, L.W. (2010). *Computers in nutrition, dietetics and foodservice management: a bibliography*. Wisconsin-Madison: The University of Wisconsin-Madison.

Suggested Readings

1. Singh, R. P. (1996). *Computer applications in food technology: use of spreadsheets in graphical, statistical, and process analysis*. New York: Elsevier.
2. Casbergue, J. P. (2008). *A compilation of information on computer applications in nutrition and food service*. Ohio: University Division of Medical Dietetics, Ohio State & Cornell University.
3. Hoover, L. W. (1985). *Computers in nutrition, dietetics and foodservice management: a bibliography*. Columbia: Curators of the University of Missouri.

FANU-8110 **Seminar-I** **1(1+0)**

The seminar is intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to submit written documentation supporting that seminar. A seminar is a form of academic instruction, either at an academic institution or offered by a commercial or professional organization. It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to participate. Seminars provide a chance to interact with experts from the specific field. Discussing about the relevant topics of the particular subject, students tend to learn about the latest information and new skills related to the concerned subject. Seminars are important and beneficial for those who have difficulty learning in a typical classroom setting where reading and writing are required. There is often a sense of friendship associated with seminar attendance, because everyone is attending with a like interest in learning about a subject important to them. Attending a seminar has numerous benefits, including improving communication skills, gaining expert knowledge, networking with others and renewing motivation and confidence.

Contents

1. The respective supervisor will assign the topic and the seminar evaluation committee will evaluate for result.

FANU-8111 **Seminar-II** **1(1+0)**

The seminar is intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to submit written documentation supporting that seminar. A seminar is a form of academic instruction, either at an academic institution or offered by a commercial or professional organization. It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to participate. Seminars provide a chance to interact with experts from the specific field. Discussing about the relevant topics of the particular subject, students tend to learn about the latest information and new skills related to the concerned subject. Seminars are important and beneficial for those who have difficulty learning in a typical classroom setting where reading and writing are required. There is often a sense of friendship associated with seminar attendance, because everyone is attending with a like interest in learning about a subject important to them. Attending a seminar has numerous benefits, including improving communication skills, gaining expert knowledge, networking with others and renewing motivation and confidence.

Contents

1. The respective supervisor will assign the topic and the seminar evaluation committee will evaluate for result.

FANU-8112 **Special Problem** **1(1+0)**

The special problem is intended to instruct students on proper techniques for scientific research and methodologies. The students are expected to prepare directed assignment and collect information and material related to current research interest. Special problem means an assignment that is expected to be temporary and is designated as a special assignment by the academic supervisor in its sole discretion. The main purpose of special problem is to increase the learning capabilities of students. The more we use our brains, the more they develop. Students learn a lot more when they read or practice something by themselves. Similarly, the purpose of assignments is to increase the practical skills of students. The main objectives of special problem assigned to students are: to enhance the knowledge of a subject, helps to develop writing skills and to enhance time management and organizing skills. It enhances your planning and organizing skills: The special problem make you do your work by prioritizing the needs and time frames. It helps you in completing all your tasks very peacefully instead of creating any panic. Special problem writing work gives students a lot of scopes to improve themselves.

Contents

1. The respective supervisor will assign the topic and evaluate for result.

STAT-8131 Statistical Methods for Agricultural Research-II 3(3+0)

This course designed for PhD programs in agriculture sciences. Modern agricultural production is characterized by some particularities and many different activities. So, it arises different problems and different nature of agricultural materials data which require different approaches to the use of statistical methods. Statistics is a discipline which mainly deals with data quantifications. Even in the case of nonnumerical data, statistical methods use transformations to change nonnumerical data to numerical data, with the aim of achieving some level of quantification to make conclusions about the matter of interest. Many data in agriculture are of numerical character which are accompanied with the existence of the variability of data. Statistics can be used as a tool for agricultural research. For these reasons "statistics can, however, help the research worker to design his experiments and to evaluate objectively the resulting numerical data". So this course is mainly focus on advanced design of experiment tools which will be helpful to find out the factors of output related to agriculture experiments. Moreover, students will also learn some statistical softwares like Minitab, R, Design Expert etc. to analyze their experimental data. The knowledge of statistical software will improve the computational and analytical skills of the students.

Contents

1. Basic principles of experimental design.
2. Layout analysis of CRD, RCBD, Latin Square Designs.
3. Estimation of Missing Observations in RCBD and Latin Square Design.
4. BIBD, PBIBD, Split plot Designs and its variations.
5. Multiple comparison tests.
6. Effect of violation of assumptions of underlying ANOVA.
7. Factorial Experiments, 2^n, 3^n… P^n.
8. Mixed levels factorial experiments.
9. Confounding and its types. Fractional replication. Application and construction of contrasts.
10. Response surface methodology.
11. Introduction of multivariate analysis.
12. Principle component analysis
13. Factor analysis
14. Cluster Analysis
15. Correspondence analysis.

Recommended Texts

1. Muhammad, F. (2000). *Statistical methods and data analysis*. Lahore: Ilmi Kitab Khana.
2. Montgomery, D. C. (2017). *Design and analysis of experiments.* (9^{th} ed.) New York: John Wiley & Sons.

Suggested Readings

1. Box, G. E. P., & Hunter, J. S. (1978). *Statistics for experimenters.* New York: John Wiley & Sons.
2. Dillon, W. R., & Goldstein, M. (1984). *Multivariate analysis: methods and applications.* New York: John Wiley & Sons.
3. Cox, D. R. (2000). *The theory of the design of experiments*. New York: Chapman and Hall.