



# **BLDE** **(DEEMED TO BE UNIVERSITY)**

**Choice Based Credit System (CBCS)**

**Curriculum**

**B.Sc. Programme in  
Food, Nutrition and Dietetics**

**2020-21**

Published by

**BLDE**

**(DEEMED TO BE UNIVERSITY)**

Declared as Deemed to be University u/s 3 of UGC Act, 1956

The Constituent College

**SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA**

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.

BLDE (DU): Phone: +918352-262770, Fax: +918352-263303, Website: [www.bldedu.ac.in](http://www.bldedu.ac.in), E-mail: [office@bldedu.ac.in](mailto:office@bldedu.ac.in)

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BLDE(DU)/REG/B.Sc.Life-Sci/2020-21/ 187/7

May 12, 2020

**NOTIFICATION**

Sub: Curriculum for B.Sc. Programme in Life Sciences with Semester Scheme

Ref: 1. Minutes of the meeting of the 5<sup>th</sup> Standing Committee Academic Council of the University held on 06- 05-2020.

2. Approval of Board of Management dtd.08-05-2020

3. Approval of Hon'ble Vice-Chancellor vide order no.1834, dtd.09-05-2020

In accordance with the Rule-09 (ii) of the Memorandum of Association (MoA) of the Deemed to be University, the Board of Management (BoM) has approved the Curriculum of '**B.Sc. Programme in Life Sciences**' in 1) Biotechnology, 2) Microbiology, 3) Biochemistry, 4) **Food, Nutrition and Dietetics**, following Choice Based Credit System (CBCS) with Semester Scheme.

The Curriculum shall be effective from the Academic Session 2020-21 onwards, in the Constituent College of the University viz. Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapura.



**REGISTRAR  
REGISTRAR**

**BLDE (Deemed to be University)  
Vijayapura-586103. Karnataka**

To,  
The Dean, Faculty of Medicine & Principal,  
Shri B. M. Patil Medical College,  
Hospital and Research Centre,  
Vijayapura

Copy to:

- The Secretary, UGC, New Delhi
- The Dean, Faculty of Medicine & Principal
- The Controller of Examinations
- The Dean, Student Affairs
- The Prof. & HoDs of Pre, Para and Clinical Departments
- The Coordinator, IQAC
- PS to the Hon'ble Chancellor
- PS to the Hon'ble Vice-Chancellor

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.

**BLDE (DU)** : Phone: +918352-262770, Fax: +918352-263303 , Website: www.bldedu.ac.in, E-mail:office@bldedu.ac.in

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**Vision:**

- To be a leader in providing quality medical education, healthcare & to become an Institution of eminence involved in multidisciplinary and translational research, the outcome of which can impact the health & the quality of life of people of this region.

**Mission:**

- To be committed to promoting sustainable development of higher education, including health science education consistent with statutory and regulatory requirements.
- To reflect the needs of changing technology
- Make use of academic autonomy to identify dynamic educational programs
- To adopt the global concepts of education in the health care sector

**SEMESTER-I**

Course Code	Course Name	No. of courses	Instruction hrs/week	Duration of Exam (hrs)	Marks			Credits	Total/Sem
					IA	Exam	Total		
BFND 1.1	Human	3T	3x4	3x3	3x20	3x80	3x100	3x2	6
BFND 1.2	Nutrition – I Food Science - I								
BFND 1.3	Human Physiology - I								
BFND 1.1 P	Human Nutrition – I	3P	3x3	3x3	3x10	3x40	3x50	3x1	3
BFND 1.2 P	Food Science - I								
BFND 1.3 P	Human Physiology - I								
a. Supportive to the discipline of study - Any ONE of the following to be opted									
BFND 1.4	Food Service Management	1T	2	1x2	1x10	1x40	1x50	1x1	1
BFND 1.5	Food Biotechnology								
BFND 1.6	Food Technology								
Languages-Two		2L	2x4	2x3	2x20	2x80	2x100	2x2	4
BFNDLAN1.7 BFNDLAN1.8									
b. Elective Foundation BFNDCIF 131		1T	1x2	1x2	1x10	1x40	1x50	1x1	1
EC & CC		1T	1x2	1x2	50	-	50	1x1	1
<b>Total</b>									<b>16</b>

## SEMESTER-II

Course Code	Course Name	No. of courses	Instruction hrs/week	Duration of Exam(hrs)	Marks			Credits	Total/ Sem
					IA	Exam	Total		
BFND 2.1	Human Nutrition – II	3T	3x4	3x3	3x20	3x80	3x100	3x2	6
BFND 2.2	Food Science- II								
BFND 2.3	Human Physiology -II								
BFND 2.1 P	Human Nutrition – II	3P	3x3	3x3	3x10	3x40	3x50	3x1	3
BFND 2.2 P	Food Science– II								
BFND 2.3 P	Human Physiology –II								
<b>b. Providing an expanded scope - Any ONE of the following to be opted</b>									
BFND 2.4	Community Nutrition	1T	1x2	1x2	1x10	1x40	1x50	1x1	1
BFND 2.5	Food packaging								
BFND 2.6	Functional Foods and Nutraceuticals								
Languages - Two		2L	2x4	2x3	2x20	2x80	2x100	2x2	4
BFNDLAN2.7	BFNDLAN2.8								
b. Elective Foundation		1T	1x2	1x2	1x10	1x40	1x50	1x1	1
EC & CC		1T	1x2	1x2	50	-	50	1x1	1
<b>Total</b>									<b>16</b>

**SEMESTER-III**

Course Code	Course Name	No. of courses	Instruction hrs/week	Duration of Exam (hrs)	Marks			Credits	Total/Sem
					IA	Exam	Total		
BFND 3.1	Lifespan Nutrition – I	3T	3x4	3	3x20	3x80	3x100	3x2	6
BFND 3.2	Chemistry – I								
BFND 3.3	Dietetics – I								
BFND 3.1	Lifespan Nutrition – I	3P	3x3	3	3x10	3x40	3x50	3x1	3
BFND 3.2	Chemistry – I								
BFND 3.3	Dietetics – I								
<b>c. Nurturing students proficiency/skill - Any ONE of the following to be opted</b>									
BFND 3.4 P	Diet Counseling	1T	1x2	2	1x10	1x40	1x50	1x1	1
BFND 3.5 P	Nutritional Assessment and Surveillance								
BFND 3.6 P	Food Sanitation and Hygiene								
Languages – TWO BFNDLAN3.7 BFNDLAN3.8		2L	2x4	3	2x20	2x80	2x100	2x2	4
b. Elective Foundation		1T	1x2	2	1x10	1x40	1x50	1x1	1
EC & CC		1T	1x2	2	50	-	50	1x1	1
<b>Total</b>									16

## SEMESTER-IV

Course Code	Course Name	No. of courses	Instruction hrs/week	Duration of Exam (hrs)	Marks			Credit	Total/Sem
					IA	Exam	Total		
BFND 4.1	Life span Nutrition-II	3T	3x4	3x3	3x20	3x80	3x100	3 x 2	6
BFND 4.2	Chemistry-II								
BFND 4.3	Dietetics – II								
BFND 4.1 P	Life span Nutrition – II –	3P	3x3	3x3	3x10	3x40	3x50	3 x 1	3
BFND 4.2 P	Chemistry – II –								
BFND 4.3 P	Dietetics – II								
<b>d. Enabling an exposure to some other discipline/ domain - Any ONE of the following to be opted</b>									
BFND 4.4	Food for Health OR	1T	1x2	1x2	1x10	1x40	1x50	1x1	1
BFND 4.5	Public Health Nutrition								
BFND 4.6	Life Style Disorders								
a. Foundation Languages – TWO BFNDLAN1.7 BFNDLAN1.8		2L	2x4	2x3	2x20	2x80	2x100	2x2=4	4
b. Elective Foundation		1T	1x2	1x2	1x10	1x40	1x50	1x1	1
EC & CC		1T	1x2	1x2	50	-	50	1x1=1	1
<b>Total</b>									16

**SEMESTER-V**

Course Code	Course Name	No. of courses	Instruction hrs/week	Duration of Exam(hrs)	Marks			Credits	Total/Sem
					IA	Exam	Total		
BFND 5.1	Nutritional Biochemistry– I	6T	6x3	6x3	6x20	6x80	6x100	6x2	12
BFND 5.2	Quality Control – I								
BFND 5.3	Chemistry – III								
BFND 5.4	Therapeutic Nutrition – I								
BFND 5.5	Food Microbiology–I								
BFND 5.6	Food Preservation - I								
BFND 5.7 P	Nutritional Biochemistry – I	6P	6x3	6x3	6x10	6x40	6x50	6x1	6
BFND 5.8 P	Quality Control – I								
BFND 5.9 P	Chemistry – III								
BFND 5.10 P	Therapeutic Nutrition – I								
BFND 5.11 P	Food Microbiology – I								
BFND 5.12 P	Food Preservation - I								
<b>Total</b>									18



## SEMESTER-VI

Course Code	Course Name	No. of courses	Instruction hrs/week	Duration of Exam(hrs)	Marks			Credits	Total/Sem
					IA	Exam	Total		
BFND 6.1	Nutritional Biochemistry – II	6T	6x3	6x3	6x20	6x80	6x100	6x2	12
BFND 6.2	Quality Control – II								
BFND 6.3	Chemistry – IV								
BFND 6.4	Therapeutic Nutrition – II								
BFND 6.5	Food Microbiology– II								
BFND 6.6	Food Preservation– II								
BFND 6.7 P	Nutritional Biochemistry– II	6P*	6x3*	6 x 3	6x10	6x40	6*x50	6x1	6
BFND 6.8 P	Quality Control – II								
BFND 6.9 P	Chemistry – IV								
BFND 6.10 P	Therapeutic Nutrition – II								
BFND 6.11 P	Food Microbiology-II								
BFND 6.12 P	Food Preservation – II								
* Internship / Project Work / Industrial Practicum in the VI semester in lieu of Food preservation practical (IA=10 + Written report = 20 + Viva = 20)									
Total									18
<b>Grand Total</b>									<b>100</b>

## Rules and Regulations of Curriculum

### B.Sc. Food, Nutrition and Dietetics

#### Definitions of Key Words:

1. **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year. Choice Based Credit System (CBCS).
2. The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).
3. **Course:** Usually referred to, as “papers” is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/ laboratory work/ outreach activities/ project work/ viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these.
4. **Credit Based Semester System (CBSS):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.
5. **Credit:** A unit by which the course work is interpreted. It functions the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.
6. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the sum total of the credit points obtained by the student in various courses in all semesters and the sum of the total credits of all courses in all the semesters.
7. **Grade Point:** It is a numerical marking allotted to each letter grade on a 10-point scale.
8. **Letter Grade:** It is an appreciated point of the student’s performance in a selected course. Grades are denoted by letters O, A+, A, B, C and RA x. Programme: An educational programme leading to award of a Degree certificate.
9. **Semester Grade Point Average (SGPA):** It is index of performance of all performance of work in a semester. Its total credit points obtained by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

10. **Semester:** Each semester will consist of minimum of 180 working days. The odd semester may be scheduled from June/ July to December and even semester from December/ January to June.

**Duration of Study Programme:** The duration of the study for B.Sc. Food, Nutrition and Dietetics will be of 3 years including 6 Months of Internship.

**Program pattern:**

- First Semester: July
- Second Semester: January
- Third Semester: July
- Fourth Semester: January
- Fifth Semester-July
- Sixth Semester-January

**Eligibility Criteria:**

- He/she has passed the Higher Secondary (10+2) with Science (PCB) or equivalent examination recognized by any Indian University or a duly constituted Board with pass marks in Physics, Chemistry, and Biology.
- Minimum percentage of marks: 45% aggregate.

**Medium of Instruction:**

English shall be the Medium of Instruction for all the Subjects of study and for examinations.

**CBCS – Definition and benefits:** Choice Based Credit System is a flexible system of learning. The distinguishing features of CBCS are the following:

- It permits students to learn at their own pace.
- The electives are selected from a wide range of elective courses offered by the other University Departments.
- Undergo additional courses and acquire more than the required number of credits.
- Adopt an inter-disciplinary and intra-disciplinary approach in learning.
- Make best use of the available expertise of the faculty across the departments or disciplines
- Has an inbuilt evaluation system to assess the analytical and creativity skills of students in addition to the conventional domain knowledge assessment pattern.

**Semester System and Choice Based Credit System:**

The semester system initiates the teaching-learning process and screws longitudinal and latitudinal mobility of students in learning. The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a sun shone" type approach in which the students can take choice of courses, learn and adopt an interdisciplinary approach of learning.

**Semesters:**

**An academic year consists of two semesters:**

	UG
Odd Semester 1 <sup>st</sup> semester	July – December
Odd Semester 3 <sup>rd</sup> , 5 <sup>th</sup> semesters	June – October/ November
Even Semester 2 <sup>nd</sup> , 4 <sup>th</sup> , 6 <sup>th</sup> semesters	December –April

**Credits:**

Credit defines the coefficient of contents/syllabus prescribed for a course and determines the number of hours of instruction required per week. Thus, normally in each of the courses, credits will be assigned on the basis of the number of lectures/ tutorial laboratory work and other forms of learning required, to complete the course contents in a 15-20 week schedule:

- a. **1 credit** = 1 hour of lecture per week
- b. **3 credits** = 3 hours of instruction per week
- ✓ Credits will be assigned on the basis of the lectures (L) / tutorials (T) / Clinical Training (CR) / laboratory work (P) / Research Project (RP) and other forms of learning in a 15- 20 week schedule L - One credit for one hour lecture per week
- c. **P/T** - One credit for every two hours of laboratory or practical
- d. **CR** - One credit for every three hours of Clinical training/Clinical rotation/posting
- e. **RP** - One credit for every two hours of Research Project per week – Max Credit 20- 25

	<b>Lecture - L</b>	<b>Tutorial - T</b>	<b>Practical - P</b>	<b>Clinical Training/ Rotation– CT/CR</b>	<b>Research Project– RP*</b>
1 Credit	1 Hour	2 Hours	2 Hours	3 Hours	2 Hours
RP*	Maximum Credit 20 – 25 / Semester				

**Types of Courses:** Courses in a programme may be of three kinds:

- **Core Course**
- **Elective Course**
- **Ability Enhancement Compulsory Courses**

**Core Course:** A course, which should compulsorily be studied by a candidate as a basic requirement is termed as a Core course. There may be a Core Course in every semester. This is the course which is to be compulsorily studied by a student as a basic requirement to complete programme of respective study.

**Elective Course:** A course which can be chosen from a very specific or advanced the subject of study or which provides an extended scope or which enables an exposure to some other domain or expertise the candidates ability is called an Elective Course.

**Discipline Specific Elective (DSE) Course:** Elective courses offered by the main subject of study are referred to as Discipline Specific Elective. The University / Institute may also offer discipline related Elective courses of interdisciplinary nature. An elective may be “Discipline Specific Electives (DSE)” gazing on those courses which add intellectual efficiency to the students.

**Dissertation / Project:** An Elective/Core course designed to acquire special / advanced knowledge, such as supplement study / support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher / faculty member is called dissertation / project.

**Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline / subject may be treated as an elective by other discipline / subject and vice versa and such electives may also be referred to as Generic Elective.

**Ability Enhancement Compulsory Courses:** The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC).

“AECC” courses are the courses based upon the content that leads to Knowledge enhancement (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines.

**Assigning Credit Hours per Course:** While there is flexibility for the departments in allocation of credits to various courses offered, the general formula would be:

- All core course should be restricted to a maximum of 4 credits.
- All electives should be restricted to a maximum of 3 credits.
- All ability enhancement course should be restricted to a maximum of 2 credits.
- Projects should be restricted to a maximum of 20-25 credits.

**Rules and Regulation for Examination of Food, Nutrition and Dietetics Program  
Under CBCS Pattern**

- 1. Title of the Programme offered: Food, Nutrition and Dietetics**
- 2. Duration of the Programme:** Three years for UG course including 6 Months of Internship.
- 3. Medium of instruction:** The medium of instruction and examination shall be in English
- 4. Letter Grades and Grade Points:**

Adopted the UGC recommended system of awarding grades and CGPA under Choice Based Credit Semester System.

- 4.1 Would be following the absolute grading system, where the marks are compounded to grades based on pre-determined class intervals.
- 4.2 The UGC recommended 10-point grading system with the following letter grades will be followed:

**Table 1: Grades and Grade Points:**

<b>Letter Grade</b>	<b>Grade</b>
O (Outstanding)	10
A+ ( Excellent)	9
A (Very Good)	8
B (Good)	7
C (Above	6
F (Fail)/ RA	0
Ab ( Absent)	0
Not Completed	0
RC (<50% in attendance or in Internal Assessment)	

- 4.3 A student obtaining Grade F/RA will be considered failed and will require reappearing in the examination.
- 4.4 Candidates with NC grading are those detained in a course (s); while RC indicate student not fulfilling the minimum criteria for academic progress or less than 50% attendance or less than 50% in internal assessments (IA). Registrations of such students for the respective courses shall be treated as cancelled. If the course is a core course, the candidate has to re-register and repeat the course when it is offered next time.

## 5. CBCS Grading System - Marks Equivalence Table

5.1 Table 2: Grades and Grade Points

Letter Grade	Gra	% of Marks
O (Outstanding)	10	86-100
A+ (Excellent)	9	70-85
A (Very Good)	8	60 -69
B (Good)	7	55 -59
C (Above Average) – Passing criteria	6	50- 54
F (Fail) )/ RA	0	Less than 50
Ab (Absent)	0	-
NC- not completed	0	-
RC- Repeat the	0	0

5.2 Table 3: Cumulative Grades and Grade Points

Letter Grade	Grade Point	CGPA
O (Outstanding)	10	9.01 - 10.00
A+ ( Excellent)	9	8.01 – 9.00
A (Very Good)	8	7.01 – 8.00
B (Good)	7	6.00 - 7.00
C (Above Average)	6	5.01 - 6.00

**6. Assessment of a Course:** Evaluation for a course shall be done on a continuous basis. Uniform procedure will be adopted under the CBCS to conduct internal assessments (IA), followed by one end-semester university examination (ES) for each course.

6.1 For all category of courses offered (Theory, Practical, Discipline Specific Elective [DE] ; Generic Elective [GE] and Ability Enhancement Courses [AE]; Skills Enhancement Courses [SE] Theory or P (Practical) & RP( Research Project), assessment will comprise of Internal Assessment (IA) in the form of continuous comprehensive evaluation and mid-semester exam, end-semester (ES) examination or college exam as applicable.

6.2 Courses in programs wherein Theory and Practical/Clinical are assessed jointly. The minimum passing head has to be 50% Grade each for theory and practical's separately. RA grade in any one of the components will amount to reappearing in both components. i.e. theory and practical.

6.3 Evaluation for a course with clinical rotation or clinical training or internship will be done on a continuous basis.



**7. Eligibility to appear for the end-semester examinations for a course includes:**

- 7.1 Candidates having  $\geq 75\%$  attendance and obtaining the minimum 40% in internal assessment in each course to qualify for appearing in the end-semester university examinations.
- 7.2 The students desirous of appearing for university examination shall submit the application form duly filled along with the prescribed examination fee.
- 7.3 Incomplete application forms or application forms submitted without prescribed fee or application form submitted after due date will be rejected and student shall not be allowed to appear for examination.

**8. Passing Heads**

- 8.1 Courses where theory and practical are involved, the minimum passing head shall be 50% in total including the internal assessment.
- 8.2 Elective subjects – the minimum prescribed marks for a pass in elective subject should be 50%. The marks obtained in elective subjects should be communicated to the university before the commencement of the university examination.

**9 Detention:** A student not meeting any of the above criteria maybe detained (NC) in that particular course for the semester. In the subsequent semester, such a candidate requires improvement in all, including attendance and/or IA minimum to become eligible for the next end-semester examination.

**10** The maximum duration for completing the program will be 6 years (minimum duration of program x 2) i.e. (3x2) = 6 years, failing which his/her registration will be cancelled. Full fees of entire program of 3 years may be liable to be paid by the students.

**11 Carry over benefit:**

- 11.1 A student will be allowed to keep term for Semester II irrespective of number of heads of failure in Semester I.
- 11.2 A student will be allowed to keep term for Semester III if she/he passes each Semester I and II OR fails in not more than 2 courses each in semester I and II.
- 11.3 Student will be allowed to keep term for Semester IV irrespective of number of heads of failure in Semester III. However, student must mandatorily have passed each course of Semester I and II in order to appear for Semester IV exam.
- 11.4 Student will be allowed to keep term for Semester V, if she/he passes Semester I,II, III and IV OR has passed in all courses of Semester I and II and fails in not more than two courses each of Semester III and IV.
- 11.5 Student will be allowed to keep term for Semester VI, irrespective of number of heads of failure in Semester V. However, student must mandatorily have passed each course of Semester I, II, III and IV in order to appear for Semester VI exam.

## 12 Grace Marks for UG Courses:

- 121 A student shall be eligible for grace marks, provided he/she appeared in all the papers prescribed for the examination.
- 122 Maximum up to 5 grace marks may be allowed for passing, spread over between subjects.
- 123 No grace marks will be awarded in internal evaluation.

## 13 University End-Semester Examinations

- 13.1 There will be one final university examination at the end of every semester.
- 13.2 A student must have minimum 75% attendance (Irrespective of the type of absence) in theory and practical in each subject to be eligible for appearing the University examination.
- 13.3 The Principal / Director shall send to the university a certificate of completion of required attendance and other requirements of the applicant as prescribed by the university, two weeks before the date of commencement of the written examination.
- 13.4 A student shall be eligible to sit for the examination only, if she / he secure a minimum of 40% in internal assessment (individually in theory and practical as applicable). Internal examinations will be conducted at college/ department level.
- 13.5 Notwithstanding any circumstances, a deficiency of attendance at lectures or practical maximum to the extent of 10% - may be condoned by the Principal / Director.
- 13.6 If a student fails either in theory or in practical, he/ she have to re-appear for both.
- 13.7 There shall be no provision of re-evaluation of answer sheets. Student may apply to the university following due procedure for recounting of theory marks in the presence of the subject experts.
- 13.8 Internal assessment shall be submitted by the Head of the Department to the University through Dean at least two weeks before commencement of University theory examination.

**14. Supplementary examination:** The supplementary examination will be held in the next semester. Eligibility to appear for supplementary examination will be as per rule number 11.1-11.5.

## 15. Re-Verification

There shall be provision of re-totaling of the answer sheets; candidate shall be permitted to apply for recounting/re-totaling of theory papers within 8 days from the date of declaration of results.

**16. Scheme of University Exam Theory UG Program:** General structure / patterns for setting up question papers for Theory / Practical courses, for UG program are given in the following tables. Changes may be incorporated as per requirements of specific courses.

## **Guidelines to Prepare Internship Research Proposal & Project**

### **1. Selection of Research Problem:**

Select your interest area of research, based on felt need, issues, social concern.

- a. State the problem in brief, concise, clear.
- b. State the purpose of selected study & topic.
- c. State the objectives of proposal/project.
- d. Prepare conceptual framework based on operational definition.
- e. Write scope of research proposal/project.

### **2. Organizing Review of Literature**

- a. Study related and relevant literature which helps to decide conceptual framework and research design to be selected for the study
- b. Add specific books, bulletins, periodicals, reports, published dissertations, encyclopaedia and text books
- c. Organize literature as per operational definition d. Prepare summary table for review of literature

### **3. Research Methodology: To determine logical structure & methodology for research project.**

- a. Decide and state approach of study i.e. experimental or non-experimental
- b. Define/find out variables to observe effects on decided items & procedure
- c. Prepare simple tool or questionnaire or observational checklist to collect data.
- d. Determined sample and sampling method
- e. Mode of selection ii) Criteria iii) Size of sample iv) Plan when, where and how data will be collected.
- f. Test validity of constructed tool
- g. Check reliability by implementing tool before pilot study(10% of sample size) h. Conduct pilot study by using constructed tool for 10% selected sample size

### **4. Data collection: To implement prepared tool**

- a. Decide location
- b. Time
- c. Write additional information in separate exercise book to support inferences and interpretation

### **5. Data analysis and processing presentation**

- a. Use appropriate method of statistical analysis i.e. frequency and percentage
- b. Use clear frequency tables, appropriate tables, graphs and figures.
- c. Interpretation of data:
- d. In relation to objectives
- e. Hypothesis
- f. Variable of study or project
- g. writing concise report

## 6. Writing Research Report

### a. Aims:

- i. To organize materials to write project report
- ii. To make comprehensive full factual information
- iii. To make appropriate language and style of writing
- iv. To make authoritative documentation by checking footnotes, references & bibliography
- v. To use computers & appropriate software

### b. Points to remember

- i. Develop thinking to write research report
- ii. Divide narration of nursing research report
- iii. Use present tense and active voice
- iv. Minimize use of technical language
- v. Use simple, straightforward, clear & concise language
- vi. Use visual aids in form of table, graphs & figures
- vii. Treat data confidentially
- viii. Review & rewrite if necessary

### Evaluation Criteria for Project Report

	Criteria	Rating					Remark
	<b>Statement of the problem</b>						
	1. Significance of the problem						
	2. Framing of title and objectives						
	<b>Literature Review</b>						
	1. Inclusion of related studies on the topic and its relevance						
	2. Operational definition						
	<b>Research Design</b>						
	1. Use of appropriate research						
	2. Usefulness of the research design to draw the inferences among						
	<b>Sampling Design</b>						
	1. Identification & description of the target population						
	2. Specification of the inclusion & exclusion criteria						
	3. Adequate sample size, justifying the study design to draw conclusions						

	<b>Data Collection Procedure</b>						
	1. Preparation of appropriate tool						
	2. Pilot study including validity & reliability of tool						
	3. Use of appropriate procedure/ method for data collection						
	<b>Analysis of Data &amp; Interpretation</b>						
	1. Clear & logical organization of						
	2. Clear presentation of tables(title, table & column heading)						
	3. Selection of appropriate						
	<b>Ethical Aspects</b>						
	1. Use of appropriate consent						
	2. Use of appropriate steps to maintain ethical aspects & principles						
	<b>Interpretation of the finding</b>						
	& appropriate discussion of the results						
	<b>Conclusion</b>						
	Summary & recommendations						
	<b>Presentation/ Report Writing</b>						
	Organization of the project work including language & style of						

Signature of the Evaluator

## 18. Eligibility for award of degree

18.1 A candidate shall have passed in all the subjects of all semester's I-VI, completed internship and submitted research project report to be eligible for award of Food, Nutrition and Dietetics degree.

The performance of a candidate in a course will be indicated as a letter grade, whereas grade point will indicate the position of the candidate in that batch of candidates. A student is considered to have completed a course successfully and earned the prescribed credits if he/she secures a letter grade other than F/RA. A letter grade RA in any course implies he/she has to Re-appear for the examination to complete the course.

18.2 The RA grade once awarded in the grade card of the student is not deleted even when he/she completes the course successfully later. The grade acquired later by the student will be indicated in the grade sheet of the subsequent semester in which the candidate has appeared for clearance in supplementary exams

18.3 If a student secures RA grade in the Project Work/Dissertation, he/she shall improve it and resubmit it, if it involves only rewriting / incorporating the revisions suggested by the evaluators. If the assessment indicates lack of student performance or data collection then the student maybe permitted to re-register by paying the prescribed re-registration fee and complete the same in the subsequent semesters.

A candidate shall be declared to have passed the examination if he/she obtains the following minimum qualifying grade / marks:-

- (a) For Core courses CT (Core Theory), CL (Core Lab), DE (Discipline centric Electives), clinical rotation and internship student shall obtain Grade B (50 % of marks) in the University End Semester Examination (ES) and in aggregate in each course which includes both Internal Assessment and End Semester Examination.
- (b) For Generic Electives (GE), Ability Enhancement (AE) and Skill Enhancement (SE) courses student shall obtain Grade D (40 % of marks) in the College Examination.

## 19. Guidelines for Clinical Internship or Research internship:

19.1 Internship may be commenced only on completion of all course work. The internship may be observed only at the clinical postings and areas of extension activities of Department of Physiotherapy, BLDEDU. No external postings will be considered during internship. Students are expected to act in a responsible and professional manner at all times during their postings.

19.2 Eligibility for appearing for Internship: On completion of all course work, a candidate is permitted by the Director/Principal to join internship during the beginning of the semester i.e., Odd/ Even.

- 193 Responsibilities during internship: During the internship period candidates should show at least 90% attendance. They must engage in practice/ skill based learning of professional conduct. Their learning outcomes must be maintained and presented in the form of logbooks/ case studies/ research project report. The appropriate formats for the postings/ clinical rotations/ research assignments will be as prescribed as required.
- 194 Evaluation of internees and award of credits: All internees will be assessed based on their satisfactory attendance, performance in the postings/ research labs and the presentation of the logbook. The credits and hours of internship will be as defined in the BFND program

### Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- i. The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone & earned by a student, i.e.,

$$\text{SGPA (Si)} = \frac{\sum(C_i \times G_i)}{\sum C_i}$$

where  $C_i$  is the number of credits of the  $i$ th course and  $G_i$  is the grade point scored by the student in the  $i$ th course.

- ii. The CGPA is also calculated in the same manner taking into account all the courses undergone & earned by a student over all the semesters of a programme, i.e.

$$\text{CGPA} = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

Where  $S_i$  is the SGPA of the  $i$ th semester and  $C_i$  is the total number of credits in that semester.

- iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration of Computation of SGPA and CGPA

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 X 8 = 24
Course 2	4	B+	7	4 X 7 = 28
Course 3	3	B	6	3 X 6 = 18
Course 4	3	O	10	3 X 10 = 30
Course 5	3	C	5	3 X 5 = 15
Course 6	4	B	6	4 X 6 = 24
	20			139
<b>Illustration for SGPA</b>				





## Ranking

The first two ranks of the programme will be decided on the basis of grades of CGPA in the courses (core and DE courses only). In case of a tie, marks % [of core and DE courses only] will be taken into account.

## Classification of Successful Candidates

Overall Performance in a Program and Ranking of a candidate is in accordance with the University regulations.

Consolidated Grade Card – BFND Program			
Letter Grade	% Marks Range	Grade point	CGPA RANGE
O	80 & Above	10	9.01 – 10
A+	75-80	9	8.01 - 9.00
A	60-74	8	7.01 - 8.00
B+	55-59	7	6.01- 7.00
B	50-54	6	5.01- 6.00
F/RA (Reappea	Less than 50	0	4.51 – 5.00
Ab (Absent)		0	
Not Completed (NC)		0	
Repeat the course RC = <50% in attendance or Internal Assessment)		0	

### A successful candidate will be:

- i. Who secures not less than O grade with a CGPA of 9.01 – 10.00 shall be declared to have secured ‘OUTSTANDING’ provided he/she passes the whole examination in the FIRST ATTEMPT;
- ii. Who secures not less than A+ grade with a CGPA of 8.01 – 9.00 shall be declared to have secured ‘EXCELLENT’ provided he/she passes the whole examination in the FIRST ATTEMPT;
- iii. Who secures not less than A grade with a CGPA of 7.01 –8.00 and completes the course within the stipulated course period shall be declared to have passed the examinations with ‘Very Good’
- iv. All other candidates (with grade B and above) shall be declared to have passed the examinations.

**SEMESTER-I**

**BFND 1.1 HUMAN NUTRITION - I**

**48 hrs - 4 hrs / week**

**OBJECTIVES**

This course will enable the students to

- Understand the functions and sources of nutrients
- Apply the knowledge in maintenance of good health for the individual and the community
- Be familiar with factors affecting availability and requirements

**UNIT I**

**12 hrs**

Nutritional Status: The relation of good nutrition to normal physical development and sound health. Definitions of the terms – Nutrition, Health, Nutrients, Nutritional status, Malnutrition, RDA. Methods of assessing nutritional status – Population sampling, collection of data on the nutritional adequacy of diet consumes, anthropometric measurements, clinical examination, and biochemical assessment. Diet surveys – methods. Energy - Definition of health and nutrition, Definition of calorie and joule, Measurement of calorific values of foods. Basal Metabolic Rate (BMR) - Factors affecting. Specific Dynamic Action (SDA) of foods. Energy needs of the body. Measurement of energy balance of the body. Direct and indirect calorimetry. Calculation of energy requirements. The ideal proportion of calories from protein, carbohydrates and fats

**UNIT II**

**12 hrs**

Carbohydrates: Classification, Basic structure, chemistry, digestion, absorption, Transport, brief overview of metabolism, functions, sources and requirements

**UNIT III**

**12 hrs**

Proteins: Classification, Structure, chemistry, digestion, absorption, brief overview of metabolism, functions, sources and requirements. Essential amino acids, evaluation of protein quality, Factors affecting bio-availability, supplementation and deficiency state

**UNIT IV**

**12 hrs**

Lipids / Fats: Classification, chemistry, digestion, absorption, brief overview of metabolism, functions, sources and requirements. Saturated and unsaturated fatty acids and effects of deficiency. Nutritional significance of SFA, MUFA, PUFA, Omega-3

**BFND 1.1 P HUMAN NUTRITION - I PRACTICALS**

**36 hrs - 3 hrs/week**

1. Qualitative tests for proteins
2. Quantitative estimation of glucose
3. Estimation of total lipid in egg yolk

## **REFERENCES**

Guthrie AH (1986) *Introductory Nutrition*, 6<sup>th</sup> Ed., The CV Mosby Company

Swaminathan M (1985) *Essentials of Food and Nutrition and Dietetics*, Vol I and II, Ganesh and Co, Madras  
Gopalan C (1991) *Nutrition value of Indian foods*, ICMR

WTO Technical Reports Series for Different Nutrients.

Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) *Normal and therapeutic nutrition*, 17<sup>th</sup> Ed., Macmillan Publ. Co.

Agarwal A, Udipi SA (2014) *Text book of human nutrition*, Jaypee Bros. Medical Publ., New Delhi

Bamji M, Rao NP, Reddy V (1996) *Text book of Human Nutrition*, Oxford and IBH Publ. Co. Pvt Ltd, New Delhi

Srilakshmi B (2015) *Nutrition science - 4<sup>th</sup> Ed.*, New age international Publ., New Delhi

Shills ME, Shike M, Ross AC, Caballero B, Cousins RJ (2005) *Modern Nutrition in health and disease – 10<sup>th</sup> Ed.*, Lippincott Williams and Wilkins

## BFND 1.2 FOOD SCIENCE - I

### OBJECTIVES

48 hrs - 4 hrs / week

This course will enable the students to:

- Understand factors to be considered during selection of basic commodities, raw and processed and various aspects of their products and distribution
- Understand the principles underlying changes in food characteristics during cooking.
- Be familiar with evaluation of food products for their quality characteristics

### UNIT I

12 hrs

Introduction to food science. Definition of food science. Food as a source of nutrients. Food groups: ICMR Five Food Group System. Eleven Food Group System. Nutritional Classification of foods. Cooking: advantages of cooking. Methods of cooking: Moist heat methods – Water/steam as a media of cooking: Boiling, simmering, poaching, stewing, steaming and pressure cooking – definition, advantages and disadvantages of each method. Dry heat method. Air as a media of cooking - grilling, roasting and baking. Fat as media of cooking – stir frying, sautéing, shallow and deep fat frying. Definition, advantages and disadvantages of each method. Combination of cooking methods – braising. Microwave cooking – mechanism of microwave cooking, construction of a microwave oven, advantages and disadvantages

### UNIT II

12 hrs

Cereals: Structure of a cereal grain. Composition and nutritive value of cereal grain. Specific cereals – nutritive value, composition and milling of rice and wheat. Parboiling – processes for parboiling, its advantages and disadvantages. Cereal protein gluten – process of gluten formation, factors that affect gluten formation. Characteristics of cereal starch – Amylose and Amylopectin. Effect of moist heat. Gelatinization of starch – process of gelatinisation, gelatinisation temperature, factors affecting gelatinisation. Changes in cooked starches – gel formation, retrogradation, syneresis. Modified starch

### UNIT III

12 hrs

Pulses, nuts, oilseeds and oils: Nutritive value and composition of pulses, nuts, oil seeds, fats and oils. Processing of pulses – effects of decortication, soaking, germination, fermentation, parching and puffing, extrusion. Toxic constituents of pulses. Pulse cookery – effect of cooking, factors that affect cooking quality. Processing of nuts and oil seeds. Specific nuts and oilseeds – groundnuts, coconut. Types of fats and oils: Vegetable oil – coconut, groundnut, sunflower and soybean. Animal fats – lard, margarine and butter. Processing of fats and oils – rendering, pressing, solvent extraction, hydrogenation and refining. Changes during cooking – effect of heating, changes in fat on heating. Storage, spoilage, rancidity. Role of fats and oils in cookery

**UNIT IV**

**12 hrs**

Fruits: Classification of fruits and nutritive value. Post harvest changes and storage. Pectin substances. Ripening of fruits. Enzymatic and non-enzymatic browning, prevention of enzymatic browning. Vegetables: Classification, nutritive value and composition. Pigments – water insoluble and soluble. Organic acids, enzymes, flavour compounds, bitter compounds. Vegetable cookery: Preliminary preparation – washing, peeling and blanching. Changes during cooking – oxidation, chemical composition, water content and cellulose. Role of nutrients – mechanical losses, solvent action of water, oxidation and chemical composition. Enzymes and non-enzymatic browning, its prevention. Flavor compounds

**BFND 1.2 P FOOD SCIENCE - I PRACTICALS**

**36 hrs - 3 hrs/week**

1. Food groups - Methods of measuring ingredients
2. Determination of the percentage of edible portion
3. Cereal cookery: Methods of cooking fine and coarse cereals, Preparation of selection Indian cereal recipes,
4. Pulses cookery: Cooking of soaked and raw pulses - Effects of adding salt, acid and alkali on cooking. Preparation of selected common recipes.
5. Vegetables and fruits: Browning reaction, Effect of acid and alkali, Preparation of selected common recipe

**REFERENCES**

Manay NS, Shadaksharaswamy M (2010) Foods - Facts and principles, New Age International Publ., New Delhi

Levies (1988) Food commodities, Heinemann Ltd., London

Hughes and Bennion M (1970) Introductory Foods, Macmillan and Co, New York  
Dowell P, Bailey A (1980) The Book of ingredients, Dorling Kindersley Ltd., London

Roseville LJ, Viera ER (1992) Elementary food science, 3<sup>rd</sup> Ed., Chapman and Hall, New York  
Charley H (1982) Food Science, 2<sup>nd</sup> Ed., John Wiley and Sons.

Potter NN, Hotchkiss JH (1966) Food Science, 5<sup>th</sup> Ed, CBS Publisher and Distributors, Delhi

**BFND 1.3 HUMAN PHYSIOLOGY -  
I**

**48 hrs - 4 hrs / week**

**OBJECTIVES**

This course will enable the students to:

- To understand the homoeostatic status of the human body
- To understand the physiological processes and functions as applicable to human nutrition

**UNIT I**

**12 hrs**

Introduction: Cell – structure and function of organelles, nucleus, chromosomes, genes, cell division, types of cell tissue transport, cell junctions homoeostasis and body fluids. Blood: Red blood cells – Erythropoiesis, stages of differentiation, function, counts, physiological variation. Hemoglobin – structure, function, concentration, physiological variation. White blood cells – production, function, life span, counts, differential counts. Platelets – origin, normal count, morphology, functions. Plasma proteins – production, concentration, types, albumin, globulin, fibrinogen. Haemostasis and blood coagulation. Haemostasis – definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors. Blood Bank - Blood groups – ABO system, Blood grouping and typing, cross matching. Rh system – Rh factor, Rh incompatibility. Blood transfusion – Indication, universal donor and recipient concept. Complications of blood transfusion and cross matching. Selection criteria of a blood donor, transfusion reactions. Anticoagulants – examples and uses. Anaemia – classification – morphological and etiological effects of anaemia on body. Blood indices – colour index, MCH, MCV, MCHC. Erythrocyte sedimentation rate (ESR) and packed cell volume. Blood volume – normal value, determination of blood volume and regulation of blood volume. Lymph – composition and function.

**UNIT II**

**12 hrs**

Cardiovascular system: Heart – physiological anatomy, nerve supply, properties of cardiac muscle, cardiac cycle – systole, diastole, conduction system. Cardiac output. Heart sounds: Normal heart sounds, areas of auscultation. Blood pressure – Definition, normal value, clinical measurement of blood pressure. Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension, radial pulse. Heart Sounds – Normal heart sounds, characteristics and signification (significance), heart rate. Electrocardiogram (ECG) – significance, coronary, cerebral circulation and capillary circulation

**UNIT III**

**12 hrs**

Digestive System: Physiological anatomy of gastro-intestinal tract, functions of digestive system. Salivary glands – structure and functions, deglutition, mastication – stages and regulation of saliva, functions of saliva. Stomach – structure and functions. Gastric secretion – composition, function, regulation of gastric juice secretion. Pancreas – structure, function, composition and regulation of pancreatic juice. Liver – functions of liver. Bile secretion - composition, function, regulation of bile secretion, bilirubin metabolism, types of bilirubin, jaundice – types, significance. Gall bladder – functions. Intestine – small intestine and large intestine. Small intestine - functions, digestion, absorption, movements. Large intestine – functions, digestion and absorption of carbohydrates, proteins, fats, lipids. Defecation

**UNIT IV**

**12 hrs**

Respiratory System: Function of respiratory system - physiological anatomy of respiratory system, respiratory tract, respiratory muscles, respiratory organs – lungs, alveoli, respiratory membrane, stages of respiration. Mechanism of normal and rigorous respiration, intra pulmonary pleural pressure, surface tension. Transportation of respiratory gases: Transportation of O<sub>2</sub>: direction, pressure gradient, forms of transportation, oxygenation of haemoglobin, quantity of O<sub>2</sub> transported. Lung volumes and capacities. Regulation of respiration, mechanisms of regulation, nervous and chemical regulation, respiratory centre. Hypoxia, cyanosis, asphyxia, dyspnoea, dysbarism, artificial respiration, apnoea

**BFND 1.3 P HUMAN PHYSIOLOGY - I PRACTICALS**

**36 hrs - 3 hrs/week**

1. Record of blood pressure – Sphygmomanometer, palpatory method, auscultatory method, variation of BP
2. Haemoglobin estimation
3. Blood grouping
4. Histology of Cartilage, bone, adipose tissue, skin, muscle

**REFERENCES**

Guyton AC, Hall JE (1996): Textbook of Medical Physiology, 9th Ed., Prism Books Pvt Ltd., Bangalore

Chatterjee CC (1988) Human Physiology, Calcutta, WB

Wilson (1989) Anatomy and Physiology in Health and Illness, Edinburgh Churchill Livingstone Sembulingam K, Sembulingam P (2012) Essentials of medical physiology, Jaypee Bros. Medical Publ., New Delhi

**ELECTIVE COURSE – a. Supportive to the discipline of study**

**BFND 1.4 FOOD SERVICE MANAGEMENT**

**24 hrs - 2hrs /  
week**

**OBJECTIVES**

This course will enable the students to

- Understand the scope of food service management in commercial and welfare organizations.
- Acquire knowledge about the process of food preparation and service.
- Understand concepts of management, marketing and entrepreneurship with reference to food service

**UNIT I**

**12 hrs**

Development and growth of the food service Industry. Classification of food service operations. Recent trends in food service. Systems approach to food service organizations. Types of food service systems. Menu Planning. Types of Menus, Menu presentation, Writing, Design and format Menu Marketing. Concept of Food flow. Procurement, Concept of Market, Buyer, Vendor and Marketing Channel Purchasing: Methods of purchasing, purchasing process. Receiving: Facilities needed for good receiving practices. Storage and Inventory. Production: Recipe formulation, Standardisation, Forecasting, Scheduling and control. Energy Management and Conservation

**UNIT II**

**12 hrs**

Kitchen Design and Layout. Service Factors affecting the choice of distribution systems. Styles of service and Service management. Food Safety and hygiene. Control of microbial quality of food throughout the food flow. Food Handling and prevention of food borne illness. Personal Hygiene. Environmental Sanitation. Waste disposal and pest control. Standards for food safety and sanitation

**REFERENCES:**

Longree K, Balaker BC (1979) Sanitary Techniques in Food Service, Wiley, New York,  
Longree K (1973) Food Service Sanitation, John Wiley and Sons.

Sethi M, Malham S (1987) Catering Management – an Integrated approach, Wiley Eastern limited, New Delhi,

West BB, Wood L, Hager, VF, Shugart G (1987) Food Services in institutions, Wiley and Sons, New York,

Bhojwani M (2007) Food service management: Principles and practice Eckel PJ (1985), College and University Food Service Management Delfakis H, Nancy L, Van Burns J (1992), Food Service Management

Spears M. C, Vaden A. E (1985), Food Service Organizations - A management and

*Food, Nutrition and Dietetics*



systems approach

Drummond K (1997) Nutrition for the Food Service Personnel

National Association Institute (1998) Handbook for Food Service Management

Vergheese B (1999) Professional Food and Beverage Service Management

Singh YP (2001) Effective Food Management, Anmol Publications Pvt. Ltd.

Fox A (1971) Hygiene and Food Production, Churchill Livingstone

**ELECTIVE COURSE – a. Supportive to the discipline of study**  
**BFND 1.5 FOOD BIOTECHNOLOGY**  
**THEORY**

**24 hrs - 2hrs / week**

**OBJECTIVES**

This course will enable the students to:

- Understand the application of biotechnology in food processing.
- Prepare fermented food products.

**UNIT I**

**12 hrs**

Biotechnology- Meaning and importance, history of biotechnology- traditional and modern biotechnology. Genetically modified foods- Definition and examples, advantages, disadvantages and safety aspects of foods produced by genetic engineering. Food biotechnology- Single cell protein, algae and spirulina: production and uses; Mushroom production and processing. Genomics and proteomics- Meaning, types and future; bioinformatics- meaning, sequences and nomenclature; information sources; uses. Bioethics: Necessity of bioethics, different paradigms of bioethics- national and international.

**UNIT II**

**12 hrs**

Enzymes- Role in food processing, importance; applications- industrial application of microbial enzymes; production of amylase, lipase and pectinase; immobilized enzymes and their applications. Fermentation- Types, advantages, factors controlling; batch fermentation and continuous fermentation; Fermented products- citric acid, lactic acid, vinegar, wine, beer, oriental fermented foods- tempeh and tofu. Biotechnology and biosafety- Introduction to Intellectual Property Rights, IP laws; TRIPS. Forms of IPR like patent, design and copyright trademark

**REFERENCES**

Dubey RC (2005) A text book of Biotechnology, S. Chand and company, New Delhi,

Tripathy SN (2006) Food biotechnology, Dominant Publ., and distributors,

Kumar HD (2004) A text book of Biotechnology, 2<sup>nd</sup> Ed., Affiliated East-West Press Pvt. Ltd., New Delhi,

Kumaresan V (2005) Biotechnology, Saras Publicat

**ELECTIVE COURSE – a. Supportive to the discipline of study**

**BFND 1.6 FOOD TECHNOLOGY**

**24 hrs - 2hrs / week**

**OBJECTIVES**

This course will enable the students to:

- Understand concepts in food technology

**UNIT I**

**12 hrs**

Introduction to food technology, Physico-chemical properties of food, classification of food groups, Food ingredients, different techniques and equipments used in preservation of food: Drying, refrigeration, thermal treatments. Innovative techniques used in food processing: RTE, RTS, edible coatings, edible film, instant premixes. Different packaging requirements and its importance.

**UNIT II**

**12 hrs**

Milk: Definition, different techniques used in processing of milk products: UHT, Pasteurization, Clarifications. Different types of milk products and processing. Sensory evaluation of the food products its importance, E-Nose & E-tongue. Application of enzymes for production in biochemical and food processing industries, Food regulations and licencing requirements.

**REFERENCES**

Flickinger MC, Drew SW (1999) Encyclopaedia of Bioprocess Technology, A Wiley Inter Science Publ.

Webb BH, Johnson AH (1988) Fundamentals of Dairy Chemistry, 3<sup>rd</sup> Ed., CBS Publ., New Delhi  
Robinson RK (2012) Modern Dairy Technology, Springer-Science

**SEMESTER- II**

**BFND 2.1 HUMAN NUTRITION – II**

**48 hrs - 4 hrs / week**

**OBJECTIVES**

This course will enable the students to:

- Understand the functions and sources of nutrients
- Apply the knowledge in maintenance of good health for individual and the community.
- To be familiar with factors affecting availability and requirements

**UNIT I**

**12 hrs**

Macro minerals: Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chlorine and Sulphur-functions, sources, requirements and effects of deficiency, Bioavailability

**UNIT II**

**12 hrs**

Macro minerals: Copper, Cobalt, Zinc, Iodine, Manganese, Fluorine, Molybdenum, Selenium, Chromium, Iron-functions, sources, requirements and effects of deficiency, Bioavailability

**UNIT III**

**12 hrs**

Vitamins: Classification on the basis of solubility, Vitamin A, D, E, K, Ascorbic acid, Thiamine, Riboflavin, Niacin, Folic acid, Vitamin B12, Pantothenic acid, Pyridoxine-functions, sources, absorption, requirements and deficiency

**UNIT IV**

**12 hrs**

Water: Importance, distribution in the body, functions, oedema, dehydration, sources, water balance and requirements. Fibre: Definition, classification, sources and role of fibre in human nutrition

**BFND 2.1 P HUMAN NUTRITION – II PRACTICALS**

**36 hrs 3 hrs/week**

1. Qualitative test for minerals
2. Quantitative estimation of Ascorbic acid using any two different samples
3. Preparation of ash solution
4. Quantitative estimation of Calcium, Phosphorus, Iron using any two different samples
5. Estimation of Calcium from types of milk

**REFERENCES**

Guthrie AH (1986): Introductory Nutrition, 6<sup>th</sup> Ed., The CV Mosby Co.

Swaminathan M (1985) Essentials of Food and Nutrition and Dietetics, Vol I and II, Ganesh and Co, Madras. Gopalan C (1991) Nutrition value of Indian foods, ICMR

WTO Technical Reports Series for Different Nutrients.

Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17<sup>th</sup> Ed., Macmillan Publ. Co.

Agarwal A, Udipi SA (2014) Text book of human nutrition, Jaypee Bros Medical Publ., New Delhi Bamji M, Rao NP, Reddy V. (2007) Text book of Human Nutrition, Oxford and IBH Publ. Co. Pvt Ltd, New Delhi

Srilakshmi B (2015) Nutrition science - 4<sup>th</sup> Ed., New Age International Publ., New Delhi Shills ME, Shike M, Ross AC, Caballero B, Cousins RJ (2005) Modern Nutrition in health and disease – 10<sup>th</sup> Ed., Lippincott Williams and Wilkins

**BFND 2.2 FOOD SCIENCE -  
II**

**48 hrs - 4 hrs / week**

**OBJECTIVES**

This course will enable the students to:

- Understand factors to be considered during selection of basic commodities, raw and processed and various aspects of their products and distribution
- Understand the principles underlying changes in food characteristics during cooking.
- Be familiar with evaluation of food products for their quality characteristics

**UNIT I**

**12 hrs**

Milk and milk products: Composition and nutritive value. Physical properties of milk. Effect of heat on milk constituents – nutrients, colour, flavour, digestibility, microorganisms, scum formation, scorching of milk. Processing of milk – clarification, pasteurization and homogenization. Preparation of cheese, butter, curd and ice cream. Problems encountered in cooking milk. Milk products – Vitamin D milk, skim milk, concentrated milk and cream

**UNIT II**

**12 hrs**

Egg: Structure and nutritive value. Composition – egg white and egg yolk proteins. Pigments in egg shell, white and yolk. Vegetarian egg. Egg quality – evaluation of egg quality, egg grading and deterioration of egg quality. Egg beating and factors affecting foaming. Egg cookery – Effects of heat and coagulation of egg proteins, microorganisms, effect of ingredients on egg protein. Egg prepared in the shell – boiled eggs – hard and soft. Egg prepared out of the shell – poached egg, fried egg, scrambled egg and omelette. Products based on egg as thickening agent – Custard. Products based on egg as emulsifying agent – Meringues. Preservation – freezing, cold storage, drying. Storage of egg

**UNIT III**

**12 hrs**

Meat: Structure, composition and nutritive value of meat. Classes of meat. Gelatin. Cuts and grades of meat and their selection. Post mortem changes, storage and changes during cooking. Ageing of meat and curing of meat. Factors affecting tenderness of meat. Meat cookery and changes during cooking, methods of cooking – dry heat and moist heat.

**UNIT IV**

**12 hrs**

Poultry, fish and spices: Classification and nutritive value. Processing and preservation. Selection and storage. Methods of cooking poultry and fish cookery. Spoilage of fish. Spices and condiments – Composition, flavouring extracts, adulteration and medicinal values. Processing and uses of major spices – Pepper (white and green), cardamom, ginger and turmeric

**BFND 2.2 P FOOD SCIENCE - II - PRACTICALS**

**36 hrs 3 hrs/week**

1. Fats and oils - Smoking point, Preparation of common recipes
2. Milk cookery - Experimental cookery on milk, Common preparations with milk, cheese and curds
3. Egg cookery - Evaluation of fresh egg. Experimental cookery – boiled egg, poached egg, omelette and custard. Preparation of selected common recipes with milk

## **REFERENCES**

Manay NS, Shadaksharaswamy M (2010) Foods - Facts and principles, New Age International Publ., New Delhi

Levies (1988) Food commodities, Heinemann Ltd., London

Hughes and Benniion M (1970) Introductory Foods, Macmillan and Co, New York

Dowell P, Bailey A (1980) The Book of ingredients, Dorling Kindersley Ltd., London

Roseville LJ, Viera ER (1992) Elementary food science, 3<sup>rd</sup> Ed., Chapman and Hall, New York  
Charley H. (1982) Food Science, 2<sup>nd</sup> Ed., John Wiley and Sons.

Potter NN, Hotchkiss JH (1966) Food Science, 5<sup>th</sup> Ed., CBS Publisher and Distributors, Delhi

## BFND 2.3 HUMAN PHYSIOLOGY - II

### OBJECTIVES

48 hrs - 4 hrs / week

This course will enable the students to:

- To understand the homeostatic status of the human body
- Understand the physiological processes and functions as applicable to human nutrition

### UNIT I

12 hrs

Endocrine System: Definition, classification of endocrine glands and their hormones, properties of hormones. Thyroid gland hormones – regulation of secretion. Disorders – hypo and hypersecretion of hormone. Adrenal gland - physiological anatomy. Adrenal cortex, cortical hormones – functions and regulation. Adrenal medulla – hormones, regulation and secretion. Functions of adrenaline and nor-adrenalin. Pituitary hormones – anterior and posterior pituitary hormones, secretion, function. Pancreas – hormones of pancreas. Insulin – secretion, regulation, function and action. Diabetes mellitus – regulation of blood glucose level. Parathyroid gland – function, action, regulation of secretion of parathyroid hormone. Calcitonin – function, action, Ca metabolism and hormone regulating Ca metabolism

### UNIT II

12 hrs

Neuro-muscular system: Vision – function of different parts of eye, light reflex, refractive errors, colour blindness, night blindness, accommodation. Hearing –function of ear, deafness, vestibular apparatus. Taste buds – functions, smell physiology, receptors. Nervous system: Functions of nervous system, neuron structure, classification and properties, neuroglia. Nerve fibre, classification, conduction of impulses, factors affecting conduction. Synapse - structure, types, properties. Receptors - definition, classification, properties. Reflex action - reflex arc, properties of reflex action. Spinal cord nerve tracts - function. Functions of medulla, pons, hypothalamus. Cerebral cortex, lobes and functions, sensory cortex, motor cortex. Cerebellum - functions. Basal ganglia - functions, EEG, Parkinson's disease. Cerebro Spinal Fluid (CSF) - formation, circulation, properties, composition and functions, lumbar puncture, sleep, types of sleep. Muscle nerve physiology: Classification of muscle, structure of skeletal muscle, sarcomere, contractile proteins. Neuromuscular junction, transmission across neuromuscular junction, excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue. Rigor mortis, isometric and isotonic concentration. Autonomic nervous system: Sympathetic and parasympathetic distribution and functions.

### UNIT III

12 hrs

Excretory system: Excretory organs - Kidney: function, structural and functional unit - nephrons, vasarecta, cortical and juxtamedullary nephrons - comparison, juxtaglomerular apparatus - structure and function. Renal circulation peculiarities. Mechanism of urine formation – ultrafiltration, criteria for filtration, GFR, plasma fraction, determination of GFR. Selective reabsorption - sites of reabsorption, substance reabsorbed, mechanisms of reabsorption. Tubular secretion, properties and composition of normal urine output. Abnormal constituents of urine. Counter-current mechanisms: micturition, innervations of bladder, cystourethrogram. Diuretics: water, diuretics, osmotic diuretics, artificial kidney, renal function tests.



**UNIT IV**

Skin - function. Body temperature measurement, physiological variation, regulation of body temperature by physical, chemical and nervous mechanisms. Hypothermia and fever. Reproductive system and puberty. Male reproductive system - functions of testis, spermatogenesis, spermiogenesis - stages, factors influencing semen, endocrine functions of testis. Androgens - Testosterone - structure and functions. Female reproductive system - ovulation, menstrual cycle, physiological changes during pregnancy, pregnancy test. Lactation: Composition of milk factors controlling lactation. Contraception

**BFND 2.3 P HUMAN PHYSIOLOGY – II PRACTICALS**

**36 hrs - 3 hrs/week**

1. Bleeding time
2. Clotting time
3. Total leucocyte count,
4. RBC count
5. Differential WBC count
6. Instruments used in haematology

**REFERENCES**

Guyton AC, Hall JE (1996) Textbook of Medical Physiology, 9th Ed., Prism Books Pvt Ltd., Bangalore

Chatterjee CC (1988) Human Physiology, Calcutta, WB

Wilson (1989) Anatomy and Physiology in Health and Illness, Edinburgh Churchill

Livingstone Sembulingam K, Sembulingam P (2012) Essentials of medical physiology, Jaypee Publ.

**ELECTIVE COURSE – b providing an expanded scope**

**BFND 2.4 COMMUNITY  
NUTRITION**

**24 hrs - 2hrs / week**

**OBJECTIVES**

This course will enable students to:

- Be aware of the nutritional problems of the community with special emphasis on vulnerable sections.
- Understand the different methods of assessing nutritional status of the community.
- Recognize the deleterious effects of malnutrition in the development of our nation and means of combating the same.

**UNIT I**

**12hrs**

Concept of community nutrition and malnutrition. Indicators of malnutrition - Infant mortality rate, Child Mortality. Maternal mortality rate, Birth rate, Death rate. Identification of vulnerable groups - Pregnant women, Nursing mother, Infants, Children with Special emphasis to girl child (including adolescents). Health agencies - FAO, WHO, ICMR, ICDS, ICAR, CSIR, ANP, VHAI, NIN and CFTRI. Role of voluntary health organisation in the improvement of Community health

**UNIT II**

**12hrs**

Assessment of Nutritional Status of a community: Anthropometry - Measurement of height, weight, head and chest circumferences, mid upper arm, circumference, skin fold thickness, interpretation of measurements and comparison with standards (NCHS, ICMR), classification according to grades of malnutrition. Biochemical parameters for assessing nutrition status. Clinical signs and symptoms of PEM, mineral and vitamin deficiencies. Diet Surveys and Sampling techniques. Definition, objectives of nutrition education. Methods of imparting nutrition education. Communication for behavioural change, planning, conducting, evaluating the nutrition education programmes Nutritional Intervention programmes to combat malnutrition. Concept of food fortification and food enrichment.

**REFERENCES**

Beredict A (1997) Preventive Nutrition – The Comprehension guide to health professionals (Ed.) New Jersey: Humana Press Inc.

Ebrahim GJ (1983) Nutrition in mother and child health – London Mac Millan and Co. Goel SL (2001) Community Health Care (New Delhi) Deep and Deep Publication

Goel SL (2001) Health Care System and Management. Vol 1-4, New Delhi: Deep and Deep Publication

Gopaldas T, Seshadri S (1987) Nutrition monitoring and assessment Delhi: Oxford Univ. Press. Jelliffe D (1966) The assessment of Nutritional Status of the Community.

Geneva WHO. Osman SR (1991) Nutrition and Poverty (Ltd.) Oxford; Oxford University Press

Rajlaxmi R (1981) Applied Nutrition, New Delhi: Oxford and IBH

Shukla P (1982) Nutritional Problems of India, New Delhi Prentice Hall of India.

Swaminathan M (1985) Essential of Food and Nutrition and Dietetics Vol I and II Bangalore, Bangalore Printing and Publ. Ltd.

Wadhwa A, Sharma S (2003) Nutrition in the Community, New Delhi: Elite Publ. House Pvt. Ltd.

**ELECTIVE COURSE – b providing an expanded scope**

**BFND 2.5 FOOD  
PACKAGING**

**OBJECTIVES**

**24 hrs - 2hrs / week**

This course will enable the students to:

- Understand the need for food packaging
- Know recent trends in packaging materials and labeling.
- Learn and gain knowledge on food packaging
- Know its applications during transportation.

**UNIT I**

**12hrs**

Food packaging Definition, functions of packaging materials for different foods, characteristics of packaging material. Food packages – bags, pouches, wrappers, tetra packs-applications. Packaging materials Packaging materials - Introduction, purpose, requirements, types of containers. Modern packaging materials and forms-Glass containers, metal cans, composite containers, aerosol containers, rigid plastic packages, semi rigid packaging, flexible packaging. Packages of radiation stabilized foods Introduction, rigid containers, flexible containers, general methods for establishing radiation stabilization. Radiation-measurement of radiations.

**UNIT II**

**12 hrs**

Biodegradable packaging material – biopolymer based edible firm. Packages of dehydrated products Orientation, metallization, co-extrusion of multilayer films, stretch, package forms and techniques. Aseptic packaging, retortable containers, modified and controlled atmosphere packaging, skin, shrink and cling film packaging, micro-ovenable containers, other package forms and components of plastics. Packaging of finished goods Weighing, filling, scaling, wrapping, cartooning, labelling, marking and trapping. Labelling: Standards, purpose, description types of labels, labelling regulation barcode, nutrition labelling, health claims, and mandatory labelling provision.

**REFERENCES**

- Khader V (2001) Text book of food science and technology, ICAR, New Delhi,
- Sacharow S, Griffin RC (1980). Principles of food packaging 2nd Ed. Avi pub Co. Westport.
- Paine FA, Paine HY, Hill L (1992) A hand book of food packaging. Blackie Academic & Professional Publ.
- Paine FA (Ed.) (2012) The packaging user's handbook, Blackie Academic & Professional Publ. Sacharow S (1976) Handbook of packaging materials. Avi Pub Co. Westport.

Crosby NT (1981) Food packaging materials. Applied Science pub Ltd.  
London. Paine FA (1977) The packaging media. Blackie & Sons Ltd.  
London. NIIR (2012) Food packaging technology Handbook, Delhi.

**ELECTIVE COURSE – b Providing an expanded scope**

**BFND 2.6 FUNCTIONAL FOODS AND NUTRACEUTICALS**

**24 hrs - 2hrs / week**

**OBJECTIVES**

To enable the students to:

- Understand the benefits and role of Functional Foods and Nutraceuticals
- Understand phytochemical components and its management on health
- Prioritize the inclusion of nutraceuticals in menu planning.

**UNIT I**

**12 hrs**

Definition, primary metabolites – pigments, sources, classification, functions. Flavor and odor components, pheromones, fatty acids and structural lipids. Secondary metabolites: alkaloids, terpenoids, glycosides, natural phenols – resveratrol. Isoprenoid derivatives. Polyphenols – sources, classification and functions. Action of nutraceuticals: Health benefits of functional ingredients existing in food- dietary fibre, oligosaccharides, sugar alcohols, polyunsaturated fatty acids, peptides and proteins, glycosides, isoprenoids and vitamins, alcohols and phenols, cholines, lactic acid bacteria, minerals and others. Biological effects of commonly used functional foods.

**UNIT II**

**12 hrs**

Functional Foods: millets, infant formula, fibre rich foods, beverages, herbal foods, probiotic foods – sources and health benefits. Antioxidants: sources, classification and functions; Antioxidant paradox. Definition, characteristics, spectrum of activity, health claim, dosage, safety, and role as functional ingredient with examples of Prebiotics, Probiotics and Synbiotics. Functional dairy foods: Bioactive peptide- definition, sources; probiotic and bioactive peptide based functional foods.

**REFERENCES**

Schmidl MK, Labuza TP (2000) Essential of functional Foods Culinary and Hospitality Industry Publications Services

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

Goldberg I (2001) Functional Foods Designer Foods Pharma Food, Nutraceuticals Culinary and Hospitality Industry Publications

Wildman REC (2001) Handbook of Nutraceuticals and functional Foods Culinary and Hospitality Industry Publications

Watson DH (2003) Performance Functional Foods Culinary and Hospitality Industry Publications

Chadwick R, Hensen S, Moseley B, Koenen G, Liakopoulos M, Midden C, Palou A, Rechkemmer G,

Shroeder D, von Wright A (2003) Functional Foods, Springer Publ.

Nath KG, Vijayalakshmi D (2014) *Nutraceuticals: Challenges and opportunities in 21st century*, Agrotech Publ. Academy, Udaipur.

Mangaraj S, Tripathi MK, Ali Nawab (2013) *Handbook of Nutraceuticals and functional foods- Soybean as an example*, Satish serial Publ. house, Delhi.

Wildman REC (Ed) (2006) *Handbook of Nutraceuticals and Functional Foods*, 2<sup>nd</sup> Ed. CRC Press Taylor and Francis Group

Ferguson LR (2013) *Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition*, CRC Press Taylor and Francis Group

**SEMESTER -III**  
**BFND 3.1 LIFE SPAN NUTRITION – I**

**48 hrs - 4 hrs / week**

**OBJECTIVES**

This course will enable the students to:

- Understand the process of growth and development from birth till adolescence
- Familiarize with nutritional needs at different stages of growth.
- Understand the concept of growth promotion

**UNIT I**

**12 hrs**

Basic principles of meal planning: Explanation of terms: Health, RDA, Adequate intake, Balanced diet. Food exchange list, food guide pyramid. Vegetarian diets - classification of vegetarianism. Quality of various nutrients - proteins, fats, minerals, vitamins, fibres and antioxidants. Principles of planning meals. Factors affecting meal planning

**UNIT II**

**12 hrs**

Nutrition during infancy: Growth and development. Use of growth chart to monitor development. Advantages of breast feeding. Nutrition factors of human milk. Difference between human and animal milk. Artificial feeding. Factors to be considered in bottle feeding. Feeding problems. Nutritional requirements. Weaning: Need and use. Points to be considered in introducing weaning foods. Problems in weaning. Types of supplementary foods

**UNIT III**

**12 hrs**

Nutritional needs for children: Pre School - Factors to be considered in planning meals for preschool children. Factors affecting nutritional status. Pica. Dietary guidelines. Nutritional requirements. Diet planning  
School children - Meal planning for school children. Feeding problems. School lunch programmes. Factors affecting feeding programmes. Nutritional requirements.

**UNIT IV**

**12 hrs**

Nutritional needs for adolescents: Special needs for girls during menarche - Food habits. Dietary guidelines. Nutritional problems- obesity, eating disorder, osteoporosis, anaemia, under nutrition, premenstrual syndrome, PCOD. Nutritional requirements.

**BFND 3.1 P LIFE SPAN NUTRITION – I PRACTICALS**

**36 hrs 3 hrs/week**

Planning, preparing and calculating the major nutrients of the following (Two planned diets with different age groups)

1. Weaning
2. Normal diet
3. Infancy
4. Preschool Child
5. School going Child
6. Adolescents



**REFERENCES**

Mahan K L, Escott-Stump S (2012) Krause's Food and the Nutrition Care Process, 13<sup>th</sup> Ed., Elsevier, Missouri

Ghosh (1992) The feeding and care of infants and young children, VHAI, 6<sup>th</sup> Ed., New Delhi WHO (1978) A growth chart for international use in maternal and child health care, Geneva Gopalan C (1993) Recent trends in nutrition, 9<sup>th</sup> Ed., Oxford Univ. Press

Mclaren DS, Meguid MM (1998) Nutrition and its disorders, Churchill Livingstone Swaminathan M (1985) Essentials of Food and Nutrition and Dietetics, Vol I and II, Ganesh and Co, Madras

**BFND 3.2 CHEMISTRY -  
I****48 hrs - 4 hrs / week****OBJECTIVES**

This course will enable the students to

- Enrich the knowledge about the basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- Provide an introduction to key concepts of modern analytical methods and to equip the students to handle the modern analytical instruments
- Expose the students to the rapid development and enormous expansion of every phase of chemistry

**UNIT I:****12 hrs**

Structure and Bonding - Chemical bonding, types of chemical bonds – ionic, covalent, coordinate. Hybridization – sp, sp<sup>2</sup>, sp<sup>3</sup>, bond length, bond angles, bond energy, van der Waals interactions, Hydrogen bonding – inter and intramolecular and their significance – anomalous properties of water. Solvents - Types of solvents and their characteristics, weak interactions in aqueous solutions, interaction between water and polar solutes, solubility of ionic solids and its dependence on lattice energy and solvation energy. Explanation for solubility of alcohols and sugars in water

**UNIT II:****12 hrs**

Methods of analysis - Qualitative, quantitative volumetry, gravimetry and instrumental methods of analysis. Errors in quantitative analysis, minimization of errors. Accuracy, precision, significant figures, measurement of accuracy – absolute error, relative error, measurement of precision – standard deviation, variance. Viscosity and surface tension - Definition, effect of temperature, determination, applications. Reaction Kinetics - Molecularity and order of reactions, second order reactions, differential integral equations, methods of determining order of a reaction, theories of reaction rates – collision theory and transition state theory, parallel and consecutive reactions with examples

**UNIT III:****12 hrs**

Acids and bases: Arrhenius, Bronsted Lowry, solvent system and Lewis concept of acids and bases. Hard and soft acids and bases. Ionic product of water, common ion effect and applications, pH scale, buffers, buffer capacity, Henderson's equation, preparation of acidic and basic buffers, buffers in biological system – blood plasma, RBC and tissue fluids, theory of acid-base indicators, pH titration curves and isoelectric pH of amino acids. Choice of indicators of acid base titrations. Binary Liquid mixtures - Liquid-liquid mixtures, ideal liquid mixtures, non ideal liquid mixtures. Azeotropes HCl – water, ethanol-water systems. Principle of fractional distillation, partially miscible liquids – phenol water system. Trimethyl amine – water and nicotine water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature, steam distillation – principle and applications.

**UNIT IV****12 hrs**

Introduction to Organic Chemistry - Classification, unique characteristics, IUPAC nomenclature of organic compounds, isomerism. Investigation of organic compounds.

Detection and quantitative estimation of elements Nitrogen, Sulphur, Phosphorus and Halogens (problems to be solved). Field effects and reaction intermediates . Resonance, hyper conjugation, aromaticity inductive and field effects, hemolytic and heterolytic bond breaking, electrophiles, nucleophiles, energy consideration, reactive intermediates, carbo – cations, carbanions free radicals, carbenes with examples. Arenes: Structure of benzene, mechanism of nitration and Fridel-Crafts reaction. Electronic interpretation of orienting influence of the substituents in the electrophilic substitution of chlorobenzene, toluene, nitrobenzene and phenol

### **BFND 3.2 P CHEMISTRY - I PRACTICALS**

**36 hrs - 3 hrs/week**

Qualitative analysis of organic compounds

1. Urea
2. Benzamide
3. Aniline
4. Acetophenone
5. O-cresol
6. Nitro benzene
7. Chlorobenzene
8. Benzoic acid
9. Resorcinol benzyl alcohol
10. Benzaldehyde

### **REFERENCES**

Soni PL (1988) A textbook of Inorganic chemistry, Sulthan Chand & Sons Lee JD (1988) Concise Inorganic Chemistry, Blackwell Science

Skoog DA, West DM, Holler JF (1993) Fundamentals of Analytical Chemistry, New York CBS Publ. Gurudeep Raj (2001) A text book of Inorganic chemistry, Goel Publ. house, Meerut

Soni PL (2000) A textbook of Organic chemistry, Sulthan Chand & Sons

Bahl A and Bahl BS (2000) Advanced organic chemistry, Sulthan Chand & Sons Vogel AI (1994) Textbook of quantitative chemical analysis, ELBS Ed.

Agarwal OP (1998) Chemistry of natural products, Goel Sulthan Chand & Sons Publ. House, Meerut Madan RL, Tuli GD (2001) Physical Chemistry, Sulthan Chand & Sons

Raj Gurudeep (2001) Textbook of advanced Physical chemistry, Goel Publ. House, Meerut Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2<sup>nd</sup> Ed. CBS Publ. and distributors

### **BFND 3.3 DIETETICS – I**

#### **OBJECTIVES**

**48 hrs - 4 hrs / week**

This course will enable the students to:

- Know the principles of diet therapy
- Understand the modifications of normal diet for therapeutic purposes
- Understand the role of dietician

#### **UNIT I**

**12 hrs**

Concept of therapy and meal planning: Reference man and woman. Balanced diet. Recommended dietary allowances [RDA] and its approaches of assessing nutrient requirements. Objectives of diet therapy. Growth and scope of dietetics. Characteristics and role of dietician. Food prescription.

#### **UNIT II**

**12 hrs**

Routine hospital diets: Liquid diet, semi-solid, regular and bland diet. Modification of normal diets. Types of feeding - oral feeding and tube feeding - enteral and parental

#### **UNIT III**

**12 hrs**

Diets in obesity and underweight: Obesity - Etiology, assessment, types. Regional distribution of fat in the body. Metabolic changes in obesity. Modification, dietary treatment. Nutritional requirements. Diet management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Under weight - Aetiology, Symptoms and complications, Dietary management - objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed

#### **UNIT IV**

**12 hrs**

Diet in infections and febrile conditions: Fever: Development, types and metabolic changes. Acute and chronic fevers. Causes and dietary management of typhoid, influenza, malaria, tuberculosis. Dietary management of all fevers - objectives, macronutrients, micronutrients, general considerations, foods allowed/ not allowed. Chronic infection- HIV (Human Immunodeficiency Virus) infection and AIDS (Acquired Immune Deficiency Syndrome). Stages of HIV infection. Aetiology, diagnosis. Malnutrition and AIDS: Dietary management - objectives, macronutrients, micronutrients, general considerations

#### **BFND 3.3 P DIETETICS – I PRACTICALS**

**36 hrs - 3 hrs/week**

Planning, preparing and calculating the following diets (Two case studies)

1. Fluid diets.
2. Obesity.
3. Underweight.
4. Febrile conditions

**REFERENCES**

Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982) Nutrition in health and disease, 17<sup>th</sup> Ed., JB Lippincott and Co., Philadelphia

Antia FP (1973) Clinical dietetics and nutrition, 2<sup>nd</sup> Ed, Oxford Univ. Press, Delhi

Williams SR (1989) Nutrition and diet therapy, 6<sup>th</sup> Ed, Time, Mirror, Mosby College Publ.

Raheen Begum (1989) A textbook of foods, nutrition and dietetics, Sterling Publ., Delhi

Joshi SA, (1992) Nutrition and dietetics, Tata McGraw Hill Publications, New Delhi

Srilakshmi B (2011) Dietetics, 6th Ed., New Age International Publ., New Delhi

## BFND 3.4 DIET COUNSELLING

24 hrs - 2hrs / week

### OBJECTIVES

This course will enable the students to:

- Understand the principles of nutritional or dietary counselling.
- Gain knowledge about the arts of a Counsellor.
- Apply the use of computers to collate and analyse information.

### UNIT I

12 hrs

Nutrition counselling - Definition, expectations, goals, scope and limits. Practical consideration in giving dietary advice and counselling - Factors affecting and individual food choice, Communication of dietary advice, Consideration of behaviour modification, motivation Dietitian – Classification, code of ethics, responsibilities. The Counselling Process - Techniques for obtaining relevant information- Clinical Information, Medical History and General Profile, nutritional assessment,

### UNIT II

12 hrs

Dietary counselling - Assessing food and nutrient intakes, Lifestyles, physical activity, stress. Implementation - Counselling the client/patient – client concurrence, co-ordination of care plans-the provision of learning experience. Evaluation - Measuring the success of performance of client and evaluating the counselling process. Computer application - Use of computers by dietitian, dietary computations, dietetic management, education/ training, information storage and administration, Research, Execution of software packages. Straight line, frequency table, bar diagram, pie chart, Preparation of dietary charts for patients. Statistical computation- mean, median, standard deviation

### REFERENCES

Antia FP (2008) Clinical dietetics and nutrition., Oxford University Press, New Delhi.  
Mahan LK, Escott-Stump S (2000). Krause's Food Nutrition and Diet Therapy 10<sup>th</sup> Ed., W.B. Saunders Ltd.

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Thomas B (1995) Blackwell Manual of Dietetic practise, 2<sup>nd</sup> Ed., Oxford: New York, 1995.  
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Mudambi SR, Rajagopal MV (2015) Fundamental of food, nutrition and diet therapy. New age International Publ., New Delhi,

Srilakshmi B (2014) Dietetics, New age international Publ., New Delhi

## **BFND 3.5 NUTRITIONAL ASSESSMENT AND SURVEILLANCE**

**24 hrs - 2hrs / week**

### **OBJECTIVES**

This course will enable the students to:

- Assess nutritional status

### **UNIT I**

**12 hrs**

Nutritional status assessment and surveillance - Meaning, need, objectives and importance. Community, regional, national and international surveillance systems. Rapid assessment procedures - Need, importance, techniques, interpretation and steps in RAP. Sources of secondary health data - sources of relevant vital statistics, importance of infant, child, maternal mortality rates, and epidemiology of nutrition related disease. Growth chart - Meaning, WHO Chart, and charts used in India, uses, use of growth charts for various age groups. meaning of reference curve and growth curve. Anthropometry: Need, importance, standards for reference, techniques of measuring height, weight, head circumference, chest circumference, mid-arm circumference, skin fold thickness, waist hip ratio, calculation of BMI, interpretation of the measurements

### **UNIT II**

**12 hrs**

Nutritional assessment - Diet Surveys: need, importance, methods, interpretation, concept of conception unit, intra inter individual distribution in the family, verifying the adequacy of the diet with respect to RDA, concept of family food security. Clinical signs, biochemical and biophysical methods: need, importance, identifying signs of deficiency diseases, interpretation of the clinical signs, biochemical and biophysical values in major diseases. Nutritional care process - Medical History assessment. Assessment of patient needs. Dietary counselling - Evaluation of the effectiveness of counselling. Education of the patient and follow up. Role of Dietitian – Professional code and ethics of a dietitian. Problems in feeding children at the hospitals. Psychology of feeding the patient

### **REFERENCES**

Antia FP (2008) Clinical dietetics and nutrition., Oxford University Press, New Delhi.  
Mahan LK, Escott-Stump S (2000) Krause's Food Nutrition and Diet Therapy 10<sup>th</sup> Ed., W.B. Saunders Ltd.

Zeeman FJ (1998) Applications of clinical nutrition. Englewood cliffs: Prentice Hall International Inc.

Thomas B (1995) Blackwell Manual of Dietetic practise, 2<sup>nd</sup> Ed., Oxford: New York, 1995.  
Robinson, (2006) Normal and therapeutic nutrition, Macmillan Pub. Company New York  
Mudambi SR, Rajagopal MV (2015) Fundamental of food, nutrition and diet therapy. New age International Publ., New Delhi,

Srilakshmi B (2014) Dietetics, New age international Publ., New Delhi

**BFND 3.6 FOOD SANITATION AND  
HYGIENE**

**24 hrs - 2hrs / week**

**OBJECTIVES**

This course will enable the students to:

- Obtain an insight into various aspects of hygiene and sanitation
- Gain knowledge on purification of water
- Understand food contamination and poisoning

**UNIT I**

**12 hrs**

Personal Hygiene & Importance of Water: General principles of food hygiene. Necessity for personal health and Hygiene (Hands and skin, hair, nose, mouth and ears, cuts, boils etc), medical checkup. Habits, Importance of Rest, Exercise and Recreation. Protective Clothing. GMP & GLP and Sanitary aspects of building and equipment. Equipment for personal hygiene. Sources of water, contamination of water. Importance of water and Purification of Water, Different methods of purification, potable water. Water quality standards, Criteria for judging water quality. Sanitary aspects of water supply, water sewage treatment

**UNIT - II**

**12 hrs**

Food Contamination, Poisonings Food borne diseases: Different Types of contamination - Bacterial, Physical, Chemical. Food Poisoning - common types and its symptoms (Salmonella, *Clostridium perfringens*, Botulism, Staphylococcus). Prevention of food poisoning. Cross contamination in food plants. Food Borne Diseases/ Illness - Amoebiasis, Acute diarrhoea /dysentery, Typhoid

**REFERENCES**

Johns N (1991) Managing Food Hygiene, Palgrave Macmillan.

Sprenger RA (2000) The Food Hygiene Handbook, High Field Publication

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Bhanot Publ. Bedi YP (1977) A handbook of social and preventive medicine, Anand Publ.

Roday S (2011) Food Hygiene and Sanitation with case studies, 2<sup>nd</sup> Ed., TATA McGraw Hill Education Pvt. Ltd. New Delhi.



**SEMESTER -IV**  
**BFND 4.1 LIFE SPAN NUTRITION -**  
**II**

**48 hrs - 4 hrs / week**

**OBJECTIVES**

This course will enable the students to:

- Understand the process of growth and development and the concept of growth promotion
- Get familiar with nutritional needs at different stages of growth.

**UNIT I**

**12 hrs**

Nutritional needs of adults: Reference man and reference woman in relation to occupation. Dietary guidelines to reduce the cost of a meal. Nutritional requirements.

**UNIT II**

**12 hrs**

Nutrition during pregnancy: Normal growth and weight gain. Physiological changes. Dietary modifications. General dietary problems. Complications during various stages of pregnancy. Nutritional requirements. Diet planning

**UNIT III**

**12 hrs**

Nutritional needs during lactation: Physiology of lactation. Milk output and factors affecting it. Dietary guidelines. Nutritional requirements. Diet planning

**UNIT IV**

**12 hrs**

Nutritional needs during old age: Physiological changes, RDA, Nutritional guidelines, nutritional, health concerns & complications and their management. Dietary modifications. Factors contributing to longevity

**BFND 4.1 P LIFE SPAN NUTRITION - II - PRACTICALS**

**36 hrs 3 hrs/week**

Planning, preparing diets and calculating the major nutrients of following (Standard with two planned diets of different calories and activities)

1. Adult
2. Pregnancy
3. Lactation
4. Old age

**REFERENCES**

- Ghosh (1992) The feeding and care of infants and young children, VHAI, 6<sup>th</sup> Ed., New Delhi  
WHO (1978) A growth chart for international use in maternal and child health care, Geneva  
Gopalan C (1993) Recent trends in nutrition, 9<sup>th</sup> Ed., Oxford Univ. Press  
Mclaren DS, Meguid MM (1998) Nutrition and its disorders, Churchill Livingstone  
Swaminathan M (1985) Essentials of Food and Nutrition and Dietetics, Vol I and II,  
Ganesh and Co, Madras  
Srilakshmi B (2011) Dietetics, 6<sup>th</sup> Ed., New Age  
International Publ., New Delhi

**BFND 4.2 CHEMISTRY - II****48 hrs - 4 hrs / week****OBJECTIVES**

This course will enable the students to:

- Enrich the knowledge about the basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- Provide an introduction to key concepts of modern analytical methods and to equip the students to handle the modern analytical instruments
- Expose the students to the rapid development and enormous expansion of every phase of chemistry

**UNIT I****12 hrs**

Bioinorganic Chemistry - Essential and trace elements in biological systems, functions of Sodium, Potassium, Calcium, Magnesium. Importance of compounds of Sulphur and Selenium in biological system. Toxicity of lead, mercury, cadmium and arsenic. Importance of phosphorus and nitrogen compounds in biological systems. Nitrogen and phosphorus cycles. Metal ions in Biological systems: Examples of naturally occurring complex compounds in living systems. Role of Iron in Hemoglobin, myoglobin and cytochromes, copper in hemocyanin, magnesium in chlorophyll, cobalt in Vitamin B12, molybdenum in nitrogenase, metalloenzymes – example and importance

**UNIT II****12 hrs**

Adsorption: Types, Freundlich adsorption isotherm, Langmuir's adsorption isotherm applications of adsorption, adsorption indicators in precipitation titrations. Colloidal State: Solids in liquids (sols), properties, kinetic optical and electrical, stability of colloids, protective action, Hardy Schulze law, Gold number, Liquids in liquids (emulsions), Types of emulsions, preparation, emulsifiers. Liquids in solids (gels). Classification, preparation and properties, Inhibition of gels – general applications of colloids. Radio chemistry: Nuclear stability, n/p ratio, Natural radioactivity, characteristics of radioactive elements, radioactive decay series, artificial transmutation using protons, neutrons, deuterons, induced radio activity, disintegration constant, half life. Radiation dosimetry. Fricke and Ferric sulphate dosimeter. Application of radio isotopes in medicine, agriculture and study of reaction mechanism and  $^{14}\text{C}$  dating. Biological effects of radiation, safety measurements in handling radio isotopes

**UNIT III****12 hrs**

Photochemistry: Laws of photochemistry – Grothus and Draper law, Einstein's law of photochemical equivalence, quantum efficiency, high and low quantum efficiency, photosensitization, photoinhibition, fluorescence, phosphorescence, chemiluminescence, bioluminescence with examples, photosynthesis. Techniques: Lambert's law, Beer's law, Beer-Lambert's law, molar absorption, molar extinction coefficient, transmittance and absorbance, their relationship, colorimeter, UV-Vis spectroscopy - instrumentation, working, applications. Flame photometry – instrumentation, working, applications

**UNIT IV****12 hrs**

Alkenes: Preparation of alkenes: Chemical reactions of alkenes: oxidation, ozonolysis, hydration, hydroxylation, polymerization, addition of HBr to propene, Markownikoff's rule. Dienes: Classification, types with examples, butadiene, methods of preparation. Chemical reactions, mechanism of addition of Br<sub>2</sub> and HBr. Polymerization, Diels alder reaction Alkynes: Acidity of alkynes, ozonolysis, polymerization. Alkyl halides: SN1 and SN2 reactions. Mechanism with one example for each. Concept of elimination reactions. E1 and E2 mechanisms.

**BFND 4.2 P CHEMISTRY – II PRACTICALS****36 hrs 3 hrs/week****Volumetric analysis**

1. Use of analytical balance and calibration of pipette
2. Preparation of standard Sodium carbonate solution and estimation in the given solution
3. Preparation of standard Oxalic acid solution. Standardization of NaOH and estimation of H<sub>2</sub>SO<sub>4</sub> in the given solution (Phenolphthalein)
4. Preparation of standard Oxalic acid solution. Standardization of KmNO<sub>4</sub> and estimation of H<sub>2</sub>O<sub>2</sub> in the given solution
5. Preparation of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>. Standardization of Na<sub>2</sub>S<sub>2</sub>C<sub>3</sub> and estimation of CuSO<sub>4</sub> in the given solution (starch)
6. Preparation of ZnSO<sub>4</sub>. Standardization of EDTA and estimation of total hardness of water using Eriochrome black T indicator
7. Preparation of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution. Estimation of Ferrous/Ferric ions in a mixture using diphenylamine indicator
8. Preparation of standard potassium bisulphate. Standardization of NaOH and estimation of HCl in the given solution (Phenolphthalein)
9. Estimation of alkali content in antacid tablet by using HCl
10. Estimation of Vitamin C
11. Estimation of Glucose
12. Estimation of amino acid

**REFERENCES**

Soni PL (1988) A textbook of Inorganic chemistry, Sulthan Chand & Sons  
 Lee JD (1988) Concise Inorganic Chemistry, Blackwell Science

Skoog DA, West DM, Holler JF (1993) Fundamentals of Analytical Chemistry, New York  
 CBS Publ. Gurudeep Raj (2001) A text book of Inorganic chemistry, Goel Publ. house,  
 Meerut

Soni PL (2000) A textbook of Organic chemistry, Sulthan Chand & Sons  
 Bahl A, Bahl BS (2000) Advanced organic chemistry, Sulthan Chand & Sons  
 Vogel AI (1994) Textbook of quantitative chemical analysis, ELBS Ed.

Agarwal OP (1998) Chemistry of natural products, Goel Sulthan Chand & Sons Publ. House, Meerut Madan RL, Tuli GD (2001) Physical Chemistry, Sulthan Chand & Sons

Raj Gurudeep (2001) Textbook of advanced Physical chemistry, Goel Publ. House, Meerut Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2<sup>nd</sup> Ed. CBS Publ., and distributors

## BFND 4.3 DIETETICS - II

### OBJECTIVES

48 hrs - 4 hrs / week

This course will enable the students to

- Know the principles of diet therapy
- Understand the modifications of normal diet for therapeutic purposes
- Understand the role of the indication.

### UNIT I

12 hrs

Diet in burns injury and surgery conditions: Burns- definition, classification, complications: Dietary management - objectives, macronutrients, micronutrients, general considerations. Injury/ Trauma- definition. Metabolic, physiological and hormonal response to Injury: Dietary management - objectives, macronutrients, micronutrients, general considerations. Surgery- definition. Metabolic, physiological and hormonal response to surgery: Dietary management - objectives, preoperative and postoperative nutritional care, macronutrients, micronutrients, general considerations

### UNIT II

12 hrs

Gastro-intestinal tract ailments: Diarrhoea- definition, classification, consequences. Treatment of diarrhoea- Fluid management- Oral Rehydration Therapy (ORT). Dietary management - objectives, macronutrients, micronutrients, general considerations, low residue and low fiber foods. Definition, symptoms, classification, complications and dietary management - objectives, macronutrients, micronutrients, general considerations, foods allowed and not allowed for the following: Constipation, Gastro Oesophageal Reflux Disease (GERD), Gastritis- acute and chronic, Peptic ulcer, Irritable bowel syndrome, Steatorrhea, Ulcerative colitis, Diverticulosis.

### UNIT III

12 hrs

Food Allergy: Definition, types of allergy, common food as allergens. Signs and Symptoms, tests for allergy. Dietetic treatment. Food intolerance: Definition, causative factors, diagnosis, treatment – elimination diet. Lactose intolerance symptoms, causative foods and stages according to severity, foods included and excluded, nutrition treatment. Gluten intolerance – symptoms, dietary treatment, foods included and excluded, nutritional treatment. Nutrient-drug interaction

### UNIT IV

12 hrs

Nutritional deficiency: Protein – energy malnutrition- aetiology, types, symptoms, dietary treatment and prevention, hospital treatment, domiciliary rehabilitation. Aetiology, clinical features, dietary treatment and prevention, prophylaxis programmes of the following: Iodine Deficiency disease and Vitamin A deficiency. Nutritional Anaemia - Aetiology, clinical features, types, dietary treatment and prevention of the following: Iron deficiency Anaemia / Disorder (IDD), Megaloblastic Anaemia, Folate Deficiency, Pernicious Anaemia

**BFND 4.3 P DIETETICS - II - PRACTICALS**

**36 hrs 3 hrs/week**

Planning, preparing and serving the following diets (two case studies)

1. Burns
2. Constipation
3. Peptic ulcer
4. Protein – deficiency
5. Iron – deficiency
6. Vitamin A deficiency

**REFERENCES**

Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982): Nutrition in health and disease, 17<sup>th</sup> Ed., JB Lippincott and Co., Philadelphia

Antia FP (1973) Clinical dietetics and nutrition, 2<sup>nd</sup> Ed., Oxford Univ. Press, Delhi

Williams SR (1989) Nutrition and diet therapy, 6<sup>th</sup> Ed., Time, Mirror, Mosby College Publ., St Louis

Raheen Begun (1989) A textbook of foods, nutrition and dietetics, Sterling Publ., New Delhi  
Joshi SA, (1992) Nutrition and dietetics, Tata McGraw Hill Publications, New Delhi

Srilakshmi B (2011) Dietetics, 6<sup>th</sup> Ed, New Age International Publ., New Delhi

Mahan LK, Arlin MT (1992) Krause's Food, Nutrition and Diet Therapy, 8<sup>th</sup> Ed., W.B Saunders Company, London

Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17<sup>th</sup> Ed, Macmillan Publ. Co.

## **BFND 4.4 FOOD FOR HEALTH**

### **OBJECTIVES**

**24 hrs - 2hrs / week**

To enable the students to:

- Know the composition of various foods.
- Understand the effects of cooking on nutritive value.

### **UNIT - I**

**12 hrs**

Introduction to Food Science- Functions of food; food guide based on basic five food groups, cooking – objectives and methods. Cereals- Composition and nutritive value of rice and wheat. Best method of cooking, loss of nutrients during cooking; Advantages of par boiling. Pulses - Composition, nutritive value, best method of cooking, loss of nutrients during cooking, germination and its advantages.

### **UNIT – II**

**12 hrs**

Vegetables – Classification, nutritive value, loss of nutrients during cooking and methods of reducing nutrient loss during cooking. Fruits- Classification, nutritive value and changes during ripening. Fleshy foods- Meat, fish, egg and milk: Nutritive value.

### **REFERENCES**

Mudambi SR, Rao SM, Rajagopal MV (2006) Food Science, 2<sup>nd</sup> Ed., New Age International Pvt. Ltd. Publ., New Delhi

Swaminathan N (1992) Food Science and Experimental foods, The Bangalore printing and Publ. Co. Ltd. Bangalore,

Srilakshmi B (2006) Food Science, New Age International Pvt. Ltd, New Delhi,

Reprint Manay SN, Shadaksharaswamy M (2005) Foods - Facts and Principles. 2<sup>nd</sup> Ed., New Age International (P) Ltd, New Delhi

**BFND 4.5 PUBLIC HEALTH  
NUTRITION**

**24 hrs - 2hrs / week**

**OBJECTIVES**

To enable the students to:

- Understand the importance of public nutrition.
- Take part in programs targeted to improve the nutritional status of the public.

**UNIT-I**

**12 hrs**

Definition of public health nutrition and health promotion; public health nutrition cycle; public health approaches- socio ecological approach, life style approach and biological approach. Assessment of nutritional status in individuals and population. Assessment of physical activity. Nutrition related policies and programs: Health, nutrition and family welfare through XII<sup>th</sup> five-year plan; ICDS- objectives and services; Public Distribution System; Anthyodaya Anna Yojana; National Food Security Act; National Food for Work Program. National and international agencies in combating malnutrition: International- WHO, FAO, UNICEF Aim and functions. National - ICAR, ICMR, NIN, NFI, FNB, CFTRI, NNMB, NSI, DFRL- Aims and functions.

**UNIT -II**

**12 hrs**

Communicable and non-communicable disease- causes, modes of transmission and preventive measures (general only). Immunization: Importance and Immunization schedule for children and adults. Public health aspects of over and under nutrition: BMI criteria by WHO; Obesity as a determinant of mortality and morbidity; under nutrition - definitions, clinical syndromes and public health consequences of under nutrition. General idea about the contamination of food (Chemical and microbial) - Sources and transmission, Elementary ideas about food toxins, aflatoxin & food toxicology with reference to Lead, Cadmium & Zinc. Contamination of water and prevention of contamination, different methods of water purification, water-borne diseases, elementary idea of microbiology of water-borne pathogens, diarrhoea, dysentery, typhoid, hepatitis, preventive measures and dietary management of such diseases.

**REFERENCES**

Gibney MJ, Margetts BM, Kearney JM, Arab L (2005) Public health nutrition, Blackwell.

Lawrence M, Worsley T (2008) Public health nutrition from principles to practice, Chennai microprint (P) Ltd., Chennai.

Srilakshmi B (2016) Nutrition science, 5<sup>th</sup> Ed., New age international (P) limited.

Park K (1997) Text book of preventive and social medicine, Banarsidas Bhanot Publ., Jabalpur.



## BFND 4.6 LIFE STYLE DISORDERS

### OBJECTIVES

24 hrs - 2hrs / week

To enable the students to:

- Identify and describe lifestyle related diseases
- Differentiate between controllable risk factors and uncontrollable risk factors for lifestyle diseases.
- Understand the importance of physical activity in managing lifestyle diseases

### UNIT - I

12 hrs

Obesity - Aetiology, Theories, Assessment complications - Principles and Dietary Modifications. Obesity and physical activity. Diabetes Mellitus - Prevalence, Etiology, Symptoms, complications, Diagnosis, Management

### UNIT - II

12 hrs

Atherosclerosis: Causes, Role of fat in the development of atherosclerosis, risk factors, Dietary guidelines and Management, Principles of diet, Importance of functional foods in management. Hypertension - Causes, types, Symptoms, Dietary Management with Principles of Diet - DASH Diet, importance of minerals and foods exclusion.

### REFERENCES

Mahan LM, Sylvia ES (2004) Krause's Food Nutrition and Diet Therapy, 11<sup>th</sup> Ed., Saunders, Elsevier  
Shils ME, Shike MS, Ross AC, Cabarellero B, Cousins RJ. (Eds.) (2005) Modern Nutrition in health and disease – 10<sup>th</sup> Ed., Lippincott Williams and Wilkins

Srilakshmi B (2011) Dietetics, 6<sup>th</sup> Ed., New Age International Ltd., New Delhi

Robinson CH, Lawler MR, Chenoweth WL, Garwick AE (1986) Normal and therapeutic nutrition, 17<sup>th</sup> Ed., Macmillan Publ. Co.

## SEMESTER-V

### BFND 5.1 NUTRITIONAL BIOCHEMISTRY I

36 hrs - 3 hrs / week

#### OBJECTIVES

This course will enable the students to:

- Understand the principles of biochemistry (as applicable to human nutrition).
- Obtain an insight into the chemistry of major nutrients and physiologically important compounds.
- Understand the biological processes and systems as applicable to human nutrition.
- Apply the knowledge acquired to human nutrition and dietetics

#### UNIT I

9 hrs

Carbohydrates: Nomenclature, Classification of carbohydrates – monosaccharides, oligosaccharides, polysaccharides – examples and structure. Metabolism – Glycolysis, TCA cycle, HMP Shunt, Glycogenesis, Glycogenolysis. Carbohydrate digestion and absorption. Importance of carbohydrates.

#### UNIT II

9 hrs

Lipids: Nomenclature, Classification of simple lipids – fats, oils, waxes. Complex lipids – phospholipids, glycolipids. Derived lipids – steroids, terpenes, carotenoids with examples, structure and function. Digestion and absorption. Fatty acids – classification – essential and non-essential fatty acids, examples, properties, functions. Metabolism –  $\beta$ -oxidation of saturated fatty acids. Biosynthesis and catabolism of cholesterol

#### UNIT III

9 hrs

Biological oxidation and enzymes: Compounds of ETC, mechanism, oxidative phosphorylation, high energy phosphate – ATP-ADP cycle and energy conservation.

#### UNIT IV

9 hrs

Enzymes: Definition, nomenclature, types and classification of enzymes. Active site. Definition, types of coenzymes, specificity of enzymes. Isoenzymes, enzyme kinetics, factors affecting velocity of enzymes catalysed reactions. Regulation of enzyme activity, enzyme inhibition

### BFND 5.1 P NUTRITIONAL BIOCHEMISTRY I - PRACTICALS

36 hrs - 3 hrs/week

1. Qualitative analysis for carbohydrates - Glucose, Fructose, Maltose, Lactose, Sucrose, Starch and Galactose
2. Quantitative analysis in blood and serum - Blood glucose, cholesterol, urea
3. Enzymes – effect of pH on human salivary  $\alpha$ -amylase activity

**REFERENCES**

West ES, Todd WR, Mason HS, Van Bruggen JT (1974) Text book of Biochemistry, 4<sup>th</sup> Ed., Amerind Publ. Co. Pvt. Ltd.,

Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2<sup>nd</sup> Ed., CBS Publ., and distributors.

Devlin TM (1986) Textbook of Biochemistry with clinical correlations, 2<sup>nd</sup> Ed., John Wiley & Sons. Stryer L (1995) Biochemistry, Freeman WH and Co.

Jain JL (2012), Fundamentals of Biochemistry, S. Chand and Company Ltd.

## **BFND 5.2 QUALITY CONTROL**

### **- I**

#### **OBJECTIVES**

**36 hrs - 3 hrs / week**

This course will enable students to:

- Gain an insight into quality of food
- Know the adulterants added to foods
- Familiarize international and national food laws, regulations and standards

#### **UNIT I**

**9 hrs**

Food Laws: PFA - Mode of work and duties of food inspectors. Essential commodities act: fruit product order, milk and milk product order, meat product order, cold storage order, the vegetable oil product order, standard and weight measurement act, the infant milk substitute, feeding bottles and infant food act.

#### **UNIT II**

**9 hrs**

Food standards: ISI, AGMARK, Export inspection council, consumer protection act, CODEX Alimentarius, FSSAI. HACCP - Importance. Principles. Determination of CCP. Problems in implementing HACCP. Importance of TQM, GMP and GLP

#### **UNIT III**

**9 hrs**

Adulteration of food: Definition. Types. Contamination of food by incidental adulteration by microorganisms, packing materials and other sources. Tests to detect common adulterants

#### **UNIT IV**

**9 hrs**

Food technology: Biotechnology in food: Application, GM foods. Nutraceuticals. Organic foods. Packaging of foods: Classification, types of packaging materials – paper, plastics, glass, tins and metals, packaging of different food products – bakery, dairy, dehydrated, fresh fruits and vegetables, fats and oils, frozen food products

#### **BFND 5.2 P QUALITY CONTROL - I - PRACTICALS**

**36 hrs - 3 hrs/week**

1. Detection of common adulterants present in the food sample – spices and condiments, food grains, sugars, preserves, fats and oils
2. Quality analysis of egg – Candling, yolk index, albumin index
3. Detection of hardness of water by titration method
4. Determination of moisture content of various food stuff

#### **REFERENCES**

Keister DC (1977) Food and beverage control, Prentice Hall Inc, New Jersey Coltman MM (1977) Food and beverage cost control, Prentice Hall Inc, New Jersey Kotas R (1973) An approach to food costing, Nelson Thornes, London

Ranjanna S (1985) Handbook of analysis and quality control for fruit and vegetable products Martin EH (1986) Standard methods for the examination of dairy products Lees R (1978) Food analysis, analytical and quality control methods for food manufacturer and buyer

**BFND 5.3 CHEMISTRY -  
III****OBJECTIVES****36 hrs - 3 hrs / week**

This course will enable the students to

- Enrich the knowledge about the basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- Provide an introduction to key concepts of modern analytical methods and to equip the students to handle the modern analytical instruments
- Expose the students to the rapid development and enormous expansion of every phase of chemistry

**UNIT I****9 hrs**

Co-ordination Compounds: Transition metals, properties (colour, oxidation states, magnetic properties, catalytic properties, complexation tendency). Double and complex salts - differences with examples. Postulates of Werner's theory (to be illustrated using Cobalt amine complexes). Types of ligands - uni, bi, poly-dentate, ambidentate with examples, coordination number, stability of complexes, factors influencing stability of complexes, Valence bond theory, structure and magnetic properties of some complexes. Applications of complex formation, metal complexes as therapeutic agents - Platinum, gold, copper complexes. Organometallic Chemistry - Definition, nomenclature and classification, preparation, properties, bonding and applications of alkyls and aryls of Li, Hg, and Al, metal carbonyls and nature of bonding

**UNIT II****9 hrs**

Dilute solutions: Dilute solutions and colligative properties. Ideal and non-ideal solutions, methods of expressing concentrations of solutions. Colligative properties, osmotic pressure and its measurement by Berkley and Hartley's method. Laws of osmotic pressure. Importance of osmotic pressure on living cells - hypotonic, hypertonic, isotonic solutions. Donnan membrane equilibrium, Raoult's law, relative lowering of vapour pressure. Molecular weight determination from osmotic pressure and relative lowering of vapour pressure. Elevation of boiling point, depression in freezing point, experimental methods for determining various colligative properties. Vant Hoff's factor. Abnormal molecular weight.

**UNIT III****9 hrs**

Alcohols: Classification, monohydric alcohols – general reactions, distinguishing reaction for 1,2 and 3 alcohols. Dihydric alcohols – Glycol preparation reactions and uses. Trihydric alcohols: Glycerol, synthesis, reactions, uses. Phenols: Acidity of phenols, effects of substituents on acidity on phenols. Reactivity of phenols towards electrophiles, uses. Carbonyl compounds: Synthesis of aldehydes and ketones. Structure, reactivity and properties of carbonyl group, nucleophilic addition reactions, aldol condensation, Perkins reaction, Cannizzaro reaction (mechanism).

**UNIT IV****9 hrs**

Carboxylic acids: Synthesis of monocarboxylic acids, acidity of carboxylic acids, effect of substituents on acidity of carboxylic acids - Hydroxy acids and dicarboxylic acids: Structure, preparation and properties of lactic acid, tartaric acid, citric acid, Succinic acid, maleic acid,

fumaric acid, Pyruvic acid, alpha ketoglutaric acid, oxaloacetic acid. Effects of heat and dehydrating agents on hydroxy acids. Amines: Classification, properties, synthesis of aliphatic and aromatic amines, separation of primary, secondary and tertiary amines and structural features affecting basicity of amines. Reactions, acylation with  $\text{HNO}_2$  and Schiff's base formation. Distinguishing reactions of primary, secondary and tertiary amines

### BFND 5.3 P CHEMISTRY - III - PRACTICALS

36 hrs - 3 hrs/week

Organic reparations

1. Acetanilide from aniline
  2. M-dinitro benzene
  3. Parabromo acetanilide
  4. Benzoic acid from toluene
  5. Benzoic acid from ethyl benzoate
  6. Aspirin from salicylic acid
- Physical chemistry experiments
7. Determination of density of a liquid using specific gravity bottle
  8. Viscosity using Ostwald's method
  9. Molecular weight of non-volatile substance by Walker Lumsden method
  10. Critical solution temperature of phenol water system
  11. Percentage of given electrolyte (NaCl) in water – phenol system by miscibility temperature method
  12. Rate constant of decomposition of  $\text{H}_2\text{O}_2$  using  $\text{KMnO}_4$
  13. Density of a liquid using specific gravity bottle and surface tension
  14. Enthalpy of ionization of weak acid

### REFERENCES

Soni PL (1988) A textbook of Inorganic chemistry, Sulthan Chand & Sons  
Lee JD (1988) Concise Inorganic Chemistry, Blackwell Science

Skoog DA, West DM, Holler JF (1993) Fundamentals of Analytical Chemistry, New York CBS Publ.  
Gurudeep Raj (2001) A text book of Inorganic chemistry, Goel Publ. house, Meerut

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Bahl A and Bahl BS (2000) Advanced organic chemistry, Sulthan Chand & Sons  
Vogel AI (1994) Textbook of quantitative chemical analysis, ELBS Ed.

Agarwal OP (1998) Chemistry of natural products, Goel Sulthan Chand & Sons Publ. House, Meerut  
Madan RL, Tuli GD (2001) Physical Chemistry, Sulthan Chand & Sons

Raj Gurudeep (2001) Textbook of advanced Physical chemistry, Goel Publ. House, Meerut  
Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2<sup>nd</sup> Ed., CBS Publ., and distributors.

**BFND 5.4 THERAPEUTIC NUTRITION**

**- I**

**36 hrs - 3 hrs / week**

**OBJECTIVES**

This course will enable students to:

- Understand the role of the dietician in preventive, promotive and curative health care
- Be able to make appropriate dietary modification for various disease conditions based on the Physiology
- Understand the role of the dietician

**UNIT I**

**9 hrs**

Definition of metabolic disorders. Definition of Diabetes mellitus. Classification and types – IDDM, NIDDM, Gestational Diabetes and MRDM, impaired Glucose tolerance (IGT), Prediabetes, MODY. Insulin resistance. Aetiology and symptoms. Diagnosis tests – Urinary sugar test, Glycosuria, Ketonuria RBS, OGTT, Glycosylated Hemoglobin test (HbA1c). Metabolism. Complications in diabetes - Acute complication, hypoglycaemia, hyperglycaemia, ketoacidosis; Chronic complications –heart disease, diabetic retinopathy, diabetic nephropathy, diabetic neuropathy, infections and wound healing. Treatment – biochemical criteria: urine sugar testing and blood glucose monitoring. Drug therapy – commonly used hypoglycaemic drugs, Insulin and its types. Management of diet in Diabetes – objectives, factors to be considered for planning diabetic diet, macronutrients, micronutrients, dietary fiber, foods permitted/avoided. Glycemia index (GI): definition, formula for GI, factors affecting GI, glycaemic indices of some common foods, Glycaemic load. Special concerns – alcohol, hypoglycaemia, illness or sick days, travel, eating out, stress. Diabetes and physical activity. Artificial sweeteners – low calorie sweeteners and non-calorie sweeteners. Dietary guidelines

**UNIT II**

**9 hrs**

Functions of liver. Agents responsible for liver damage. Damage caused to the liver. Malnutrition in liver disease. Infective hepatitis: definition, viruses responsible for hepatitis, aetiology for acute and chronic hepatitis. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Cirrhosis of liver. Definition, aetiology, symptoms. Pathogenesis of alcoholic liver disease (ALD). Complications – ascites, portal hypertension, oesophageal varices, hepatic coma: Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Hepatic coma – Definition, aetiology, symptoms. Clinical stages: Dietary management – objectives and recommendations.

**UNIT III**

**9 hrs**

Gall bladder diseases: terms – cholestasis, cholelithiasis, cholecystitis, cholecystectomy, biliary sludge. Functions of gall bladder. Cholecystitis – definition, types – acute and chronic phases, risk factors. Types of gallstones – Cholesterol stones, pigment stones and mixed stones. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Pancreatitis – definition, clinical features. Acute pancreatitis – aetiology, symptoms, complications and dietary management. Chronic pancreatitis – aetiology, symptoms, dietary management, special considerations and guidelines.

**UNIT IV****9 hrs**

Functions of the kidney. Glomerulonephritis (Nephritis) – acute and chronic: definitions, causes, symptoms and metabolic changes. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Renal failure – acute and chronic – definition, causes, symptoms and metabolic changes. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Nephrotic syndrome – definition, symptoms, metabolic changes. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Urolithiasis (Kidney stones / uremia) – definition, causes, symptoms, types of kidney stones. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed. Dialysis – definition, types of dialysis. Dietary management – objectives, macronutrients, micronutrients, general considerations, foods allowed/not allowed.

**BFND 5.4 P THERAPEUTIC NUTRITION - I - PRACTICALS****36 hrs 3 hrs/week**

Planning, preparing and calculating the major nutrient of the following (2 case studies)

1. 24 hrs recall method
2. Diabetes mellitus
3. Liver disease
4. Renal disease
5. Pancreatic disease
6. Gall bladder disease

**REFERENCES**

Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982): Nutrition in health and disease, 17th Ed., JB Lippincott and Co., Philadelphia

Antia FP (1973) Clinical dietetics and nutrition, 2<sup>nd</sup> Ed., Oxford Univ. Press, Delhi

Williams SR (1989) Nutrition and diet therapy, 6<sup>th</sup> Ed., Time, Mirror, Mosby College Publ., St Louis  
Raheen Begum (1989) A textbook of foods, nutrition and dietetics, Sterling Publ., New Delhi

Joshi SA (1992) Nutrition and dietetics, Tata McGraw Hill Publications,

New Delhi  
Srilakshmi B (2011) Dietetics, 6<sup>th</sup> Ed., New Age International Publ., New Delhi



**BFND 5.5 FOOD MICROBIOLOGY –  
I**

**OBJECTIVES**

**36 hrs - 3 hrs / week**

This course will enable students to:

- Understand the nature of microorganisms involved in food - spoilage, food infections and intoxications
- Understand the importance of microorganisms in food industry

**UNIT I**

**9 hrs**

Definition and history of microbiology - Contributions of Antonie van Leewenhoek, Loius Pasteur, Lazarro Spallanzani, Robert Koch, Joseph Lister, Edward Jenner, Alexander Fleming, MW Beijerinck and Dmitri Ivanowsky to the development of microbiology. Culture media used in the isolation and culturing of microorganisms. The common nutrient requirement for bacteria - macro and micronutrients.

**UNIT II**

**9 hrs**

Instrumentation in microbiology - Construction and working principles of autoclave, hot air oven, pH meter, laminar air flow, incubator, bacterial colony counter, spectrophotometer and membrane filter unit. Sterilization - Physical methods - heat, irradiation, filtration, solarisation, ultrasonic vibration. Chemical methods - alcohol, aldehydes, dyes, halogens, phenols, metallic salts, surface active agents, gases

**UNIT III**

**9 hrs**

Bacteria - classification according to Bergey's manual upto levels of section, ultrastructure, reproduction - asexual and sexual methods, importance of bacteria in food. Viruses - structure and classification - plant, animal, bacterial and cyanophycean viruses, life cycle in virus - lytic and lysogenic cycle.

**UNIT IV**

**9 hrs**

Yeast - morphology, reproduction - haplobiontic, diplobiontic and haplodiplobiontic cycle, physiology and nutrition in yeast. Importance of yeast in food. Mold - outlines of classification and reproduction - asexual and sexual modes. Type study of *Aspergillus*, *Penicillium Rhizopus* and *Mucor*. Importance of molds in food.

**BFND 5.5 P FOOD MICROBIOLOGY – I - PRACTICALS**

**36 hrs 3 hrs/week**

1. Introduction –Good laboratory Practices. Study of apparatus used in microbiology lab
2. Study of compound microscope.
3. Cleaning and sterilisation of glassware.
4. Preparation of culture media-Nutrient agar, Potato Dextrose Agar, EMB agar.
5. Culturing of micro-organisms –point inoculation, streak inoculation, spread plate method, pour plate method and swab method.
6. Simple staining of bacteria. Gram staining of bacteria. Negative staining of bacteria.
7. Wet mount of fungi using lactophenol blue stain.
8. Study of bacterial motility by hanging drop technique.

9. Sampling of soil-Serial dilution technique.
10. Sampling of air by Plate exposure method.

#### **REFERENCES**

Frazier WC, Westoff DC (1998), Food Microbiology 4<sup>th</sup> Ed., Tata Mc Graw Hill Publ. Co. Ltd. Jay J M (1986) Modern Food microbiology, 3<sup>rd</sup> Ed., Van No Strand Reinhold Co. Inc.

Pelezer ML, Reid RD (1978) Microbiology, McGraw Hill Book Co., New York Brown A, Smith H (2015) Benson's Microbiological applications, McGraw Hill Publ.

## **BFND 5.6 FOOD PRESERVATION**

### **- I**

#### **OBJECTIVES**

**36 hrs - 3 hrs / week**

This course will enable students to:

- Understand the basic concepts and parameters of preservation techniques
- Know the types and variety of foods available in the markets
- Learn to purchase and preserved different foods
- Learn various quality and preservation techniques used in various foods

#### **UNIT I**

**9 hrs**

Definition, Importance of food preservation. Causes of food spoilage - microorganisms, enzymes, insects, parasites and rodents, environmental factors and measures to control them. Classification of food by ease of spoilage. General principles of food preservation. Methods of food preservation - asepsis (keeping out of microorganisms), maintenance of aseptic condition, removal of microorganisms - clarification, filtration, centrifugation, thermal processing (blanching, pasteurization, sterilization and microbial death time), food drying and dehydration, cooling and freezing, food preservation using chemicals, irradiation and other emerging techniques (CAP, MAP, genetic engineering). Classification of food for processing.

#### **UNIT II**

**9 hrs**

Preservation with high concentrations: Concept of food concentration. Sugar concentrates - general principles. Methods of preparation of jam, jellies and marmalade, tests of doneness, problems in jam and jelly preparation. Theory of gel formation. Factors affecting gel formation. Definition, preservation and preparation of crystallized and glazed fruits, squashes and syrups. Types of syrups. Temperature test for syrups and candies. Salt concentrates - general principles. Role of ingredients in preparation of pickles. Types of pickles. Definitions and preparation of sauerkraut, dill and common Indian pickles

#### **UNIT III**

**9 hrs**

Irradiation: Definition, principles, Sources of radiation, mechanism of irradiation, Units of irradiation, Dosimetry, mode of action. Use of radioisotopes in irradiation, Effects on foods and nutrients, Advantages and disadvantages. Uses, Effect of food irradiation on food quality.

#### **UNIT IV**

**9 hrs**

Drying: Definition, General Principle, Methods of drying – Sun/solar drying, artificial drying. Types of driers: air convection drier, drum/roller drier, vacuum drier, freeze drier, vacuum belt driers, osmotic drying. Factors controlling drying and dehydration. Dehydration: Definition, principles, pre-treatments for drying, changes during drying, effects of drying on nutritive value, Factors influencing dehydration, Sun drying vs. artificial drying

#### **BFND 5.6 P FOOD PRESERVATION – I - PRACTICALS**

**36 hrs - 3 hrs/week**

1. Prepare the following recipes – jellies, jams, squashes, pickles, dehydrated vegetables
2. To estimate the acidity of fruit juice
3. Prepare the following: Tutti frutti, ketchups & sauces, Chutneys, Chutney powder, Frozen fruits and vegetables

4. Visit to food industry

**REFERENCES**

razier WC, Westoff DC (1998) Food Microbiology 4<sup>th</sup> Ed., Tata Mc Graw Hill Publ. Co. Ltd

Prescott SC, Proctor BE (1937) Food Technology, McGraw Hill

Desroier NV (1963) The technology of food preservation, AVI Pub. Co

Lal G, Siddappa GS, Tandon GL (1960) Preservation of food and vegetables, ICAR, New Delhi

Manay NS, Shadaksharaswamy M (2010) Foods - Facts and principles, New Age

International Publ., New Delhi

**SEMESTER-VI****BFND 6.1 NUTRITIONAL BIOCHEMISTRY - II****36 hrs - 3 hrs / week****OBJECTIVES**

This course will enable the students to:

- Understand the principles of biochemistry (as applicable to human nutrition).
- Obtain an insight into the chemistry of major nutrients and physiologically important compounds.
- Understand the biological processes and systems as applicable to human nutrition.
- Apply the knowledge acquired to human nutrition and dietetics

**UNIT 1****12 hrs**

Proteins – Amino acids, chemical bonds (peptide, ionic, hydrogen bonds, van der Waal's forces and hydrophobic interactions) involved in protein structure, Protein configuration – primary, secondary, tertiary and quaternary structures with suitable examples, biological role of proteins. Classification of proteins – simple, conjugated proteins, derived proteins with examples. Biosynthesis, protein digestion and absorption, protein malnutrition.

**UNIT II****12 hrs**

Nucleic acids: Introduction, components, nucleosides, nucleotides - DNA, base composition, double helical structure, DNA – Denaturation, DNA replication mechanism, DNA Repair Mechanisms, Transcription – requirements and mechanism. RNA – Types, structure and functions

**UNIT III****9 hrs**

Hormones: Biological role of hormones of pituitary, adrenal Cortex and Medulla, Thyroid Parathyroid and Pancreas.

**UNIT IV****9 hrs**

Vitamins: Chemistry and biochemical role of fat soluble vitamins – A,D,E and K. Water soluble vitamins B1,B2, B3, B6 and C. Storage of vitamins in the body, daily human requirements, deficiency disorders. Minerals: Biochemical role of inorganic elements, deficiency disorders.

**BFND 6.1 P NUTRITIONAL BIOCHEMISTRY - II – PRACTICALS****36 hrs - 3 hrs/week**

1. Qualitative analysis for proteins - Egg albumin, Gelatin, Peptone and Casein
2. Quantitative analysis - Serum inorganic phosphate, Serum protein, Creatinine in urine,
3. Estimation of Ascorbic acid content of foods by colorimetric method, Estimation of DNA and A/G ratio

**REFERENCES**

West ES, Todd WR, Mason HS, Van Bruggen JT (1974) Text book of Biochemistry, 4<sup>th</sup> Ed., Amerind Publ. Co. Pvt. Ltd.,

Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2<sup>nd</sup> Ed. CBS Publ., and distributors. Devlin TM (1986) Text book of Biochemistry with clinical correlations, 2<sup>nd</sup> Ed., Wiley and sons.

Stryer L (1995) Biochemistry, Freeman WH and Co.

Jain JL (2012) Fundamentals of Biochemistry, S. Chand and Company Ltd.

**BFND 6.2 QUALITY CONTROL - II**

**OBJECTIVES**

**36 hrs - 3 hrs / week**

This course will enable the students to:

- Gain an insight into quality of food
- Know the importance and uses of food additives
- Know how food is fortified and enriched with certain nutrients
- Be familiar with the sensory evaluation of various quality parameters of food.

**UNIT I**

**9 hrs**

Food quality and quality control: Definitions. Principles of quality control. Food quality. Sample and sampling methods. Industrial quality control: Raw material control, Process control, Finished. Product control and inspection.

**UNIT II**

**9 hrs**

Food additives, fortification and enrichment: Definitions. Principles and objectives. Classification and uses. Colouring agents: Natural, Synthetic and non-certified colours. Leavening agents: Classification and uses. Flavouring agents: Natural and Synthetic flavours.

**UNIT III**

**9 hrs**

Food fortification and enrichment: Definition and importance. Principles. Commonly fortified and enriched foods. Non-nutritional constituents and food safety: naturally occurring toxicants, microbial toxins, bacterial food poisoning and contamination arising from processing

**UNIT IV**

**9 hrs**

Sensory evaluation of food quality: Sensory characteristics of food, Types of tests. Objective evaluation: Types of tests, Texture evaluation. Conducting sensory tests and preparation of evaluation card

**BFND 6.2 P QUALITY CONTROL - II - PRACTICALS**

**36 hrs - 3 hrs/week**

1. Quality evaluation of milk – lactometer reading and tests to detect adulteration of milk
2. Iodine test
3. Determination of fat using butyrometer
4. Sensory evaluation of foods - Sweet, sour, bitter, salt. Different tests employed in sensory evaluation
5. Quality of fats and oil. Iodine value. Acid number
6. Visit to a food industry

**REFERENCES**

Keister DC (1977) Food and beverage control, Prentice Hall Inc, New Jersey

Coltman MM (1977) Food and beverage cost control, Prentice Hall Inc, New Jersey

Kotas R (1973) An approach to food costing, Nelson Thornes, London

Ranjanna S (1985) Handbook of analysis and quality control for fruit and vegetable products

Martin EH (1986) Standard methods for the examination of dairy products

Lees R (1978) Food analysis, analytical and quality control methods for food manufacturer and buyer



**BFND 6.3 CHEMISTRY - IV****OBJECTIVES****36 hrs - 3 hrs / week**

This course will enable the students to:

- Enrich the knowledge about the basic principles, fundamental concepts and unique mechanistic steps involved in chemical and biochemical reactions
- Provide an introduction to key concepts of modern analytical methods and to equip the students to handle the modern analytical instruments
- Expose the students to the rapid development and enormous expansion of every phase of chemistry

**UNIT I****9 hrs**

Electrochemistry: Specific equivalent and molar conductance, Kohlrausch's law, electrodes, electrode potential. Nernst equation. Reference electrode, Hydrogen electrode and calomel electrode, Quinhydrone electrode, glass electrode. Determination of equivalent conductance of NaCl. Conductometric titrations. Potentiometric titration. Determination of pKa values of weak acids by potentiometric method. Determination of pH using quinhydrone electrode. Chemical equilibrium: Second and third law of thermodynamics, concept of entropy, Equilibrium constant and energy, Lechatelier's principle and its applications

**UNIT II****9 hrs**

Stereochemistry of organic compounds: Stereoisomerism, types of stereoisomerism, optical isomerism. Elements of symmetry, asymmetric, atom molecular dissymmetry, chirality, optical isomerism in glyceraldehydes, lactic acid and tartaric acid, Enantiomers, diastereomers, meso compounds resolution of enantiomers and racemisation. Geometrical isomerism – condition, examples, geometrical isomerism in oximes. Conformational isomerism: conformational analysis of ethane and butane, Newman projection difference between configuration and conformation.

**UNIT III****9 hrs**

Heterocyclic compounds: Occurrence, structural formula and importance of furan, pyrrole, thiophene, pyridine, purine, indole, imidazole, quinoline and isoquinoline, aromatic characteristics of pyrrole, furan, thiophene, pyridine, reactions. Terpenes: Classification isoprene rule, structure, occurrence and importance of limonene, menthol, camphor, santonin, phytol, lonosterol, dolichols. Alkaloids: Classification biological functions with examples, structure and physiological action of LSD, morphine, nicotine, atropine. Polymers: Classification, polymerization process, number average and weight average molecular weights, properties of polymers, preparation and applications of PET, nylon-6,6, Bakelite, PVC, polythene, polypropylene, polystyrene

**UNIT IV****9 hrs**

Environmental Chemistry: Air pollution – air pollutants, their sources, effects and control. Water pollution: Types of water pollutants, biodegradation, dissolved oxygen level of water, Biochemical Oxygen Demand (BOD) of water, Chemical Oxygen Demand (COD) of water. Determination of DO, BOD and COD of waste water, industrial effluents, their effects, treatment of polluted water and sewage treatment. Soil pollution: pollutants, agricultural animal manures, crop harvesting. Pesticides. Use of fertilizers. Radioactive wastes. Control of soil pollution. Chromatography: General principles, adsorption and partition techniques. Paper chromatography, ascending and circular. Rf values. TLC, Column chromatography, Principles of gel chromatography, ion exchange chromatography and their applications.

**BFND 6.3 P CHEMISTRY - IV - PRACTICALS****36 hrs - 3 hrs/week**

Extraction of bio-molecules

1. Starch from potato
2. Caffeine from tea leaves
3. Casein from milk Physical chemistry experiments (instrumental)
4. Conductometric titration of strong acid and strong base
5. Conductometric titration of acid mixture against strong base.
6. Verification of Beer-Lambert's law by colorimeter.
7. Potentiometric titration of Mohr's salt against Potassium dichromate.
8. Determination of pH of buffer by pH meter or potentiometer.
9. Determination of equivalent conductance of strong electrolyte.  
Chromatography experiments
10. Identification of amino acids by circular paper chromatography
11. Separation of green leaf pigments by column chromatography

**REFERENCES**

Soni PL (1988) A textbook of Inorganic chemistry, Sulthan Chand &amp; Sons

Lee JD (1988) Concise Inorganic Chemistry, Blackwell Science

Skoog DA, West DM, Holler JF (1993) Fundamentals of Analytical Chemistry, New York CBS Publ.

Gurudeep Raj (2001) A text book of Inorganic chemistry, Goel Publ. house, Meerut

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Bahl A and Bahl BS (2000) Advanced organic chemistry, Sulthan Chand &amp; Sons

Vogel AI (1994) Textbook of quantitative chemical analysis, ELBS Ed.

Agarwal OP (1998) Chemistry of natural products, Goel Sulthan Chand &amp; Sons Publ. House, Meerut

Madan RL, Tuli GD (2001) Physical Chemistry, Sulthan Chand &amp; Sons

Raj Gurudeep (2001) Textbook of advanced Physical chemistry, Goel Publ. House, Meerut

Lehninger AL, Nelson DL, Cox MM (1993) Principles of Bio Chemistry, 2<sup>nd</sup> Ed. CBS Publ., and distributors

**BFND 6.4 THERAPEUTIC NUTRITION -  
II**

**36 hrs - 3 hrs / week**

**OBJECTIVES**

This course will enable students to:

- Know the principles of diet therapy
- Understand the modifications of normal diet for therapeutic purposes

**UNIT I**

**9 hrs**

Diseases of the Cardiovascular system: Definition of coronary heart disease (CHD) - Clinical features and Risk factors - modifiable and non-modifiable. Common disorders of Coronary heart disease: Dyslipidaemia/ hyperlipidaemia/ hypercholesterolemia - Definition, classes of lipoproteins and other parameters in CHD, aetiology, symptoms - xanthoma, complications. Dietary management- objectives, macronutrients, micronutrients, foods allowed/ not allowed. Atherosclerosis - Definition, aetiology, Role of fat in the development of atherosclerosis - Cholesterol, Saturated fatty acids, Trans fatty acids, Physical activity and heart diseases. Functional foods. Dietary guidelines. Hypertension: Definition, classification and stages. Pathogenesis, aetiology, symptoms, complications. Dietary management- objectives, macronutrients, micronutrients, foods allowed/ not allowed, High and low sources of sodium. Lifestyle modifications to manage hypertension; Dietary Approach to Stop Hypertension (DASH)

**UNIT II**

**9 hrs**

Cancer: Definition, Steps in development of cancer, characteristics of cancer, tumours - benign and malignant. Classification of malignant tumours. Risk factors, dietary and non-dietary factors. Symptoms of specific cancers. Metabolic alterations and its associated nutritional problems. Carcinogenic foods. Role of food in the prevention of cancer. Nutrition problems of cancer therapy. Feeding problems in cancer patients. Dietary management - objectives, macronutrients, micronutrients.

**UNIT III**

**9 hrs**

Genetic and metabolic disorders: Definition of metabolic disorders. Gout - definition, aetiology, metabolic changes, clinical features and symptoms, Dietary management- objectives, macronutrients, micronutrients, foods allowed/ not allowed. Inborn errors of metabolism. Galactosemia – Definition, metabolic changes, diagnosis, Aetiology and dietary management - objectives, macronutrients, micronutrients, galactose containing foods and low galactose foods.

**UNIT IV**

**9 hrs**

Genetic and neurological disorders: Phenylketonuria (PKU) - Definition, aetiology, metabolic changes, diagnosis, Prognosis, Dietary management- objectives, macronutrients, micronutrients, low phenylalanine foods, PKU formulae. Neurologic disorders- nutritional and non-nutritional. Epilepsy – definition, aetiology, clinical features. Dietary Management- Ketogenic diet- mechanism of the diet, short term and long term side effects, foods allowed and not allowed

**BFND 6.4 P THERAPEUTIC NUTRITION - II – PRACTICALS**

**36 hrs - 3 hrs / week**

Planning, preparing and calculating the major nutrient of the following (2 case studies) –

1. Cardiovascular diseases- atherosclerosis
2. Dyslipidaemia
3. Hypertension
4. Cancer
5. Phenylketonuria
6. Galactosemia
7. Epilepsy

**REFERENCES**

Anderson L, Dibble MV, Turkki PR, Mitchall HS, Rynbergin HJ (1982): Nutrition in health and disease, 17<sup>th</sup> Ed., JB Lippincott and Co., Philadelphia

Antia FP (1973) Clinical dietetics and nutrition, 2<sup>nd</sup> Ed., Oxford Univ. Press, Delhi

Williams SR (1989) Nutrition and diet therapy, 6<sup>th</sup> Ed., Time, Mirror, Mosby College Publ., St Louis  
Raheen Begum (1989) A textbook of foods, nutrition and dietetics, Sterling Publ., New Delhi

Joshi SA (1992) Nutrition and dietetics, Tata McGraw Hill Publications, New Delhi  
Srilakshmi B (2011) Dietetics, 6<sup>th</sup> Ed., New Age International Publ., New Delhi

## BFND 6.5 FOOD MICROBIOLOGY - II

### OBJECTIVES

36 hrs - 3 hrs / week

This course will enable the students to:

- Understand the principles of various methods used in the prevention and control of microorganisms in foods
- Understand the criteria for microbiological safety in various food operations to avoid public health hazards due to contaminated foods

### UNIT I

9 hrs

General principles underlying spoilage of food - Fitness and unfitness of food for consumption; Causes for spoilage. Microbiology of air borne diseases - bacterial and fungal.

### UNIT II

9 hrs

Microbiology of water – sources, bacteriological examinations, total count, test for *E.coli*. Purification of water – filtration, sedimentation, disinfection. Water borne diseases - bacterial, viral, protozoan. Microbiology of sewage and sewage disposal.

### UNIT II

9 hrs

Factors affecting kinds and numbers of microorganisms in food. Factors affecting the growth of microorganisms in food. Contamination and kinds of organisms causing spoilage of fruits and vegetables. Contamination and kinds of organisms causing spoilage of meat, poultry, fish and eggs. Contamination and kinds of organisms causing spoilage of milk and milk products. Contamination and spoilage of fats and oils, bottled beverages, spices and condiments.

### UNIT III

9 hrs

Food poisoning - Staphylococcal poisoning, Streptococcal poisoning, botulism, salmonellas, Shigellosis. Food borne infections - *Clostridium perfringens*, Vibrio, EPEC, *Bacillus cereus*, Campylobacter, Listeria, yersiniosis.

### BFND 6.5 P FOOD MICROBIOLOGY -II – PRACTICALS 36 hrs - 3 hrs / week

1. Estimation of lactic acid in milk
2. Iodometric estimation of milk lactose.
3. Quality tests for milk-Methylene Blue Reduction Test, Resazurin test, Phosphatase test, Turbidity test.
4. Isolation of micro-organisms from food samples and spoiled vegetables
5. Sampling of water-Membrane filtration technique.
6. Standard Plate Count for water and milk samples.
7. Coliform count for water and milk samples.
8. Sampling of food handlers.
9. Determination of microbial count of milk products.

**REFERENCES**

- Frazier WC, Westoff DC (1998) Food Microbiology 4<sup>th</sup> Ed., Tata Mc Graw Hill Publ. Co. Ltd Jay JM (1986) Modern Food microbiology, 3<sup>rd</sup> Ed., Van No Strand Reinhold Co. Inc.
- Pelezer ML, Reid RD (1978) Microbiology, McGraw Hill Book Co., New York Brown A, Smith H (2015) Benson's Microbiological applications, McGraw Hill Publ.

## **BFND 6.6 FOOD PRESERVATION - II**

### **OBJECTIVES**

**36 hrs - 3 hrs / week**

This course will enable students to:

- Understand basic concepts and parameters of preservation techniques
- Know the types and variety of foods available in the markets
- Learn to purchase and preserve different foods
- Learn various quality preservation techniques used in various foods

### **UNIT I**

**9 hrs**

Types of heating: Conduction and convection heating. Microwave heating – advantages and disadvantages. Preservation of semi-moist foods / intermediate moist foods. Non-thermal Processing-Definition, principles, application, merits and demerits of Ohmic heating, Infrared heating, High pressure processing, Pulsed electric field. Hurdle Technology-Principles, application, advantages and disadvantages

### **UNIT II**

**9 hrs**

Preservation by use of low temperature: Refrigeration: Definition, general principles, selection of refrigerant. Chilling injury to food, approaches to control chilling injury. Freezing: Definition, general principles, advantages of frozen fruits and vegetables, limitations, methods of freezing, pre-treatment prior to freezing, air freezing, indirect freezing, direct contact freezing, immersion freezing, ice formation. Selection and preparation of foods for freezing. Changes during freezing, Freezer burn. Thawing. Effects of freezing on nutritive value.

### **UNIT III**

**9 hrs**

Preservation by use of high temperature: High temperature: Effect of heat on texture, composition- nutrient and microbial. Definition, methods, advantages and disadvantages– Blanching, pasteurization and sterilization. Canning – definition, General principles, steps in canning / bottling of any one fruit and vegetable, Advantage and disadvantages of canning, Storage of canned foods. Process evaluation, thermal death time and heat penetration

### **UNIT IV**

**9 hrs**

Preservation with chemicals: Characteristics of chemical preservatives, Classification of preservatives, Types and mode of action of organic and inorganic preservatives, uses, natural preservatives, antibiotics, antioxidant, anti-browning, cleaning, sanitizing and fungicidal agents – mode of action, uses. Health impacts use to excessive use of chemical preservatives

**REFERENCES**

Frazier WC, Westoff DC (1998), Food Microbiology 4<sup>th</sup> Ed., Tata Mc Graw Hill Publ. Co. Ltd Desroier NV (1963) The technology of food preservation, AVI Pub. Co

Lal G, Siddappa GS, Tandon GL (1960) Preservation of food and vegetables, ICAR, New Delhi Potter NN, Hotchkiss JH (1966) Food Science, 5<sup>th</sup> Ed., CBS Publisher and Distributors, Delhi Prescott SC, Proctor BE (1937) Food Technology, McGraw Hill

Johnson R, Anderson MT (2012) Food Preservation,

Manay NS, Shadaksharaswamy M (2010) Foods - Facts and principles, New Age International Publ., New Delhi



## **INTERNSHIP / PROJECT WORK / INDUSTRIAL PRACTICUM**

### **OBJECTIVES**

To enable the students to:

- Assess nutritional status and dietary pattern of patients
- Plan and prepare therapeutic diets
- Develop skills in feeding patients and supervise food service
- Develop skills in diet counseling
- Take up dietetics as a profession
- Carry out project work on food/nutrition/diet/hygiene/sanitation related aspects
- Work in the industry sector to gain experience in industry
- Work in the industry sector to venture into entrepreneurship
- FSSAI-based modules to be used for training in villages/schools/SHGs etc.

A candidate shall undergo dietetics internship in hospital or carry out project work on food related aspects or do an internship in the food industry (industrial training) during the mid- term vacation and submit the report

### **DISTRIBUTION OF MARKS**

Internal Assessment	- 10
Project report	- 20
Viva	- 20
Total	- 50



**REGISTRAR**  
**BLDE (Deemed to be University)**  
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