

KRISHNA VISHWA VIDYAPEETH (DEEMED TO BE UNIVERSITY), KARAD

Accredited By NAAC With 'A+' Grade



***Revised Syllabus (CBCS) For
Bachelor of Science Nutrition & Dietetics
(In a Phase Manner)***

Prologue

The Institute of Allied Sciences (Then Krishna Institute of Biotechnology and Bioinformatics) was established in 2007 with five Under graduate courses Microbiology, Biotechnology, Environmental Science, Nutrition & Dietetics and Food & Dairy Technology. Currently Eighteen faculty members are engaged in Academic functions.

The seemingly overwhelming and ever-expanding state of knowledge about microorganisms, their genetic material, Molecular Biology and Recombinant DNA Technology increases the scope of Biotechnology. This newly emerging branch of science offers something for everyone and it cultivates informed citizens who can make perceptive decisions on important events. Many discoveries made by Microbiologists and Biotechnologists have spawned new fields of science such as molecular Biology, Genetics, Enzyme Technology, Fermentation Technology, Bioengineering, Genetic Engineering, Immunology etc. Many studies have been made using Science and Biotechnology to understand the principles that govern life.

New developments are occurring constantly in these areas and thus Biotechnologies have become the mainstays of many technologies. This has necessitated the formation of the Biotechnology courses for the development of competent, smart and dynamic Biotechnologists that are required in Academic Institutes, Research organizations, Professional organizations and in various industries such as Pharmaceutical Industries, Enzyme Industries, Food and Dairy Industries, Wine and Alcohol Industries, Agro based Industries. **The Choice -Based Credits System (CBCS)** provides for a framework within which there is flexibility in the design of courses and their content, simultaneously also providing the students a choice of the courses he/she wishes to study. The courses are assigned credits based on teaching hours, which in turn is linked to courses content and structure

The rapid pace of discovery and their application dictates a somewhat selective inclusion of theory paper / topics and practical and proper training of the students. The course is designed in such a way that students remain constantly busy with their studies through the Lecture and Practical periods, Seminar periods, Home assignments, Mid - term examinations (Periodic tests), Preliminary or term end examinations and also gets exposure to outside world through visits to Research Laboratories / Science Institutes / Industries of Microbiological /Biotechnological interest. The course also makes the provision for training in research through the research project (during one or two semesters) and / or Industrial training in organization of Microbiological interest. (During one semester / one summer vacation.)

Over all it is aimed to design **Three year under graduate (B.Sc.) course in Nutrition & Dietetics** with a balanced coverage of traditional and “cutting edge technology” along with the necessary courses (Communication skills, Biostatistics, Computer science, Scientific writing and Presentation, Research training / Industrial

training) as per the UGC guidelines and produce competent Biotechnologists to meet the demand of Industries, Research organizations and Academic Institutes in the country and abroad.

Process of Curriculum Design

The Choice-Based Credit System (CBCS) provides a framework within which there is flexibility in the design of courses and their content. At the same time it also provides the student a choice of the courses he/she wishes to study. The courses are assigned credits based on teaching hours, which in turn is linked to course content and structure.

Curriculum Designing Process

Following procedure was adopted for curriculum designing: For curriculum development first need analysis was done and then based on need analysis draft syllabus was prepared in the Departmental Curriculum Committee meeting and it was subsequently discussed in College Curriculum Committee meeting where all faculty members participated in the discussion and debated over the draft syllabus. The draft syllabus approved in the College Curriculum Committee meeting was sent to BOS where given by external subject experts were considered and incorporated in the final draft. The draft syllabus finalized in BOS was sent to Academic Council for its approval.

When revising the syllabi for the courses, the courses to be implemented as well as the content of each course was extensively discussed and debated on, feedback obtained from students, faculty, subject experts from academic institutes, industry experts, alumni were extensively discussed and debated in the meetings of curriculum committees and BOS and the inputs were considered. Thus, for the development of syllabus contributions came from external subject experts, faculty members, feedback obtained from students, alumni, external experts and members of industry.

B.Sc. Nutrition & Dietetics program objectives

After completion, the students are expected to understand the:

- a) Basic and applied aspects of human nutrition, including macronutrients and micronutrients, their metabolism, and the role they play in maintaining health and preventing disease.
- b) Principles, working, and application of bioinstruments and techniques used in assessing nutritional status, dietary intake, and the composition of foods.
- c) Characteristics and significance of various food groups, their nutritional value, and the impact of food processing, storage, and preparation on nutrient availability.

- d) Influence of dietary patterns, lifestyle factors, and genetic predisposition on human health, disease prevention, and management.
- e) Structure, properties, and functions of bioactive compounds in food and their implications for health and disease prevention.
- f) Basic and applied aspects of food safety, food laws, and regulations, including the assessment and management of foodborne risks.
- g) Causes, mechanisms, and consequences of nutrient deficiencies, overnutrition, and their related disorders, along with strategies for their prevention and treatment.
- h) Basic concepts of diet planning, therapeutic nutrition, and the role of dietitians in clinical settings, public health, and community nutrition programs.

Structure of B.Sc. program in Nutrition & Dietetics

B.Sc. Nutrition & Dietetics program is of two years duration and is conducted in four semesters. As recommended by UGC university has adopted a outcome-based education approach. The various courses of the program are designed to include classroom teaching, laboratory work, project work, seminars, home assignments, industrial visit etc.

Program Educational Objectives:

The objectives of the **B. Sc. Programme in Nutrition & Dietetics** are:

- i) To equip the students with the basic and applied knowledge of molecular mechanisms of cellular processes in living systems including microbes, plants, animals and humans.
- ii) To provide the students with laboratory (experimental) training so that they are competent enough to work in industries.
- iii) To provide the students with the current updates in the areas of Analytical Techniques, Industrial Fermentations, Environmental Biotechnology.
- iv) To train students with research work methodology through small project work.
- v) To generate competent skilled human resource for industries and research organization.

Eligibility

Candidates must have passed B.Sc. With minimum 50% marks with Biotechnology/ Microbiology/ Industrial Microbiology/ Zoology/Botany as principal subject or with Biochemistry/ Microbiology/ Botany/ Zoology as subsidiary subjects at B.Sc. II level

Course fees

As shown in Admission Broacher of respective year (Subject to change as and when required)

Duration

The duration of B.Sc. (Nutrition & Dietetics) degree program shall consist of two academic years divided in to four semesters. Each Semester consist of 90 working days. Each theory and practical course must be completed in 60 lectures/Practical periods, respectively of 60 min duration.

Medium of instruction

The medium of instruction and examination for each course shall be English.

Credit to contact hour

One credit is equivalent to 15 periods of 60 minutes each for theory course lecture. While credit weightage for self-learning based on e-content shall be 50% or less than that for lectures.

Attendance

The student enrolled for B.Sc. Nutrition & Dietetics must have 75% attendance in each course in order to appear for term end examinations, otherwise the candidate may not be allowed to appear for term end examination as per ordinance.

1. The entire B.Sc. course in Nutrition & Dietetics shall be covered in 28 [Twenty-Eight] theory papers, 28 [Twenty-Eight] practical courses [semester I, II, III] and a project work / Industrial training [in lieu of one practical courses of semester IV] each semester there shall be four theory papers each carrying 100 marks and for first three semesters viz. semester I, II and III, there shall be two practical courses each practical course shall carry 100 marks. However, for semester IV there shall be a research project work / Industrial training of 100 [one hundred] marks in lieu of one practical course in addition to four-theory paper and one practical course.

Semester I: Eight theory papers and Eight practical courses.

Semester II: Eight theory papers and Eight practical courses.

Semester III: Six theory papers and Six practical courses.

Semester IV: Six theory papers. Six practical course and a project work/Industrial training practical course for every student.

- 2] Each theory paper will be covered in four lectures of 60 min each per week.

Practical course shall be covered in 04 practical turns of 04 clock hours practical periods per week.

- 3] A practical batch shall be of 12 [twelve] to 15 [fifteen] students.

- 4] For university practical examination the duration should be as shown below,

For every semester there shall be two/three days practical examination for not less than 5 ½ hours.

5] Each candidate must produce a certificate from the Head of the Department in his/her college / Institute / University stating that he/she has completed, in a satisfactory manner, a practical course on the lines laid down from time to time by Academic Council on the recommendations of Board of studies and that the laboratory journal has been properly maintained. Every candidate must have recorded his/her observation in the laboratory journal and a written report on each exercise performed. Every journal is to be checked and signed periodically by a member of teaching staff and certified by the Head of the Department at the end of each semester. Candidates are to produce their journal at the time of practical examination.

6] There shall be one compulsory seminar of minimum 15 min. delivery per paper per semester for each student and there shall be two marks for each seminar in Internal evaluation.

During semester I & II students shall have to undertake an academic tour to visit a minimum one place of academic interests like Academic Institute/ Research Institution / R&D Department/Industry. The student should submit the report of their visit at the time of practical examination. The report should be duly certified by the Head of the Department of Microbiology, Biotechnology and Nutrition & Dietetics.

7] During semester Student is to undertake a research project [as part of the semester IV] which is to be started in the beginning of semester III so as to give enough time for duly completion of project. In the project student is to study research methodology Information collection (reference work) selection of topic, outline of the work, thinking and planning, project report writing in the form of dissertation or small Project Report and the submission of the project report [Introduction, Aims and objectives, Material and method, Results and Discussions, summary, Conclusions and Bibliography] For the research project work out of one hundred marks, fifty marks shall be given by university examiners though assessment of Project Report at the time of semester IV practical examination. The remaining fifty marks shall be given by the Committee for Internal Evaluation of Projects (CIEP) as an internal evaluation. CIEP is to be constituted by the Principal (and which shall be consisting of HOD, Guide/Teacher in - charge and at least one other faculty members). The method and process of Internal evaluation is to be worked out by the CIEP.

- a) **The Institute or guide of student should locate the industry and depute the student in the industry for the period of one month.
- b) Student should complete its industrial training cum industrial project in the vacation period after semester II
- c) Student should study microbiological and / or biotechnological aspects in industry and submit its report in the form of dissertation or small Project Report duly signed by industry authority, concerned guide and Head of the Department of Microbiology, Biotechnology, Industrial Microbiology and nutrition and dietetics.

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	N			T	P	To	T	P	T	P		
CGPA Theory Courses												
CGP A	1	UG ND – T101 CC	Fundamentals of Nutrition and Dietetics – I	2	-	2	1 0	-	4 0	-	50	1.5
	2	UG ND – T102 CC	Fundamentals of Nutrition and Dietetics – II	2	-	2	1 0	-	4 0	-	50	1.5
	3	UG ND – T103 CC	Food Science – I	2	-	2	1 0	-	4 0	-	50	1.5
	4	UG ND – T104 CC	Food Science – II	2	-	2	1 0	-	4 0	-	50	1.5
	5	UG ND – T105 CC	Human Anatomy and Physiology – I	2	-	2	1 0	-	4 0	-	50	1.5
	6	UG ND – T106 CC	Human Anatomy and Physiology – II	2	-	2	1 0	-	4 0	-	50	1.5
	7	UG ND – T107 CCS	Fundamentals of Food Microbiology	2	-	2	1 0	-	4 0	-	50	1.5
	8	UG ND – T108 DSC	Food Microbiology, Hygiene and Sanitation	2	-	2	1 0	-	4 0	-	50	1.5
CGPA Practical Courses												
CGP A	9	UG ND – P101 CC	Practicals related to the theory paper - Fundamentals of Nutrition and Dietetics – I	-	2	2	-	1 0	-	40	50	1
	10	UG ND – P102 CC	Practicals related to the theory paper - Fundamentals of Nutrition and Dietetics – II	-	2	2	-	1 0	-	40	50	1
	11	UG ND – P103 CC	Practicals related to the theory paper - Food Science – I	-	2	2	-	1 0	-	40	50	1
	12	UG ND – P104 CC	Practicals related to the theory paper - Food Science – II	-	2	2	-	1 0	-	40	50	1
	13	UG ND – P105 CC	Practicals related to the theory paper - Human Anatomy and Physiology – I	-	2	2	-	1 0	-	40	50	1
	14	UG ND – P106 CC	Practicals related to the theory paper - Human Anatomy and Physiology – II	-	2	2	-	1 0	-	40	50	1
	15	UG ND – P107	Practicals related to the theory paper -	-	2	2	-	1 0	-	40	50	1

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		CCS	Fundamentals of Food Microbiology										
	16	UG ND – P108 DSC	Practicals related to the theory paper - Food Microbiology, Hygiene and Sanitation	-	2	2	-	10	-	40	50	1	
CGP A	17	UG ND – P109 PP	Project I	-	1	1	-	5	-	-	5	0.5	
		Total		16	17	33	80	85	320	320	805	20.5	
Mandatory Non CGPA Courses													
Non - CGP A	18	UG ND – T109 SECC	Yoga and Meditation	0.5	-	0.5	25	-	-	-	25	0.5	
	19	UG ND – T110 AECC	Spoken English - I	0.5	-	0.5	25	-	-	-	25	0.5	
		Total		1	-	1	50	-	-	-	50	1	
<p align="center">Total Credits for Semester I : 21.5 (T = Theory: 12, P = Practical : 8, Project : 0.5, Non-CGPA : 1) CC : Core Course, CCS : Core Course Specialization, DSC : Discipline Specific Course, DSE : Discipline Specific Elective, PP : Project SECC = Skill Enhancement Compulsory Course : 0.5, AECC = Ability Enhancement Compulsory Course : 0.5, Total Credits for Semester I CGPA Course = 20.5 credits</p>													

B.Sc. Nutrition and Dietetics Part I, Semester II

B.Sc. Nutrition and Dietetics Part I, Semester II (w.e.f. 2022-2023)												
S r · N o	Course Code	Course Title	Teaching Hours/ Week			Marks					Credit s	
			T	P	To tal	Intern al		Exter nal		To tal		
						T	P	T	P			
CGPA Theory Courses												
CGP A	1	UG ND – T201 CC	Food Biochemistry – I	2	-	2	1 0	-	4 0	-	50	1.5
	2	UG ND – T202 CC	Food Biochemistry – II	2	-	2	1 0	-	4 0	-	50	1.5
	3	UG ND – T203 CC	General Home Science – I	2	-	2	1 0	-	4 0	-	50	1.5
	4	UG ND – T204 CC	General Home Science – II	2	-	2	1 0	-	4 0	-	50	1.5
	5	UG ND – T205 CC	Food Preservation and Safety	2	-	2	1 0	-	4 0	-	50	1.5
	6	UG ND – T206 CC	Food Processing	2	-	2	1 0	-	4 0	-	50	1.5
	7	UG ND – T207 CCS	Food Standards and Quality Control	2	-	2	1 0	-	4 0	-	50	1.5
	8	UG ND – T208 DSC	Food Analysis	2	-	2	1 0	-	4 0	-	50	1.5
CGPA Practical Courses												
CGP A	9	UG ND – P201 CC	Practicals related to the theory paper - Food Biochemistry – I	-	2	2	-	1 0	-	4 0	50	1
	10	UG ND – P202 CC	Practicals related to the theory paper - Food Biochemistry – II	-	2	2	-	1 0	-	4 0	50	1
	11	UG ND – P203 CC	Practicals related to the theory paper - General Home Science – I	-	2	2	-	1 0	-	4 0	50	1
	12	UG ND – P204 CC	Practicals related to the theory paper - General Home Science – II	-	2	2	-	1 0	-	4 0	50	1
	13	UG ND – P205 CC	Practicals related to the theory paper - Food Preservation and Safety	-	2	2	-	1 0	-	4 0	50	1

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	14	UG ND – P206 CC	Practicals related to the theory paper - Food Processing	-	2	2	-	10	-	40	50	1
	15	UG ND – P207 CCS	Practicals related to the theory paper - Food Standards and Quality Control	-	2	2	-	10	-	40	50	1
	16	UG ND – P208 DSC	Practicals related to the theory paper - Food Analysis	-	2	2	-	10	-	40	50	1
CGP A	17	UG ND – P209 PP	Project II	-	1	1	-	5	-	-	5	0.5
		Total		16	17	33	80	85	30	32	805	20.5
Mandatory Non CGPA Courses												
Non - CGP A	18	UG ND – T209 SECC	Soft Skill and Personality Development	0.5	-	0.5	25	-	-	-	25	0.5
	19	UG ND – T210 AECC	Spoken English – II (Communication Skills)	0.5	-	0.5	25	-	-	-	25	0.5
		Total		1	-	1	50	-	-	-	50	1
<p>Total Credits for Semester II : 21.5 (T = Theory: 12, P = Practical : 8, Project : 0.5, Non-CGPA : 1) CC : Core Course, CCS : Core Course Specialization, DSC : Discipline Specific Course, DSE : Discipline Specific Elective, PP : Project SECC = Skill Enhancement Compulsory Course : 0.5, AECC = Ability Enhancement Compulsory Course : 0.5, Total Credits for Semester II CGPA Course = 20.5 credits</p>												

B.Sc. Nutrition and Dietetics Part II, Semester III

B.Sc. Nutrition and Dietetics Part II, Semester III (w.e.f. 2023-2024)												
S r · N o	Course Code	Course Title	Teaching Hours/ Week			Marks					Credit s	
			T	P	To tal	Intern al		Exter nal		To tal		
						T	P	T	P			
CGPA Theory Courses												
CGP A	1	UG ND – T301 CC	Nutrition across Life Cycle – I	3	-	3	1 0	-	4 0	-	50	2.5
	2	UG ND – T302 CC	Nutrition across Life Cycle – II	3	-	3	1 0	-	4 0	-	50	2.5
	3	UG ND – T303 CC	Micronutrients in Health	3	-	3	1 0	-	4 0	-	50	2.5
	4	UG ND – T304 CC	Macronutrients in Health	3	-	3	1 0	-	4 0	-	50	2.5
	5	UG ND – T305 CCS	Food Packaging and Safety	3	-	3	1 0	-	4 0	-	50	2.5
	6	UG ND – T306 DSC	Public Health and Community Nutrition	3	-	3	1 0	-	4 0	-	50	2.5
CGPA Practical Courses												
CGP A	7	UG ND – P301 CC	Practicals related to the theory paper - Nutrition across Life Cycle – I	-	1	1	-	1 0	-	4 0	50	1
	8	UG ND – P302 CC	Practicals related to the theory paper - Nutrition across Life Cycle – II	-	1	1	-	1 0	-	4 0	50	1
	9	UG ND – P303 CC	Practicals related to the theory paper - Micronutrients in Health	-	1	1	-	1 0	-	4 0	50	1
	10	UG ND – P304 CC	Practicals related to the theory paper - Macronutrients in Health	-	1	1	-	1 0	-	4 0	50	1
	11	UG ND – P305 CCS	Practicals related to the theory paper - Food Packaging and Safety	-	1	1	-	1 0	-	4 0	50	1
	12	UG ND – P306 DSC	Practicals related to the theory paper - Public Health and Community Nutrition	-	1	1	-	1 0	-	4 0	50	1

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	1 3	UG ND – P307 PP	Project III	-	1	1	-	5	-	-	5	0.5
			Total	18	7	25	6 0	6 5	2 4 0	2 4 0	60 5	21.5
			Mandatory Non CGPA Courses									
Non - CGP A	1 4	UG ND – T306 SECC	Leadership Development	0.5	-	0.5	2 5	-	-	-	25	0.5
	1 5	UG ND – T307 AECC	Environmental Studies – I	0.5	-	0.5	2 5	-	-	-	25	0.5
			Total	1	-	1	5 0	-	-	-	50	1
<p>Total Credits for Semester III : 22.5 (T = Theory: 15, P = Practical : 6, Project : 0.5, Non-CGPA : 1) CC : Core Course, CCS : Core Course Specialization, DSC : Discipline Specific Course, DSE : Discipline Specific Elective, PP : Project SECC = Skill Enhancement Compulsory Course : 0.5, AECC = Ability Enhancement Compulsory Course : 0.5, Total Credits for Semester III CGPA Course = 21.5 credits</p>												

B.Sc. Nutrition and Dietetics Part II, Semester IV

B.Sc. Nutrition and Dietetics Part II, Semester IV (w.e.f. 2023-2024)												
S r · N o	Course Code	Course Title	Teaching Hours/ Week			Marks				Credits		
			T	P	To tal	Intern al		Exter nal			Total	
						T	P	T	P			
CGPA Theory Courses												
CGP A	1	UG ND – T401 CC	Problems in Human Nutrition	3	-	3	1 0	-	4 0	-	50	2.5
	2	UG ND – T402 CC	General and Therapeutic Nutrition	3	-	3	1 0	-	4 0	-	50	2.5
	3	UG ND – T403 CC	Sports Nutrition and Fitness Management	3	-	3	1 0	-	4 0	-	50	2.5
	4	UG ND – T404 CC	Bariatric Nutrition	3	-	3	1 0	-	4 0	-	50	2.5
	5	UG ND – T405 CCS	Nutrition and Ayurveda	3	-	3	1 0	-	4 0	-	50	2.5
	6	UG ND – T406 DSC	Specialized Dietetics	3	-	3	1 0	-	4 0	-	50	2.5
CGPA Practical Courses												
CGP A	7	UG ND – P401 CC	Practicals related to the theory paper - Problems in Human Nutrition	-	1	1	-	1 0	-	40	50	1
	8	UG ND – P402 CC	Practicals related to the theory paper - General and Therapeutic Nutrition	-	1	1	-	1 0	-	40	50	1
	9	UG ND – P403 CC	Practicals related to the theory paper - Sports Nutrition and Fitness Management	-	1	1	-	1 0	-	40	50	1
	10	UG ND – P404 CC	Practicals related to the theory paper - Bariatric Nutrition	-	1	1	-	1 0	-	40	50	1
	11	UG ND – P405 CCS	Practicals related to the theory paper - Nutrition and Ayurveda	-	1	1	-	1 0	-	40	50	1
	12	UG ND – P406 DSC	Practicals related to the theory paper - Specialized Dietetics	-	1	1	-	1 0	-	40	50	1
	13	UG ND – P407 PP	Project IV	-	1	1	-	1 0	-	-	10	0.5

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				Total	18	7	25	60	70	240	610	21.5
Mandatory Non CGPA Courses												
Non - CGP A	14	UG ND – T406 SECC	Indian Constitution and Governance	0.5	-	0.5	25	-	-	-	25	0.5
	15	UG ND – T407 AECC	Environmental Studies – II	0.5	-	0.5	25	-	-	-	25	0.5
				Total	1	-	1	50	-	-	50	1
<p align="center">Total Credits for Semester IV : 22.5 (T = Theory: 15, P = Practical : 6, Project : 0.5, Non-CGPA : 1) CC : Core Course, CCS : Core Course Specialization, DSC : Discipline Specific Course, DSE : Discipline Specific Elective, , PP : Project SECC = Skill Enhancement Compulsory Course : 0.5, AECC = Ability Enhancement Compulsory Course : 0.5, Total Credits for Semester IV CGPA Course = 21.5 credits</p>												

B.Sc. Nutrition and Dietetics Part III, Semester V

B.Sc. Nutrition and Dietetics Part III, Semester V (w.e.f. 2024-2025)												
S r · N o	Course Code	Course Title	Teaching Hours/ Week			Marks				Credits		
						Intern al		Exter nal			Total	
			T	P	To tal	T	P	T	P			
CGPA Theory Courses												
CGP A	1	UG ND – T501 CCS	Global Cuisines and Nutrition	4	-	4	2 0	-	8 0	-	100	4
	2	UG ND – T502 DSC	Food Adulteration and Safety	4	-	4	2 0	-	8 0	-	100	4
	3	UG ND – T503 CC	Nutritional Communication and Counselling	4	-	4	2 0	-	8 0	-	100	4
	4	UG ND – T504 DSE	Psychology of Eating	4	-	4	2 0	-	8 0	-	100	4
	5	UG ND – T505 DSE	Yoga and Nutrition									
CGPA Practical Courses												
CGP A	6	UG ND – P501 CCS	Practicals related to the theory paper - Global Cuisines and Nutrition	-	1	1	-	1 0	-	40	50	1
	7	UG ND – P502 CC	Practicals related to the theory paper - Food Adulteration and Safety	-	1	1	-	1 0	-	40	50	1
	8	UG ND – P503 DSC	Practicals related to the theory paper - Nutritional Communication and Counselling	-	1	1	-	1 0	-	40	50	1
	9	UG ND – P504 CC	Practicals related to the theory paper - Psychology of Eating	-	1	1	-	1 0	-	40	50	1
	10	UG ND – P505 DSE	Practicals related to the theory paper - Yoga and Nutrition									
	CGP A	11	UG ND – P506 DSE	Project V	-	1	1	-	1 0	-	-	5
Total				12	5	17	8 0	5 0	3 2 0	16 0	610	20.5
Mandatory Non CGPA Courses												
Non -	12	UG ND – T506	Personal Hygiene and Cleanliness	0.5	-	0.5	2 5	-	-	-	25	0.5

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CGP A		SECC										
	1 3	UG ND – T507 AECC	Cyber Security	0.5	-	0.5	2 5	-	-	-	25	0.5
		Total		1	-	1	5 0	-	-	-	50	1

Total Credits for Semester V : 21.5 (T = Theory: 16, P = Practical : 4, Project : 0.5, Non-CGPA : 1)
CC : Core Course, CCS : Core Course Specialization, DSC : Discipline Specific Course, DSE : Discipline Specific Elective, PP : Project
SECC = Skill Enhancement Compulsory Course : 0.5, AECC = Ability Enhancement Compulsory Course : 0.5,
Total Credits for Semester V CGPA Course = 20.5 credits

B.Sc. Nutrition and Dietetics Part III, Semester VI

B.Sc. Nutrition and Dietetics Part III, Semester VI (w.e.f. 2024-2025)												
S r · N o	Course Code	Course Title	Teaching Hours/ Week			Marks				Credits		
						Intern al		Exter nal			Total	
			T	P	To tal	T	P	T	P			
CGPA Theory Courses												
CGP A	1	UG ND – T601 CCS	Exercise, Physiology and Sports Nutrition	4	-	4	2 0	-	8 0	-	100	4
	2	UG ND – T602 DSC	Techniques of Nutritional Assessment	4	-	4	2 0	-	8 0	-	100	4
	3	UG ND – T603 CC	Geriatric Nutrition	4	-	4	2 0	-	8 0	-	100	4
	4	UG ND – T604 DSE	Quantitate Food Science and Physical Facilities	4	-	4	2 0	-	8 0	-	100	4
	5	UG ND – T605 DSE	Enzymes and Nutrition									
CGPA Practical Courses												
CGP A	6	UG ND – P601 CCS	Practicals related to the theory paper - Exercise, Physiology and Sports Nutrition	-	1	1	-	1 0	-	4 0	50	1
	7	UG ND – P602 DSC	Practicals related to the theory paper - Techniques of Nutritional Assessment	-	1	1	-	1 0	-	4 0	50	1
	8	UG ND – P603 CC	Practicals related to the theory paper - Geriatric Nutrition	-	1	1	-	1 0	-	4 0	50	1
	9	UG ND – P604 DSE	Practicals related to the theory paper - Quantitate Food Science and Physical Facilities	-	1	1	-	1 0	-	4 0	50	1
	10	UG ND – P605 DSE	Practicals related to the theory paper - Enzymes and Nutrition									
	11	UG ND – P606 PP	Project VI	-	1	1	-	1 5	-	-	5	0.5
Total				12	5	17	8 0	5 5	3 2 0	1 6 0	615	20.5
Mandatory Non CGPA Courses												

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Non - CGPA	1 2	UG ND – T606 SECC	Human Rights and Human Values	0.5	-	0.5	2 5	-	-	-	25	0.5
	1 3	UG ND – T607 AECC	Biotechnology Data Care Management	0.5	-	0.5	2 5	-	-	-	25	0.5
Total				1	-	1	5 0	-	-	-	50	1

Total Credits for Semester VI : 21.5 (T = Theory: 16, P = Practical : 4, Project : 0.5, Non-CGPA : 1)

CC : Core Course, CCS : Core Course Specialization, DSC : Discipline Specific Course, DSE : Discipline Specific Elective, PP : Project

SECC = Skill Enhancement Compulsory Course : 0.5, AECC = Ability Enhancement Compulsory Course : 0.5,

Total Credits for Semester VI CGPA Course = 20.5 credits

B.Sc. I Semester I Nutrition & Dietetics

UG ND – P101 CC Fundamentals of Nutrition & Dietetics – I 60 h

Unit 1	<ul style="list-style-type: none"> ❖ Introduction to nutritional science- Definitions, history, nutrition research in India, Global food history, food changes as evolution of man –Stone edge, paleolithic age (old stone age), Mesolithic age (middle stone age) & Neolithic age (new stone age), geographical distribution of food grain in India. ❖ Science of Nutrition- Concept of nutrition, definition of nutrition, health national status & malnutrition, national status using dietary survey, anthropometry, clinical science of biochemical methods. ❖ Recommended Dietary Allowances (RDA)- Definition, factors affecting RDA, general principles, general methods used for deriving RDA, requirements & RDA, formulation of RDA & dietary guidelines – references men & women, balanced diet 	15 h
Unit 2	<p>Classification of Carbohydrates (Energy giving) & Dietary fibers - Definition, composition, functions, maintenance of blood sugar levels, requirements, sources, digestion & absorption Dietary fibers – Definition, classification, physiological effects & sources.</p>	10 h
Unit 3	<p>Classification of lipids (Energy giving fat) – Definition, composition, functions, sources, requirements, digestion & absorption, Essential fatty acids - - Definition, functions, sources & effects of deficiency</p>	10 h
Unit 4	<p>Classification of Proteins (body Buildings)- Definition, composition, nutritional classifications of proteins & amino acids, functions, sources, requirements, digestion & absorption, evaluation of proteins, PER, BV, NPU & chemical score.</p>	10 h
Unit 5	<p>Classification of Vitamins (Protein & regulating) – Water & fat soluble, water soluble vitamins – Thiamin, Riboflavin Niacin, Ascorbic acid, Folic acid, D6, B12, Fat soluble vitamins- Vitamin A, D ,E, K, functions, requirements, sources & effects of deficiency</p>	10 h

UG ND – P101 CC Practicals - Fundamentals of Nutrition and Dietetics – I

Sr. No.	Practical	Hours
1	Planning of Protein & energy rich dish	2
2	Planning of Vitamin A & energy rich dish	2
3	Planning of Vitamin B ₁ & energy rich dish	2
4	Planning of Vitamin B ₂ & energy rich dish	2
5	Planning of Vitamin B ₃ & energy rich dish	2
6	Planning of Vitamin C & energy rich dish	2
7	Planning of Calcium & energy rich dish	2
8	Planning of Iron & energy rich dish	2
9	Planning of Zinc & energy rich dish	2
10	Planning of Fiber & energy rich dish	2
11	Geographical distribution of good grains (Millets) in India	2
12	Qualitative identification of Carbohydrates – Glucose, Fructose, Galactose, Sucrose, Maltose, Lactose	2
13	Preparation of Osazone & their identification	2
14	Qualitative identification of amino acids – histidine, tyrosine, tryptophan, cysteine & arginine	2
15	Qualitative identification of lipids – solubility, saponification, Acrolein test, Salkowski test, Liebermann – Burchard test	1
16	Quantitative estimation of glucose	1

UG ND – P102 CC Fundamentals of Nutrition & Dietetics – II**60 h**

Unit 1	Energy- Definition, Units of measurement, Direct & indirect calorimetry, determination of energy value of food, Total energy requirement, Factor affecting physical activity, Factor affecting Basal Metabolic Rate (BMR), Factors affecting thermic effect of food (specific dynamic action).	15 h
Unit 2	Water & Electrolytes in Diet - Intake & output of water, Distribution of water in body (ICF & ECF) Electrolyte composition of body fluids, isotonic/ hypotonic/ hypertonic contraction & expansion of ECF, water activity & food spoilage	15 h
Unit 3	Minerals a) Macro minerals – Calcium & Phosphorus – Function, requirements, sources & effect of deficiency. b) Micro minerals – Iron, Iodine, Copper, Manganese & Zinc – Functions, sources, requirements & effects of deficiency. c) Sodium & Potassium – Functions, sources, requirements & effects of imbalances	15 h
Unit 4	Nutrition education, Policies & their implementation, non-conventional foods & their use	15 h

UG ND – P102 CC Practicals - Fundamentals of Nutrition and Dietetics – II

Sr. No.	Practical	Hours
1	Estimation of calorific value of food	4
2	Computation of energy requirements on the basis of physical activity and adult consumption units	5
3	Standardization of snacks and meals, Planning & preparation of balanced diets for adults in a family (standardized recipes)	6
4	Calculation of BMR (Harns Benedicts equation)	4
5	Identification of staple foods from all the states from India along with their importance	3
6	Qualitative test for minerals	4
7	Diet survey & anthropometric measurements of vulnerable groups in community	4

UG ND – 103CC Food Sciences - I

Unit 1	Food- Definition, functional classification, groups, food pyramid, balances diet, hunger – hollow hunger, Hidden hunger, Appetite, Society, health, meal & menu.	12 h
Unit 2	Cooking - Definition & objectives – methods, moist heat method, dry heat method, combination of both & microwave cooking, effect of cooking on nutrients, solar cooking, merits & demerits, introduction to food science.	12 h
Unit 3	Beverages – Classification, coffee beverage – constituents & method of preparation, Tea types & preparation, Cocoa – Composition, nutrition value & preparation of Coco beverages, Fruit beverages – Types, introduction of vegetable juices, milk based beverages, Malted beverages, Carbonated nonalcoholic beverages & alcoholic beverages	12 h
Unit 4	Cereals, Millets & Pulses – a) Structure, composition & nutritive value of rice, wheat & oats nutritive value of Maize, Jawar, Raggi & Bajara milling of rice & wheat, perboling of rice. Cereal, cookery – Effect of moist heat, hydrolysis, gelatinization & functions affecting gelatinization, Gel format, retro-gradation & syneresis, effect of dry heat, Caramelization, meillard reaction, role of cereals in cookery. b) Pulses & legume - Compost, nutrition value, toxic constituents, pulse cookery – effect of cooking, factors affecting cooking quality, role of pulses in cookery, germination & it's advantages.	12 h
Unit 5	a) Milk & milk products – Types of pasteurization, Composition & nutritive value of milk, milk cookery – effect of heat, effect of acid & effect of enzymes milk products, non-fermented & fermented products (does not includes preparation), role of milk in cookery, changes during processing & storage of milk & milk products. b) Health foods – Functional foods, prebiotics, probiotics, postbiotics, nutraceutical's, organic foods & GM foods	12 h

UG ND – 104CC Food Sciences - II

<p>Unit 1</p>	<p>Meat, Fish & Poultry:</p> <p>a) Meat – Classification, structure, composition, nutritive value, rigor mortis, ageing & tenderizing, effect of different processing, Meat cookery – Changes during cooking.</p> <p>b) Poultry - Classification, composition & nutritive value, Aves – structure.</p> <p>c) Eggs – Cookery – Effect of heat, factors affecting coagulation of egg proteins & effect of other ingredient on egg protein, role of egg in cookery, home scale method for detecting egg quality, grading changes during cooking & storage.</p> <p>d) Fish – Classification, composition, nutritive value, selection & principles of fish cookery.</p>	<p>15 h</p>
<p>Unit 2</p>	<p>Vegetables & Fruits -</p> <p>a) Vegetables – Classification (nutritional), composition & nutritive value, pigments in vegetables, water soluble, water insoluble, enzymes, flavor compounds, bitter compounds, vegetable cookery – preliminary preparation, changes during cooking, loss of nutrients during cooking, effect of cooking on pigments, role of vegetables in cookery.</p> <p>b) Fruits - Classification, composition & nutritive value, ripening of fruits, browning – Types of preventing measures, climacteric & non-climacteric foods.</p> <p>c) Spices, Herbs & Condiments – Spices - Definition & classification, chemical composition & general function, role in cookery, medicinal value of commonly used spices used in Indian cookery.</p>	<p>15 h</p>
<p>Unit 3</p>	<p>Nuts, Oils & Fats – Composition & nutritive value, basic knowledge about consuming used fats & oils (lard, butter, margarine, cottoned oil, groundnut oil, coconut oil, soyabean oil, olive oil, rice bran oil, sesame oil, rapeseed oil, mustard oil & palm oil) spoilage of fat types & prevention, effect of heating, role of fats, oils in cookery, refining absorption of fat during cooking factors, Nuts & proteins – texturized, vegetable proteins</p>	<p>15 h</p>

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Unit 4	Sugar & related products – Nutritive value, characteristics & uses of various types of sugar, sugar cookery – crystallization & factors affecting crystallization, stages of sugar cookery, role of sugar in cookery.	15 h
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**UG ND – P103CC Practicals paper - Food Science – I
and
UG ND – P104CC Food Science – II**

Sr. No.	Practical	Hours
1	Grouping of foods as per	2
2	Measurement of food material – Spoon, weighing	2
3	Find the percentage of edible portion foods	2
4	Observe the microscopic structures of starches before & after gelatinization (rice, wheat, corn)	3
5	Study the effect of temperature, time of heating, concentration, addition of sugar & acid on gelatinization of starch.	2
6	Prepare recipes using the following processes- Gelatinization, gluten formation, gel formation.	2
7	Demonstrate the best method cooking rice.	2
8	Demonstrate the effect of soaking, hard water, sodium bicarbonate & papaya on cooking quality of pulses.	2
9	Prepare recipes using 4 gm Dhal, pulse flour, sprouts pulses & cereal – pulse combination (Sambar, Sandal, Bholi, Mysore Pak, Vada, Channa masala, Thuwail, Green gram payasm, Besan omlet, sprouted salad, coottu)	2
10	Demonstrate the factors affecting coagulation of milk proteins.	2
11	Prepare recipe using milk & its products(Paneer, Buttermilk, Butter, Cheese, Cottage, Phirni, Payasam, Ice-cream, Khoa, Buttermilk curry, Basundi, Jamun)	2
12	Demonstrate the formation of ferrous sulphide in boiling eggs & its preventive measures, preparation of boiled, scrambled, prached, curry, masala & omlet - eggs	2
13	Demonstrate the effect of addition of acid/fat/salt/water & sugar on the texture of omletts.	2
14	Prepare recipes where egg acts as- thickening agent, binding agent, emulsifying agent & enriching agent	1

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15	Demonstrate the effect of acid/alkali/over cooking or vegetables containing different pigments	2
16	Demonstrate the effect of different amounts of water added to vegetables during cooking on flavor & appearance	2
17	Demonstrate the enzymatic browning in vegetables & fruits & any four methods of preventing it	2
18	Prepare the following using fruits & vegetables & different processes- selecting, cleaning, pouring, pitting & chopping of fruits & vegetables, avail, Porrial, poghath, stew, kurma, cutlet, fry, chips, podimas, pachadi, stuffed chapatti, kootuu, salads, soups & curry. Fruits- Frittles, halwa, salad, stuffed items, gelly, payasam, thokku, sauce & jams.	2
19	Preparation of rice by steaming, absorption method, straining & pressure cooking, batters & dough, preparation of idli, dosa, upma, khichadi, chapatti, puri, fried rice, biryani & variety rice	2
20	Determine smoking point of any four cooking oils	1
21	Prepare recipes using shallow fat & deep fat frying methods	3
22	Demonstrate the stages of sugar cooking	2
23	Prepare recipes using various stages of sugar cooking & Jaggery	2
24	Preparation of any one beverage under the following types – refreshing, nourishing, stimulating, soothing, appetizing	2
25	Observation of different types of pulses, fruits, vegetables, nuts, oil	2
26	Score card preparation & sensory evaluation of foods	2
27	Visit to modern rice mill / dairy farm /milk processing unit	2
28	Demonstrate the Leo methods of recipe (as per preparation method) - Boiling, roasting, frying, soting, baking (as per value addition), fermentation, malting & germination Canning, pickling, drying, roasting & freezing (as per food preservation method)	2
29	Project presentation on market survey, ready to eat, ready to cook food products.	2
30	Preparation of spices, sauces, ketchups, their combination & mixtures	1
31	Use of left-over foods	1

UG ND –105 CC - Human Anatomy & Physiology - I

Unit 1	<p>The Cell -</p> <ul style="list-style-type: none"> a) Cellular levels of organization plasma membrane. Organelles, cell life cycle. b) Tissues level of organization – Types of tissues, Structure & function. c) Support & movement – The integumentary system – epidermis, dermis, hair, sebaceous glands & sweat glands, the skeletal system – Classification of bones a/c their shape & structure, bone matrix & cells. Bone growth & development, Muscular system, arrangement of muscles, descriptive terms used to name muscles, mechanism of muscle contraction (isometric & isotonic) 	12 h
Unit 2	<p>Nervous System -</p> <ul style="list-style-type: none"> a) Anatomical & functional division of nervous system – Functions of various parts of brain – (Cerebellum, basal ganglia, hypothalamus, thalamus, autonomic nervous system) b) Structure & functions of neurons, axons, spinal cord, brain & cranial nerves. c) Synaptic activity – Classification of reflexes d) The autonomic nervous system (organization & division) 	12 h
Unit 3	<p>The Sensory System -</p> <ul style="list-style-type: none"> a) Olfactory system b) Taste receptors (gustation) c) Internal & external eye structure (vision) d) The ear & hearing e) Cutaneous sensation 	12 h
Unit 4	<p>The Endocrine System - Structure, location, functions of pituitary, Thyroid, Parathyroid, adrenal, pancreas, sex glands, different hormones.</p>	12 h
Unit 5	<p>Cardiovascular Blood & System -</p> <ul style="list-style-type: none"> a) Blood - Composition, components and function of blood (serum/plasma differences), Coagulation & factors affecting coagulation, blood groups (A, B, O & Rh system), hemorrhage & wounds, erythropoiesis & anemia. b) Cardiovascular System - Structure of heart, cardiac cycle, cardiac output & factors affecting cardiac outputs, the conducting system of heart, blood pressure & its regulation, 	12 h

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	<p>normal ECG, heart failure, origin & conduction of heartbeat, heart sounds, Properties of cardiac muscles .</p> <p>c) Blood circulation – Structure of vessel walls, arteries, veins & capillaries, blood pressure – peripheral resistance pulmonary circuit & systemic circuit</p>	
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UG ND – 106 CC - Human Anatomy & Physiology - II

Unit 1	<p>Lymphatic System & Immunity - Lymphatic system – Functions, Lymphatic vessels, lymphocytes, lymphoid tissues & organs, body defense (nonspecific & specific), innate, acquired passive & active immunity, cell mediated immunity, humoral immunity & complement system, immune response</p>	12 h
Unit 2	<p>Respiratory System - Parts of respiratory system (upper & lower respiratory system), Structure of lungs, lung volumes & capacities, gaseous exchange in the lung, external & internal respiration, pulmonary ventilation, mechanism of respiration & factors affecting efficiency of respiration</p>	12 h
Unit 3	<p>Digestive System - Structure & functions of ---- Oral cavity, stomach, intestines, pancreas, liver, gall bladder Process of digestion & absorption of fats, carbohydrates & proteins</p>	12 h
Unit 4	<p>Excretory System - a) Urinary system – Structure & functions of kidney, ureters, bladder, urethra, nephrons, physiology & urine formation, acid-based balance. b) Skin – Structure & functions, regulation of body, temperature, water balance.</p>	12 h
Unit 5	<p>Reproductive System - Structure & function of male & female reproductive system / organs, hormonal regulation of female reproductive function, menstrual cycle, menarche & menopause, brief concept spermatogenesis & oogenesis, fertilization, pregnancy lactation – hormone influence</p>	12 h

**UG ND – P105 CC Practicals - Human Anatomy and Physiology – I and UG ND – P106
CC Practicals - Human Anatomy and Physiology – II**

Sr. No.	Practical	Hours
1	Microscopic study of different tissues – Epithelial, connective, muscular & nervous tissues	5
2	Microscopic study of – Pancreas, stomach, small intestine, liver, lung, trachea, kidney, nephron, ovary, uterus, mammary glands, testis, thyroid, pituitary and adrenal glands	5
3	Collection of blood sample – Capillary blood from finger tips & venous blood	3
4	Separation of blood components (centrifugation)	3
5	Preparation & examination of fresh/ stained blood smear (wedge or glass slide method)	2
6	Detection of blood group	3
7	Estimation of haemoglobin - Sahil's acid hematin method	3
8	Determination of hemotocrit & (wintrobe method) erythro cycle sedimentation rate	3
9	Determination of Bleeding Time (BT) (Duke method) & coagulation / Clotting Time (CT) (capillary tube method)	2
10	Platelet count (Rees Ecker method by hemocytometry)	3
11	Clinical examination of pulse rate (radial pulse) in resting condition & after exercise	2
12	Measurement of blood pressure by Sphygmomanometer (Auscultatory method)	2
13	Measurement of temperature	2
14	Auscultation for heart sound	2
15	Spirometry – Description of normal findings	2
16	Artificial respiration	2
17	Isolation & differentiation of T & B lymphocytes	3
18	Complement fixation test	3

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19	Purification of serum proteins	3
20	Assay of salivary amylase & pancreatic trypsin	3
21	Estimation of male & female reproductive hormone	3

UG ND – 107CCS Fundamentals of Food Microbiology

Unit 1	<p>Introduction to Food Microbiology –</p> <p>a) History of development of food microbiology, definition & scope of food microbiology.</p> <p>b) Types of microbes in food, classification & nomenclature, morphology & structure, importance in food (Yeast, molds, algae, bacteria, protozoa, viruses), significance of spores, sources of microorganisms & factor affecting the sources.</p> <p>c) Microscopic observation of food microbes- Light, phase contrast & electron microscope.</p>	15 h
Unit 2	<p>Isolation, Culture & Study of Food Microbes –</p> <p>a) Food microbial growth, bacterial growth curve, diauxic & synchronous growth, factors affecting the growth of microorganisms-PH, Temperature, Water activity, Nutrients, oxygen.</p> <p>b) Cultivation of microorganisms- Batch & continue culture, nutrient media (types) & sterilization, methods of enumeration.</p> <p>c) Observation of microorganisms- staining & non staining microscopic Method.</p>	15 h
Unit 3	<p>Microbiology of Perishable & Non- Perishable Food-</p> <p>a) Perishable Food- Sources of contamination, spoilage of vegetable & fruits, milk & milk products, meat & meat products, eggs & poultry.</p> <p>b) Non- Perishable Food – Sources of contamination, spoilage of cereal & cereal products, sugar & sugar products, fats & oils, nuts & oil seeds.</p>	15 h
Unit 4	<p>Beneficial aspects of microorganisms –</p> <p>a) Prebiotics, probiotics & post biotics</p> <p>b) Food fermentation – Fermentation – Definition & types, microorganisms used in food fermentation, fermented foods, types methods of manufacture for vinegar (citric acid), sauerkraut, yoghurt, soya sauce, meat sausages & fermented fish products, wine & traditional Indian foods (Curd, butter) & fermented cereal products- Idali, vada,</p>	15 h

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	dosa, bhatura, dhokla, soya souce, meso, tempeh, jillebi, fermented wheat & millet products.	
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UG ND – P107CCS Practicals Fundamentals of Food Microbiology

Sr. No.	Practical	Hours
1	Introduction to the basic microbiology laboratory practices & equipments, their function (microscope, autoclave, hot air oven etc.& other equipments)	4
2	Preparation & sterilization of culture media (solid & liquid) - bacterial & fungal media	4
3	Microscopic identification of microbes (prepared slides)	3
4	Pure culture & enumeration techniques (serial dilution method, streak, sprade, pour plate methods)	4
5	Morphological, cultural biochemical & genetical methods for characterization & identification of common food microorganisms (<i>E.coli</i> , <i>Staphylococcus aureus</i> , <i>Salmonella</i> , <i>Shigella</i> , <i>Vibrio spp.</i> , <i>Saccharomyces</i> & common holds etc.)	5
6	Hanging drop preparation for mobility of bacteria	2
7	Staining techniques - Simple (monochrome) & different (gram & acid fast) special staining (spores)	2
8	Study of bacterial growth curve, diauxic & synchronous growth culture, chemostat & batch culture	3
9	Yogurt / wine/fermented millets producers	2

UG ND –108 DSC - Food Microbiology, Hygiene & Sanitation

Unit 1	Food Preservation: Methods & principles, use of high & low temperatures, drying, use of chemicals & irradiations, Hurdle technology	10 h
Unit 2	Food Hazards- Significance of food borne diseases, incidence of food borne illness, risk factors associate with food borne illness	10 h
Unit 3	<p>Food Born Illness – Bacterial & non bacterial</p> <p>a) Bacterial-</p> <p>(i) Food borne in toxications - Staph poisoning & botulisms</p> <p>(ii) Food borne infections- Salmonellosis, shigellosis,</p> <p>(iii) Food borne toxic infections- Cholera, Listeriosis, Enterotoxic E Coli.</p> <p>The organisms, pathogenesis, clinical features & association with foods</p> <p>b) Nonbacterial-</p> <p>(i) Fungal- Micotoxins- afla toxin, patulin & ochre toxin</p> <p>(ii) Food born parasites- Trichinosis</p> <p>(iii) Sea food toxicants- Shell fish poisoning, scombroid poisoning</p>	10 h
Unit 4	<p>Introduction to Food Safety –</p> <p>Definition, types of hazards, biological, chemical, physical hazards, factors affecting food safety.</p>	10 h
Unit 5	<p>Hygiene & Sanitation in food service establishments –</p> <p>Introduction, sources of contamination, control methods using physical & chemical agents, microbiology & food plants & sanitation, personnel testing, water, air & food quality testing, waste disposal, pest & rodent control.</p>	10 h
Unit 6	<p>Food Safety Management Tools –</p> <p>Basic concept, prerequisites, HACCP, ISO series, TQM & risk analysis, microbial standards as per FSSAI for different food groups</p>	10 h

UG ND – P108 DSC Practicals Food Microbiology, Hygiene and Sanitation

Sr. No.	Practical	Hours
1	Microbiological analysis of air, water, soil, milk & different foods (processed & unprocessed)	8
2	Microbiological examination of tableware equipments & containers in food plant organizations	4
3	Testing of quality of milk – Detection of acidity (clot on boiling test, alcohol test), direct microscopic count, SPC, MBRT test, Phosphatase test & turbidity test	6
4	Isolation of spoilage microorganisms from different food commodities	4
5	Industrial field visit to see food safety norms	2
6	Detection of alfa toxin in foods	3
7	Isolation of food pathogenic bacteria – (<i>Bacillus cerus</i> , <i>Staphylococcus aureus</i> , <i>Salmonella spp.</i> , <i>Vibrio parahenolytics etc.</i>)	3

B.Sc. I Semester II Nutrition & Dietetics

UG ND T-201: Nutritional Bio Chemistry

Unit I	Historical perspective- Origin of life with respect to abiotic production of biomolecules, cellular and chemical foundation of life- an overview	12 h
Unit II	Chemical foundation-(Overview) a) Biomolecules as compounds of carbon with variety of functional groups b) Universal set of small molecules, macromolecules as the major constituents of cells: configuration and conformation with definitions and suitable example only, Types of stereoisomers and importance of stereoisomers in biology, types of bonds and their importance - electrovalent, covalent, ester, phosphodiester, thioester, peptide and glycosidic bonds	12 h
Unit III	Water - properties of water, hydrogen bonding, structure ionization, interactions of biological molecules in water, osmosis, concept of pH and buffers, Buffering system in living cells	10 h
Unit IV	Carbohydrates- Definition, classification, biological role, structure, sugars and non-sugars, Monosaccharides- families of monosaccharides- aldoses, ketoses, trioses, tetraoses, pentoses and hexoses Definition, classification and brief account of monosaccharides (based on aldehyde and ketone groups), D and L configuration, mutarotation, epimers, anomers, chemical and physical, properties, glycosidic bond-properties and reaction of glucose and fructose-isomerism, oxidation and reduction, esterification and glycoside formation, osazone- structure of ribose, deoxyribose, glucose, galactose and fructose Oligosaccharides and disaccharides- concept of reducing non-reducing sugars, glycosides bonds, structure of lactose, sucrose, maltose, cellobiose, inversion of sugars Polysaccharides- its classification based on function- storage polysaccharides, homopolymers - starch and glycogens, heteropolymere -	15 h

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	inuline, Structural polysaccharides- cellulose and chitin, peptidoglycan – functions of carbohydrates	
Unit V	<p>Lipids : Blur's Classification, Storage and Structural lipids, Simple lipids (Triacylglycerol and waxes), Compound and complex lipids, phospholipids –phosphatidyl colin, ethanol amine, glycerolipids, sphingolipids, glycolipids, sterols, derived lipids, sphingomyline, cetebrosides, gangliosides, lipoproteins - LDL,VLDL,HDL; Lysosome Chylomicrones Fatty acids – nomenclature structure and properties (up to C18), Properties of lipids - Physical properties (state, colour, odour, melting point, solubility, specific gravity, geometric isomerism, emulsification and surface tension), Chemical properties (SAP value, Acid value, iodine number, rancidity), Functions of lipids</p>	12 h

UG ND P-201: Nutritional Bio Chemistry

Practical:

1	Biochemical calculations - preparation of solutions and buffers (pKa values) – w/v, v/v, %, ppm, ppb, mg/L, normality, molarity, molality	4 h
2	Study of colorimetry and preparation of standard graph and calculation of λ_{\max} for given samples (Tyrosine/ purines/ pyrimidines), Verification of Beer-Lambert law by using Ammonium Copper compound, identification of purines from λ_{\max}	4 h
3	Isolation and identification of Starch from plant source	2 h
4	Saponification number - To find out saponification number of given lipid	2 h
5	Qualitative analysis for sugars and lipids	3 h
6	To estimate concentration of reducing sugar by DNSA method	3 h
7	To estimate concentration of Cholesterol in given sample (Iron reagent)	2 h
8	To separate and identify sugars by paper chromatography/ TLC	2 h
9	Detection of unknown carbohydrate from mixture (glucose, fructose, maltose, xylose, starch and sucrose)	2 h
10	To estimate reducing sugar from apple juice by Benedicts methods/Molish test	1 h
11	Validation of glass pipettes and balance	1 h
12	Standardization of solution (0.25 N $K_2Cr_2O_7$) using 0.1 N ferrous ammonium sulphate and ferroin indicator	2 h
13	Determination of pH of different food samples by using pH paper/ universal pH standards	2 h

B. Sc. Part I Semester II Nutrition and Dietetics

UG ND T- 202: Nutritional Bio Chemistry

Theory

Unit I	<p>Proteins:</p> <p>i) Amino acids as building blocks of proteins, classifications of common amino acids (by R groups), uncommon amino acids and their functions, chemistry of amino acids, ionization of amino acid side chains, configuration, zwitterions, reactions of amino acids, titration of amino acids, isoelectric pH, reaction with Ninhydrin, Sanger reaction</p> <p>ii) Peptides and proteins: oligopeptides- structure and function of naturally occurring glutathione, insulin and synthetic aspartem</p> <p>Protein structure: importance of amino acid sequence; primary structures and concepts of N & C terminal, peptide bond formation, characteristics of peptide bonds; Secondary structures: Ramchandran Plot, alpha helix and beta sheets, secondary repeats; tertiary and quaternary structure of protein (Haemoglobin), forces holding the polypeptides together - hydrogen bonds, Vanderwaals forces, covalent, ionic bonds and salt linkages; Protein denaturation and renaturation; Classification of protein shape, structural, transport, chromosomal, phospho and glyco proteins and the biological role of proteins.</p>	10 h
Unit II	<p>Nucleic acids:</p> <p>Occurrence, purines, pyrimidines, Pentoses (Ribose and Deoxyribose) phosphates, AMP and cAMP, ADP and ATP, TDP and TTP, GDP and GTP, NDA, NADP, FMN and FAD; Polynucleotides, covalent structure of DNA (different forms of DNA) and RNA (mRNA, tRNA, rRNA and SnRNA); Forces stabilizing nucleic acid structures, N-β glycosidic bonds, Phosphodister bonds,</p> <p>Properties of nucleic acids, denaturation and renaturation, Watson and Crick's model of DNA structure, ribozyme, Biological role of nucleic acids</p>	8 h
Unit III	<p>Vitamins: Occurrence and sources, rich sources of different Vitamins, classification, structure & biochemical functions of water-soluble vitamins;</p> <p>Role as coenzymes: Thiamine, Riboflavin, Niacin, Pyridoxine, Pantothenic acid, Coenzyme A, Lypoic acid, Folic acid and B12; functions and deficiency symptoms</p>	12 h
Unit IV	<p>Minerals: Role of Na, K, Mg,Fe, Zn, Co, Ca, P and I in physiology, general electronic configuration and their shape and significance in metalloenzymes</p>	12 h
Unit V	<p>Enzymes : Definition, structure and concept of Apoenzyme, Coenzyme, Cofactor Prosthetic group, Active site, Types of enzyme, Extracellular and intracellular, Constitutive and inducible, general overviews of enzyme- substrate reaction, mechanism of enzyme action, factors affecting enzyme reactions</p>	12 h
Unit VI	<p>Plant Pigments and Dyes: Chlorophyll, Xanthophylls, Flavonides, Carotenes, etc.</p>	6 h

UG ND P- 202: Nutritional Bio Chemistry**Practical:**

1	Estimation of concentration of protein by Biuret method and Lowry method (Albumin)	2
2	Study of melting temperature of nucleic acid- to determine T_m of DNA and mole percent G+C content	1
3	To separate amino acid by TLC	1
4	To study amylase enzyme assay- and to study effects of pH, temperature, concentration of enzyme, activators and inhibitors	3
5	General tests for amino acids and detection of unknown amino acid from mixture (Arginine, cysteine, methionine, Tyrosine, histidine, proline and tryptophan)	2
6	Isolation and characterization casein from milk by Isoelectric pH method	2
7	Estimation of DNA by DPA and RNA by Orcinol methods	2
8	Preparation of titration curve of acidic, basic and neutral amino acids	1
9	Quantitative estimation of ascorbic acid	2
10	Bioassay of Vitamin B12	2
11	Separation of pigment and dyes by adsorption and ion exchange chromatography	2
12	Extraction of genomic DNA from onion/yeast/ rat liver/ bacteria and confirmation with DPA and agarose gel electrophoresis	3
13	Study of karyotype analysis (karyotyping)	2
14	Detection of significant industrial enzymes (amylase, protease, lipase, invertase, phosphatase and cellulase)	2
25	Enzymatic preparation of biomolecules - Dextrin- production of maltodextrin by using β amylase Glucose- Productive of glucose by bacterial α - amylase and amyloglucosidase Production of invert sugar by invertase Peptide preparation of proteolysis by using papain Softening of Chhole/Rajma/ Idli by using papain	3

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UG ND T-203 General Home Science I

Theory

Unit I	Textile – Definition, terminology and classification of textile fibres. Basic unit and polymer bonds in textile fibre, Physical and Chemical Properties of fibres. Processing of Manufacture of all Natural and Man-Made fibres – Plant, Protein, Man-Made, Cellulosic, Synthetic, Metallic, Mineral and Elastomeric fibres.	12 h
Unit II	Clothing: Origin of Clothing, Principles of Clothing, Clothing Construction – Drafting flat pattern and Dapping. Textile Designing, Fashion Designing – Influence Factors, Fashion Cycle, Broken fashion cycles, Fashion adoption theories and Business and Merchandizing.	12 h
Unit III	Home Management: Definition, Characteristic of Management, Importance of Home Management, Motivation Factors of Management (Values, Goals, Standards), Home Management Process	12 h
Unit IV	Family Resource Management: Types and Characteristics of Family Resource. Family Decision Making – Definition and Types of Decision Making. Housing – Definition, Importance and Functions of a House, Principles of Planning, Space Allocation and Organization in Independent Houses, Apartments and Flats. Symbols used in Drafting Plans, Reading Plans and blueprints.	12 h
Unit V	Interior Design: Definition, Principles and Classification. Household Equipment's, Colors - Definition, Classification, Factors Influencing Choice of Colors, Furniture and Lighting- Definition and Types.	12 h

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UG ND P-203 General Home Science I

Practicals:

1	Identification and classification of fibre.	2 h
2	Colouring of Fabric tie and dye method/stencil painting.	2 h
3	Weaving pattern.	2 h
4	Planning of motivational factors to management of Value.	2 h
5	Planning of motivational factors to management of Goals.	2 h
6	Planning of motivational factors to management of Standard.	2 h
7	Drawing of Site plan.	2 h
8	Drawing of Floor plan.	3 h
9	Drawing of Elevation plan.	3 h
10	Symbols used in Drafting Plans.	2 h
11	Study of the fundamental principle of designing.	4 h
12	Study on elements of interior design	4 h

Reference

1. Sunita Mishra (2018), Selective and Scientific Books, New Delhi.
2. Bhargava, B. (2001). Family Resource Management and Interior Decoration, Delhi: University Book House. Bhargava, B. (2001).
3. Housing and Space Management. Jaipur: University Book House Ltd.
4. Seetharaman, P., Batra, S., & Mehra, P. (2005). An Introduction to Family Resource Management. New Delhi: CBS Publishers & Distributors (ISBN 13: 9788123911861)
5. Shukul, M., and Gandotra, V. (2006). Home Management and Family Finance. New Delhi: Dominant Publishers and Distributors. (ISBN No. 81-7888-403-8).

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UG ND T- 204 General Home Science II

Unit I	Family: Meaning and Characteristics of Family, Types of Family, Family Life Cycle.	12 h
Unit II	Child Development: Principles of Development, Stages of Growth and Development. Development psychology – Psychoanalytic Theory (Freud), Psycho-Social Theory (Erikson), Cognitive Developmental Theory (Piaget), Kohlberg’s Moral Reasoning Theory, Bronfenbrenner's Ecological Systems Theory, Life-Span and Life-Cycle Theory, Social Learning Theory (Bandura).	12 h
Unit III	Early Childhood Care and Education: Development Problems, Mental Sub normality, Mental retardation, Learning disabilities, Behaviour difficulties, Speech and Language disorders, Hearing impairment, Visual impairment ,Physical handicap, Giftedness, Guidance and Counselling.	12 h
Unit IV	Socialization in various Family Contexts Across Different Cultures – Process in Socialization, Social and Non-Social People, Difficulties in Conforming to Social Expectations, Foundations of Social Behaviour in Babyhood, Behaviour patterns in social situations during early childhood. Women studies - Women Empowerment, Women’s Equality, Violence against Women, Women Health, Women and Human Rights.	12 h
Unit V	Extension Education: History and development of Home Science Extension, Concepts of Extension Education, Philosophy of Extension Education, Principles of Extension Education, Difference between Formal and Non-Formal Education. Objectives of formal and nonformal education Developed discipline, curriculum planning and development. Planning nonformal education Programme. Management and Administration of formal/nonformal and extension education, Monitoring, Supervision and evaluation formal, nonformal and extension education. Major types of test, Qualities of a good test. Aids used for education	12 h

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UG ND P- 204 General Home Science II

Practicals:

1	Planning of family budget and expenditure as per given family income.	3 h
2	Preparation of an article on consumer protection rights.	2 h
3	Study on Psycho-Analytic Theory of Freud.	3 h
4	Study on Cognitive Developmental Theory of Jean Piaget.	3 h
5	Study of Psycho social development theory of Erick Erickson.	3 h
6	Study on moral development theory of Kohlberg's	3 h
7	Study on Social behaviour patterns in social situations during early childhood.	3 h
8	Study on Formal education /Informal education	2 h
9	Study on different method of communication.	3 h
10	Study on Learning Disabilities during childhood.	3 h

Reference

1. Bhargava, B. (2005). Family Resource Management and Interior Decoration, Jaipur: Apple Printer and V. R. Printers. 66
2. Deacon, R. F., and Firebaugh, F.M. (1975). Home Management: Contexts and Concepts. Boston: Houghton Mifflin Company.
3. Nisha, M. (2006). Understanding Extension Education. New Delhi: Kalpay Publications.
4. Reddy, A.A. (2001). Extension Education. Bapatla: Sri Lakshmi Press.
5. Singh, U.K and Nayak, A.K. (2007). Extension Education. New Delhi: Common Wealth Publishers.
6. Sunita Mishra (2018), Selective and Scientific Books, New Delhi.

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UG ND T-205 Food Preservation and Safety

Theory

Unit I	<p>1. Introduction to food preservation- Importance, methods, principles and applications of food preservation.</p> <p>2. Preservation by use physical method of preservation - Preservation by use of high (Canning , Pasteurisation) and low temperature (chilling, refrigeration, freezing, blast freezing, cryogenic freezing), concentration (drying, dehydration, concentration), radiation (alpha rays, beta rays, gamma rays, x rays and microwave), filtration (membrane filtration, reverse osmosis)</p> <p>3. Preservation by use chemical method of preservation – Sulphites, Nitrites, Acids, Alkali.</p> <p>4. Preservation by use biological method of preservation – fermentation.</p> <p>5. Enhancement of foods – food fortification, enrichment, supplementation, fermentation, germination, pre- and probiotics and organic foods.</p>	12 h
Unit II	<p>1 Food hygiene – introduction, definition, basic aspects of personal hygiene, disease transmission.</p> <p>2 Food handling -preventing food borne illnesses, education of food handler in handling and serving food, importance of personal hygiene of the food handler, pest control.</p> <p>3 Water treatment- sources, principles of water purification, disposal of water.</p> <p>4. Waste disposal – types of wastes, solid wastes, liquid wastes, gaseous wastes and disposal.</p>	12 h
Unit III	<p>Food Additives: Classification of food additives, <u>Intentional Additives</u>, <u>Classification of Intentional food Additives</u>. Un Intentional Additives, Coding of food additives, Safety Of Food Additives, Generally Recognised as Safe (GRAS) Foods, Types Of Food Additives.</p>	12 h
Unit IV	<p>1.. Food spoilage –Physical, chemical and microbiological spoilage of foods.</p> <p>2. Food adulteration – Definition of adulteration, adulterants, types of adulterants,</p> <p>3. Food hazards: Physical hazards, Chemical hazards, Biological Hazards</p> <p>4.<u>Contaminants</u>- Definition and classification</p>	12 h
Unit V	<p>1. Food borne intoxication- food poisoning: Food toxin- Hemagglutinins, Saponins, Oxalates, Phytates. Food Toxicants, Cyanogens, Gossypol, Glucosinolates or Goitrogens, Lathrogens., Allergens, Cycasin, Favism, Phytoalexins, Pyrrolizidine alkaloids.</p> <p>2. Microbial causing food intoxication staphylococcus, botulism, salmonellosis</p> <p>3. Food borne infections – cholera and typhoid.</p>	12 h

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UG ND T-205 Food Preservation and Safety

Practicals

	Title	Hours
1	Preservation of Fruits/Vegetables by low temperature and High temperature	3 h
2	Preservation of Food by Asepsis method (Canning)	3 h
3	Preservation of Food by moisture removal/Dehydration	3 h
4	Preservation of Food by in activation of Enzymes/Blanching.	3 h
5	Preservation of Fruits/Vegetables by using natural packaging material/waxing.	3 h
6	Preservation of Food by using concentration method. Syruping / Salting.	3 h
7	Study of different natural packaging material on storage study of Food.	3 h
8	Study of different synthetic packaging material on storage study of Food.	3 h
9	Preparation of Ideal Food label and Nutritive label.	2 h
10	Preparation of Ideal Food by using sulphites, nitrites and acid.	2 h
11	Physical methods of identification of different adulterants present in food.	2 h
12	Chemical methods of identification of different adulterants present in food.	2 h

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UG ND T-206 Food Processing

Unit	Topics	Hours
Unit I	Introduction: Defining food; Classification of food; constituents of foods; food processing; food preservation; food spoilage – introduction, causes of foodspoilage, food poisoning, food-borne intoxication, food-borne infection	15
	Food preservation and processing: Introduction; necessary; methodology; principles and methods of food preservation	
	High Temperature Preservation: Introduction; blanching; pasteurization; sterilization; canning	
	Low temperature preservation: Introduction; methods of low temperature preservation; chilling; refrigeration and cold storage; factors affecting refrigerated & frozen storage of foods, cryogenic preservation effect of freezing on constituents of foods	
Unit II	Drying, dehydration and concentration: Introduction; purpose; water activity and relative humidity; factors affecting rate of drying and dehydration; drying methods; changes during drying and dehydration; different driers; concentration- methods of concentration, changes; effect of drying, dehydration and concentration on quality of foods	15
	Food irradiation: Introduction; radiation sources; measurement of radiation dose; mechanism of action; type of irradiation; factors affecting food irradiation; effect of irradiation	
Unit III	Preservation using sugar, salt and acids: Sugar – Introduction, factors affecting osmotic pressure of sugar solution, foods preserved using sugar; salt: introduction, antimicrobial activity of salt, estimation of salt, food products preserved using salt; acid – Introduction, mechanism, common foods preserved using acids	15
	Preservation by use of chemicals: Introduction; objectives; factors affecting antimicrobial activity of preservatives; type of chemical preservatives; sulphur dioxide, benzoic acid, etc; use of other chemicals like acidulants, antioxidants, mold inhibitors, antibodies, etc.	
Unit IV	Food fermentation: Introduction, methods, common fermented foods.	15
	Recent methods in processing: Introduction; PEF, HPP, ultrasound, dielectric heating; microwave heating, ohmic heating; infrared heating; UV light, X-rays, membrane processing, ozonization; high intensity electric field in pulses; new hybrid drying technologies; monitoring by NMR and MRI Technology, etc	
	Effect of processing on nutritional value of food: Introduction; consuming raw foods; changes during meat grilling; effect of processing on vitamins; effect of processing on minerals; effect of processing on carbohydrates; effect of processing on lipids	

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UG ND T-206 Food Processing

Practical

Topics	Hours
1.Demonstration of various machineries used in processing	
2.Demonstration of effect of blanching on food quality characteristics	
3.Preservation using heat	
4.Preservation by low temperature	
5.Preservation by high concentration of sugar (Jam/Jelly/syrup/squash)	
6.Preservation by using salt (pickling)	
7.Preservation by using chemical preservatives (sodium benzoate, calcium propionate)	
8.Drying and dehydration of fruits and vegetables	
9.Reconstitution test for fruits and vegetables	
10.Preservation of coconut shreds using humectants	
11.Spray drying of milk	
12.Preparation of fermented product	

TEXTBOOKS

Sr. No.	Name of Book	Author	Publisher
1	Preservation of Fruits & Vegetables	Girdhari Lal, G. S. Siddappa, G. L. Tandon,	Indian Council of Agricultural Research, Publications 1986
2	Food Processing Technology: Principles and Practice	P. Fellows	CRC Press, 2000 ISBN: 9780849308871
3	Handbook of Food Preservation	Shafiur Rahman M.	CRC Press, 2007 ISBN: 9781420017373
4	Emerging Technologies for Food Processing	Da-Wen Sun	Academic Press, 2005 ISBN: 9780080455648
5	Introduction to Food Processing	Jelen P.	Prentice Hall , 1985
6	Handbook of Analysis and Quality Control for Fruit and Vegetable Products.	Ranganna S.	2nd Ed. Tata-McGraw-Hill. 2001.

REFERENCE BOOKS

Sr. No.	Name of Book	Author	Publisher
1	Technology of Food Preservation	Desroiser N.W.	AVI Pub. Co., 1997
2	Introduction to Food Science and Technology	Stewart GP and Amerine MA	Elsevier, 2012 ISBN: 0323156649,
3	Food Processing Handbook	Brennan JG	John Wiley & Sons, 2012 ISBN: 9783527634378
	Food Science	Potter NN and Hotchkiss JH	Springer Science & Business Media, 2013 ISBN: 9401572623

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4	Essentials of Food Science	Vickie AV	Springer Science & Business Media, 2013 ISBN: 9781461491385
5	Food Processing and Preservation	B. Sivasankar	PHI Learning Pvt. Ltd., 2002 ISBN: 9788120320864

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UG ND T-207 Food Standard and Quality Control

Theory

Unit 1	<p>Introduction- <u>History, Definition and importance of quality control in ancient India. The Beginning of FDA. Food borne diseases and their causes. Need for food laws.</u></p> <p>Sampling- Purpose, classification, approach, levels, sample size, Sampling process, Problems of sampling, sample preparation.</p> <p>Specifications for raw materials: Indicators of quality in different foods. Establishment of specification. Specifications for cereals, pulses, oils seeds, fruits and vegetables.</p>	10 h
Unit 2	<p>Quality inspection: Factors affecting food quality: a) <u>Pre harvest, Animal Production. Storage, Transport and Trade Conditions.</u> b) <u>Post-harvest handling. Processing. Food storage. Humidity. Temperature. Transportation.</u></p> <p>Determination of quality of foods (Objective methods): <u>Quality Parameters- Texture, colour, flavour.</u></p> <p>Methods of Analysis: a) <u>Instrumental Methods- Viscometers, colour, flavour.</u> b) <u>Physical methods - weight, volume, specific gravity. density, viscosity, porosity.</u> c) Chemical methods: <u>Chemical method, Physico-chemical methods, Microbial examination.</u></p>	10 h
Unit 3	<p>Determination Of Quality Foods – (Subjective Methods): <u>Sensory attributes-</u> a) <u>External- Appearance, Colour, Flavour, Odour.</u></p> <p>b) <u>Internal- Taste, Texture, Mouth feel</u> Sensory Evaluation :Selection of panel members, Training of judges, Types of Sensory Evaluation- a) Descriptive tests b)Discriminative tests.</p>	10 h
Unit 4	<p>Contaminants: Classification, Biological contaminants, Non-biological, Food additives, Agricultural residues, Environmental Contaminants, Processing Contaminants. Food adulteration and adulterants: Classification <u>Simple Tests For Food Adulterants,</u></p>	10 h
Unit 5	<p>1 Food packaging – definition, functions, classification, and laws related to packaging. 2 Food labelling: standards, purpose, description types of labels, labelling regulation barcode.</p> <p>3 Nutrition labelling – nutrition labelling, health claims, and mandatory labelling provision.</p>	10 h
Unit 6	<p>Standards For Product Quality And Safety, Public Standards, Private Standards, Industry Standards, Consumer Standards National and international Agencies involved in Food Quality Control, Food Laws And Regulations.</p>	10 h

B. Sc. Part I Semester II Nutrition and Dietetics**UG ND T-207 Food Standard and Quality Control****Practicals:**

	Title	Hours
1	Study on different methods of sampling.	3 h
2	Study on different factors affecting quality of food.	3 h
3	Study quality of food using quality parameters (objective method) texture, colour, flavour.	3 h
4	Study instrumentation method of food quality analysis.	3 h
5	Study physical method of food quality analysis.	3 h
5	Study chemical method of food quality analysis.	3 h
6	Study of different sensory attributes used to access quality of food.	3 h
7	Study of different types of sensory evaluation.	3 h
8	Determination of contaminants present in food that are classified physical hazards.	3 h
9	Determination of adulterants in milk and oil.	3 h
10	Shelf-life study of fruits in different packaging material.	3 h

Reference

1. Siddappaa, G. S., Girdhari Lal and Tandon, G.L. 1998. Preservation of Fruits and Vegetables. ICAR, New Delhi
2. Sivasankar, B. 2002. Food Processing and Preservation. PHI Learning Pvt. Ltd. Delhi
3. Srilakshmi. 2010. Food Science. New age International 978-81-224- 2724-0.
4. Srivastava, R. P. & Sanjeev Kumar. 2002. Fruits and vegetable Preservation – Principles and Practice. International Book Distributing Co., Lucknow.
5. Swaminathan, M. 1988. Hand book of Food Science & Experimental Foods. Bappco publishers, Bangalore
6. U.D. Chavan and J.V. Patil. 2013. Industrial Processing of fruits and vegetables. Astral International Pvt Ltd. New Delhi.
7. Vijay, K. 2001. Text Book of Food Sciences and Technology. ICAR, New Delhi.

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UG ND T-208 Food Analysis

Theory

<p>Unit 1 Nature and concepts of food analysis i. Rules and regulations of food analysis ii. Safety in laboratory iii. Sampling techniques</p>	15 h
<p>Unit 2 Principles and methodology involved in analytical techniques i. PH Meter and use of ion selective electrodes ii. Spectroscopy a. Ultra violet visible, florescence b. Infrared spectro c. Atomic absorption and emission d. Mass spectroscopy iii. Nuclear magnetic resonance and electron spin resonance 1. Chromatography a. Adsorption b. Column c. Partition d. Gel-filtration e. Affinity f. Ion-exchange g. Size-exclusion method h. Gas liquid i. High performance liquid chromatography 2. Separation techniques a. Dialysis b. Electrophoresis i) Paper ii) SDS gel electrophoresis iii) Immuno electrophoresis c. Sedimentation, ultra-filtration, ultracentrifugation d. Iso-electric focusing e. Isotopic techniques f. Manometric techniques.</p>	15 h
<p>Unit 3 Principles and methodology involved in analysis of foods. i. Rheological analysis ii. Textural profile</p>	15 h
<p>Unit 4 Evaluation of analytical data i. Accuracy and precision ii. Statistical significance iii. Co-relations regression iv. Computers for data analysis and result interpretation</p>	15 h
<p>Unit 5 Sensory analysis of food i. Objective method ii) Subjective method</p>	15 h

B. Sc. Part I Semester II Nutrition and Dietetics**UG ND T-208 Food Analysis****Practicals**

1. Analysis of heavy metal using atomic absorption spectrophotometer.	3 h
2. Estimation of carotenoid using spectrophotometer.	3 h
3. Separation of amino acids by two-dimensional paper chromatography.	3 h
4. The identification of sugars in fruit juice using TLC.	3 h
5. Separation of prolines by Ion-exchange chromatography.	3 h
6. Molecular weight determination using sephadox-gel.	3 h
7. Identification of organic acids by paper electrophoresis.	3 h
8. Gel-electrophoresis for analytic techniques.	3 h
9. Quantitative determination of sugars and fatty acid profile by GLC.	3 h
10. Quantitative make-up of water- and fat-soluble vitamins using HPLC.	3 h