

School of Science and Technology

B.Sc (Honors) in Food Science and Nutrition

Program Handbook
(Regulations and Syllabus)



Bangladesh Open University

বাংলাদেশ উন্মুক্ত বিশ্ববিদ্যালয়

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Vice-Chancellor's Message



Dear Learners,

I welcome you to the academic session 2019-2020 at Bangladesh Open University (BOU). You deserve my heartfelt congratulations for your achievement of getting entrance to the B.Sc (Honors) in Food Science and Nutrition program at this Open and Distance Learning (ODL) University in the country. BOU is the only public university in the country offering education through distance mode of delivery. It is recognized nationally and internationally for its quality education since 1992. Our mission is to provide you the best start for your professional future.

You are the most fortunate ones to have an enrolment opportunity in the said program at the School of Science and Technology. The curriculum and syllabus of B.Sc (Honors) in Food Science and Nutrition program are the most up-to-date which is internationally comparable. The learners will get scope for doing their practical work and hands-on training using modern laboratory facilities of BOU. We have a dream to establish a digitally enabled open university where you will be able to groom your potentiality further.

Finally, I would like to point out an important issue that BOU follows a multi-channel approach for academic instructions. The four-year B.Sc (Honors) in Food Science and Nutrition program comprises two types of delivery modes: one is distance mode and the other is face to face regular mode. I firmly believe that you would enjoy the articulately designed curriculum and course materials throughout your study period and will become a leader in the field of food science and nutrition.

I wish all of you a grand success in your studies.

Professor Dr. M A Mannan
Vice-Chancellor
Bangladesh Open University

Pro-Vice Chancellor's Message



Dear Learners,

It gives me great pleasure to welcome you to Bangladesh Open University (BOU). Through a wide mode of distance education programs, BOU have extended its learning opportunities to cross-sectional people across the country. I am happy to know that the School of Science and Technology is going to offer four-year B.Sc (Honors) in Food Science and Nutrition program. This is one of the leading efforts to promote the practical knowledge in Food and Nutrition which is indispensable for developing planned human resources with specialization in the field of food and nutrition.

To meet the increasing demand of graduates in the field of Food and Nutrition, the School of Science and Technology of BOU has decided to offer B.Sc (Honors) in Food Science and Nutrition program following open and distance methodology, tools and techniques. The proposed courses and curricula have been up-dated and integrated some advanced courses in the said academic program. We have also made the provision of extensive research, practical and internship activities in the said academic program. We hope that the offered theoretical and practical knowledge will be useful for developing skilled professional graduates.

The B.Sc (Honors) in Food and Nutrition program is basically comprised of both the distance as well as conventional mode of delivery. For doing that, besides BOU own study center we have made collaborative arrangement between BOU and other reputed universities/academic institutes so that the learners would able to benefit from the blended mode of operation.

I do believe that you will get every insight of knowledge after successfully completing the program and able to apply the acquired skill and knowledge in developing your own career and serving the nation.

I must thanks honorable Dean, the School of Science and Technology of BOU for introducing the B.Sc (Honors) in Food Science and Nutrition program in BOU and would also like to express my deep gratitude to those who are involved in developing the Program Handbook.

Best wishes for your success.

Professor Dr. Khondoker Mokaddem Hossain
Pro-Vice Chancellor
Bangladesh Open University

Treasurer's Message



Welcome to Bangladesh Open University!

I am pleased to know that the regulations and course contents of B.Sc (Honors) in Food Science and Nutrition program being published in a Handbook and ready for handling it over to our learners and other stakeholders. Being the centre of open and distance education, Bangladesh Open University has earned good reputation for creating skill human resources. I get to know from my interactions and observations, the School of Science and Technology engages the learners with academic activities through lectures, practical classes, project work, field work, internship, online activities and audio-video programs to ensure learning.

Distance as well as conventional educational approaches is taken by the School of Science and Technology to groom the learners who enter into the B.Sc (Honors) in Food Science and Nutrition program. Every human being should know about proper food and nutrition which is essential to build a health nation. Food Science and Nutrition is highly demandable subject in today's context which has vast employment opportunity in both home and abroad. I expect that the School of Science and Technology will be able to skill the learners in food and nutrition to face the challenges in the global setting. I am also optimistic that these future experts in food and nutrition will do their best in food and nutrition sectors to add more success stories for Bangladesh Open University.

I hope the information furnished in Program Handbook will help concerned stakeholders to understand regulations and syllabus of B.Sc (Honors) in Food Science and Nutrition program more deeply. I would like to express my heartfelt thanks to those who are involved in developing the Program Handbook, Regulations and Syllabus.

I sincerely believe that every academic endeavor made by the School of Science and Technology will be a splendid success.

Professor Dr. Ashfaque Hossain
Treasurer
Bangladesh Open University

Dean's Message



Dear Learners,

I welcome distance and regular batches of the learners of the B.Sc (Honors) in Food Science and Nutrition program. Preliminary two batches of learners will be admitted into the program: distance batch and regular batch. Those who are unable to attend classes in working days regularly will have chance to choose distance education system. Face to face classes for distance education batch will be held every Friday and Saturday and for regular batch at least four days in a week according to class routine.

Education will be provided to the regular batch through face to face lectures, internship and hands-on training in lab, and in addition to these for distance education batch audio-video programs and online education support will be provided to facilitate their learning process.

The program is designed on the basis of the latest development in food and nutrition sectors. Its syllabus and curriculum are equivalent to international standard and also reflects Bangladesh perspective. I strongly believe that the content of B.Sc (Honors) in Food and Nutrition will be conducive for learners to be skilled in theoretical and practical knowledge of food and nutrition and can apply knowledge and skills in the core curricular areas of the program.

The program Handbook contains detailed regulations and syllabus of B.Sc (Honors) in Food Science and Nutrition program which are very helpful for the learners for their day to day academic activities. Additionally, some useful addresses are given in the Handbook for your regular correspondence. So, the learners are advised to hold this Program Handbook until successful completion of the program. The learners are advised to study the specific topic of a course content in advance that is going to be lectured in the class for better understanding and solving problems.

B.Sc (Honors) in Food Science and Nutrition program is a job orientated program. I firmly believe that after successful completion of this program your employment opportunity in home and abroad will increase many folds. SST, BOU is committed to provide all-out support for your successful completion of the program. Finally, it is my sincere gratitude to Dr. Md. Abdul Mojid Mondol, Associate Professor, SST, BOU for preparing this Handbook under the light of curriculum and syllabus of B.Sc (Honors) in Food Science and Nutrition program.

Best wishes for your success.

Professor Dr. Sharker Md. Numan
Dean, School of Science and Technology
Bangladesh Open University

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Brief Profile of Bangladesh Open University (BOU)

VISION:

The vision of BOU is to ensure quality education for all classes of the population of the country through open and distance learning system and to establish as a center of excellence for higher education and research.

MISSION:

The mission of BOU is to provide state-of-the art physical and instructional facilities for its learners to adapt in complex environmental settings as well as re-align curricula and produce human resources.

Basic Facts

Establishment	: October 21, 1992
Type	: Public University
Mode of Education	: Open and Distance Learning (ODL)
Chancellor	: Md. Abdul Hamid Honorable President of the People's Republic of Bangladesh
Vice-Chancellor	: Prof. Dr. M A Mannan
Pro-vice Chancellor	: Prof. Dr. Khondoker Mokaddem Hossain
Treasurer	: Prof. Dr. Ashfaque Hossain
Area	: 35 acres
Location	: Board Bazar, Gazipur
No. of Schools (Faculties)	: 6
No. of Division	: 11
No. of Teachers (Full time)	: 156
No. of Teachers/Tutors (Adjunct)	: 29788
No. of Students	: 520,000 (31 st October, 2018)
No. of Officers	: 536
No. of Employees	: 690
No. of Formal Programs	: 56
No. of Non-formal Programs	: 19
No. of Regional Centers	: 12
No. of Sub-Regional Centers	: 80
No. of Study Centers	: 1506

Important Academic Programs of Different Schools of BOU

School of Education (SoE)

- ◆ Bachelor of Education (BEd)
- ◆ Master of Education (MEd)
- ◆ M.Phil. and Ph.D. on Education

School of Social Science, Humanities and Language (SSHLL)

- ◆ BA and BSS (3-year program)
- ◆ MA and MSS (1 and 2-year program)
- ◆ 4-year Bachelor (Hons) programs: Bangla, History, Philosophy, Islamic Studies, Political Science, Sociology and Law

Open School (OS)

- ◆ Secondary School Certificate (SSC)
- ◆ Higher Secondary Certificate (HSC)
- ◆ Master of Business Administration (MBA)

School of Business (SoB)

- ◆ Bachelor of Business Administration (BBA)
- ◆ Master of Business Administration (MBA)
- ◆ Commonwealth Executive Master of Business Administration (CEMBA)
- ◆ Commonwealth Executive Master of Public Administration (CEMPA)
- ◆ M.Phil. and Ph.D.

School of Agriculture and Rural Development (SARD)

- ◆ Bachelor of Agricultural Education (BAgEd)
- ◆ MS in Agriculture Science

School of Science and Technology (SST)

- ◆ Diploma in Computer Science and Application (DCSA)
- ◆ B.Sc in Computer Science and Engineering (B.Sc in CSE)
- ◆ Master of Disability Management and Rehabilitation (MDMR)
- ◆ Master of Public Health (MPH)
- ◆ Post-Graduate Diploma in Medical Ultrasound (PGDMU)
- ◆ B.Sc (Hons) in Food Science and Nutrition
- ◆ *M.Sc in Software Engineering (Upcoming)*
- ◆ *M.Sc in Pharmacology, B.Pharm (Hons) and M.Pharm (Upcoming)*
- ◆ *Diploma in Health Professionals Education (Upcoming)*
- ◆ *M.Phil. and Ph.D. (Upcoming)*

Faculty of the School of Science and Technology

Professors



Dr. Sharker Md. Numan

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Associate Professors



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Lecturers



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Dr. Mohammad Habibur Rahman

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Welcome to the Open and Distance Learning System of Bangladesh Open University (BOU). BOU is the only public University in Bangladesh offering a wide range of educational programs through distance mode. Besides distance education, BOU is going to launch programs for regular students. Bangladesh Open University provides learning opportunities to all classes of the population across the country. It facilitates you to complete your learning process through self-determined studying schedule and places. Our commitment to distance/regular learning will facilitate your pursuit of knowledge relevant to your life and career. BOU degree is nationally and internationally accepted for higher studies and job placement.

Conventional Education vs Distance Education Systems

In conventional education system, teaching-learning takes place in class where teachers give lecture in front of students. It is compulsory for every student has to attend classes regularly on every working day with little or no flexibility. This is a teacher-centric education system. On the contrary, in Distance Education System, learners do not need to attend face to face class lecture regularly. Attending classes are not compulsory in distance education system but recommended to attend classes regularly. Learners have to complete the learning process by their own responsibility. So, it is a flexible as well as self-centric mode of learning. But in case of science-based programs, learners are highly recommended (in some cases it is compulsory) to attend theoretical and practical classes regularly. To complete a particular course content in Distance Education System, the learners have to go through a number of learning processes such as reading self-learning study materials, attending tutorial classes to solve the course content related problems, watching audio and video programs prepared on the course content, reading reference books and text material available in the internet, etc.

Overview of Bangladesh Open University

Introduction

Bangladesh Open University was established on October 21, 1992 under the Bangladesh Open University Act, 1992. BOU is the only public university in Bangladesh offers academic programs through open and distance learning system to all classes of people of the society especially to the disadvantage groups, those who are unable to receive traditional class attending education and women using various technologies. Besides distance education, BOU is going to offer educational programs

especially honors programs through traditional education delivery mode. The main campus of the University is situated at Board Bazar, Gazipur about 18 kilometers north of Dhaka.

There are six schools (faculties) which offer 56 formal (from certificate to PhD level) and 19 non-formal programs. BOU conducts its academic and administrative activities across the country through 12 regional centers (RCs), 80 sub-regional centers (SRCs) and 1506 study centers. There are 156 full-time teachers, 29788 tutors (adjunct) and 5,20,000 learners (31st October, 2018) in BOU. The teaching-learning in BOU takes place through online and face to face class lectures, audio-video programs, printed self-learning study materials, journals, internet, etc.

Mission of BOU

The main missions of BOU are as follows-

- To educate disadvantage groups of population of the society irrespective of their age, sex, religion and race using various educational technologies in a flexible manner;
- To develop skill manpower by offering need-based programs for self-reliance in Bangladesh as well as in foreign countries;
- To create scope for learners who want to pursue higher education;
- To develop human resources with high standard ethical, moral and cross-cultural values;
- To develop researchers to enrich research sectors with a view for economic development of individuals, family, society and country as a whole.

Vision of BOU

The vision of BOU is to flourish as a center of excellence in providing need-based and higher education as well as for quality research.

Objectives of BOU

The main objectives of the university are to

- Provide state-of-the art physical and instructional facilities that are compatible to changing needs of the learners to adapt in complex environmental settings;
- Motivate learners for life-long learning and to respect for ethnic and cultural diversity;
- Build capacity of learners to think critically and tolerate differences of opinion, values of hard work and dedication, and being responsible citizens of the society;
- Re-align curricula based on changing needs of society, country and globe as a whole;

- To produce resources in the field of research and development.

Overview of School of Science and Technology

Introduction

School of Science and Technology (SST) is one of the six schools of Bangladesh Open University. B.Sc (Hons) in Food Science and Nutrition program has been offered by SST. Currently, this school is offering five academic programs in the field of health and computer science; these are Diploma in Computer Science and Application (DCSA), B.Sc in Computer Science and Engineering (B.Sc in CSE), Master of Disability Management and Rehabilitation (MDMR), Master of Public Health (MPH), Post Graduate Diploma in Medical Ultrasound (PGDMU) and B.Sc (Hons) in Food Science and Nutrition.

A number of programs are in the pipeline to be offered from this school: Master of Science in Software Engineering, M.Sc in Pharmacology, Diploma in Dental Hygiene, Diploma in Health Professionals Education, B.Pharm (Hons) and M.Pharm as well as M. Phil. and Ph.D.

Mission of SST

The mission of the School of Science and Technology is to provide safe and healthy learning environment with quality education in order to develop-

- Responsible human resources with intellectual capability, leadership, life-long learning spirit, cross cultural and ethical values who can contribute to better life, better diverse society and nation;
- Learners with creative and critical thinking, learning skills and enables them to apply in the core curricular areas.

Vision of SST

The vision of SST is to be a leader in providing the highest standard education in the field of biological and computer sciences.

Objectives of SST

Under the stated mission & vision, the School of Science and Technology intends to:

- Offer graduate, postgraduate, M.Phil. and Ph.D. programs in the field of biological and computer sciences;
- Provide conducive teaching-learning environment and engage learners in the learning process;

- To produce graduates with highly moral and ethical standard in real life situation;
- Develop good citizens with enlightened careers;
- Develop dynamic leadership for employment generation and socioeconomic development of the country;
- To develop graduates with effective interpersonal communication (both verbal and written in English), leadership and team work skills to face the challenges in the global setting;
- Promote regional integration and university-industry collaboration (UIC) for research and intellectual exchange.

Overview of B.Sc (Hons) in Food Science and Nutrition Program

1. Necessity of the Program

Bangladesh is an agricultural based country and has remarkably advanced in food production. But like food production, food preservation, processing, packaging and dealing with nutritional aspects of food are not so advanced due to lack of sufficient skilled manpower in food sector. Additionally, due to lack of proper knowledge about food and nutrition, a large number of populations of Bangladesh are suffering from malnutrition which is a huge obstacle in building healthy nation. As a result, food producers, consumers and as a whole country are not getting maximum benefit from foods. So, we need skilled manpower equipped with scientific knowledge in food preservation, processing, packaging; able to develop innovative, safe and healthy food products; able to advice and provide nutritional information to the populations; with entrepreneurial skills to set up safe food related business ventures.

Every year, lakhs of learners are passing from H.S.C science group. But due to limited number of seats in government universities, thousands of meritorious learners are being deprived of higher education. Additionally, thousands of diploma learners are passing from different Institutes of Health/Food Technology and Agriculture Training Institute (ATI) every year. These diploma holders do not have enough scope in Bangladesh to receive higher education. In both the cases, thousands of learners, who are either not getting chance or desired subjects at government universities, are being forced to seek admission at either foreign or private university. Tuition fees in foreign and private universities are very high which in many cases are unbearable for the family of the prospective learners. So, we need quality and employ oriented program to create scope for higher education for those deprived meritorious learners with affordable cost.

There is a huge employment scope of graduates from B.Sc (Hons) in Food Science and Nutrition program in Bangladesh as well as in foreign countries in food and nutrition sectors. Offering B.Sc (Hons) in Food Science and Nutrition program for deprived learners of higher education with science background will help to develop skilled manpower to meet growing demand in food and nutrition sectors, extend job opportunity and employment scopes, and create scopes for further higher education. Considering these matters, SST, BOU has launched 4-year B.Sc (Hons) in Food Science and Nutrition program.

2. Objectives of the Program

- To develop graduates with knowledge about the sources, functions and process of utilization of nutrients in the body;
- To develop graduates with required knowledge in promoting health through healthy dietary practices and preventing nutrition-related diseases;
- To develop graduates skill in analyzing food components and food hazards;
- To develop graduates expert in assessing nutritional status and prescribing appropriate diets in different stages of life and conditions;
- To equip graduates with theoretical and technical knowledge in ensuring food safety and hygiene;
- To produce graduates with scientific knowledge in processing, preservation, preparation and controlling quality of foods;
- To develop graduates skill in designing research proposal, conducting research and writing research report;
- To develop graduates with knowledge in running/developing small to medium scale food business and entrepreneurial mind;
- To develop graduates with interpersonal communication (both written and verbal in English) skills, leadership and group work skills to face the challenges in the global setting;
- To develop graduates with high standard ethical, moral and cultural values.

3. Learning Outcomes of the Program

Upon completion of the program, the learners will be able to

- Describe sources, functions and deficiency diseases of essential nutrients;
- Design diet and nutritional plan for any stage of life and condition;
- Enumerate physiological process of nutrients;
- Analyze food components and food hazards;
- Assess individuals and community nutritional status;
- Evaluate food safety and food hygiene;

- Process, preserve, prepare and control quality of foods;
- Formulate and conduct research work;
- Write research report;
- Develop and run small to medium scale food enterprise.
- Communicate interpersonally (in English) and can lead and work in group;
- Demonstrate high stand ethical, moral and cultural values.

4. Graduate Profiles/Generic Skills

- Intellectual skills (critical thinking, problem-solving, decision-making, creativity);
- Interpersonal, teamwork, leadership and communication (in English) skills;
- Self-management and professional development skills;
- Managerial, entrepreneurial and innovation skills;
- Research and awareness skills;
- Moral, ethical and social values' skills;
- Information management and life-long learning skills;
- Personal effectiveness/development and career management skills.

5. Career Prospects

After completion of B.Sc (Hons) in Food Science and Nutrition program, the learners can choose one of the following areas to build their career-

- As nutritionists at government/nongovernment hospitals and clinics;
- As food inspectors under ministry of food;
- In food processing, preservation, preparation and quality control sectors of food companies;
- In marketing sectors of food companies;
- In research and development sectors of food and nutrition;
- In academic institutions;
- As nutrition counselor;
- Running/setting up food related his/her own business ventures.

Academic Regulation

6. Name of the Program

Bachelor of Science (Honors) in Food Science and Nutrition; In-short B.Sc (Hons) in Food Science and Nutrition

7. Title of the Degree: B.Sc (Hons) in Food Science and Nutrition

8. Mode of Teaching-Learning

Teaching -Learning of B.Sc (Hons) in Food Science and Nutrition program shall take place through face-face lecture, practical work in lab, presentation, seminar, hands-on training in hospital and food company, audio and video programs, reference text materials, etc.

9. Study Center

Preliminary two study centers shall be opened to conduct academic activities of this program: One at the Department of Nutrition and Food Engineering, Daffodil International University, Dhaka and another is Uttara Campus, Bangladesh Open University.

10. Number of Seats per Study Center

Preliminary the number of seats per study center shall be 50-60. It can be increased to 80-100 seats/study center depending on the resources and facilities.

11. Nature of the Program

B.Sc (Hons) in Food Science and Nutrition program shall be operated through distance mode for a batch of learners each year at the Department of Nutrition and Food Engineering, Daffodil International University study center and two batches for Uttara Campus, Bangladesh Open University: one for distance mode and another for full-time regular program.

12. Minimum Qualification for Admission into the Program

The minimum qualification for admission into the B.Sc (Hons) in Food Science and Nutrition program is S.S.C (science) and H.S.C (science) with GPA 2.50/2nd division separately or S.S.C (science) with 2nd division/GPA 2.50 and diploma with 2nd division/CGPA 2.75/pass from any recognized institute (Institute of Health Technology, Agriculture Training Institute, Nursing Institute, Medical Assistant

Training School, Food Technology Institute, etc.) or equivalent. Biology/physiology/nutrition and chemistry must be included in any examination of the applicants.

13. Admission Procedure

- (a) **Call for Admission:** Call for admission into the program shall be invited once in an academic year.
- (b) **Collection of Admission Form:** Admission form and program overview shall be collected from Bangladesh Open University website (www.bou.edu.bd) after call for admission into the program in national newspapers, TV and BOU website (www.bou.edu.bd).
- (c) **Submission of Admission Form:** Properly filled up prescribed application form shall be submitted with following documents to Dhaka Regional Center (4/Ka Government Laboratory School Road, Dhanmondi, Dhaka) of BOU.
- (i) Attested copies of all certificates and mark sheets of S.S.C and H.S.C/Diploma or equivalents;
 - (ii) 3 copies of attested passport size recent photos;
 - (iii) Attested copy of testimonial from last academic institute;
 - (iv) Attested copy of National Identity Card (if have);
 - (v) Bank receipt copy of necessary fees as per BOU rules for application.

(d) Selection Criteria

Learners shall be selected for admission into the B.Sc (Hons) in Food Science and Nutrition program on the basis of result of the admission test. Admission test (in MCQ type questions) shall be of 100 marks for one hour with the following marks distribution.

Subject	Marks
Chemistry	30
Biology	30
English	20
General Knowledge	20
Total	100

14. Course and other Fees

Course and other fees shall be applicable as per rules of Bangladesh Open University.

15. Medium of Instruction

The medium of instruction of B.Sc (Hons) in Food Science and Nutrition program shall be English.

16. Study Materials

The syllabus of B.Sc (Hons) in Food Science and Nutrition program is updating regularly as new ideas replacing the old ones. So, the text and reference books of different publishers on Food Science and Nutrition as well as course teacher lecture sheets, online educational resources and audio-video programs shall be study materials for the learners of this program. If necessary, soft copy of each theoretical course written precisely depending on the content and manual of practical courses shall be provided to each learner.

17. Program Plan and Program Duration

Duration of the program	:	4 years
Total Semester	:	8
Semester Length	:	6 months
Total Credits	:	130

18. Types of Courses

The Courses for this program consist of

- (a) Theoretical;
- (b) Practical;
- (c) Project Work/Thesis work;
- (d) Internship at Food Industry/Hospital and
- (e) Comprehensive Viva voce.

19. Course Details for B.Sc (Hons) in Food Science and Nutrition Program

- (a) Total courses: 46
- (b) Core courses: 24 (66 credits) (Theory: $18 \times 3 = 54$ and Lab: $6 \times 2 = 12$ credits)
- (c) Ancillary courses: 21 (52 credits) (Theory: $14 \times 3 = 42$ and Lab: $5 \times 2 = 10$ credits)
- (d) One Project/Thesis Work course: 6 credits
- (e) One Comprehensive Viva voce course: 3 credits
- (f) Internship: 3 credits

20. Course Lay-out and Credit Hours

1st Year 1st Semester

Course Code	Course Title	Credits	Prerequisite
FSN11301T	Basic Nutrition	3.0	
FSN11302T	Physical Chemistry	3.0	
FSN11303T	Inorganic Chemistry	3.0	
FSN11304T	Functional English	3.0	
FSN11205P	Experiment in Physical Chemistry	2.0	
FSN11206P	Experiment in Inorganic Chemistry	2.0	
Total		16.0	

1st Year 2nd Semester

Course Code	Course Title	Credits	Prerequisite
FSN12307T	Human Physiology-I	3.0	
FSN12308T	Food Chemistry	3.0	
FSN12309T	Organic Chemistry	3.0	
FSN12310T	Food Microbiology	3.0	
FSN12211P	Macronutrients Analysis of Foods	2.0	FSN12308T
FSN12212P	Blood and Urine Analysis	2.0	FSN12307T
Total		16.0	

2nd Year 1st Semester

Course Code	Course Title	Credits	Prerequisite
FSN21313T	Human Physiology-II	3.0	
FSN21314T	Food Safety and Regulations	3.0	
FSN21315T	Instrumental Methods in Food Analysis-I	3.0	
FSN21316T	Nutritional Biochemistry	3.0	
FSN21317T	Nutrition Through Life Cycle	3.0	
FSN21218P	Analysis of Foodborne Pathogens	2.0	FSN12310T
Total		17.0	

2nd Year 2nd Semester

Course Code	Course Title	Credits	Prerequisite
FSN22319T	Instrumental Methods in Food Analysis-II	3.0	
FSN22320T	Food Processing Methods	3.0	
FSN22321T	Food Toxicology and Food Adulteration	3.0	
FSN22322T	Environmental Studies	3.0	
FSN22223P	Analysis of Food Micro-components	2.0	FSN21315T FSN22319T
FSN22224P	Analysis of Food Chemical Hazards	2.0	FSN21315T FSN22319T FSN22321T
Total		16.0	

3rd Year 1st Semester

Course Code	Course Title	Credits	Prerequisite
FSN31325T	Food Preservation Methods	3.0	
FSN31326T	Food Packaging	3.0	
FSN31327T	Nutritional Assessment	3.0	
FSN31328T	Diet Planning	3.0	
FSN31329T	Nutrition Counseling	3.0	
FSN31230P	Nutritional Assessment of Clients	2.0	FSN31329T
Total		17.0	

3rd Year 2nd Semester

Course Code	Course Title	Credits	Prerequisite
FSN32331T	Nutrition and Diet Therapy	3.0	
FSN32332T	Community Nutrition	3.0	
FSN32333T	Food Fortification and Supplementation	3.0	
FSN32334T	Nutraceuticals and Functional Foods	3.0	
FSN32235P	Nutrition and Diet Calculation in Disease States	2.0	FSN32331T
FSN32236P	Evaluation of Fortified Foods and Nutraceuticals	2.0	FSN32334T
Total		16.0	

4th Year 1st Semester

Course Code	Course Title	Credits	Prerequisite
FSN41337T	Entrepreneurship Development	3.0	
FSN41338T	Biostatistics	3.0	
FSN41339T	Research Methodology	3.0	
FSN41340T	Essentials of Food Science and Preparation	3.0	
FSN41341T	Food Quality Control and Quality Assurance	3.0	
FSN41242P	Food Quality Evaluation	2.0	FSN41341T
Total		17.0	

4th Year 2nd Semester

Course Code	Course Title	Credits	Prerequisite
FSN42343T	Food Biotechnology	3.0	
FSN42344In	Internship	3.0	
FSN42645PW	Project Work/Thesis Work	6.0	FSN41339T
FSN42346CV	Comprehensive Viva voce	3.0	
Total		15.0	

21. Classes of the Program

Face to face classes shall be held from Friday to Saturday for distance mode and any 4-5 days of the week for full-time regular mode except government vacation. In case of Uttara Study Center, BOU shall provide all the lab facilities to the learners to complete the practical work of each practical course. Practical classes shall be held after completing the classes of the theoretical courses. BOU shall provide additional lab support to the Daffodil International University study center, if they need.

22. Registration for the Second and Subsequent Semesters

Learners who shall complete 70% courses including prerequisite courses of the previous semester are eligible to register for all the courses prescribed for the next or following semester. When a theory course is a prerequisite course for a particular practical course in the same semester, in that case the learners have to participate all the class tests and attend at least 80% classes of that prerequisite course; otherwise she/he shall not be allowed to participate in practical classes and semester final examination of that practical course. The learners fail to fulfill

the above condition due to valid reason may continue their study in subsequent semester after taking special permission from the Dean, School of Science and Technology.

23. Learner's Identification Number

Each enrolled learner shall be given an Identification Card (ID) with specific identification (ID) number after admission into the program. The learner must use complete ID number during class test, quiz, examination and communication with the BOU. Example of ID number is given below-

2	0	-	2	0	1	-	5	6	-	8	1	5	-	0	0	1
Ad. year			Term				Program code			Center code				Serial No		

If the ID card is lost, the concerned learner shall require to make a General Diary (GD) at the nearest Police Station and has to apply with a copy of GD to the respective Regional Center of BOU (with fees if applicable) to get a duplicate one within 15 days of the incident.

24. Registration and Validity of Registration

Each learner must register with necessary fees before starting his/her semester within the stipulated time. The registration of a learner of B.Sc (Hons) in Food Science and Nutrition program shall remain valid for a period of six (06) years (i.e., 12 consecutive semesters) since admission into the program, if s/he is not subjected to

- (i) cancellation or suspension of registration, or
- (ii) discontinuation, or
- (iii) expulsion for adopting unfairmeans.

25. Cancellation of Registration

In the event of any misconduct or breach any of the relevant regulations of the BOU by any learner, the University may take necessary disciplinary action to cancel registration of the concerned learner as per the BOU Rules.

26. 'DE-NOVO' Registration

If any learner fails to complete the program within the tenure (six years) of registration, he/she may get the chance of *de-novo* registration. But the learners failed to complete at least 80% of the total courses during tenure period shall not be allowed to apply for the *de-novo* registration. Interested learners shall have to

apply to the School of Dean in prescribed form for *de-novo* registration. Under *de-novo* registration, learners with expired initial registration shall be allowed for further two years as new admission to finish his/her remaining course successfully. In that case, such learners shall be allowed exemption from the courses completed earlier successfully.

27. Class Duration

The duration of each theory class shall be one hour and after two consecutive theory classes there shall be a break of 10 minutes. The duration of each practical class shall be minimum four hours.

28. Academic Schedule

The academic session shall consist of two semesters per year. Generally, Spring Semester (January-June) shall start in January and Fall Semester (July-December) shall start in July; however it may slightly differ in any particular semester depending on arising unexpected situation. In each semester, 16 weeks shall be utilized for academic activities, 1 week for examination preparation, 5 weeks for semester final examination and 2 weeks for semester break.

29. Attendance Requirement

The learners must attend every theoretical and practical class. However, to accommodate for sickness and other contingencies, the attendance requirement shall be a minimum of 75% of the classes in any particular subject, otherwise s/he shall not be allowed to take the final examination in that course.

30. Absence in Quizzes and Class Tests

A learner shall get zero mark if he/she does not participate in quizzes and class tests during semester. Such absence shall naturally lead to reduction in marks which shall count towards the final grade; even may not be allowed to sit for the specific course final exam.

31. Conduct and Discipline

A learner should conform to the highest standard of discipline and shall conduct himself/herself within and outside the premises of the university and study center in a manner befitting the learner of national importance. He/she shall show the courtesy and consideration to the teachers/tutors and other employees of the university and render sincere co-operation to his/her fellow learners. The learners

must also pay due attention and courtesy to the visitors. A learner who shall be involved in any immoral, indiscipline, fanatic or subversive activity to the state, he/she shall be expelled without prior notice.

32. Course Designation and Numbering System

Each course is designated by using a three-letter code identifying the discipline, five digits and finally letter code. Digits and last letter code carry the following information-

- (i) The first digit indicates the year in which the course is normally taken;
- (ii) The second digit indicates the number of semester in that year;
- (iii) The third digit indicates the total credits of the course;
- (iv) The fourth and fifth digits are reserved for the course number;
- (v) The characters T, P, PW/TW, CV and In stand for Theory, Practical, Project Work/Thesis Work, Comprehensive Viva voce and Internship, respectively.

33. Duration of the Program

Duration of B.Sc (Hons) in Food Science and Nutrition program shall be 4 years divided into 8 semesters. The length of each semester shall six months. But a learner shall get 6 consecutive years (12 consecutive semesters) time to finish the program since his/her admission into the program.

34. Total Credits and Credit value

The total credit hours of B.Sc (Hons) in Food Science and Nutrition program is 130; out of which 66, 52, 3, 6 and 3 credit hours have been allocated for core courses, ancillary courses, internship (Hospital/Food Manufacturing Company), project/thesis work and comprehensive viva voce courses, respectively. For theory courses, 1 (one) credit hour is equal to 3 contact hours (face to face lecture) and a minimum of 3 hours out of class work per week for 16 weeks (or equivalent) in a semester.

For Laboratory courses, 1 (one) credit hour is equal to no less than 2 contact hours and a minimum of 2 hours out of class work each week for 16 weeks (or equivalent) in a semester. The required contact hours of the courses shall meet through face to face lecture, audio-video supports, assignments, homework, quizzes, class tests, self-study, hands-on training, demonstration, case study, field visit, etc

35. Assessments

Theoretical courses shall be assessed through formative and summative assessments. Formative assessment includes class tests, presentation, case study, etc and summative assessment shall be done through semester final examination. Similarly, practical courses shall be assessed through formative and summative assessments; formative assessment includes assignments, quizzes, presentation, case study, hospital and food company visits, etc and summative assessment shall be done through semester practical final examination.

36. Certification

BOU shall provide certificate to the learners after successful completion of the program.

Examination Regulation

37. Conduct of Examination

Semester final examination shall be held as per schedule notified by the controller of examinations of BOU.

38. Examination Center

Examination center shall be declared before starting semester final examination by the examination division of BOU.

39. Duration of Semester Final Examination

The duration of semester final examination for theoretical and practical courses shall be 3 (three) and 4 (four) hours, respectively.

40. Evaluation Procedure

To complete a course successfully, a learner shall be required to go through an evaluation procedure. The performance of a learner in each course (theoretical and practical) shall be evaluated based on a scheme of continuous assessments and semester final examination.

- (i) For theory courses, the continuous assessment of the learners shall be done through class tests.
- (ii) For practical courses, the continuous assessment of the learners shall be done through home work/assignment/quiz/practical work.

41. Total Marks

Total marks of the B.Sc (Hons) in Food Science and Nutrition program shall be 4150; out of which 3200 marks for theoretical courses, 550 marks for practical courses, 200 marks for project work, 100 marks for internship and 100 marks for comprehensive viva voce.

42. Distribution of Marks for Evaluation

(a) Distribution of Marks for Theory and Comprehensive Viva voce Courses

Course Type	Credits	Continuous Assessment		Semester Final Exam	Total marks
		Attendance	Class test		
Theory	3	10 marks	15×2=30 marks	60 marks	100
Com. Viva voce	3	-	-	-	100

(b) Distribution of Marks for Practical Courses

Course Type	Credits	Category	Marks
Practical	2	1. Class attendance	5
		2. HW/Assignment/Quiz	10
		3. Laboratory note book	10
		4. Experiment	20
		5. Viva voce	5
		Total	50

(c) Distribution of Marks for Project/Thesis Work

Course Type	Credits	Category	Marks
Project/ Thesis Work	6	Objective(s) of the work done	20
		Methodology adopted	40
		Results	20
		Discussions	40
		Conclusions and future perspective	20
		Viva (after project/thesis presentation)	60
		Total	200

(d) Distribution of Marks of Internship Course

Course Type	Credits	Category	Marks
Internship	3	Report	50
		Seminar	20
		Viva	30
Total			100

43. Performance Assessment

(i) Formative/Continuous Assessment

After completing 30% and 70% syllabus of each theoretical course, 1st and 2nd class tests shall be conducted, respectively for 15 marks each. The duration of class test shall be 40 min. In case of practical course, continuous assessment shall be done during practical classes through quiz/assignment/home work/practical work. 10 and 5 marks shall be allocated for class attendance for theoretical and practical courses, respectively. The basis of awarding marks for class attendance shall be as follows:

% Attendance	Theory	Practical
90% and above	10	5
80% to less than 90%	8	4
75% to less than 80%	6	3
Less than 75%	0	0

(ii) Summative Assessment/Semester Final Assessment

Summative assessment/Semester final assessment shall be done through written examination on each theoretical course at the end of the respective semester; practical courses shall be assessed through practical works/case study.

44. Question Pattern and Duration of Semester Final Examination

There shall be 10 questions in each theoretical course final examination out of which 6 questions (6×10=60 marks) shall be answered. Each question may have 2-3 sub-questions. The duration of examination shall be 3 hours.

45. Practical Examination

Practical examination shall be held after completion of theoretical courses semester final examination. The duration of practical examination shall be 4-6 hours depending on the length of the practical work.

46. Internship at Food Manufacturing Company/Hospital

In 4th year 2nd semester, every learner has to take part in internship at a hospital/a food company for one month and has to submit a report and to give a seminar on the report in front of an evaluation board.

47. Project/Thesis Work

- (i) Each learner shall be assigned a project/thesis work under a supervisor in the beginning of 4th year 2nd semester who shall be a faculty member of BOU/course teacher/any recognized university/institute having experience in the relevant field.
- (ii) The learner shall certify that the project work/thesis work was done by him has not been submitted elsewhere or for any other degree or diploma.
- (iii) Every learner submitting a project/thesis report in partial fulfillment of the requirement of a degree shall be required to appear at an oral examination.
- (iv) The project/thesis report must be signed by the project/thesis supervisor.
- (v) The project report shall be submitted in triplicate (typed & bound copy).
- (vi) Each learner has to give a presentation on his/her thesis/project report in front of an evaluation board as defense.

48. Comprehensive Viva voce

After completion of project work and internship in 4th year 2nd semester, each learner has to sit for comprehensive viva voce. Comprehensive viva voce shall be conducted by an evaluation board.

49. Withholding Results

The result of a learner of the B.Sc (Hons) in Food Science and Nutrition program may be withheld for any of the following reasons:

- (i) The learner in question has liability to the University;
- (ii) A disciplinary proceeding is pending against him/her;
- (iii) For any other reason for which the Board of Governors suggests to withhold the result.

50. Activities belong to Unfairmeans

The following activities shall be considered as unfairmeans-

- (i) Copying from another learner's assignment/script/paper;
- (ii) Copying from desk or palm of hand or other hand writing/printing documents;
- (iii) Possession of any hand writing/printed document;
- (iv) Unruly behavior or misbehavior with the invigilator.

The learners adopting any unfairmeans shall be subjected to punishment as per the Disciplinary Rules of the BOU.

51. Pass Marks and Grading System

(i) **Pass Marks:** Pass marks for each course of the program is 40%.

(ii) **Grading System:** The letter grade in any particular course is an indication of a learner's relative performance in that course. A minimum grade point average (GPA) is essential for satisfactory progress. Letter grades and corresponding grade points shall be as follows-

Range of Marks	Letter Grade	Grade Point
80% or above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F (Fail)	0.00
Incomplete	I	-
Withheld	W	-

(iii) Calculation of Cumulative Grade Point Average (CGPA)

(a) Semester grade point average (SGPA)

The performance of a learner in a semester shall be evaluated in terms of the semester grade point average (SGPA). The performance of a learner in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the learner during the semester. For example, if a learner takes five courses (Theory and or Practical) in a

semester with credits C_1, C_2, C_3, C_4 and C_5 and the learner's grade points in these courses are G_1, G_2, G_3, G_4 and G_5 , respectively, and then learner's SGPA shall be equal to:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The SGPA is calculated to two decimal points.

(b) Cumulative Grade Point Average (CGPA)

The learner's final grade shall be calculated on cumulative grade point average (CGPA) using the following formula.

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6 + C_7S_7 + C_8S_8}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8}$$

Where C_1, C_2, C_3, \dots is the total number of credits for semester First, Second, Third,.....and S_1, S_2, S_3, \dots is the SGPA of semester 1st, 2nd, 3rd,.....

52. Repeat/Improvement

The Repeat/Improvement course(s) shall be guided by the following rules:

- (i) If a learner obtains 'F' grade in any course can improve the grade when offered in the subsequent semester(s) by paying necessary re-examination fee(s).
- (ii) A learner earning a "B-" (B minus) grade or below may also choose to improve the grade when offered in the subsequent semester(s). The following rules shall apply for in this regard:
 - (a) Improvement opportunity shall be once only for each course. In such case, learners shall have to pay twice of the normal re-examination fees for each course. However, improvement of a course is not allowed after the graduation.
 - (b) In the case of failure to improve his/her course grade at the course improvement examination, the previous grade shall remain valid.
 - (c) In any of the above cases, the learners shall not require either to appear class test/quiz or submit assignments, if done once.

53. Requirements for Obtaining B.Sc (Hons) in Food Science and Nutrition Degree

- (i) Complete 130 credits successfully;
- (ii) Obtain a minimum grade of 'D' in each course;
- (iii) Secure a minimum Cumulative Grade Point Average (CGPA) 2.00;
- (iv) Complete the program within six academic years (12 consecutive semesters) since his/ her first admission year into the program.

54. Transcript and Certificate

Every learner shall get mark sheet for each semester. The learners shall get transcript and provisional certificate after graduation. The original certificate shall be issued only during convocation.



HPLC in Biological Science Lab of BOU

Syllabus

1st Year 1st Semester

FSN11301T: Basic Nutrition

Objective:

This course will expose learners to

- Different nutrients, their sources, functions and deficiency diseases.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Classify nutrients;
- List sources, functions and deficiency diseases of different nutrients.

Content:

1. Definition of food, nutrition, nutrients and calorie, composition of foods, classification of foods; classification of nutrients, organic and inorganic nutrients, essential and nonessential nutrients, macronutrients and micronutrients, refined/processed grains and whole grains, composition of the body, energy calculation of foods; overview of health and nutrition.
2. Carbohydrates: Definition, classification, sources, storage carbohydrates (glycogen), starch, glycemic index of different foods, physiological functions and deficiency diseases of carbohydrates.
3. Definition of dietary fibers, classification of dietary fibers, functions of dietary fibers, mechanisms of reducing blood cholesterol and sugar, deficiency diseases of dietary fibers, daily requirement of fibers.
4. Lipids: Definition, dietary classification, sources, essential and nonessential fatty acids and their sources, functions of different lipids, deficiency diseases of lipids, lipids and heart disease, types of lipids need daily.
5. Proteins: Definition, dietary classification, essential and nonessential amino acids, complete and incomplete proteins and their sources, mutual supplementation of foods for complete protein sources, LDL and HDL and their health implications, functions and deficiency diseases. Water-as a nutrient, function, sources, requirement, water balance & effect of deficiency.
6. Definition of vitamins, classification, sources, functions, deficiency diseases and toxicities of different fat- and water-soluble vitamins; daily RDA of vitamins.

7. Minerals: Definition and classification, sources, functions, deficiency diseases and toxicities of different minerals; trace elements and their functions; daily RDA of minerals. Body fluids and its electrolyte balance, acidosis and alkalosis.

Recommended Books:

- Lori A. Smolin, Mary B Grosvenor. Basic Nutrition, 2010, Publisher: Chelsea House, 132 West 31st Street, New York NY 10001.
- Janice L. Thompson, Melinda M. Manore, Linda A. Vaughan. The science of nutrition, 2nd ed., 2017, Publisher: Pearson, USA.
- Linda K. DeBruyne, Kathryn Pinna, Eleanor N. Whitney. Nutrition and Diet Therapy, 8th ed., 2013, Publisher: Cengage Learning, Mason, OH, USA.

FSN11302T: Physical Chemistry

Objectives:

This course will expose learners to

- Concentration units and properties of dispersed system;
- Laws of thermodynamics and reaction orders.

Learning Outcomes:

Upon completion of this course, the learners would able to

- Calculate concentration of the liquid in different units;
- Describe the properties of liquid;
- Describe the reaction orders and laws of thermodynamics.

Content:

1. Concentration units: Percent by weight and volume, mole fraction, molarity, molality, normality, formality, ppm.
2. Ideal and real solution: Definition of ideal and real solution, properties of solution, Raoult's law; colligative properties: elevation of boiling point, depression of freezing point, lowering vapor pressure and osmotic pressure; determination of molecular weight using colligative properties, osmosis and osmosis in physiology and biochemistry, abnormal colligative properties of dilute solutions. Types of electrolytes, colligative properties of electrolytes, electrolysis, ionic strength, dielectric effect, diffusion, electrophoresis, isoelectric and isoionic points.
3. Viscosity and viscosity coefficient, measurement of viscosity coefficient, effect of temperature, pressure and other factors on viscosity, viscosity of liquid mixtures.
4. Solubility and partition coefficient, endothermic and exothermic reaction, density, surface tension, boiling point, melting point.

5. Dispersed system: Colloids: definition of colloids and crystalloids, classification of colloids, preparation and purification techniques of colloidal dispersion, Tyndal effect, brownian movement, electrophoresis, electro-osmosis, protective colloids, gold number, zeta potential, lyophilic, lyophobic, amphiphilic colloids; Definition, classification and importance of suspension, gel and emulsion; emulsifiers, stabilization by emulsification, micelles, critical micelles concentration (CMC).
6. Order of reactions (zero, first, second and third): The rates of reactions; rate laws and rate constants; zero, first, second and third order reactions; molecularity of reactions, determination of order of reactions (i. integration method, ii. graphical method, iii. Half-life method). Characteristics of zero, first second and third order reactions; rate determining step and steady state approximation; endothermic and exothermic reactions.
7. Thermodynamics: Basic concepts of thermodynamics, zeroth and first laws of thermodynamics, spontaneous and non-spontaneous process with examples, statements of second law of thermodynamics, Carnot's cycle and its efficiency. entropy, physical significance of entropy, statement of third law of thermodynamics and calculation of absolute entropies of substances.

Recommended Books:

- Raymond Chang. Physical Chemistry for Chemical and Biological Sciences, 3rd ed., 2000, Printer: Edwards Brothers Inc., 55D Gate Five Road, Sausalito, CA 94965, USA.
- Arun Bahl, B.S. Bahl, G.D. Tuli. Essentials of Physical Chemistry, 2012, S. Chand Publishing, India.
- Atkins, P., and J. de Paula. Physical Chemistry. 7th ed. New York, NY: W.H. Freeman and Company, 2001. ISBN: 9780716735397.
- Silbey, R., R. Alberty, and M. Bawendi. Physical Chemistry. 4th ed. New York, NY: John Wiley & Sons, 2004. ISBN: 9780471215

FSN11303T: Inorganic Chemistry

Objectives:

This course will expose learners to

- The structure of atoms;
- The theories of acid and base;
- The procedure of titration;
- The properties of modern periodic table and co-ordination compounds.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Draw electronic structure of atoms;
- Describe different theories of acid and base;
- Describe the periodic table and co-ordination compounds.

Content:

1. Atom: Atomic number, mass number, atomic mass unit, atomic mass, isotopes, isobars, isotones, radionuclides, atomic structure (electronic configuration).
2. pH and buffer: Definition and importance of pH and buffer, pH scale and adjusting pH of solution; the effect of ionic strength and temperature on buffer solution, preparing a buffer solution with specific pH, buffer capacity, maintaining the pH of blood.
3. Acids, bases and salts: Definition of acids, bases and salts, dissociation of acids and bases, Lewis, Arrhenius, and Bronsted-Lowry theories of acid-base, strength of acids and bases, the relationship between the dissociation constant of acid and its conjugate base, amphoterism; hydrolysis of salts; types of chemical bonds.
4. Oxidation-reduction reaction, oxidizing and reducing agents, strength of oxidants and reductants, balancing of redox reactions.
5. Primary and secondary standards, acid-base titrations (strong acid and base, strong acid/base and weak acid/base), pH titration curve, theories of indicator, pH range of indicator, choice of an acid-base indicator in titrations equivalent weight, equivalence point and end point; redox titrations: redox reactions, redox indicators.
6. Periodic Table: Periodic law, classification of elements, modern periodic table in the light of electronic configurations of elements, different types of elements, periodic properties, atomic, covalent and ionic radii, ionization energy, electronegativity, electron affinity, effective nuclear charge.
7. Co-ordination compounds: Structures of co-ordination compounds, co-ordination number, types of ligands, metal-ligand bond, chelates, conditions for complex

formation, nomenclature, isomerisms; valence bond model for complexes, importance of complex compounds in biological system.

8. Electrolytes: Electrolyte, nonelectrolyte, polyelectrolyte, electrolysis and Faraday's laws; conductance; specific conductance, molar conductance; Kohlrausch's law.

Recommended Books:

- D. N. Singh. Basic Concept of Inorganic Chemistry, 2010, Dorling Kindersley, India.
- James E. House. Inorganic Chemistry, 2nd ed., 2013, Publisher: Elsevier, 225 Wyman Street, Waltham, MA 02451, USA.

FSN11304T: Functional English

Objectives:

This course will expose learners to

- Review of basic English grammar;
- Techniques of reading, speaking and writing English.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Apply grammatical rules in writing English;
- Speak in English in different social occasions;
- Read and write English.

Content:

1. Social English: Expressing opinions, agreeing and disagreeing, making enquiries, attracting others' attention, greeting and appreciation, appreciation, asking for permission, giving permission, expressing gratitude, farewell, expressing regrets, describing a place, participating in small talks- at the office, at the railway station, at the airport, at the travel agency, at the bank, at the hospital, talking on the telephone.
2. Functional Reading- a) Reading official Letters and Profiles, b) Reading News Reports/Newspapers, c) Reading Online Content, d) Reading Comprehension, Description and Narration (Objects, Places and People).
3. Grammar: Word order of sentences, framing questions, articles, prepositions, parts of speech, structure of sentence, tense, modal verbs: can/could, may/might, must, will/would, and shall/should, linking words and their uses, common phrases-meaning and their uses in the sentences, punctuation, voice
4. Writing skills:
 - Writing correct sentences, completing sentences and combining sentences.

- Situational writing: Posters, notices, slogans, memos, advertisements etc.
- Paragraph writing: Structure of a paragraph; topic sentences; developing ideas; writing a conclusion; types of paragraphs (narrative, descriptive, expository, persuasive); techniques of paragraph development (such as listing, cause and effect, comparison and contrast).
- Newspaper writing: Reports, press releases dialogues etc.
- Writing resumes, writing letters: Formal and informal letters, letters to the editor, request letters, job applications, complaint letters etc.
- Essay: Writing introductions, developing ideas, writing conclusions, revising and editing.

Recommended Book:

- A Passage to the English Language written by S.M. Zakir Hussain.

FSN11205T: Experiment in Physical Chemistry

Objectives:

This course will expose learners to

- The procedure for determination boiling point, melting point, viscosity, pH, concentration, density, molecular weight, partition coefficient and heat of solution;
- The procedure for preparation of buffer solution with specific pH value.

Learning Outcomes:

Upon completion of this course, the learners would able to

- Determine boiling point, viscosity, pH, density and concentration of liquid;
- Determine melting point of solid;
- Determine molecular weight of solutes;
- Prepare buffer solution with specific pH;
- Determine partition coefficient of solute and heat of solution.

Content:

1. Good laboratory practices and safety regulations
2. Preparation of different concentration and strength of solution.
3. Determination of pH and preparation of buffer solution.
4. Determination of melting point of solid, boiling point of liquid organic compounds and viscosity of liquid.
5. Determination of the coefficient of viscosity of a liquid/solution by Ostwald's viscometer method.
6. Determination of the density of a liquid/solution

7. Measurement of density of solution at different molar concentration and determination of the unknown concentration of a solution
8. Determination of the molecular weight of a solute by depression of freezing point method.
9. Determination of the molecular weight of a solute by elevation of boiling point method.
10. Determination of partition coefficient of iodine between methylene chloride and water.
11. Determination of partition coefficient of acetic acid between water and n-hexane/cyclohexane.
12. Determination of heat of solution by solubility method

Recommended Books:

- G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney. Textbook of Quantitative Chemical Analysis, 5th ed., 1989, Publisher: John Wiley and Sons Inc, 605 Third Avenue, New York NY 10158
- M. A. Malati. Experimental Inorganic/Physical Chemistry, 1999, Publisher: Woodhead Publishing India Private Ltd, New Delhi, India
- VK Ahluwalia, Sunita Dhingra, Adarsh Gulati. College Practical Chemistry, Publisher: University Press (India) Private Ltd, Hyderabad, India.

FSN11206T: Experiment in Inorganic Chemistry

Objectives:

This course will expose learners to

- The procedure for determination of the strength of acid and base by titration;
- Procedures for detection and separation of anions and cations.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Determine the strength of acid and base by titration;
- Detect and separate anions and cations from mixtures.

Content:

1. Calibration of volumetric apparatus.
2. Preparation of decinormal sulphuric acid and hydrochloric acid and their standardization with sodium carbonate
3. Standardization of potassium permanganate solution by sodium oxalate.

4. Estimation of amount of acetic acid from the given vinegar sample by titrimetric method
5. To prepare standard 0.1 N KMnO_4 solution and to determine the strength of given oxalic acid solution.
6. To determine quantity of Fe(II) ions from the given solutions by titrating it with 0.1 N $\text{K}_2\text{Cr}_2\text{O}_7$ solution by using internal indicator.
7. To estimate amount of Cu(II) ions by iodometric titration by using $\text{Na}_2\text{S}_2\text{O}_3$ solution.
8. Standardization of potassium permanganate solution by sodium oxalate
9. Estimation of iron (ferrous and ferric) in solution/ore/oxide by titration with $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$
10. Determination of calcium in limestone by KMnO_4
11. Detection of cations and anions in a supplied sample.
12. Separation of cations and anions by paper chromatography/thin layer chromatography.

Recommended Books:

- G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney. Textbook of Quantitative Chemical Analysis, 5th ed., 1989, Publisher: John Wiley and Sons Inc., NY, USA.
- M. A. Malati. Experimental Inorganic/Physical Chemistry, 1999, Publisher: Woodhead Publishing Private Ltd, New Delhi, India.
- VK Ahluwalia, Sunita Dhingra, Adarsh Gulati. College Practical Chemistry, Publisher: University Press (India) Private Ltd, Hyderabad, India.

1st Year 2nd Semester

FSN12307T: Human Physiology-I

Objectives:

This course will expose learners to

- Functional unit of the body and mechanism of homeostasis;
- Structure and functions of digestive, cardiovascular and endocrine systems.

Learning outcomes:

Upon completion of this course, the learners would be able to

- Describe functional unit of the body and mechanism of homeostasis;
- Describe structure and functions of digestive, cardiovascular and endocrine systems.

Content:

1. Definition and scope of physiology, levels of organization, homeostasis, structure of cell and function of its components.
2. Blood: Definition, compositions and functions of blood, types of blood cells and their functions, ESR, significance of ESR, blood coagulation, structure and types and functions of haemoglobin, variation of Hb in different physiological conditions, blood groups and blood types, blood transfusion.
3. Digestive system: Structure and functions of different parts of digestive system, mechanism of secretion of different digestive juices.
4. Endocrine system: Definition of endocrine glands, classification of hormones, functions of hormones secreted from different glands, mechanisms of hormone action and control of hormone secretion.
5. Cardiovascular system: Structure and functions of heart, types of blood vessels and their functions, cardiac output, blood pressures, blood circulation (systemic and regional), classification of blood pressure and their implication, heart diseases.
6. Tissues: Definition of tissues, classification and structure of tissues, properties of different tissues, and functions of tissues.
7. Membrane transport, fluid, electrolytes and acid-base balance: Passive transport and facilitated diffusion, active transport (pumps and exchangers), osmosis and osmotic pressure, electrolytes in body fluid, fluid and electrolyte balance, acid-base balance.

Recommended Books:

- Gerard J. Tortora and Bryan Derrickson. Principles of Anatomy and Physiology, 15th ed., 2017, Publisher: John Wiley & Sons Inc., USA.
- Wilson and Ross. Anatomy and physiology in the Health and Illness, 12th ed., 2014, Publisher: Churchill Livingstone, UK.
- C.C Chatterjee. Human physiology, 12th ed., Volume I&II, CBS Publishers and Distributors Pvt. Ltd, New Delhi, India.
- Lauralee Sherwood. Fundamentals of Human Physiology, 4th ed., 2012, Publisher: Cengage Learning, USA.

FSN12308T: Food Chemistry**Objectives:**

This course will expose learners to

- Properties and chemical structures of nutrients;
- Classification and functions of additives;
- Drug-nutrient interaction.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe physical and chemical properties of nutrients;
- Classify food additives;
- Describe importance of food additives
- Describe the effects of drug-nutrient interaction.

Content:

1. Definition of food chemistry, its functions and scope.
2. Carbohydrates: Chemical classification of carbohydrates, properties of simple & complex carbohydrates, glycosidic linkage, chemical reactions of sugars, oxidation-reduction reactions, osazone formation, structure of the disaccharides: sucrose and lactose, nonreducing nature of sucrose, dietary fibers.
3. Hard water vs soft water, free or bound water, composition of water, measuring calories, functions of water in food, chemical reactions
4. Lipids: Definition, chemical classification, nomenclature of lipid, physical and chemical properties, saturated and unsaturated as well as *cis* and *trans* fatty acids, chemical structures of essential and nonessential fatty acids, lipid oxidation (rancidity) and iodine binding reactions; hydrogenation (margarine), lipid reactions, health effects of banaspati, ghee and *trans* fatty, fat replacers and mimetics, extraction of edible fats and oils, refining of oils, groups of fat products.

5. Amino acids and Proteins: Definition, classification of amino acids and proteins, physical and chemical properties, essential and nonessential amino acids, acidity and basicity, isoelectric point, denaturation of proteins and its significance, hydrolysis of protein, protein quality and its measurement, UV absorption, nutritive value of proteins.
6. Vitamins: Classification, chemical structures, stability and degradation
7. Food additives: definitions, classification, purposes of using food additives, risks and benefits of food additives; important food additives and their functions- sweeteners (general, low calorie and non-nutritive), natural and synthetic colorants, pH controlling agents, nutritive additives, acidulants, enzymes, antioxidants, preservatives, emulsifying and stabilizing agents, anti-caking agents, flavoring agents, thickeners, firming agents, flour bleaching agents, clarifying agents.
8. Drug-nutrient interactions, food allergies and food intolerance

Recommended Books:

- S.A. Iqbal and Y. Mido. Food Chemistry, 1st ed., 2005, Discovery Publishing House, New Delhi, India.
- A. Larry Branen, P. Michael Davidson, Seppo Salminen, John Thorngate. Food Additives Series: Food Science and Technology, 2001, CRC Press, USA.
- J. Smith, L. Hong-Shum. Food Additives Data Book, 2nd ed., 2011, Wiley-Blackwell Publishing, UK.
- Richard Owusu-Apenten (2004). Introduction to Food Chemistry, 1st ed., CDC Press, Florida, USA.
- L H Meyer. Food Chemistry, 2004, CBS Publisher, New Delhi, India.
- H D Belitz, W. Groech and P. Schieberle. Food Chemistry, 3rd ed., 2004, Publisher: Springer Berlin Heidelberg, Germany.
- S.N. Mahindru. Food Additives: Characteristics, Detection and Estimation, 2008, Publisher: APH Publishing Corporation, New Delhi, India.

FSN12309T: Organic Chemistry

Objectives:

This course will expose learners to

- The classification of organic compounds;
- The rules for naming aliphatic and aromatic compounds;
- The representation reactions of aliphatic and aromatic compounds;
- The stereochemistry and isomerisms.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- The classification of organic compounds;
- The rules for naming aliphatic and aromatic compounds;
- Describe the representation reactions of aliphatic and aromatic compounds;
- Determine stereochemistry and isomers.

Content:

1. Introduction to Organic Chemistry: Definition and classification of organic compounds, necessities of organic compounds in life, sources of organic compounds, application of organic chemistry.
2. Aliphatic compounds
 - Naming, general methods of preparation, properties, characteristic reactions and uses of the following aliphatic compounds: alkane, alkene (*cis* and *trans*), alkyne, alkyl halide, alcohol, ether, aldehyde, ketone, amine and alcohols
 - Naming, general methods of preparation, properties, characteristic reactions and uses of the following compounds: carboxylic acids; mono, di, tri and polycarboxylic acids, ester, anhydride, acyl halides and amides.
3. Aromatic compounds
 - Classification of aromatic compounds
 - Structure of benzene, Huckel's rule and aromaticity of benzene, nomenclature of aromatic compounds.
 - Mechanism of electrophilic and nucleophilic substitution reactions of benzene.
 - Preparation, properties, characteristic reactions and uses of the following aromatic compounds-benzene, toluene, benzoic acid, phenol, nitrobenzene, aniline and diazonium salts.
4. Stereochemistry and Isomerism
 - Stereochemistry: Definition, different types of stereoisomers with example.
 - Geometric isomerism-definition, condition of geometrical isomerism, properties of geometrical isomers,

- Optical isomerism- optical activity, chirality and chiral molecules, significance of chirality in biological world, enantiomers, racemic modification, D, L-notations, diastereoisomers, absolute configuration (assigning *R* and *S* configuration).
- 5. Pesticides and Dyes: Classification of pesticides and dyes, application and health effects.
- 6. Polymers: Definition of polymers, properties and classification of polymers, polymerization reactions (addition and condensation).

Recommended Books:

- Bhupinder Mehta, Manju Mehta. Organic Chemistry, 2nd ed., 2015, Publisher: PHI Learning Private Limited, Delhi, India.
- William H. Brown, Christopher S. Foote, Brent L. Iverson, Eric V. Anslyn, Bruce M. Novak. Organic Chemistry, 6th ed., 2012, Publisher: Cengage Learning, USA.
- R. L. Madan. Organic chemistry, 2013, Publisher: Tata Mc Graw Hill Education Private Limited, New Delhi, India.
- Robert T. Morrison, Robert N. Boyd. Organic Chemistry, 6th ed., 1992, Publisher: Prentice Hall, USA.
- Arun Bahl and B. S. Bahl. Advanced Organic Chemistry, 5th ed., 2014, Publisher: S Chand & Co Ltd, India.

FSN12310T: Food Microbiology

Objectives:

This course will expose learners to

- Classification, growth and survival of microorganisms;
- Microbial food spoilage process and methods of spoilage control;
- Microbiological methods.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Classify microorganisms;
- Describe growth and survival process of microorganisms;
- Identify causes of food spoilage and food spoilage bacteria;
- Isolate and preserve bacteria and fungi.

Content:

1. History of microorganisms in foods, importance of microorganisms in foods, types of microorganisms in foods, morphology and structure of microorganisms in foods: bacteria, fungi (yeast and molds) and virus; microbial reproduction or growth (binary fission, generation time, growth curve), natural of microbial growth in foods (mixed population; symbiotic, synergistic and antagonistic growth), factors affecting growth and survival of microorganisms in foods.
2. Sources of microorganisms in foods, significance of microorganisms in foods, microbial spoilage of foods (principles of food spoilage; spoilage of meat and meat products, eggs and egg products, milk and milk products, seafood and their products, vegetables and fruits, cereal and their products, canned foods, miscellaneous foods), classification of foods by ease of spoilage, indicators of microbial food spoilage (indicators of foodborne pathogens), microbial foodborne diseases, methods of control of microorganisms in food, beneficial uses of microorganisms in food, permissible level of organisms in food
3. Microbiological methods: different culture media, aseptic techniques, sterilization, isolation techniques of bacteria and fungi, technique of pure culture, preservation of microorganisms, method of identification of foodborne pathogenic bacteria in foods.

Recommended Books:

- E.C.S. Chan, Michael J. Pelczar, Jr., Noel R. Krieg. Microbiology, 5th ed., Published by Tata McGraw-Hill Education Pvt. Ltd, India.
- Thomas J. Montville, Karl R. Matthews, Kalmia E. Kniel. Food Microbiology: An Introduction, 3rd ed., 2012, ASM Press, USA.

- Osman Erkmen, T Faruk Bozoğlu. Food Microbiology: Principles into Practice, Vol. I and II, 2016, John Wiley & Sons Ltd, UK.
- Thomas J. Montville. Food Microbiology, 2008, John Wiley & Sons Ltd, UK.

FSN12211P: Macronutrients Analysis of Foods

Objective:

This course will expose learners to

- The procedure for analysis of macronutrients of foods.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Analyze water, proteins, carbohydrates and fats of foods.

Content:

1. Determination of moisture, total solids and ash content of foods.
2. Determination of ash content of foods.
3. Determination of protein content of foods.
4. Determination of fat content of foods.
5. Determination of dietary fiber content in foods.
6. Determination of the lactose content of milk by polarimetry.
7. Calculation of the calorific value of foods.
8. Qualitative and quantitative analysis of carbohydrates in foods.
9. Determination of saponification, acid and iodine values of lipids.
10. Detection of N, S and halogens in organic compounds and different functional groups.
11. Determination of molecular mass and molecular formula.
12. Determination of functional groups by IR spectroscopy and confirm by chemical methods.

[Note: Only those practical works of the above will be done having all lab facilities.]

Recommended Books:

- C. S. James. Analytical Chemistry of Foods, 1995, 1st ed., Publisher: Chapman & Hall, USA.
- David T. Plummer. An Introduction to Practical Biochemistry, 1987, 3rd ed., Published by Tata McGraw-Hill Education Pvt. Ltd, India.
- S. Suzanne Nielsen (Editor). Food Analysis, 5th ed., 2017, Publisher: Springer Nature, Gewerbestrasse 11, 6330 Cham, Switzerland.

- Semih Otles (Editor) (2005). Methods of Analysis of Food Components and Additives, Publisher: CRC Press, Tylor and Francis Group, 600 Broken Sound Parkway NW, Suite 300.
- Monika Waksmundzka-Hajnos, Joseph Sherma. High Performance Liquid Chromatography in Phytochemical Analysis, Publisher: CRC press, Tylor and Francis Group, 6000 Broken Sound Parkway NW, Suite 300.
- Rui M.S. Cruz, Igor Khmelinskil, Margarida C. Vieira. Methods in Food Analysis, Publisher: CRC press, Tylor and Francis Group, 6000 Broken Sound Parkway NW, Suite 300.
- Handbook of food Analytical Chemistry (Water, Proteins, Enzymes, Lipids, and Carbohydrates). Published by John Wiley & Sons, Inc., Hoboken, New Jersey, USA.

FSN12212P: Blood and Urine Analysis

Objectives:

This course will expose learners to

- Procedure for analysis of blood components and urine components.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Estimate of haemoglobin, RBC, WBC and ESR of a patient;
- Determine blood group and lipid profile of a patient.
- Measure blood pressure;
- Quantify blood glucose level;
- Determine normal and abnormal constituents of urine.

Content:

1. Estimation of haemoglobin, RBC, WBC and ESR.
2. Determination of blood groups.
3. Determination of lipids of blood.
4. Measurement of blood pressure.
5. Determination of glucose level in blood.
6. Determination of some important normal and abnormal constituents of urine (e.g., glucose, uric acid, creatinine, ketone bodies, albumin, etc).

Recommended Books:

- Dr. Rashmi A. Joshi, Dr. Manju Saraswat. A textbook of Practical Biochemistry, 1st ed., 2002, B. Jain Publishers (P) Ltd, New Delhi, India.
- David T. Plummer. An Introduction to Practical Biochemistry, 1987, 3rd ed., Published by Tata McGraw-Hill Education Pvt. Ltd, India.
- Ranjna Chawla. Practical Clinical Biochemistry: Methods and Interpretations, 4th ed., 2014, Jaypee Brothers Medical Publishers (P) Ltd, India.
- Barbara J. Bain. Blood Cells: A Practical Guide, 4th ed., 2006, Blackwell Publishing, Inc., 350 Main Street, Malden, Massachusetts 02148-5020, USA.

2nd Year 1st Semester

FSN21313: Human Physiology II

Objectives:

This course will expose learners to

- Structures and functions of reproductive, urinary, nervous, lymphatic, respiratory and skeletal systems.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe structures and functions of reproductive, urinary, nervous, lymphatic, respiratory and skeletal systems.

Content:

- 1.Reproductive system: Male and female reproductive systems; menstrual cycle and spermatogenesis as well as their regulation; ovulation and its control, pregnancy, controlling fertility
- 2.Urinary system: Anatomy of the kidneys, functions of kidneys, functional unit of kidney (nephron), renal processes (glomerular filtration, tubular reabsorption and tubular secretion), mechanism of production of dilute and concentrated urine, role of kidney in homeostasis, kidney function test.
- 3.Liver: Functions, liver diseases
- 4.Nervous system: Definition of neuron, structure of functional unit of nervous system, organization of nervous system, synapses and neurotransmitters, classification of nervous systems and their functions, mechanism of signal transmission, action potential.
- 5.Lymphatic system and immunity: Overview of the lymphatic system, lymphatic vessels and lymph circulation, functions of lymphatic system, concept of immunity, types of immunity.
- 6.Muscular tissues: Definition of muscular tissue, classification and functions of muscular tissues, contraction and relaxation of muscle fibers.
- 7.Respiratory system: Structure and functions of respiratory system, lung volumes and capacities, regulation of respiration, transport of oxygen and carbon dioxide in blood, hypoxia.
- 8.Skeletal System and joints: Introduction, composition of bone, bone development, function of bones, classification of joints, general structures of a synovial joint, types of synovial joints, types of joint movements, factors affecting contact and range of motion at synovial joints, aging and joints.

Recommended Books:

- Gerard J. Tortora and Bryan Derrickson. Principles of Anatomy and Physiology, 15th ed., 2017, Publisher: John Wiley & Sons, Inc., USA
- Wilson and Ross. Anatomy and physiology in the Health and Illness, 12th ed., 2014, Publisher: Churchill Livingstone, UK.
- C.C Chatterjee. Human physiology, 12th ed., Volume I&II, CBS Publishers and Distributors Pvt. Ltd, New Delhi, India.
- Lauralee Sherwood. Fundamentals of Human Physiology, 4th ed., 2012, Publisher: Cengage Learning, USA.

FSN21314T: Food Safety and Regulations**Objectives:**

This course will expose learners to

- Concept of food safety and hygiene;
- Food hazards and their health effects;
- Process of reducing hazards of foods;
- Bangladeshi and International food safety laws and regulations.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe the causes of inclusion of health hazards in foods;
- Reduce and control hazards of foods;
- Describe Bangladeshi and International food safety laws and regulations.

Content:

1. Basic food safety concepts: Definition of food safety, food safety: facts and figures, concept of product 'quality', Food safety: key concepts (concepts of 'hazard', 'risk' and 'crisis'; 'product', 'food chain', 'process', system, traceability), key role of operators in ensuring food safety,
2. Definition of food hygiene, importance of food hygiene for safety and quality; classification of food hazards, their origin and associated health risks; contamination and cross contamination of foods; causes of food poisoning, high risk foods for food poisoning; good practices to prevent food contamination during production, transportation, storage, preparation and storage; personal hygiene to prevent food contamination; safe storage of common household foods, food-borne public health concern chemicals such as veterinary drugs, heavy metals, persistent organic pollutants, naturally occurring toxins and their house reduction methods in foods; safety and health risks of street foods of Bangladesh;

3. Criteria for judging safe foods for consumption, condition that could lead to food spoilage, signs of spoilage in fresh, dry and preserved foods; cleaning and disinfecting food areas, control of pests in food handling area, storage and disposal of wastes, good agricultural and manufacturing practices, hazards analysis critical control points - ISO standards.

4. Food Safety Laws and Regulations

- The Food Safety Act, 2013
- Food Safety (Contaminants, Toxins and Harmful Residues) Regulations, 2017
- Food Safety (Labeling) Regulations, 2017
- Use of Food Additives Regulations, 2017
- Food Sample collection, testing and analysis Regulations, 2017
- Food Safety (Food Hygiene) Regulations, 2018
- International food laws and regulations.

Recommended Books:

- Principles of Hygiene and Food Safety Management. PIP c/o COLEACP 130, rue du Trône, B-1050 Brussels, Belgium.
- Ronald H. Schmidt and Gary E. Rodrick. Food Safety Handbook, 2003, Published by John Wiley & Sons, Inc., Hoboken, New Jersey, USA.
- Osman Erkmen, T Faruk Bozoğlu. Food Microbiology: Principles into Practice, Vol. I, 2016, John Wiley & Sons Ltd, UK.

FSN21315T: Instrumental Methods in Food Analysis-I

Objectives:

This course will expose learners to

- Principle and methods of UV-Vis, IR, NMR and Mass spectrometers;
- Methods of extraction and purification.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describes the principle and methods of UV-Vis, IR, NMR and Mass spectrometers;
- Analysis of UV-Vis, IR, NMR and Mass spectrometric data;
- Extract and purify bioactive compounds from foods.

Content:

1. Ultra violet and visible spectroscopy: Principle, Beer-Lambert's law and determination of concentration, instrumentation, electronic transition, transition

probability, selection rules, chromophore, auxochrome, absorption & intensity shift, absorption bands, solvent effects, application in food analysis.

2. Infra-red spectroscopy: Principle, molecular vibration and their types, hook's law, fundamental vibration, number of fundamental vibration, characteristics IR absorption of different function groups, instrumentation, finger pointing regions and its importance, application in food analysis.
3. NMR spectroscopy: ¹H-NMR spectroscopy: Principle, relaxation process, instrumentation, chemical shift, spin-spin coupling, different spin systems, coupling constants, spin-spin decoupling, long range coupling; ¹³C NMR: Theory and structure; application in food analysis.
4. Mass spectroscopy: Principle, instrumentation, origin of mass spectrum, determination of molecular weight, ionization technique, recognition of molecular ion and isotopic peaks, fragmentation process, high resolution MS, application in food analysis.
5. Extraction and purification of bioactive components of foods (conventional and recent extraction techniques, purification techniques); identification of bioactive components from foods (groups identification, structure determination, identification of chemical components).

Recommended Textbook:

- J.R.J. Paré, J.M.R. Bélanger. Instrumental Methods in Food Analysis, volume 18, 1st ed., 1997, Publisher: Elsevier Science B.V., Amsterdam, The Netherlands.

FSN21316T: Nutritional Biochemistry

Objectives:

This course will expose learners to

- Physiological process of nutrient in the body;
- Structure and functions of DNA and RNA;
- Physiological roles of enzymes and co-enzymes.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe metabolic process of nutrients;
- Describe structure and functions of DNA and RNA;
- Describe enzymes and co-enzymes and their physiological roles.

Content:

1. Digestion and absorption of carbohydrates, proteins and lipids; biochemical mechanism of absorption of important vitamins and minerals and causes of absorption inhibition.
2. Metabolism of carbohydrates, proteins and lipids.
3. Basic concept of nucleic acid: definition, classification, structure and function of DNA and RNA, synthesis of protein (transcription and translation), genes and chromosomes and their functions (in brief).
4. Enzymes: chemical nature, classification, enzyme kinetics, enzyme specificity, characteristics of active sites, factors affecting enzyme activity, enzyme activation, enzyme inhibition, irreversible inhibition of poisons and toxins, enzyme catalyst.
5. Coenzymes: Different co-enzymes and their biochemical roles (e.g., thiamine pyrophosphate, flavin coenzyme, TH4, pantothenic acid, NAD⁺, NADPH⁺ pyridoxal pyrophosphate, biotin, vitamin B12, etc).

Recommended Books:

- Gerard J. Tortora and Bryan Derrickson. Principles of Anatomy and Physiology, 15th ed., 2017, Publisher: John Wiley & Sons, Inc., USA
- Wilson and Ross. Anatomy and physiology in the Health and Illness, 12th ed., 2014, Publisher: Churchill Livingstone, UK.
- C.C Chatterjee. Human physiology, 12th ed., Volume I&II, CBS Publishers and Distributors Pvt. Ltd, New Delhi, India.
- Lauralee Sherwood. Fundamentals of Human Physiology, 4th ed., 2012, Publisher: Cengage Learning, USA.

FSN21317T: Nutrition Through Life Cycle**Objectives:**

This course will expose learners to

- The requirements of nutrients and calories in different stages of life.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe nutrients and calories requirements in different stages of life.

Content:

1. Definition of recommended dietary allowances (RDAs), adequate intakes (AIs), dietary reference intakes (DRIs) and upper limit intakes (ULIs).
2. Nutrition for infants and young children: classifications of infants and children by age, growth and development of infants and young children, energy and nutrient

requirements during infancy; feeding of infants: breast feeding and bottle feeding, feeding frequencies, acceptable reasons of formulation feeding, advantages of breastfeeding, techniques of breastfeeding, signs of effective breastfeeding, Factors affecting successful breastfeeding, breast milk expression and storing, identifying hunger and satiety; supplementary feeding: definition, starting time, nature and complementary food groups, guidelines for healthy and safely infants feeding practices, supplements for infants; feeding term and preterm infants, common nutrition problems in infants and their prevention.

3. Nutrition for children and adolescents: Growth and development in children and adolescents, nutritional requirements for children and adolescents, factors influencing food choice in adolescents and nutrition concerns; tips for parents choosing healthy diets for children and adolescents, common nutritional problems and their prevention, nutrition for the athlete
4. Nutrition during pregnancy and lactation: nutritional needs during prepregnancy, weight gain during pregnancy, nutritional needs during pregnancy, fulfillment of nutritional needs during in pregnancy, concerns during pregnancy, dietary supplements during pregnancy, common health problems during pregnancy and their prevention, nutritional requirements and adolescent pregnancy, nutritional requirements in lactation.
5. Adult nutrition: Calorie and nutrients requirements, nutritional concerns, weight Control.
6. Older adult nutrition: Calorie and nutrients recommendation, nutritional concerns.

Recommended Books:

- Judith E. Brown. Nutrition Through the Life Cycle, 6th ed., 2016, Publisher: Wadsworth Publishing, USA.
- Ruth A. Roth. Nutrition & Diet Therapy, 10th ed., Publisher: Maxwell Drive Clifton Park, NY, USA.
- Janice J. Thompson, Melinda M. Manore, Linda A. Vaughan. Science of Nutrition, 3rd ed., 2013, Publisher: Pearson, USA.

FSN21218P: Analysis of Foodborne Pathogens

Objectives:

This course will expose learners to

- Techniques of isolating bacteria and identifying bacteria;
- Methods of antibiotic sensitivity testing and viable microbial count in food.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Isolate and identify bacteria;
- Test antibiotics sensitivity against pathogens;
- Count viable microbes in food.

Content:

1. Aseptic culture technique
2. Method of isolation of pure culture
3. Identification of bacteria by Gram-staining
4. Antibiotics sensitivity testing
5. Isolation and identification of common food borne pathogens.
6. Determination of number of viable microorganisms in food sample.
7. Microbial testing of water

Recommended Books:

- Naveena Varghese, Joy P.P (2014). Microbiology Laboratory Manual, Kerala Agricultural University, Pineapple Research Station, Kerala, India.
- Neelima Garg, K L Garg. Laboratory Manual of Food Microbiology, 2010, Publisher: K G Mukerji, New Delhi, India.
- W.F. Harrigan, Margaret E. McCance. Laboratory Methods in Microbiology, Academic Press (September 28, 2014).

2nd Year 2nd Semester

FSN22319T: Instrumental Methods in Food Analysis-II

Objectives:

This course will expose learners to

- Different chromatographic methods of separation;
- Principle and methods of absorption spectroscopy.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe the principle and procedure for separation of compounds by chromatography.
- Describe the principle and procedure for analysis of minerals by absorption spectroscopy
- Describe the procedure for analysis of compounds by gas chromatography.

Content:

1. Chromatography: Basic principle, chromatogram, retention volume, capacity factor, selectivity and resolution.
2. Modes of separation: adsorption, partition, ion-exchange and size-exclusion chromatography.
3. Stationary versus mobile phase, planar chromatography: paper and thin layer chromatography (theory, technique and detection); liquid-solid and liquid-liquid chromatography, application in food analysis.
4. HPLC: Introduction, theory and principle, instrumentation, characteristics of stationary and mobile phases, reversed and normal phase HPLC, detector and application in food analysis.
5. Atomic absorption spectroscopy: principle, instrumentation, procedure for determination of mineral concentration of sample (e.g., standard addition methods), application in food analysis.
6. Gas chromatography- principle, instrumentation, procedure for analysis of different types of samples by GC, application in food analysis

Recommended Textbook:

- J.R.J. Paré, J.M.R. Bélanger. Instrumental Methods in Food Analysis, volume 18, 1st ed., 1997, Publisher: Elsevier Science B.V., Amsterdam, The Netherlands.
- Raymond P.W. Scott. Techniques and Practice of Chromatography, 1st ed., 1995, Publisher: CRC Press, NY, USA.

FSN22320T: Food Processing Methods

Objectives:

This course will expose learners to

- The concept of food processing;
- The methods of food processing.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe the concept and methods of food processing.

Content:

1. Definition food processing, general concept of food processing, importance of food processing, Advantages and disadvantages of food processing, major causes of food deterioration/spoilage, classification of foods based on perishability.
2. Postharvest handling and preparation of foods for processing (properties of raw food materials and their susceptibility to deterioration and damage, storage and transportation of raw materials, raw material cleaning, sorting and grading).
3. Methods of food processing: Mixing (agitation, blending), size reduction or milling (crushing, grinding-dry and wet grinding for solid, and homogenization and atomization for liquid comminution), chopping or slicing, emulsification, peeling or skinning, screening of solids (removing), filtration, membrane separation, centrifugation, extraction, crystallization, heat processing, extrusion, gelling, baking, cooking (such as boiling, broiling, frying, steaming or grilling), roasting and toasting, high pressure processing, membrane processing, ozone processing, novel thermal processing techniques, separation and concentration, dough processing.

Recommended Books:

- B. Sivasankar. Food Processing and Preservation, 1st ed., 2004, Publisher: PHI Learning Private Ltd, Connaught Circus, New Delhi, India.
- Suwendu Bhattacharya (editor). Conventional and Advanced Food Processing Technologies, 2015, Publisher: Wiley, USA.
- Richard W Hartel, Dennis R. Heldman. Principle of Food Processing, 1997 ed., Publisher Chapman and Hall, USA.
- Ernest R. Vieira. Elementary Food Science, 4th ed., International Thomson Publishing, Chapman and Hall, NY, USA.

FSN22321T: Food Toxicology and Food Adulteration

Objectives:

This course will expose learners to

- Classification of toxicants and adulterants and their health effects;
- Physiological process of toxicants;
- Methods of detection of adulterants/toxicants.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Classify toxicants and food adulterants;
- Describe the physiological process of toxicants;
- Describe the procedure for detection of adulterants/toxicants.

Content:

1. Definition, history, scope and importance of Food Toxicology; toxicokinetics and toxicodynamics, classification of toxicants, health effects of different toxicants; potency and efficacy; major routes and media of exposure to toxicants, bioaccumulation and bioconcentration of toxicants (heavy metals and persistent organic pollutants) in food chain; different types of doses (test dose, TD, ED₅₀, LD₅₀, LD₁₀₀,); dose response relationship of toxicants, graphs and interpretation;
2. Distribution, storage and biotransformation of toxicants, factor affecting distribution and biotransformation, Phase I and Phase II biotransformation reactions, elimination of toxicants, antidotes of toxicants.
3. Types of toxicities, determination of toxicants in foods (qualitative and quantitative), and risk-benefit analysis, permissible limits of different toxicants.
4. Food adulteration: Definition, types, nature of adulterants, different techniques used in food adulteration, commonly used food adulterants in Bangladesh, causes of food adulteration, health effects of these food adulterants, methods of detection (simple tests for detection of adulteration), methods of evaluation of food adulterants and toxic constituents, recommendation to prevent food adulterations.

Recommended Books:

- Debasis Bagchi, Anand Swaroop. Food Toxicology, 1st ed., 2016, CRC Press, UK.
- Takayuki Shibamoto, Leonard F. Bjeldanes. Introduction to Food Toxicology, 1st ed., 2012, Academic Press, California, USA.
- Tõnu Püssa. Principles of Food Toxicology, 2nd ed., 2013, CRC press, UK.
- B. Srilakshmi. Food Science, 3rd ed., 2005, Publishers: New Age International Ltd., Ansari Road, Daryaganj, New Delhi, India.

- Bryan, F.L. (1992): Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organization, Geneva.

FSN22322T: Environmental Studies

Objectives:

This course will expose learners to

- Structure and composition of different spheres;
- Natural resources and its sustainable uses, causes and effects of pollution;
- Biodiversity and environmental biotechnology;
- Environmental chemistry and impact assessment, protection act and climate change.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe the structure and composition of different spheres;
- Describe natural resources and its sustainable uses;
- Classify ecosystem and biodiversity and identify their importance;
- List pollutants and their health effects;
- Describe the causes of climate change and impacts on environment as well as protection act;
- Assess impact of pollution and climate change on environment.

Content:

1. Definition, scope and importance of environmental studies.
2. Structure and composition: atmosphere, hydrosphere, lithosphere and biosphere.
3. Natural Resources:
 - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
 - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
 - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
 - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
 - Sustainable use of natural resources.

4. Pollution: Definition of pollution and pollutants, classification of pollutants (environmental hazards); causes, health effects and control measures of air, water, soil and noise pollution.
5. Ecosystems: Concept of ecosystem, classification of ecosystem, structure and function of ecosystem; producers, consumers and decomposers; food chains, food webs and ecological pyramids.
6. Biodiversity: Definition and classification, importance of biodiversity, threats to biodiversity, endangered and endemic species, conservation of biodiversity (in-situ and ex-situ).
7. Environmental biotechnology: bioremediation (definition, types and role of plants and microbes for in situ and ex situ remediation), fermentation technology, vermiculture technology, biofertilizer technology.
8. Fundamental of environmental chemistry: classification of elements and stoichiometry; Climate change: causes and its impact on environment.
9. Environment impact assessment and environmental protection act.

Recommended Books:

- Benny Joseph. Environmental Studies, 2nd ed., 2008, Tata McGraw-Hill Publishing Company Limited, New Delhi, India.
- Erach Bharucha. Textbook of Environmental Studies, 2nd ed., 2013, Publisher: Orient Blackswan, India.

FSN22223P: Analysis of Food Micro-components

Objectives:

This course will expose learners to

- The procedure for analysis of micronutrients, flavonoids, bioactive compounds and food additives;
- The methods of determining molecular mass of the bioactive food compounds.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Extract and determine micronutrients and flavonoids of foods;
- Separate food additives;
- Determine molecular mass of the bioactive compounds of foods.

Content:

1. Analysis of mineral content of foods by atomic absorption spectrophotometer (ashing and nonashing processes) and traditional methods.
2. Analysis of water-soluble vitamins in foods.
3. Analysis of fat-soluble vitamins in foods.
4. Determination of calcium in foods by permanganate titration
5. Extraction and quantification of fruit flavonoids by HPLC analysis.
6. Extraction and chromatographic purification of food bioactive compounds (e.g., carotenoids).
7. Determination of molecular mass by mass spectrometry.
8. Separation of food additives.

Recommended Books:

- S. Suzanne Nielsen. Food Analysis, 5th ed., 2017, Springer Nature, Switzerland.
- Monika Waksmundzka-Hajnos, Joseph Sherma. High Performance Liquid Chromatography in Phytochemical Analysis, 1st ed., 2010, CRC press, UK.
- Tibor Cserhati, Esther Forgacs. Chromatograph in Food Science and Technology, Publisher: Technomic Publishing Company, Pennsylvania, USA.

FSN22224P: Analysis of Food Chemical Hazards**Objectives:**

This course will expose learners to

- The procedure for analysis of health hazards in foods.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Analyze health hazards in foods.

Content:

1. Separation and detection of pesticides by TLC in foods.
2. Separation and detection of pesticides by HPLC in foods.
3. Detection of heavy metals in foods
4. Detection or microscopic examination of common food adulterants in main foodstuffs: cereals, pulses, beverages, milk, vegetable fats and oils, ghee, sweets, spices and condiments.
5. Analysis of PCBs and preservatives in foods.
6. Detection and quantification of antibiotics and growth promoters' residues in foods.
7. Analysis of food allergens.

8. Analysis of food ripening chemical.

Recommended Books:

- B. K. Sharma. Analytical Chemistry, 2nd ed., 2006, Publisher: Krishna Prakahsan Media (P) Ltd., Meerut, New Delhi, India
- Leo M.L. Nollet, Fidel Toldra. Food Analysis by HPLC, 3rd ed., 2012, Publisher: CDC Press, NY, USA.
- S. Suzanne Nielsen (editor). Food Analysis, 5th ed., 2017, Publisher: Springer Nature, Switzerland.
- Shyam Narayan Jha. Rapid Detection of Food Adulterants and Contaminants: Theory and Practice, 1st ed., 2015, Publisher: Academic Press, USA.

3rd Year 1st Semester

FSN31325T: Food Preservation Methods

Objectives:

This course will expose learners to

- The methods of food preservation;
- Advantages and disadvantages of different food preservation methods.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe different methods of food preservation;
- List advantages and disadvantages of different food preservation methods.

Content:

1. Definition of food preservation, principles of food preservation (aims of food preservation), advantages of food preservation, suitable temperature and time for preserving different foods, recommended storage temperature, causes of food spoilage, factor affecting food spoilage.
2. Classification of food preservation methods, detailed description with advantages and disadvantages of the following food preservation methods-
 - Physical methods-low temperature or refrigeration, freezing, boiling, heating, drying or dehydration, chilling, smoking, canning, jelling, jugging, vacuum packing, irradiation, high pressure, pasteurization, concentration, air dehydration, frozen storage, blanching, sterilization, curing, smoking cured meats, edible coating, ohmic heating, irradiation, pulsed light.
 - Chemical methods-salting, sugaring, pickling, pH control, preservatives.
 - Biological methods-fermentation.

Recommended Books:

- B. Sivasankar. Food Processing and Preservation, 1st ed., 2004, Publisher: PHI Learning Private Ltd, Connaught Circus, New Delhi, India.
- Ernest R. Vieira. Elementary Food Science, 4th ed., International Thomson Publishing, Chapman and Hall, NY, USA.
- Amy C. Brown: Understanding Food Principles and Preparation, 6th ed., 2017, 20 channel Center Street, Boston, USA.

FSN31326T: Food Packaging

Objectives:

This course will expose learners to

- Different types of food packaging materials and packaging systems;
- Importance of food package labeling;
- Methods of determining shelf-life and testing of packaging materials.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe types as well as advantages and disadvantages packaging materials;
- Describe different packaging systems;
- Describe the procedure for determining shelf-life and testing of packaging materials.

Content:

1. Definition of food packaging, importance of food packaging.
2. Different types of food packaging materials, their characteristics, advantages, disadvantages and uses: plastics, biodegradable packaging materials, glass containers, metals and natural materials.
3. Natural (rigid, semi-rigid and flexible) and forms (box, bottle, pouch, etc) of packaging and their uses with respect to the natural foods; primary, secondary and tertiary packaging
4. Different packaging systems (e.g., retortable, vacuum, free oxygen scavenging, gas-exchange and aseptic packaging).
5. Packaging systems and their selection for raw and processed foods: meat, fish, poultry, eggs; milk and dairy products, fruits and vegetables; cereal grains and baked food products; beverages, snacks, sea foods and frozen foods.
6. Package labeling- importance, information (e.g., a statement of identity, the net contents of the package, ingredient list and labeling, the name and address of the food manufacturer, packer, or distributor, nutritional facts, daily value, date of production and expiry, education for consumers) and regulations.
7. Factor influencing the shelf life of packaged foods, shelf Life estimation methods.
8. Testing of packaging materials like thickness, GSM, grease resistance, bursting strength, tearing resistance, WVTR, puncture resistance, etc.
9. Recycling, reuse and disposal of food packaging materials: Bangladesh perspective

Recommended Books:

- M. Mathlouthi (editor). Food Packaging and Preservation, 1994 ed., Publisher: Springer, Switzerland.

- Takashi Kadoya. Food Packaging, 1st ed, 2012, Publisher: Academic Press.
- Gordon L. Robertson. Food Packaging: Principles and Practice, 3rd ed., 2012, Publisher: CRC press, UK.
- Gordon L. Robertson. Food Packaging and Shelf Life: A Practical Guide, 1st ed., 2010, CRC press, UK.
- Susan Selke, John Culter, and Ruben Hernandez. Plastics Packaging: Properties, Processing, Applications, and Regulations, 3rd ed., 2015, Publisher: München Hanser, Germany.
- Walter Soroka. Fundamentals of Packaging Technology, 4th ed., 2009, DEStech Publications Inc., USA.

FSN31327T: Nutritional Assessment

Objectives:

This course will expose learners to

- Classification of nutritional assessment methods;
- Procedure of assessing nutritional status by the different methods.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Classifying nutritional assessment methods;
- Describe procedure of assessing nutritional status by the different methods;
- Outline advantages and disadvantages of nutritional assessment methods.

Content:

1. Definition of nutritional status, nutrition surveys, nutrition surveillance, nutrition screening and nutrition intervention; purposes of Nutritional assessment
2. Classification of nutritional assessment methods
3. Anthropometric methods of nutritional assessment: procedure, Recommended limits/cut-off points and public health significance of the following indices- length, weight, height, head circumference, body mass index, mid-arm circumference (1-5 years), skin-fold thickness; weight-for-age, height-for-age and weight-for-height; waist circumference; overall advantages and disadvantages of anthropometric methods
4. Biochemical methods of nutritional assessment: Procedure for determination of concentration of common nutrients (e.g., serum protein e.g., albumin level; iron, folate, iodine, vit. B₁₂, vit. A), their cut-off values and significances; procedure for determination of blood lipids and sugar, their cut-off values and significance to

determine chronic diseases; overall advantages and disadvantages of biochemical methods.

5. Clinical methods of nutritional assessment: signs and symptoms used to determine the deficiency of particular nutrients, advantages and disadvantages of clinical methods.
6. Dietary survey methods of nutritional assessment: measuring food consumption at individual level (24-hour food recall, food frequency questionnaire, food dairy/food intake record, diet history, observed food consumption, weighed food records and dietary score methods), measuring food consumption at family/community level (food inventory, food account, household food record and household 24-hour food recall methods), measuring food consumption at national level (food balance sheets method); overall advantages and disadvantages of dietary survey methods.
7. Designing a nutritional status assessment survey program.

Recommended Books:

- Rosalind S. Gibson. Principles of Nutritional Assessment, 2nd ed., 2005, Publisher: Oxford University Press, Inc., 198 Madison Avenue, New York-10016, USA.

FSN31328T: Diet Planning

Objectives:

This course will expose learners to

- Terminology related to diet planning;
- Process of energy calculation;
- Methods of diet calculation.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe terminology related with diet planning;
- Calculate energy requirement based on activity level;
- Plan diet based on energy requirements.

Content:

1. Terminology (low calorie, calorie free, low fat, fat free, low saturated fat, low cholesterol, cholesterol free, no added sugar, low sodium, very low sodium), nutritive values of the commonly consumed foods in Bangladesh.
2. Definition of healthy diet/balanced diet, characteristics of healthy diets, recommendation of energy consumption from macronutrients, factors affecting energy requirements, equations for energy calculation based on age and physical

activity, calculation of total energy requirements, factors affecting food acceptance, factor affecting BMR, energy balance and set point theory.

3. Dietary guidelines/tools for choosing healthy diets (adequate nutrients within calorie needs, weight management, physical activity, food groups to encourage, fats, carbohydrates, sodium and potassium, alcoholic beverages, food safety).
4. Serving size and amount of calorie and nutrients, MyPyramid food guidance system/MyPlate food guidance system for daily planning healthy diets, meal planning for family and various age groups, hospital menu patterns, creating the menu, meal pattern for vegetarian, adaptation of normal diet for changing need, current food label.
5. The healthful way to eat out, concept of discretionary energy, diet calculation for different age groups based on physical activity, fad diets.

Recommended Books:

- Dietary Reference Intakes: Applications in Dietary Planning (2000), The National Academies Press, Washington, D.C.
- Janice L. Thompson, Melinda M. Manore, Linda A. Vaughan. The science of nutrition, 2nd ed., 2017, Publisher: Pearson, USA.
- Linda K. DeBruyne, Kathryn Pinna, Eleanor N. Whitney. Nutrition and Diet Therapy, 8th ed., 2013, Publisher: Cengage Learning, Mason, OH, USA.

FSN31329T: Nutrition Counseling

Objectives:

This course will expose learners to

- The successive steps of nutrition counseling;
- The required information for nutrition counseling in particular states of the clients.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe the successive steps of nutrition counseling;
- Counsel clients for nutrition and education based on their needs.

Content:

1. Overview of nutrition counseling-Definition, history and theories of nutrition counseling, food choice model, importance of nutrition counseling, health belief model, counseling skills and spectrum.
2. Communication skills: Effective counselor-client relationships, nutrition counseling goals, stages of skill development, model of communication, verbal and nonverbal

communications; effective communication; cultural influence on communication, basic counseling responses.

3. Nutrition counseling protocols: Analysis and flow of a counseling interview and counseling session; developing a nutrition care plan
4. Promoting change to facilitate self-management-Strategies to promote change, assessment of client's readiness to change, food management tools, tracking, behavior change/motivational strategies, cognitive restructuring, supporting self-management.
5. Making counseling effective, nutrition counseling on general nutrition, Counseling on how to increase energy intake, Counseling on how to address moderate malnutrition, nutrition counseling for pregnancy, counseling on infant and young child feeding (IYCF), counseling on IYCF for children who are ill, counseling HIV-positive mothers on IYCF, nutrition counseling for people who are ill, nutrition counseling for people with infectious diseases, nutrition counseling for people with non-communicable diseases, counseling on water, sanitation, and hygiene (WASH), counseling on hand washing, counseling on safe water treatment and storage, counseling on food safety
6. Nutritional counseling in prevention and treatment of obesity, coronary heart disease, diabetes, renal diseases, hypertension, cancer risk and eating disorders.
7. Nutritional counseling for cholesterol and saturated fat restriction, fat restriction, high fiber and fiber restrictions, high protein and protein restrictions, sodium restriction, vegetarian, weight control
8. Evaluation and follow up: Evaluation of counselor and client progress, strategies to maintain dietary adherence, reinstatement of intervention or treatment, the termination process

Recommended Books:

- Kathleen D. Bauer, Doreen Liou. Nutrition Counseling and Education Skill Development, 3rd ed., 2014, publisher: Cengage Learning, 20 Channel Center Street, Boston, USA.
- Linda G. Snetselaar. Nutrition Counseling for the Nutrition Care Process, 4th ed., 2009, Publishers: Jones and Bartlett International, Barb House, Bard Mews, London, UK.
- Marcia Herrin and Maria Larkin. Nutrition Counseling in the Treatment of Eating Disorders, 2nd ed., 2013, Publisher: Routledge, NY, USA.

FSN31230P: Nutritional Assessment of Clients

Objectives:

This course will expose learners to

- Procedure/Demonstration for assessing nutritional status of anthropometric, clinical symptom, diet survey and biochemical methods.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Assess nutritional status using anthropometric, clinical symptom, diet survey and biochemical methods.

Content:

1. Determination of nutritional status at least 10 individuals by anthropometric, clinical symptom method and 24 hours diet recall methods with interpretation of data.
2. Determination of nutritional status (iron, minerals, vitamins and proteins) at least four vulnerable individuals by biochemical method with interpretation of data.

Recommended Books:

- Rosalind S. Gibson. Nutritional Assessment: A Laboratory Manual, 1993, New York: Oxford University Press, USA.
- Margaret D. Simko, Catherine Cowell, Judith A. Gilbride. Nutrition Assessment: A Comprehensive Guide for Planning Intervention, 2nd ed., 1995, Aspen Publishers, inc. Gaithersburg, Maryland, USA.

3rd Year 2nd Semester

FSN32331T: Nutrition and Diet Therapy

Objectives:

This course will expose learners to

- Concept of diet therapy and types of diets;
- Calculation of diets for patients of diabetes, cardiovascular and renal diseases;
- Diet for different disease states/conditions such as gastrointestinal disorders, cancer, clients with special needs, and allergy and skin diseases.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe concept of diet therapy and types of diets;
- Prescribe diets for controlling underweight and overweight;
- Calculate diets for patients of diabetes, cardiovascular and renal diseases.
- Prescribe diets in gastrointestinal disorders, cancer, clients with special needs, and allergy and skin diseases.

Content:

1. Definition of diet therapy, basic concepts of diet therapy, role of hospital & community dietitian; objectives of nutrition and diet therapy; hospital diets - normal diet, liquid diet, soft diet, bland diet, modification in nutritive value, modification in quantity, modification in method of feeding), different routes of diet therapy; Diet for controlling underweight and overweight.
2. Diet and Diabetes: Definition of diabetes; global and Bangladesh scenario, etiology (cause), symptoms, classification, relation between sugar (glucose) level in blood and diabetes, vulnerable group of diabetes, complications of uncontrolled diabetes, managing diabetes, acceptable and rejectable foods for diabetic patients, special considerations for the diabetic client.
3. Diet and cardiovascular disease: Types of cardiovascular disease (CVDs), risk factors for CVDs; causes of atherosclerosis, myocardial infarction, congestive heart failure and hypertension and their dietary management.
4. Diet and renal disease: Cause of renal diseases, classification of renal diseases, and dietary management of renal diseases.
5. Diet and gastrointestinal problems-Disorders of the primary organs (dyspepsia, esophagitis, hiatal hernia, peptic ulcers, diverticulosis/diverticulitis, inflammatory bowel disease, ileostomy or colostomy, celiac disease), disorders of the

accessory organs (cirrhosis, hepatitis, cholecystitis and cholelithiasis, pancreatitis), dietary management of gastrointestinal diseases.

6. Diet and cancer- Definition and causes of cancer, classification of cancer, relationships of food and cancer, nutritional care of the cancer client.
7. Diet and clients with special needs- The surgical client (pre-surgery nutritional care, post-surgery nutritional care), the client receiving enteral nutrition (possible complications with enteral nutrition), the client receiving parenteral nutrition (possible complications with parenteral nutrition), the client with burns, the client with infection, the client with AIDS (the relationship of HIV infection and nutrition, problems related to feeding AIDS clients)
8. Diet in allergy and skin disturbances: definition, classification, manifestations, common food allergies and test and dietary management; feeding patients
9. Factors affecting individual food choice, role and responsibilities of the nutrition counselor, teaching aids used by dietitians- charts, leaflets, posters etc.

Recommended Books:

- Sumati R. Mudambi. Fundamentals of Foods, Nutrition and Diet Therapy, 5th ed., 2007, Publisher: New Age International (P) Ltd, New Delhi, India.
- Janice L. Thompson, Melinda M. Manore, Linda A. Vaughan. The science of nutrition, 2nd ed., 2017, Publisher: Pearson, USA.
- Linda K. DeBruyne, Kathryn Pinna, Eleanor N. Whitney. Nutrition and Diet Therapy, 8th ed., 2013, Publisher: Cengage Learning, Mason, OH, USA.

FSN32332T: Community Nutrition

Objectives:

This course will expose learners to

- Concept of community nutrition;
- Community based approaches to address malnutrition;
- Nutrition strategies, policies and programs.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe concept of community nutrition;
- Address malnutrition of the community;
- Develop nutrition strategies, policies and programs.

Content:

1. Concept of community nutrition, the relationship between eating behavior and chronic diseases, primary prevention of diseases (food-borne illness, healthy

eating practice), level of prevention, health promotion, advantages and disadvantages of population and individual level health promotion strategies, strategies for designing a health promotion campaign, roles of community nutritionist in promoting public health.

2. The purpose of community nutrition assessment, different methods and tools for assessing nutrition status, principles of effective community nutrition programs.
3. Definition of malnutrition, classification of malnutrition, causes of malnutrition; Community based approaches to address malnutrition: increasing food security & food availability to families, nutrition intervention for vulnerable population (infants, pregnant mothers, lactating mothers and older persons) (immunization, food and nutrition programs during pregnancy, lactation and infancy), home gardening, nutrition education in school, clinic, MCH centers and importance of weaning, breast feeding and dietary diversity habits.
4. Principles of nutrition education: Introduction, education principles, applying educational principles to program in designing and intervention, education across life span, education and culture, developing a nutrition education plan, developing a lesson plan, enhancing and achieving program participation, general ideas for designing messages.
5. Growth monitoring of children: Definition of growth, importance of growth monitoring, factors affecting growth of children, types of growth chart, indicators for growth monitoring, procedure reading growth chart, interpretation of growth chart, identification of growth problems and growth promotion.
6. Nutrition strategies, policies and programs.

Recommended Book:

- Nweze Eunice Nnakwe. Community Nutrition: Planning Health Promotion and Disease Prevention, 3rd ed., 2017, Publisher: Jones & Bartlett Learning, USA.

FSN32333T: Food Fortification and Supplementation

Objectives:

This course will expose learners to

- The importance of food fortification and supplement;
- Forms of supplement;
- Process of food fortification and enrichment.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe importance of food fortification and supplement;
- Describe different forms of nutrient supplement;

- Describe the process of food fortification/enrichment.

Content:

1. Definition of food fortification, enrichment and supplement; importance of food fortification and supplement, types of food fortification, legal considerations: mandatory versus voluntary fortification in relation to public health, estimating the cost-effectiveness and cost-benefit of fortification, main concerns of food fortification.
2. Definition of food fortificants, common fortificants; fortificants: physical characteristics, selection and use with specific food vehicles and methods of increasing bioavailability of fortificants and safety issues.
3. Forms of food supplements (tablets, capsules, liquid supplements, supplements in powder forms)-definition, classification, specific nutrients used in different forms of food supplements.
4. Enrichment of foods with healthy polyunsaturated fatty acids (ω -3 and ω -6), fortification of foods with substances (polyphenols, carotenoids, fatty acids and phyosterols) other than vitamins and minerals.
5. Technical aspects of micronutrients addition to foods; Factors affecting stability of vitamins in fortified foods.

Recommended Textbook:

- P. B. Ottaway. Food Fortification and Supplementation, 1st ed., 2008, Woodhead Publishing, USA.

FSN32334T: Nutraceutical and Functional Foods

Objectives:

This course will expose learners to

- Classification of nutraceuticals;
- Physiological functions of different nutraceuticals;
- The roles of different foods in preventing diseases;
- Bioactive compounds and their role in preventing diseases.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Classify nutraceuticals;
- Apply nutraceuticals in preventing diseases;
- Suggest different foods for preventing diseases;

Content:**Nutraceuticals:**

1. Fundamentals, nutraceuticals and related terms, the relationship between nutraceutical, foods and medicine, classification of nutraceuticals.
2. Sources of major nutraceuticals and their health applications- bioactive proteins, curcumin, resveratrol, coenzyme Q10, melatonin, conjugated linoleic acid, chondroitin, glucosamine, carnitine, creatine, lycopene, etc; safety and adverse effects associated with the consumption of nutraceuticals; phytochemicals as nutraceuticals, natural colorants as nutraceuticals, market for nutraceuticals, nutraceuticals and new tendencies.
3. Metabolism, bioavailability and pharmacokinetics of nutraceuticals.

Functional foods:

4. Definition and limitations, relevance of functional foods, functional foods vs pharmaceuticals, sources and classification of functional foods, scientific perspectives.
5. The role of the following food components in specific disease states: fruits (apple, raspberry, blueberry, blackberry, strawberry, cherry) and vegetables (fiber), fish, cereal grains, flaxseed, buckwheat, tea, plant nuts, mushrooms, olive oil; probiotic and prebiotic foods; procedures for the development and entry of marketable functional foods: safety, bioavailability and bioactivity studies.
6. Definition of bioactive compound and secondary metabolites of foods, major class of bioactive compounds found in foods, causes of formation of bioactive compounds in foods.
7. Major bioactive compounds found in vegetables, fruits, cereals, fish, marine foods, milk and mushrooms, their chemical nature and functions and usages.
8. The role of bioactive compounds of foods in prevention and control of cardiovascular disease, cancer, diabetes, arthritis and inflammatory diseases, liver and gastrointestinal diseases.
9. Use of probiotics, prebiotics and symbiotics in enteral nutrition.

Recommended Textbook:

- Rotimi E. Aluko. Functional Foods and Nutraceuticals, 1st ed., 2012, Publisher: Springer-Verlag New York Inc., NY, USA.

FSN32235P: Nutrition and Diet Calculation in Disease States

Objective:

This course will expose learners to

- Different food groups and nutrition suitable for treating different acute and chronic diseases.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Plan suitable diets for patients suffering from acute and chronic diseases.

Content:

Prepare a diet plan for a patient suffering from

1. diarrhoea and constipation
2. peptic ulcer and liver disease.
3. diabetes mellitus and cardiovascular diseases
4. kidney failure, kidney transplant, renal complication & kidney stones.
5. cancer, burns & surgery.

Recommended Books:

- Sumati R. Mudambi. Fundamentals of Foods, Nutrition and Diet Therapy, 5th ed., 2007, Publisher: New Age International (P) Ltd, New Delhi, India.
- Janice L. Thompson, Melinda M. Manore, Linda A. Vaughan. The science of nutrition, 2nd ed., 2017, Publisher: Pearson, USA.
- Linda K. DeBruyne, Kathryn Pinna, Eleanor N. Whitney. Nutrition and Diet Therapy, 8th ed., 2013, Publisher: Cengage Learning, Mason, OH, USA.

FSN32236P: Evaluation of Fortified Foods and Nutraceuticals

Objectives:

This course will expose learners to

- The methods of analysis of fortificants in foods;
- Methods of identification of bioactive compounds/functional foods.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Determine vitamins and minerals in fortified foods;
- Analysis of fatty acids in fortified foods;
- Analyze bioavailability (in vitro) of different forms of supplement;
- Identify antimicrobial/anticancer bioactive compounds/foods.

Content:

1. Analysis of vitamins and minerals in fortified foods.
2. Analysis of fatty acids in fortified foods
3. Analysis of bioavailability (*in vitro*) of nutraceuticals.
4. Identify antimicrobial/anticancer bioactive compounds/foods.

Recommended Books:

- W. Jeffrey Hurst (Editor) (2008). Methods of Analysis of Functional Foods and Nutraceuticals, 2nd ed., 2008, Publisher: CRC Press, FL, USA.
- Michacel Rychlik (editor). Fortified Foods with Vitamins, 1st ed., 2011, Wiley-VCH Verlag GmbH, Germany.

4th Year 1st Semester

FSN41333T: Entrepreneurship Development

Objectives:

This course will expose learners to

- Basic entrepreneurial skills and understanding to run a business efficiently and effectively;
- Developing and strengthening entrepreneurial quality and motivation.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Strengthen entrepreneurial quality and motivation;
- Develop and run small to medium scale food enterprise efficiently and effectively.

Content:

1. Entrepreneurship: Definition of entrepreneurship, types of entrepreneurs, difference between entrepreneur and intrapreneur entrepreneurship in economic growth, factors affecting entrepreneurial growth.
2. Motivation: Major motives influencing an entrepreneur-achievement motivation training, self-rating, business games, thematic apperception test-stress management, entrepreneurship development programs-need, objectives.
3. Business: Small enterprises-definition, classification-characteristics, ownership structures-project formulation-steps involved in setting up a business-identifying, selecting a good business opportunity, market survey and research, techno economic feasibility assessment-preparation of preliminary project reports-project appraisal-sources of information-classification of needs and agencies.
4. Financing and accounting: Sources of finance, term loans, capital structure, financial institution, management of working capital, costing, break even analysis, taxation-income tax, excise duty- sales tax.
5. Support to entrepreneurs: Sickness in small business-concept, magnitude, causes and consequences, corrective measures-business incubators-government policy for small scale enterprises-growth strategies in small industry-expansion, diversification, joint venture, merger and sub-contracting.

Recommended Textbooks:

- Khanka. S.S. Entrepreneurial Development, 5th ed., 2013, S. Chand & Company Ltd, New Delhi, India.

- D. F.Kuratko. Entrepreneurship: Theory, Process and Practice, 9th ed., 2013, Cengage Learning, UK.

FSN41338T: Biostatistics

Objectives:

This course will expose learners to

- The basic tools for presentation and analysis of research data.

Learning Outcomes:

- Apply basic statistical concepts commonly used in biological sciences;
- Use basic analytical techniques to generate results;
- Interpret results of commonly used statistical analyses in written summaries;
- Demonstrate statistical reasoning skills correctly and contextually.

Content:

1. Definition of statistics and biostatistics, importance of studying biostatistics.
2. Measures of central tendency: Computation of means, median and mode from grouped and ungrouped data, geometric mean and harmonic mean; comparison of mean, median and mode.
3. Measure of dispersion: Computation of standard deviation, standard error and their coefficients.
4. Presenting data: Arithmetic-scale and logarithmic-scale line graphs, bar charts, pie charts, histogram, frequency polygon, cumulative frequency, frequency table, area map, spot map, stem and leaf plot, box plot, scatter plot, population pyramid and percentages
5. Variables: Definition of variable, types of variables (dependent and independent variables, confounded variables, discrete and continuous random variables), measurement of variables, types of measurement scales and their comparison; reliability and validity of measurements.
6. Range, percentiles, quartiles, rates and ratios, linear growth, geometric growth and exponential growth, prevalence and incidence, relationship between prevalence and incidence, sample and population and their relationship.
7. Applying statistics to food quality: Measuring food quality quantitatively, methods of evaluation of sensory data, detection and assessment of food shelf life.
8. Simple linear regression and correlation, multiple regressions and correlation, regression analysis.

9. Confidence intervals: Interval estimation, single sample confidence intervals, two samples comparative confidence intervals.
10. Probability: Definition of probability, basic probability rules, conditional and independence probabilities, Baye's theorem, probability models (Binomial and normal probability model), Z-scores.
11. Hypothesis testing: The components of a hypothesis test, Null and alternative hypotheses, Type-1 and Type-II errors, *P*-values and level/test of significance, degrees of freedom, rejection and acceptance regions. Test of single mean, single variance, two sample means and variances. Test for 2x2 contingency tables, independence test and practical examples.

Recommended Books:

- Ray M. Merrill. Fundamentals of Epidemiology and Biostatistics: Combining the Basics, 2013, Publisher: Jones and Bartlett Learning, 5 Wall Street, Burlington, MA 01803.
- Indranil Saha and Bobby Paul. Biostatistics: MCQ and Essentials, 2010, 1st ed., Publisher: Academic Publishers, 5A Bhawani Dutta Lane, Kolkata, India.
- Richard J. Rossi. Applied Biostatistics for Health Science, 2010, Publisher: John Wiley and Sons Inc., Hoboken, New Jersey, USA.
- Michael R. Chernick and Robert H. Friis. Introductory Biostatistics for the Health Sciences, 2003, Publisher: John Wiley and Sons, Inc., Hoboken, New Jersey, USA.
- Chap T. Le. Introductory Biostatistics, 2003, Publisher: John Wiley and Sons, Inc., Hoboken, New Jersey, USA.

FSN41339T: Research Methodology

Objectives:

This course will expose learners to

- The basic framework of research process;
- Various research designs and techniques;
- Various sources of information for literature review and data collection;
- The ethical dimensions of conducting applied research.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe different steps of research;
- Prepare research proposal;
- Write research/thesis report.

Content:

1. Fundamental of research: Definitions of research and methodology, difference between research methodology and method, objectives of research, motivation in research, general characteristics of research, criteria of good research, research approaches, types of research.
2. The research problem and hypothesis: Definition of research problem, problem identification process, selecting the problem, statement of a problem; identifying variables, meaning and significance hypothesis, formulating the research hypothesis-types of research hypothesis.
3. Literature review: Meaning of literature review, need of literature review, objectives of literature review, sources of literature, the functions of literature, how to conduct the review of literature.
4. Data collection methods-Definition of data, classification and sources of data, methods of data collection: questionnaire, interview, schedule, focus group, case-study, survey, observation and their advantages and disadvantages, ethical issues in collecting data.
5. Sampling: Definition of sampling, classification of sampling methods, characteristics of a good sample, determination of sample size.
6. Research design and sample design: Basic concepts of research design, classifications of research design with brief description; sample design, characteristics of a good sample design.
7. Research process: Brief description of different steps of research process.
8. Processing of data: Editing, coding, classification and tabulation
9. Scaling: Techniques of scaling, types of scales, comparison of measurement scales.
10. Writing research proposal and research report paper writing/ thesis: Brief description of contents of research proposal (title, table of contents, statement of the problem, literature review, formulation of objectives, research methodology, utilization and dissemination of results, work plan, resources/budget, limitation and delimitation of the research study, references), brief description of contents of research report/thesis (title with authors' name, abstract, statement of the problem, background list in brief and purpose and scope, key words, materials and methods, results, discussion, implications and future perspective, conclusion, acknowledgements, references, errata, footnotes; types of research reports, difference between research proposal and reports, dissemination of research result.
11. Reference materials.

12. Ethics in research: Meaning of research ethics; ethical codes, plagiarism and self-plagiarism.
13. Role of SPSS and Excel in research.

Recommended Books:

- Ranjit Kumar. Research Methodology: A step by step guide for the beginners, 4th ed., 2014, Publisher: SAGE Publications Ltd, London, UK.
- P. Sam Daniel, Aroma G. Sam. Research Methodology, 2011, Kalpaz Publications, New Delhi, India.
- C. R. Kothari. Research Methodology: Methods and Techniques, 2nd ed., 2004, Publisher: New Age International (P) Ltd., New Delhi, India
- Mukul Gupta and Deepa Gupta. Research Methodology, 2011, Publisher: PHI Learning Private Limited, New Delhi, India.

FN41340T: Essentials of Food Science and Preparation

Objectives:

This course will expose learners to

- Techniques of restoring nutritive values of foods during preparation;
- Classification, composition, processing, preparation and storage of common foods;
- Recipe, preparation procedure and testing of doneness of some foods.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Suggest techniques of restoring nutritive values of foods during preparation;
- Classify common foods items,
- Describe composition, processing, preparation and storage of common foods.

Content:

1. Food selection criteria, effect of preparation on nutritive values of different foods and their remedial measures; technique of reducing fats from foods.
2. Food preparation basics: heating foods, types of moist-heat preparation, types of dry-heat preparation, cutlery techniques, measuring ingredients and utensils, mixing techniques, seasonings and flavorings, food presentation; commonly used utensils in food preparation
3. Classification, composition, processing, preparation and storage of the following categories of foods: meat, poultry, fish and shellfish, milk, cheese and eggs; vegetables and legumes; fruits; soups, salads, and gelatins; cereal grains and pastas; flours and flour mixtures; starches and sauces; quick breads; yeast

bread; sweeteners; fats and oils; cakes and cookies; candy; frozen desserts; beverages; pastries and pies.

4. Recipe, preparation procedure and testing of doneness of the following foods: biscuits, chana chur, sweetmeats, pickles, jelly, jam, yogurt, sour curd, chips, margarine, ice cream, butter, ghee, etc.

Recommended Books:

- Amy C. Brown: Understanding Food Principles and Preparation, 6th ed., 2019, Publisher: Cengage Learning, Boston, USA.
- Ernest R. Vieira. Elementary Food Science, 4th ed., International Thomson Publishing, NY, USA.
- Vickie Vaclavik, Elizabeth W. Christian. Essentials of Food Science, 4th ed., 2013, Springer, NY, USA.
- B. Srilakshmi. Food Science, 7th ed., 2018, New Age International, New Delhi, India.
- B. Sivasankar. Food processing and preservation, 1st ed., 2009, Publisher: PHI, New Delhi, India.

FSN41341T: Food Quality Control and Quality Assurance

Objectives:

This course will expose learners to

- Principles of quality control (QC) and quality assurance (QA);
- Methods of quality control;
- Quality evaluation techniques of foods.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe principles of quality control (QC) and quality assurance (QA);
- Describe Methods of quality control;
- Evaluate quality of foods.

Content:

1. Definition of food quality and nutritive quality, general principles of quality control (QC) and quality assurance (QA); difference between QC and QA.
2. Quality management systems and the ISO standards; total quality management (TQM), pre-shipment inspection and inspection at the port of destination and certification and quality marks.
3. Quality evaluation methods (subjective method, objective method and microscopic method).

4. Quality assurance of therapeutic, functional, nutraceutical and novel foods.
5. Indices of food quality and authenticity: meat and meat products, fish and fish products, milk and dairy products, vegetables, fruits and their products, grain, pulses and oil seeds, coffee, tea and spices.
6. Microbial quality control: determination of microorganisms in foods by cultural, microscopic, physical, chemical methods.
7. Quality factors for consumer safety, food safety standards.
8. Good manufacturing practices (GMP), quality control of raw materials, intermediate and finished foods; quality control of packaging materials; Quality control documentation; commissioning test; pest control in food processing area.

Recommended Books:

- Rekha S. Singhal, Pushpa R Kulkarni, Dinanath V. Rege. Indices of Food Quality and Authenticity, 1997, Woodhead Publishing Limited, Cambridge, England.
- Amy C. Brown: Understanding Food Principles and Preparation, 6th ed., 2017, Boston, USA.
- Early, R. Guide to Quality Management Systems for the Food Industry, 1995, Blackie, Academic and professional, London, UK.
- Gould, W.A and Gould, R.W. (2005) Total Quality Assurance for the Food Industries, CTI Publications Inc. Baltimore.
- Pomeraz, Y. and Me Loari, C.E. (2008) Food Analysis: Theory and Practice, CBS publishers and Distributor, New Delhi.
- Bryan, F.L. (2007) Hazard Analysis Critical Control Point Evaluations A Guide to Identifying Hazards and Assessing Risks Associated with Food Preparation and Storage. World Health Organization, Geneva.
- Kirk, R.S and Sawyer, R. (Pearson's Composition and Analysis of Foods, Longman Scientific and Technical, 9th ed., 2005, England.
- FAO (2006) Manuals of Food Quality Control. 2-Additives Contaminants Techniques, Rome.

FSN41242P: Food Quality Evaluation

Objectives:

This course will expose learners to

- Demonstration to evaluate food quality by food indices.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Evaluate food quality by the analysis of food indices.

Content:

1. Evaluation of quality of common foods by food indices available in the market (at least 20).

Recommended Books:

- Rekha S. Singhal, Pushpa R Kulkarni, Dinanath V. Rege(1997). Indices of Food Quality and Authenticity, Woodhead Publishing Limited, Abington Hall, Abington, Cambridge CBI 6AH, 1997, England.
- Pomeraz, Y. and Me Loari, C.E. (2008) Food Analysis: Theory and Practice, CBS publishers and Distributor, New Delhi, India.

4th Year 2nd Semester

FSN42343T: Food Biotechnology

Objectives:

This course will expose learners to

- The fundamental aspects of biotechnology in food production.

Learning Outcomes:

Upon completion of this course, the learners would be able to

- Describe the biotechnological procedures of food production;
- Assess the safety of genetically modified foods.

Content:

1. Definition of biotechnology and food biotechnology; biotechnological application of animals, plants and microbes.
2. Techniques of fermentation of bacteria and fungi, and scale-up and scale-down of fermentation.
3. Technology of protein ingredients (extraction, recovery, texturization, extrusion, fiber spinning and gelation).
4. Classification and reproduction of biotechnologically important microorganisms.
5. Biotechnological processes of bacteria and yeast-based food products: dairy products, fermented fish and meat, alcoholic beverages, fermented vegetables and soy products, vinegar and other organic acids, production of enzymes and protein engineering, sweeteners, vitamins and pigments, cocoa, tea and coffee fermentation, probiotics and prebiotics.
6. Food application of algae, cheese making, reduction of food protein allergy.
7. Genomic basics for food improvement
 - Molecular biotechnology for minerals and vitamins enrichment of food crops.
 - Biotechnological approaches to improve nutritional quality and shelf life of fruits and vegetables.
 - Biofortification of rice, wheat, maize and cassava; oil crops biofortified with ω -3 fatty acids.
 - Seaweed liquid fertilizers: A novel strategy for the biofortification of vegetables and crops.
8. Genetically modified foods
 - Transgenic animal models and genetically altered species.
 - Genetically modified microorganisms and their products.
 - Genetically modified plants and their products.

- Genetically modified animals and their products.
 - Advantages and disadvantages of genetically modified foods.
9. Food safety of genetically modified foods
- Safety assessment of biotechnological products.
 - Safety approaches and regulations-biotechnology derived foods.

Recommended Books:

- Byong H. Lee. Fundamentals of Food Biotechnology, 2nd ed., 2015, Publisher: John Wiley and Sons Ltd, UK.
- Kalidas Shetty, Gopinadhan Paliyath, Anthony Pometto, Robert E. Levin (editors). Food Biotechnology, 2nd ed., 2005, Publishers: Taylor and Francis, London, UK.
- Ravishankar Rai V. (edited). Advances in Food Biotechnology, 2016, Publisher: John Wiley and Sons Ltd, West Sussex, UK.
- Richard Owusu-Apenten. Introduction to Food Chemistry, 1st ed., 2004, Publisher: CDC Press, Florida, USA.

For Necessary Information

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Important Address and Websites of BOU

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Result Publishing Websites	: www.bou.ac.bd & exam.bou.edu.bd
BOU Tube	: www.boutube.edu.bd
OER Repository	: oer.bou.edu.bd
LMS/E-Learning Site	: lms.bou.edu.bd
WebTV	: http://webtv.bou.org.bd
WebRadio	: http://webradio.bou.org.bd
BOU Academic Programs	: BOU Website & Google Play Store
E-learning/LMS	: elearning.bou.edu.bd
Official social networks	
YouTube Channel	: www.youtube.com/user/bdopenuniversity
Facebook	: www.facebook.com/bdopenuniversity
Facebook Group	: www.facebook.com/groups/bouedu
Twitter	: www.twitter.com/bouedu

**Tutor Evaluation Form-B.Sc (Hons) in FSN Program
School of Science and Technology, BOU**

Name:	ID	<table border="1" style="width: 100%; height: 20px; border-collapse: collapse;"> <tr> <td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td><td style="width: 5%;"></td> </tr> </table>																				
RC:	Study Center:																					

Your opinion about the Tutor of Your Registered Courses

Semester:....., **Batch:**.....

Course Code	Tutor Name	Assessment about respective tutor				
		Teaching Skill	Subject knowledge	Problem Solving Capacity	Sincerity and Punctuality	Personality
FSN						
FSN						
FSN						
FSN						
FSN						
FSN						

*N.B. You can give your opinion by using:
A – Excellent; B – Very Good; C – Good; D - Not Good; E - Bad*

[Note: Please feel free to fill up this form immediately after completion of tutorial session for each course of the respective semester. Your tutor evaluation through this form will be treated as highly confidential matter. Your evaluation will help us to improve tutorial class services more effective way.]

আপনার মতামত প্রেরণের ঠিকানা

ডীন

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বাংলাদেশ উন্মুক্ত বিশ্ববিদ্যালয়

বোর্ড বাজার, গাজীপুর- ১৭০৫

বাংলাদেশ।

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Profession _____

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Learner's Identification (ID) Number _____

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What aspects of BOU did attract you most? _____

What do you want to know about BOU? _____

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Bangladesh Open University

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