

Department of Food Technology
Vikram University, Ujjain (MP)

SYLLABUS

B. SC. (HONS.) FOOD TECHNOLOGY
FOUR YEARS (8 SEMESTER) CBCS
(FOR UTD)

(As per the "Guidelines for Multiple Entry and Exit in Academic programmes offered in Higher Education Institutions" issued by UGC, New Delhi under National Education Policy 2020) (Ordinance 14 A)

*ORDINANCE FOR FOUR YEARS UNDERGRADUATE DEGREE (CBCS SEMESTER
MODE)*

(UNDER NEW EDUCATION POLICY 2020)

COURSE STRUCTURE

CHOICE BASED CREDIT SYSTEM (CBCS)

2021-2025 ONWARDS

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01/07/2021



PREAMBLE

The new course four years Undergraduate Degree (CBCS Semester Mode) has been prepared, as per the "Guidelines for Multiple Entry and Exit in Academic programmes offered in Higher Education Institutions" issued by UGC, New Delhi Under National Education Policy 2020 (Ordinance 14 A) and keeping in view, the unique requirements of B.Sc. (H) Food Technology students. The objectives of the course are-

- To impart knowledge of various areas related to Food Science and Technology,
- To enable the students to understand food composition and its physico-chemical, nutritional, microbiological and sensory aspects,
- To familiarize the students about the processing and preservation techniques of pulses, oilseeds, spices, fruits and vegetables, meat, fish, poultry, milk & milk products,
- To emphasize the importance of food safety, food quality, food plant sanitation, food laws and regulations, food engineering and packaging in food industry.

The contents have been drawn-up to accommodate the widening horizons of the discipline of Food Technology. They reflect the current changing needs of the students. For the Generic elective (GE) to be chosen by Food Technology students, It is recommended that subjects like Biochemistry, Biology, Chemistry, Maths & statistics, Biostatistics, Physics be chosen as they are synergistic to the curriculum. However, students are free to pick up any of the Generic Elective Courses offered by other departments.

- For each paper, the objectives have been listed and the contents divided into units.
- The detailed syllabus for each paper is appended with the list of suggested readings.

Teaching time allotted for each paper shall be 4 periods for each theory paper and 4 periods for each practical class per week for each paper per week. Each practical batch should ideally be between 15-20 students so that each student receives individual attention.

Programme Mission:

The purpose of the programme is creation of knowledgeable human resources to work in Government, Semi-Government, Private and Public sector owned Food Technology and Food Processing organizations and also to assume administration positions. With further progression in education, graduates should be able to undertake teaching and research in colleges and universities as well as in scientific organizations.

Graduate Attributes:

1. Ability to apply fundamental knowledge of Biology, Biochemistry, Food Chemistry, Food Microbiology for developing food products and preservation.
2. Ability to develop technologies for food processing and preservation
3. Ability to develop processes for food product development
4. Ability to test food for quality, safety and nutrition
5. Ability to develop packaging for preservation and distribution
6. Ability to perform administrative duties in government, semi-government, private and public sector organizations
7. Ability to teach in schools, colleges and universities with additional qualification and training
8. Ability to understand and solve scientific problems by conducting experimental investigations
9. Ability to apply appropriate tools, techniques and understand utilization of resources appropriately in various laboratories

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10. Ability to understand the effect of scientific solutions on legal, cultural, social and public health and safety aspects
11. Ability to develop sustainable solutions and understand their effect on society and environment
12. Ability to apply ethical principles to scientific practices and professional responsibilities
13. Ability to work as a member of a team, to plan and to integrate knowledge of various disciplines and to lead teams in multidisciplinary settings
14. Ability to make effective oral presentations and communicate technical ideas to a broad audience using written and oral means
15. Ability to adapt to the changes and advancements in science and engage in independent and life-long learning

Programme Objective:

The Bachelor of Science honours degree programme in Food Technology imparts knowledge and understanding of Biology, Biochemistry, Food Chemistry, Food Microbiology, Food Science, Food processing, Food safety, Food quality, Food product storage, Food product preservation, Food product packaging and Food product distribution.

The Programme also provides sufficient understanding and cognitive abilities to design and develop technologies for food processing, preservation and packaging as per the legal and safety requirements. In addition, the programme imparts knowledge and training to develop transferable skills and entrepreneurship abilities.

The objectives of the programme are to enable the students to:

1. To impart knowledge of Biology, Food -Biochemistry, Food Chemistry and Food Microbiology
2. To impart knowledge and understanding of technology of vegetables, fruits, plantation crops, meat, poultry, dairy and sea foods, bakery and confectionery.
3. To impart abilities to design technologies for food processing and food preservation
4. To impart abilities to design and develop food packaging and distribution
5. To train students on use of various instrumentation for the evaluation of food quality and safety
6. To train students to conduct scientific experiments and document scientific investigations
7. To educate on professional ethics, economics, social sciences, inter personal and communication skills relevant to professional practice,
8. To provide a general perspective on lifelong learning and opportunities for a career in industry, scientific organization, education, business and commerce

Intended Learning Outcomes of the Programme:

The Intended Learning Outcomes (ILOs) are listed under four headings:

1. Knowledge and Understanding,
2. Cognitive Skills
3. Practical Skills and
4. Capability /Transferable Skills.

Knowledge and Understanding:

After undergoing this programme, a student will be able to:

1. Explain with illustrations chemical, biochemical and microbiological phenomenon as applied to food processing and preservation
2. Explain various food processing, preservation and packaging technologies
3. Recognize the importance of food quality, safety and nutrition

4. Describes technologies of vegetables, fruits, cereals, millets, plantation crops, meat, poultry, dairy products, sea foods, bakery and confectionery

Practical Skills:

After undergoing this programme, a student will be able to:

1. Choose appropriate instrumentation system for testing and evaluation of food products
2. Operate machines and systems that process and package food
3. Market and Distribute Food products
4. Assess demand for new food products and economics of food products

Capability / Transferable Skills

After undergoing this programme, a student will be able to:

1. Manage information, develop scientific reports and make presentations
2. Build, Manage and Lead a team to successfully complete a project and Communicate across teams and organizations to achieve professional objectives
3. Work under various constraints to meet project targets

Adopt to the chosen profession by continuously upgrading his/her knowledge and understanding through Life-long Learning philosophy

After completion of the program of B.Sc. (Hons.), Food Technology, every student will know the following attributes:

1. An ability to apply the knowledge of science, microbiology and technology.
2. An ability to apply the knowledge of underlying chemistry, properties and effects of processing on food components.
3. An ability to use the techniques, skills, and modern tools necessary food processing operations.
4. Demonstrate knowledge and understanding of technology and management principles, manage projects efficiently in food science and technology and multidisciplinary environments after consideration of economical and financial factors.
5. An ability to design and conduct experiments, as well as to analyze and interpret data.
6. An ability to apply knowledge for production of safe food and shelf-life extension of food products.
7. An ability to identify, formulate, and solve food science and technology problems.
8. An ability to extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyze and interpret data. Contribute individually/in group(s) to the development of scientific/technological knowledge in food science and technology

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VIKRAM UNIVERSITY, UJJAIN MP.
B. Sc. (Hons) FOUR YEARS (EIGHT SEMESTERS), CBCS SCHEME (NEP-2020)
SUBJECT-FOOD TECHNOLOGY

The Students will get:

1. Certificate after completion of 1st Year (40 credits)
2. Diploma after completion of 2nd Years (80 credits)
3. B. Sc.(Hons.) Degree after completion of 3rd Year (120 credits)
4. B. Sc.(Hons.) with Research degree after completion of 4th Year (160 credits)

B.Sc. (HONS) FIRST YEARS SEMESTER- Ist CBCS FOOD TECHNOLOGY

S.N.	Code	Name of Course	Type of Course	Distribution of Credits			Max. Marks		Total
				T	P	Total	Internal Max.	External Max.	
1	FTB 101	Fundamentals of Food Technology	*Core-1 Major-I	3	-	3	40	60	100
2	FTB 102	Principles of Food Science	Core-2 Major-II	2	-	2	30	45=75	100
		Practical-I	-	-	1	1	10	15=25	
3	FTB 103	Food Chemistry	Minor-1	3	-	3	40	60	100
4	FTB 104	Food Adulteration	GEC-1	3	-	3	40	60	100
5	FTB 105	Medical diagnostics	**SEC -1	4	-	4	40	60	100
6	FTB 106	Hindi	AEC-1	2	-	2	20	30	50
7	FTB 107	English	AEC-2	2	-	2	20	30	50
Total Credits and Marks				19	1	20			600

Note:- A student has to take two major courses; one minor from any other department of same faculty, one minor from any department of any faculty, One Ability Enhancement Course (AEC) in Hindi and English, and One Vocational/Skill Enhancement Course. Student can choose MOOC or Online Course of equal credits in all the above categories.

*For the students of other department

Categories: Group Code

(1) Core Courses (Two core courses of 3 credits each)

Major-I (3 credits)

Major-II (3 credits)

(2) Minor-I (3 credits) : to be opted for other Department of faculty of Life Sciences Student and can opt MOOC

(3) Minor-II (3 credits) : Generic Electives (GE): (Generic Elective Course to be opted from other faculty (Department of different faculty/ MOOC)

(4) Skill Enhancement Course/Vocational course (SEC) to be opted from courses offered by University/ MOOC

(5) Ability Enhancement Course (AEC) (2+2 =4 credits)- To be opted from courses offered by University

(6) Field Project/Internship/ Community engagement and services (4 credits)- Not applicable in First Semester and Applicable in Second Semester.

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B.Sc. (HONS) FIRST YEARS SEMESTER- IInd-CBCS FOOD TECHNOLOGY

S.N.	Code	Name of Course	Type of Course	Distribution of Credits			Max. Marks		Total
				T	P	Total	Internal Max.	External Max.	
1	FTB 201	Technology of Food Preservation	*Core-3 Major-III	3	-	3	40	60	100
2	FTB 202	Food Processing Technology	Core-4 Major-IV	2	-	2	30	45=75	100
		Practical-I	-	-	1	1	10	15=25	
3	FTB 203	Functional Foods and Nutraceuticals	Minor-2	3	-	3	40	60	100
4	FTB 204	Intellectual Property Rights	GEC-2	3	-	3	40	60	100
5	FTB 207	Field project/Internship/Community engagement and Services		2	-	2	20	30	50
6	FTB 205	Environment Education	AEC-3	4	-	4	40	60	100
7	FTB 206	Yoga and Meditation	AEC-4	2	-	2	20	30	50
Total Credits and Marks				19	1	20			600

Note:- A student has to take two major courses; one minor from any other department of same faculty, one minor from any department of any faculty, One Ability Enhancement Course (AEC) in Hindi and English, and One Vocational/Skill Enhancement Course. Student can choose MOOC or Online Course of equal credits in all the above categories.

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Categories: Group Code

1. Core Courses (Two core courses of 3 credits each)

Major-I (3 credits)

Major-II (3 credits)

2. Minor-I (3 credits) : to be opted for other Department of faculty of Life Sciences Student and can opt MOOC

3. Minor-II (3 credits) : Generic Electives (GE): (Generic Elective Course to be opted from other faculty (Department of different faculty/ MOOC)

4. Skill Enhancement Course/Vocational course (SEC) to be opted from courses offered by University/ MOOC

5. Ability Enhancement Course (AEC) (2+2 =4 credits)- To be opted from courses offered by University

6. Field Project/Internship/ Community engagement and services (4 credits)- Not applicable in First Semester and Applicable in Second Semester.

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VIKRAM UNIVERSITY, UJJAIN MP

B. Sc. (Hons) FOUR YEARS (EIGHT SEMESTERS), CBCS SCHEME

SUBJECT-FOOD TECHNOLOGY

B.Sc. (HONS) SECOND YEARS SEMESTER- IIIrd CBCS FOOD TECHNOLOGY

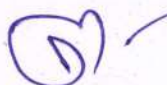
S.N.	Code	Name of Course	Type of Course	Distribution of Credits			Max. Marks		Total
				T	P	Total	Internal Max.	External Max.	
1	FTB 301	Food Microbiology	*Core-5 Major-V	3	-	3	40	60	100
2	FTB 302	Food and Nutrition	Core-6 Major-VI	2	-	2	30	45=75	100
		Practical-I	-	-	1	1	10	15=25	
3	FTB 303	Biology	Minor-3	3	-	3	40	60	100
4	FTB 304	Food Additives	GEC-3	3	-	3	40	60	100
5	FTB 305	Nursery and Gardening	**SEC -2	4	-	4	40	60	100
6	FTB 306		AEC-5	2	-	2	20	30	50
7	FTB 307		AEC-6	2	-	2	20	30	50
Total Credits and				19	1	20			600
Marks									

Note:- A student has to take two major courses; one minor from any other department of same faculty, one minor from any department of any faculty, One Ability Enhancement Course (AEC) in Hindi and English, and One Vocational/Skill Enhancement Course. Student can choose MOOC or Online Course of equal credits in all the above categories.

*For the students of other department

Categories: Group Code

- Core Courses (Two core courses of 3 credits each)
Major-I (3 credits)
Major-II (3 credits)
- Minor-I (3 credits) : to be opted for other Department of faculty of Life Sciences Student and can opt MOOC
- Minor-II (3 credits) : Generic Electives (GE): (Generic Elective Course to be opted from other faculty (Department of different faculty/ MOOC)
- Skill Enhancement Course/Vocational course (SEC) to be opted from courses offered by University/ MOOC
- Ability Enhancement Course (AEC) (2+2 =4 credits)- To be opted from courses offered by University
- Field Project/Internship/ Community engagement and services (4 credits)- Not applicable in First Semester and Applicable in Second Semester.

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B.Sc. (HONS) SECOND YEARS SEMESTER- IVTH CBCS FOOD TECHNOLOGY

S.N.	Code	Name of Course	Type of Course	Distribution of Credits			Max. Marks		Total
				T	P	Total	Internal Max.	External Max.	
1	FTB 401	Technology of fruits, Vegetables and Plantation Crops	*Core-7 Major-VII	3	-	3	40	60	100
2	FTB 402	Technology of Dairy And Sea Food	Core-8 Major-VIII	2	-	2	30	45=75	100
		Practical-I	-	-	1	1	10	15=25	
3	FTB 403	Food Chemistry & Analytical Instrumentation	Minor-4	3	-	3	40	60	100
4	FTB 404	Herbal Technology	GEC-4	3	-	3	40	60	100
5	FTB 405	Field project/Internship/Community engagement and Services		4	-	4	40	60	100
6	FTB 406		AEC-7	2	-	2	20	30	50
7	FTB 407		AEC-8	2	-	2	20	30	50
Total Credits and Marks				19	1	20			600

Note:- A student has to take two major courses; one minor from any other department of same faculty, one minor from any department of any faculty, One Ability Enhancement Course (AEC) in Hindi and English, and One Vocational/Skill Enhancement Course. Student can choose MOOC or Online Course of equal credits in all the above categories.

*For the students of other department

Categories: Group Code

- Core Courses (Two core courses of 3 credits each)
Major-I (3 credits)
Major-II (3 credits)
- Minor-I (3 credits) : to be opted for other Department of faculty of Life Sciences Student and can opt MOOC
- Minor-II (3 credits) : Generic Electives (GE): (Generic Elective Course to be opted from other faculty (Department of different faculty/ MOOC)
- Skill Enhancement Course/Vocational course (SEC) to be opted from courses offered by University/ MOOC
- Ability Enhancement Course (AEC) (2+2 =4 credits)- To be opted from courses offered by University
- Field Project/Internship/ Community engagement and services (4 credits)- Not applicable in First Semester and Applicable in Second Semester.

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SUBJECT: FOOD TECHNOLOGY (HONS) FIRST YEAR, CBCS SEMESTER-I
COURSE CODE NO.: FTB 101: FUNDAMENTALS OF FOOD TECHNOLOGY
(*CORE-1 MAJOR I)

Course Objective:

The objective of the course is to impart:

- 1- The knowledge about basic concepts of food technology and recent trends
- 2- The knowledge about basic biology, chemistry, and microbiology of foods

Course Outcome:

To enable the students to:

1. To understand the history and evolution of food processing.
2. To study the structure, composition, nutritional quality and post harvest changes of various plant foods.
3. To study the structure and composition of various animal foods.

Unit I Introduction

Scope of food science and Technology, Functions of food, Nutrients, Water, Carbohydrates, Proteins, Lipids, Vitamins and Minerals

Unit II Composition and nutritive value

Pulses & Legumes, Nuts & Oilseeds, Meat, Fish, Egg and Milk Structure and composition of Wheat and Rice, Classification and Composition of Fruits, Vegetables and Spices.

Unit III Food Quality Assessment

Sensory assessment-Appearance of food- visual perception, colour of foods, smell, flavor and taste, Threshold tests, difference tests, ranking test & hedonic scale

Unit IV Food Additives

Preservatives, coloring agents, flavour and flavour enhancer, Anti-oxidants, Artificial sweeteners, stabilizers, thickening agents, anticaking agents, bleaching and maturing agents, flour improvers, leavening agents, surface active agents.

Unit V Health foods

Functional foods, Prebiotics, Probiotics, Nutraceuticals, organic foods, GM foods

Unit VI Food Research & Food Technology updates

Major centres of food research in India –CFTRI, DFRL, NIFTEM, IICPT & CIFT. Major Food Industries in India, Journals of Food Science & Technology, Indian Food Industry, Beverage, Food World, Indian Food Packer, AFST (I)

Suggesting Readings:

1. Potter NN, Hotchkiss JH. Food Science. CBS publishers and distributors
2. S. Manany, N S. Swamy Food Facts and Principles. New Age International Publishers
3. Murano, Peter S. Understanding Food Science and Technology. Thomson
4. Sumati R Mudambi, Rajagopal M V. Fundamentals of Food and Nutrition. New Age International Publishers

5. Shubhangini A Joshi . Nutrition and Dietics. Tata McGraw Hill Education Private Limited
6. Vijaya Khader. Text Book of Food Science and Technology. ICAR
7. Swaminathan M. Food Science Chemistry and Experimental Foods. Bappco
8. Journals: Indian Food Industry

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COURSE CODE NO.: FTB 102: PRINCIPLES OF FOOD SCIENCE(CORE-2 MAJOR II)**Course Objective:**

The student will develop an understanding of world food production, principles of consumerism, the importance of food safety and procedures in processing, packaging, and storage of foods, and career opportunities in the food science and technology field.

Course Outcome:

Upon successful completion of this course, students will:

- 1- Identify the principles of food science related to food production, quality, safety, nutrition, and distribution.
- 2- Describe common and emerging technologies in food science.
- 3- Explain how engineering, microbiology, and chemistry are applied in food production and processing systems.
- 4- Describe food safety procedures in Indian production systems.
- 5- Demonstrate appropriate food handling/food safety procedures.
- 6- Explain nutrient composition and the link between nutrition and health.
- 7- Examine the dynamics of global food supply.

Unit I: Food dispersions:

Characteristics, sols, gels, pectin gels, colloidal sols, stabilization of colloidal system, syneresis, emulsions, properties of emulsions, formation of emulsion, emulsifying agent, food foams, formation stability and destruction of foam, application of colloidal chemistry to food preparation.

Unit II: Sensory evaluation of food:

Objectives, type of food panels, characteristics of panel member, layout of sensory evaluation laboratory, sensitivity tests, threshold value, paired comparison test, duo- trio test, triangle test, hedonic scale, chemical dimension of basic tastes, Amoore's classification of odorous compounds; Sherman and Szczniak classification of food texture.

Unit III: Growth of microorganisms in foods:

Food as a substrate for microorganism, factors affecting growth of microbes: pH, water activity, O-R potential, nutrient contents, inhibitory substance and biological structure.

Hurdle technology: Principles and applications, Hurdle effect in fermented foods, shelf stable products, intermediate moisture foods, application of hurdle technology.

Unit IV: Minimal processing:

Minimal processing of foods with thermal methods and non thermal methods-safety criteria in minimally processed foods-Minimal processing in practice-fruits and vegetables-seafood-effect on quality-Future developments

Ohmic heating and High Pressure processing: Principles, equipment and processing, effect on food.

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Unit V: Water disposal and sanitation:

Waste water; hardness of water, break point chlorination, physical and chemical of impurities; BOD, COD, waste water treatment, milk plant sanitation, CIP system, sanitizers used in food industry.

Packaging

Objectives of packaging, flexible packaging, properties of the following packaging materials-low density polyethylene, high density polyethylene, polypropylene, polyvinyl chloride, polyvinylidene chloride, ethylene vinyl alcohol, polystyrene, polyethylene terephthalate, nylon, ethylene vinyl acetate, ethylene acrylic acid, ethylene methacrylic acid, ionomers.

Suggestive Readings:

1. Coles R, McDowell D and Kirwan MJ, Food Packaging Technology, CRC Press, 2003
2. De S, Outlines of Dairy Technology, Oxford Publishers, 1980
3. Deman JM, Principles of Food Chemistry, 2nd ed. Van Nostrand Reinhold, NY 1990
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004
5. Jenkins WA and Harrington JP, Packaging Foods with Plastics, Technomic Publishing Company Inc., USA, 1991
6. Manay NS and Shadaksharaswamy M, Food-Facts and Principles, New Age International (P) Ltd. Publishers, New Delhi, 1987
7. Meyer LH, Food Chemistry, CBS Publication, New Delhi, 1987
8. Potter NH, Food Science, CBS Publication, New Delhi, 1998
9. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press, 2006
10. Ranganna S, Handbook of Analysis and Quality Control for Fruits and Vegetable Products, 2nd ed. TMH Education Pvt. Ltd, 1986

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COURSE CODE NO.: FTB 103: FOOD CHEMISTRY (MINOR-1)**Course Objective:**

The objective of the course is to provide the students with a deep understanding of how food components contributes to overall quality of foods; and to enable students to evaluate and explain how the highly complex nature of food may result in a multitude of desired and undesired reactions which are controlled by a variety of foods .

Course Outcome:

To enable the students to:

- 1.To understand the chemistry of foods - composition of food, role of each component and their interaction.
- 2.To understand the functional aspects of food components and to study their role in food processing.
- 3.To understand the chemistry of food components and their interactions.
- 4.To know about the role of enzymes and various processing treatments in food industry.
- 5.To understand the concept of new product development.

Unit I: Introduction to Food Chemistry: Definition, Composition of food

Water: Definition of water in food; Structure of water and ice; Types of water; Sorption phenomenon; Water activity and packaging; Water activity and shelf-life

Lipids: Classification of lipids ; Physical properties-melting point, softening point, specific gravity; refractive index, smoke, flash and fire point, turbidity point; Chemical properties-reichert meissel value, polenske value, iodine; value, peroxide value, saponification value; Effect of frying on fats ; Changes in fats and oils- rancidity, lipolysis, flavor reversion; Auto-oxidation and its prevention ; Technology of edible fats and oils- Refining, *Hydrogenation and; Interesterification, Fat Mimetic

Unit II: Proteins: Protein classification and structure; Nature of food proteins(plant and animal proteins); Properties of proteins (electrophoresis, sedimentation, amphoterism and; denaturation,); Functional properties of proteins eg. organoleptic, solubility, viscosity ,binding gelation / texturization , emulsification , foaming.

Carbohydrates: Classification (mono, oligo and poly saccharides); Structure of important polysaccharides (starch, glycogen, cellulose, pectin; hemicellulose, gums); Chemical reactions of carbohydrates –oxidation, reduction, with acid & alkali ; Modified celluloses and starches

Vitamins: Structure, Importance and Stability; Water soluble vitamins ; Fat soluble vitamins

Unit III: Flavour: Definition and basic tastes; Chemical structure and taste; Description of food flavours; Flavour enhancers

Minerals: Major and minor minerals; Metal uptake in canned foods; Toxic metals

Natural Food Pigments: Introduction and classification; Food pigments (chlorophyll, carotenoids, anthocyanins and flavonoids,beet pigments, caramel)

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Unit IV: Browning Reactions In Food: Enzymatic browning; Non – Enzymatic browning; Maillard reaction; Caramelization reaction; Ascorbic acid oxidation

Enzymes: Introduction, classification ; General characteristics; Enzymes in food processing; Industrial Uses of Enzymes ; Immobilized enzymes

Unit V: Physico-chemical and nutritional changes occurring during food processing treatments; Drying and dehydration; Irradiation; Freezing; Canning

New product development: Definition; Importance; Need of product development; Steps of product development-; Product development tools; Reasons for failure

Suggesting Readings:

- 1.Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York,1996
- 2.Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada,2002
- 3.Wong, Dominic WS, Food Enzymes, Chapman and Hall, New York, 1995
- 4.Potter,N.N.and Hotchkiss,J.H, Food Science, 5th Ed., Chapman & Hall,1995
- 5.DeMan, J.M., Principles of Food Chemistry, AVI, NewYork, 1980
- 2.deMan, John M., Principles of Food Chemistry ,3rd Ed., Springer 1999
- 3.Desrosier, Norman W. and Desrosier.,James N.,The technology of food preservation , 4th Ed., Westport, Conn. : AVI Pub. Co., 1977.
- 4.Fennema, Owen R, Food Chemistry, 3rd Ed., Marcell Dekker, New York,1996
- 5.Fuller, Gordon W, New Product Development From Concept to Marketplace,CRC Press,2004.
- 6.Whitehurst and Law, Enzymes in Food Technology, CRC Press, Canada,2002

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COURSE CODE NO.: FTB 104: FOOD ADULTERATION (GEC-1)**Course Objective:**

1. To provide theoretical basis of adulteration test of food products and learn adulteration testing methods of food through hands-on experience.
2. To provide hands-on training using the latest analysis techniques, instruments and methods to analyzed food samples

Course Outcome:

1. To introduce students to food safety and standardization act and quality control offoods.
2. To educate about common food adulterants and their detection.
3. To impart knowledge in the legislative aspects of adulteration.
4. To educate about standards and composition of foods and role of consumer

Unit – I

Food adulteration – Introduction of Food adulteration, definition; new adulterants in foods, Historical Food legislation in India; Central food laboratory, Municipal laboratories, Export inspection council laboratory, Central grain analysis laboratory, standards of weights and measures act, solvent extracted oil deoiled meal and edible flour order, export and quality control and inspection act and other acts and orders.

Unit – II

Food Safety and Standards Act 2006. vertical standards Vs horizontal standards
Food safety officer; powers, procedures, role of food analyst most important international laws; Codex alimentarius, FDA, USDA, FAO and WHO
Other International regulatory bodies like EFSA –European food safety authority Food standards of Australia and Newzealand , Soudi Arabia food regulations

Unit– III

Consumer protection; role of voluntary agencies such as, Agmark, I.S.I. Quality control laboratories of companies ,private testing laboratories, Quality control laboratories of consumer co-operatives,.

Unit-IV

Standardization of Foods; Definition, Standards of Quality, for cereals, starchy foods, spices and condiments, sweetening agents, meat and meat products, vinegar, sugar and confectionary, beverages-alcoholic and non alcoholic , carbonated water etc., Milk and milk products , oils and fats , Canned foods , fruits and vegetables products.

Unit-V

Food additives – classification, nature and characteristics and use of additives in foods such as antioxidants, chelating agents, coloring agents, curing agents, emulsions, flavors and flavor enhancers, flour improvers, humectants and anti caking agents, nutrient supplements, non-nutritive sweeteners, pH control agents, stabilizers and thickeners. Raising agents – types and their role in food processing., artificial colors Artificial flavors

Consumer education, consumer's problems rights and responsibilities, copra 1986, tips for wise purchasing, redressal measures how to give complaints and proforma of complaints

Suggesting Readings:

1. A first course in Food Analysis – A.Y. Sathe, New Age International (P) Ltd., 1999.
2. Food Safety, case studies – Ramesh. V. Bhat, NIN, 1992.

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COURSE CODE: FTB 105: MEDICAL DIAGNOSTICS (VOCATIONAL COURSE) (SEC-1)****Course Objective:**

The major objective of this paper is to give idea about detection of pathogens in clinical samples and different diagnostics methods used in pathological laboratories.

Course Learning Outcome:

Upon successful completion of the course, the student:-

1. Understand the importance and challenges in detecting pathogens.
2. Learn about the collection and transport of clinical samples.
3. Learn about different diagnostic methods.

Unit-I:

Types of Diseases- Bacterial (Tuberculosis, Cholera and Typhoid), Viral (Influenza, Herpes and HIV), Fungal (Aspergillosis, Blastomycosis and Candidiasis) and Protozoan (Malaria, Balantidiasis and Amoebiasis), Pathogenesis,

Unit-II:

Collection of clinical samples (Oral cavity, throat, Urine, Skin, Blood, CSF and feces) and their precautions

Methods of transport of clinical samples to laboratory and storage, Laboratory diagnosis of clinical samples

Unit-III:

Types of Culture Media, Preparation and use of culture media- PDA, SDA, Nutrient Agar, Blood Agar, Mac Conkey Agar, L-J media, and Differential media, selective and Enrichment media. Cultivation of clinical sample, Identification of Pathogenic Microorganisms by Gram's staining, Acid fast staining, Giemsa staining, Lacto-phenol Cotton Blue Staining,

Unit IV:

Biochemical methods- IMViC, TSIA, Oxides, catalase, Pathogenicity test: Blood Agar, Coagulase test, Fibrinolyses,, Serological Methods- Agglutination, ELISA, SEM, PCR, Electrophoresis.

Widal test, Khan's test, Blood grouping,

Unit V:

Antibiotic sensitivity test for Bacteria and Fungi, Determination of resistance/Sensitivity of bacteria using antibiotics disc diffusion method, Determination of MIC and LD50.

Reference Books:

- 1- Topley and Wilson's Microbiology and Microbial infections. 8 volumes 2005 10th edition
- 2- Color Atlas and Textbook of Diagnostic Microbiology: Elmer W Koneman -2006, 6 th edition
- 3- Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases-2004, 6th edition
- 4- Microbiology and Clinical Practice: Shanson-1999, 3rd edition
- 5- Immunology: Janis Kuby- 2003.

- 6- Basic Clinical Immunology. Fudenburg, Stites, Caldwell, Weils.
- 7- Control of Hospital Infection- A practical handbook (most recent edition)-2000,4th edition
- 8- Bailey and Scott's Diagnostic Microbiology.
- 9- Text book of Parasitology - Chatterjee K.D.
- 10- Microbiology in Clinical Practice Shanson D.C.
- 11- Text book of Parasitology – P.C.Beaver
- 12- Text book of microbiology –Ananthanarayan
- 13- Text book of microbiology – P. chakraborty
- 14- Text book of Parasitology – Damale & Karyakante
- 15- Mackie & MacCartney's Practical microbiology Further Reading
- 16- Mycology - Rippons
- 17- Essentials of Immunology- Roitt
- 18- Virology- Clinical Virology by Rich
- 19- Gradwohl's Clinical Laboratory Methods and Diagnosis.
- 20- Biochemical tests for the Identification of Medical Bacteria- MacFaddin JF
- 21- Manual of Clinical Microbiology- ASM press

Sude 

COURSE CODE NO.: FTB 106: HINDI (AEC-1)

सूचक (5) -

COURSE CODE NO.: FTB 107: ENGLISH (AEC-2)

Scd
①

SUBJECT: FOOD TECHNOLOGY (HONS) FIRST YEAR, CBCS SEMESTER-II
COURSE CODE NO.: FTB 201: TECHNOLOGY OF FOOD PRESERVATION
(*CORE-3 MAJOR III)

Course Objective:

The goal of this course is to provide students with a fundamental understanding of food preservation and food packaging techniques and to ensure students are technically ready for the food industry through a practical, problem-solving approach, Reuse, disposability and printing of packaging.
To study the importance microorganisms in food preservation
To introduce the basics of various food processing and preservation technologies

Course Outcome:

To enable the students to:

1. Understand scientific principles underlying food storage and preservation.
2. Learn the principles and processes of different methods of food preservation.
3. Develop skills and techniques in food preservation for ensuring safety, conservation of nutrients, and palatability.

Unit I- Food Microbiology

Principles of Food Preservation, microorganisms associated with foods- bacteria, yeast and mold, ~~hpane~~ of bacteria, yeast and molds in foods. Classification of microorganisms based on temperature, pH, water activity, nutrient and oxygen requirements, typical growth curve of micro-organisms. Classification of food based on pH, Food infection, food intoxication, definition of shelf life, perishable foods, semi perishable foods, shelf stable foods.

Unit II-Food Preservation by Low temperature

Freezing and Refrigeration :Introduction to refrigeration, cool storage and freezing, definition, principle of freezing, freezing curve, changes occurring during freezing, types of freezing i.e. slow freezing, quick freezing, introduction to thawing, changes during thawing and its effect on food.

Unit III Food Preservation by high temperature

Thermal Processing- Commercial heat preservation methods: Sterilization, commercialsterilization, Pasteurization, and blanching.


Unit IV Food Preservation by Moisture control

Drying and Dehydration - Definition, drying as a means of preservation, differences between sun drying and dehydration (i.e. mechanical drying), heat and mass transfer, factors affecting rate of drying, normal drying curve, names of types of driers used in the food industry.

Evaporation – Definition, factors affecting evaporation, names of evaporators used in food industry.

Unit V Food Preservation by Irradiation

Introduction, units of radiation, kinds of ionizing radiations used in food irradiation, mechanism of action, uses of radiation processing in food industry, concept of cold sterilization.

Sudh 

Suggesting Readings:

1. B. Srilakshmi, Food science, New Age Publishers,2002
2. Meyer, Food Chemistry, New Age,2004
3. Bawa. A.S, O.P Chauhan etal. Food Science. New India Publishing agency, 2013
4. Frazier WC and Westhoff DC, Food Microbiology, TMH Publication, New Delhi, 2004

Sudh (S) -

COURSE CODE NO.: FTB 202: FOOD PROCESSING TECHNOLOGY(CORE-4 MAJOR IV)**Course Objective:**

- 1.The course will give students an understanding of the advanced principles of food processing and how to choose a method of processing in relation to food composition.
- 2.Occupational health and safety, food safety and food quality aspects of food and beverage processing are an integral component of all coursework.
- 3.This course has an advanced food processing component and overview conventional and emerging novel food processing methods available to maximize the nutrition levels in the making of foods that are safe, high quality and with maximum shelf life and convenience.
- 4.The course explores various advanced methods of food processing technology available in India.
- 5.Introduce different engineering approaches for processing of food products
- 6.To understand the food property required in optimal food processing
- 7.Minimal loss of food quality of developing new food or food products.
- 8.Engineering processing approaches for good food quality or food safety
- 9.To develop the optimal processing condition for transformed of foods
10. To apply standard processing conditions for good food products

Course Outcome:

To impart basic knowledge of:

- 1.After the completion of this course, the student will be able to
- 2.Understand the principle of non-thermal modes of food processing, use thermal processing for minimal nutrition losses, obtain higher nutritional quantity during food processing, and understand the application and limitations of non-thermal food processing.
- 3.The student will be able to understand the importance of food quality standards, use recommended food quality guidelines or standards for food safety, assess foods for checking quality, understand the mechanisms from prevention to control of food hazards
- 4.The student will be able to explain the nutritional significance during food processing, summarize techniques and equipment used in food processing, appreciate the importance of processed foods for world, apply recommendation and standards of different foods at industrial production

Unit I: Cold preservation:

Freezing: requirements of refrigerated storage - controlled low temperature, air circulation and humidity; changes in food during refrigerated storage, progressive freezing; changes during freezing - concentration effect and ice crystal damage, freezer burn. Refrigeration load, factors determining freezing rate-food composition and non compositional influences


Freezing- Mechanism and freezers:

Freezing methods -direct and indirect, still air sharp freezer, blast freezer, fluidized freezer, plate freezer, spiral freezer and cryogenic freezing.

Unit II: Dehydration:

Normal drying curve , effect of food properties on dehydration , change in food during drying , drying methods and equipments air convection dryer, tray dryer, tunnel dryer ,continuous belt dryer , fluidized bed dryer, spray dryer, drum dryer, vacuum dryer, freeze drying ,foam mat drying.

Food Irradiation and Microwave Heating:

Scudc 

Ionizing radiation and sources; unit of radiations, direct and indirect radiation effects; safety and wholesomeness of irradiated food; Microwave heating and application.

Unit III: Packaging of foods:

Packaging: Properties of packaging material, factors determining the packaging requirements of various foods and brief description of packaging of frozen products, dried products, fats and oils and thermally processed foods

Unit IV: Material handling

Elementary concept of material handling in food industry; equipment and functioning of belt conveyor, screw conveyor, bucket elevator and pneumatic conveyor.

Unit V: Thermal processing

Introduction, classification of Thermal Processes, Principles of thermal processing, Thermal resistance of microorganisms, Thermal Death Time, Lethality concept, characterization of heat penetration data, Thermal process Calculations

Separation processes

Principles and methods of: distillation, extraction, washing, filtration, sedimentation, sieving and centrifugation

Suggesting Readings

1. Desrosier NW and Desrosier JN, The Technology of Food Preservation, CBS Publication, New Delhi, 1998
2. Paine FA and Paine HY, Handbook of Food Packaging, Thomson Press India Pvt Ltd, New Delhi- 1992
3. Potter NH, Food Science, CBS Publication, New Delhi, 1998
4. Ramaswamy H and Marcott M, Food Processing Principles and Applications CRC Press, 2006
5. Rao PG, Fundamentals of Food Engineering, PHI Learning Pvt Ltd, New Delhi, 2010
6. Toledo Romeo T, Fundamentals of Food Process Engineering, Aspen Publishers, 1999

Sudh 

COURSE CODE NO.: FTB 203: FUNCTIONAL FOODS AND NUTRACEUTICALS (MINOR-2)**Course Objective:**

1. The objective of this course is to discuss several classes of functional foods and nutraceuticals and identify the specific compounds that have health promoting properties.
2. Discussion will also focus on the structure-function/dynamic-mechanisms relationship with both human and animal systems leading to the observed benefits.

Course Outcome:

To enable the students to:

1. Develop an understanding of the concept and classification of functional foods and nutraceuticals.
2. Appreciate of the potential health benefits of functional foods and nutraceuticals.
3. Highlight the importance of safety and efficacy of functional foods and ingredients.
4. To develop comprehensive understanding of different nutraceuticals and functional foods
5. To understand the potential of various functional foods in promoting human health

Unit I: Introduction:

Background, status of nutraceuticals and functional food market, definitions, difference between nutraceuticals and functional foods, types of nutraceutical compounds and their health benefits, current scenario.

Unit II: Nutraceuticals:

Types of nutraceutical compounds – Phytochemicals, phytosterols and other bioactive compounds, peptides and proteins, carbohydrates (dietary fibers, oligosaccharides and resistant starch), prebiotics, probiotics and symbiotic, lipids (Conjugated Linoleic Acid, omega-3 fatty acids, fat replacers), vitamins and minerals; their sources and role in promoting human health.

Unit III: Functional Foods:

Cereal and cereal products, Milk and milk products, egg, oils, meat and products, sea foods, nuts and oilseeds, functional fruits and vegetables, herbs and spices, beverages (tea, wine etc), Fermented foods – their health benefits and role in conditions like cardiovascular diseases, hypertension, diabetes etc.

Unit IV:


Future prospects of functional foods and nutraceuticals and their potential for use in improving health; Development in processing of functional foods; Formulation and fabrication of functional foods.

Unit V: Legal Aspects:

Stability of nutraceuticals; Safety, Consumer acceptance and assessment of health claims, labeling, marketing and regulatory issues related to nutraceuticals and functional foods

Suggesting readings:

1. Wildman REC, Handbook of Nutraceutical and Functional Foods, CRC Press 2001



2. Ghosh D et al, Innovations in Healthy and Functional Foods, CRC Press 2012
3. Pathak YV, Handbook of nutraceuticals Volume 2, CRC Press 2011
4. Various journals of food technology, food science and allied subjects.
5. Ranganna S.1986. Handbook of analysis and quality control for fruits and vegetable products,Tata McGraw-Hill publishing company limited, second edition

Sudhakar (S) -

COURSE CODE NO.: FTB 204: INTELLECTUAL PROPERTY RIGHTS (GEC-2)**Course Objective:**

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
3. To disseminate knowledge on copyrights and its related rights and registration aspects
4. To disseminate knowledge on trademarks and registration aspects
5. To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects
6. To aware about current trends in IPR and Govt. steps in fostering IPR

Course Outcome:

1. The students once they complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works
2. During their research career, information in patent documents provides useful insight on novelty of their idea from state-of-the art search. This provide further way for developing their idea or innovations
3. Pave the way for the students to catch up Intellectual Property (IP) as a career option:
 - a. R&D IP Counsel
 - b. Government Jobs – Patent Examiner
 - c. Private Jobs
 - d. Patent agent Patent agent and Trademark agent
 - e. Entrepreneur

Unit I: Introduction to intellectual property right (IPR):

Concept and kinds; Economic importance; IPR in India and world: Genesis and scope, some important examples. IPR and WTO (TRIPS, WIPO).

Unit II: Patents:

Objectives, Rights, Patent Act 1970 and its amendments; Procedure of obtaining patents; working of patents; Infringement

Copyright: Introduction, Works Infringement. Protected under copyright law, Rights, Transfer
Trademarks: Objectives, Types, Rights, Protection of goodwill, Infringement, Passing off, Defenses', Domain name.

Unit III: Geographical Indications:

Objectives, Justification, International Position, Multilateral Treaties, National Level; Indian Position;

Protection of Traditional Knowledge: Objective, Concept of Traditional Knowledge, Holders, Issues concerning, Bio-Propecting and Bio-Piracy, Alternative ways, Protect ability, need for a Sui-Generis regime, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library.

Unit IV: Industrial Designs:

Objectives, Rights, Assignments, Infringements, Defenses' of Design Infringement

Protection of Plant Varieties: Plant Varieties Protection-Objectives, Justification, International Position, Plant varieties protection in India; Rights of farmers, Breeders and Researchers; National gene bank, Benefit sharing; Protection of Plant Varieties and Farmers' Rights Act, 2001;

Unit V: Information Technology Related Intellectual Property Rights:

Computer Software and Intellectual Property, Database and Data Protection, Protection of Semi-conductor chips, Domain Name Protection

Biotechnology and Intellectual Property Rights: Patenting Biotech Inventions: Objective, Applications, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions.

Suggested Readings

- 1) N.S. Gopalakrishnan & T.G. Agitha, (2009) Principles of Intellectual Property Eastern Book Company, Lucknow.
- 2) Kerly's Law of Trade Marks and Trade Names (14th Edition) Thomson, Sweet & Maxweel.
- 3) Ajit Parulekar and Sarita D' Souza, (2006) Indian Patents Law – Legal & Business Implications; Macmillan India Ltd.
- 4) B.L.Wadehra (2000) Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications; Universal law Publishing Pvt. Ltd., India.
- 5) P. Narayanan (2010) Law of Copyright and Industrial Designs; Eastern law House, Delhi.

Sude (D) -

**COURSE CODE NO.: FTB 205: FIELD PROJECT/INTERNSHIP/
COMMUNITY ENGAGEMENT AND SERVICES-I**

Course Objective:

1. Field project/Internships/Community engagements are designed to expand the depth and breadth of academic learning for you in your particular areas of study.
2. It is an opportunity for you to receive experience in applying theories learned in the classroom to specific experiences in the community and work world.
3. An internship can also heighten your awareness of community issues, motivate you to create opportunities, embrace new ideas, and give direction to positive change.
4. A successful internship can give you valuable information in making decisions about the direction of future studies or employment.
5. An internship is an opportunity to not only use and develop industry-related knowledge and skills, but also to enhance some of the skills that are transferable to any professional work setting.
6. This internship may be your first introduction to the world of work, or maybe you have been exposed to professionalism many times before.
7. No matter where your skills and understanding of professionalism lie, your internship is a chance to develop them even further.

Course Outcome:

By the end of the internship, our hope is that you will have:

- 1- Linked academic theory to practice in your discipline;
- 2- Applied your knowledge, skills, experience to a work environment;
- 3- Acquired new learning through challenging and meaningful activities;
- 4- Reflected on the content and process of the learning experience;
- 5- Advocated for your own learning in alignment with internship goals;
- 6- Demonstrated professional skills in the workplace;
- 7- Built and maintained positive professional relationships;
- 8- Demonstrated awareness of community and/or organizational issues;
- 9- Identified, clarified and/or confirmed professional direction as it relates to your academic studies and future career path;
- 10- Developed self-understanding, self-discipline, maturity and confidence;
- 11- Developed strong networking/mentoring relationships.

Review of the state of research in a particular problem involving food, and development of hypothesis, Planning and conducting the experiment, Periodic analysis of data and preparation of report, Final preparation of project report as dissertation to be submitted in partial fulfillment of B.Sc. Programme.



COURSE CODE NO.: FTB 206: ENVIRONMENT EDUCATION (AEC-3)

Sum (S) -

COURSE CODE NO.: FTB 207: YOGA AND MEDITATION (AEC-4)

Swati



**B. Sc. (Hons) FOUR YEARS (EIGHT SEMESTERS), CBCS SCHEME
SUBJECT: FOOD TECHNOLOGY (HONS) SECOND YEAR, SEMESTER-IIIrd**

COURSE CODE NO.: FTB 301: FOOD MICROBIOLOGY (CORE-5 Major-V)

Course Objective:

- To know the important genera of microorganisms associated with food and their characteristics.
- To understand the role of microbes in fermentation, spoilage and food borne diseases.

Course Outcome:

CO1: Illustrate the role of microorganisms in food safety

CO2: Cultivate and enumerate microorganisms from various food samples

CO3: Compare various physical and chemical methods used in the control of microorganisms

UNIT I: Introduction to Food Microbiology:

History and Development of Food Microbiology, Definition and Scope of food microbiology; Inter-relationship of microbiology with other sciences

Characteristics of Microorganisms in Food: Types of microorganisms associated with food, their morphology and structure; Significance of spores in food microbiology

UNIT II: Microbial Growth in Food:

Bacterial growth curve and microbial growth in food; Factors affecting the growth of microorganisms in food

Microbial Food Spoilage: Sources of Microorganisms in foods,; Some important food spoilage microorganisms; Spoilage of specific food groups- Milk and dairy products, Meat, poultry and sea foods, Cereal and cereal products, Fruits and vegetables and Canned products

UNIT III: Food Fermentations:

Fermentation –definition and types, Microorganisms used in food fermentations; Dairy Fermentations-starter cultures and their types , concept of probiotics, Fermented Foods-types, methods of manufacture for vinegar, sauerkraut, tempeh, miso , soya sauce , beer, wine and traditional Indian foods

Food borne Diseases: Types – food borne infections, foodborne intoxications and toxin-infections, Common and Recent Examples

UNIT IV: Cultivation of Micro-organisms:

Pure culture technique, Methods of isolation and cultivation, Enumeration of Microorganisms-qualitative and quantitative

UNIT V. Control of Microorganisms in Foods:

Principles and methods of preservation; Physical Methods of Food Preservation- Dehydration, Freezing, Cool Storage, Heat Treatment (esp. thermo bacteriology), Irradiation, Bio-preservatives Bacteriocins; Introduction to Hurdle concept and Non Thermal methods

Trends in Food Microbiology: Rapid Methods of Detection, Recent Advances

Recommended Readings

- 1) Frazier William C and Westhoff, Dennis C. Food Microbiology, TMH, New Delhi, 2004
- 2) Jay, James M. Modern Food Microbiology, CBS Publication, New Delhi, 2000
- 3) Garbutt, John. Essentials of Food Microbiology, Arnold, London, 1997
- 4) Pelczar MJ, Chan E.C.S and Krieg, Noel R. Microbiology, 5th Ed., TMH, NewDelhi, 1993

Sude 

FOOD MICROBIOLOGY

Practicals:

1. Introduction to the Basic Microbiology Laboratory Practises and Equipments
2. Functioning and use of compound microscope
3. Cleaning and sterilization of glassware
4. Preparation and sterilization of nutrient broth
5. Cultivation and sub-culturing of microbes
6. Preparation of slant, stab and plates using nutrient agar
7. Morphological study of bacteria and fungi using permanent slides
8. Simple staining
9. Gram's staining
10. Standard Plate Count Method

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COURSE CODE NO.: FTB 302: FOOD AND NUTRITION (CORE-6 Major-VI)**Course Objective:**

This course will enable the student to:

1. Gain knowledge on the functions, food sources and requirements of essential nutrients.
2. Learn about dietary reference intakes, RDA and dietary values.
3. Understand the adverse effects of inadequate intake of nutrients.
4. Apply the knowledge in maintenance of good health for the individual and community.

Course Outcome:

1. Understand the relationship between food, nutrition and health.
2. Understand the functions of food.
3. Learn about various food groups and balanced diet.
4. Understand digestion, absorption and function of various nutrients and their sources

UNIT I: Introduction To Food And Nutrition

Basic terms used in study of food and nutrition, BMI and Nutritional Status, Understanding relationship between food, nutrition and health.

UNIT II: Balanced Diet

Functions of food-physiological; psychological and social, Concept of Balanced Diet, Food Groups, Food Pyramid

UNIT III: Nutrients

Classification, digestion, functions, dietary sources, RDA, clinical manifestations of deficiency and excess and factors affecting absorption of the following in brief:

- Energy
- Carbohydrates, lipids and proteins
- Fat soluble vitamins-A, D, E and K
- Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, foliate, vitamin B12 and vitamin C
- Minerals – calcium, iron, iodine, fluorine, copper and zinc

UNIT IV: Concepts of Meal Planning

Factors affecting meal planning, understanding specific considerations for planning meal for different groups of people

UNIT V: Methods of Cooking

Dry, moist, frying and microwave cooking, Advantages, disadvantages and the effect of various methods of cooking on foods

Nutritional Labeling: Importance, global trends, codex guidelines, nutritional labeling in India, FSSAI guidelines.

Suggesting Readings:

1. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd Edition. Oxford and IBH Publishing Co. Pvt. Ltd.
2. Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd.
3. Srilakshmi, (2005), Dietetics, Revised 5th edition. New Age International Ltd.
4. Wardlaw MG, Paul M Insel Mosby 1996). Perspectives in Nutrition, Third Edition.
5. Codex Guidelines on Nutrition Labelling (CAC/GL 2_1985) (Rev.1_1993). Rome, Food and Agriculture Organisation of the United Nations / World Health Organisation, 1993.

6. Food Safety and Standards Authority of India portal, Government of India
7. Gopalan, C., (1990). NIN, ICMR. Nutritive Value of Indian Foods.
8. Seth V, Singh K (2005). Diet planning through the Life Cycle: Part 1. Normal Nutrition. A Practical Manual, Fourth edition, Elite Publishing House Pvt Ltd.

FOOD AND NUTRITION

Practicals:

1. Identification of food sources for various nutrients using food composition tables.
2. Record diet of self using 24 hour dietary recall and its nutritional analysis.
3. Introduction to meal planning, concept of food exchange system.
4. Planning of meals for adults of different activity levels for various income groups.
5. Planning of nutritious snacks for different age and income groups.
6. Preparation of nutritious snacks using various methods of cooking.
7. Nutritional labeling of food products.
8. Estimation of BMI and other nutritional status parameters.

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COURSE CODE NO.: FTB: 303: BIOLOGY (MINOR-3)**Course Objective:**

Define basic biological concepts and processes. Describe levels of organization and related functions in plants and animals. Identify the characteristics and basic needs of living organisms. Explain the processes of growth and development in individuals and populations.

Course Outcome:

The students will be able to:

1. Read, understand, and critically interpret the primary biological literature
2. Design, conduct analyse and communicate biological research
3. Will be able to explain the organic evolution and its principles and mechanism

UNIT: I

Cell structure and function in prokaryotes and eukaryotes Properties, classification and function of carbohydrates, proteins, nucleic acids and lipids, Study of blood components and body fluids

UNIT: II

Principles of taxonomy and system of classification of angiosperms (Bentham and Hooker) and Gymnosperms (chamberlain) Origin of life and Geological time scale. Mechanical and conducting tissue systems in plants

UNIT: III

Acid, base, and buffers, Beer and Lambert's law, colorimetry and spectrophotometry, principles methods and application of chromatography and electrophoresis

UNIT: IV

Basics of microbiology and concept of pure culture technique microscopy principle and types of microscopy Broad classification of microorganisms - Immunity and immune system, Structure and Interaction of antigens and antibody, ELISA, western blot, and Southern blot techniques.

UNIT: V

Genetic materials – structural organization and function; Mendelian principles, sex linkage and sex determination Recombinant DNA technology and its applications in health, and diseases

Suggestive Readings

1. A Dictionary of ecology – Michael Alleby
2. Encyclopedia of evolution – Stanley rice
3. Desk encyclopedia of microbiology – Moselio

Sum 

COURSE CODE NO.: FTB: 304: FOOD ADDITIVES (GEC-3)

Course Objective:

1. To describe various food additives and contaminants.
2. To illustrate the functionality of food additives.
3. To exemplify the limits of permissible additives in processed foods

Course Outcome:

After the completion of the course, the students will be able to:

1. Understand the role of food additives in manufacturing of food products.
2. Have the knowledge regarding permissible additives and their limits in the processed food
3. Perceive the contaminants from various sources.
4. Comprehend the effects of contaminants on human health.

UNIT-I

Additives in food processing and preservation: Classification, need, properties, functions and safety, quality evaluation of additives, Food labeling, Laws and regulations for food additives

UNIT-II

Chemistry, uses and functions: Chemical preservative, bio-preservatives, fortification, antioxidants, emulsifiers, humectants, stabilizers, chelating agents, pH control agents and acidulants, texturizing agents, plasticizers, flavor enhancers, enzymes, coloring agents, sweeteners, flavoring agents

UNIT-III

Food contaminants: biological, chemical, physical and environmental contaminants, Inorganic and organometallic food contaminants, Sources and their impact on human health

UNIT-IV

Food contaminants from industrial wastes: Heavy metals, polychlorinated polyphenyls, dioxins, Toxicants formed during food processing polycyclic aromatic hydrocarbons, nitrosamines, veterinary drug residues and melamine contaminations, Pesticide residues in food


UNIT-V

Their importance and utilization, Flavoring agents and related substances, clarifying agents, Description of generally recommended as safe (GRAS) food additives.

Use of additives in bakery, fruits, vegetables, milk and meat products, Determination of adulteration in milk, cereals, oils & fats, spices.

Books Recommended:

1. Food Chemistry, O.R.Fennema
2. Food Chemistry, Belitz, Grosch
3. Food Facts & Principles by Shakuntala Manay N & Shadoksharaswamy N, 1996, New Age, World Publishers.

Seal 

**COURSE CODE NO.: FTB: 305: NURSERY AND GARDENING
(VOCATIONAL COURSE) (SEC-II)**

Course Objective:

1. Know what the attributes of high-quality stock are.
2. Understand how nursery culture is based on the natural growth cycle of trees and why this is important for post-planting performance.
3. Know the phases of nursery culture including, sowing, control of shoot and root morphology, dormancy induction, lifting, storage, and shipping.
4. It is possible to grow and maintain a large number of plants per unit area.
5. Small and expensive hybrid seeds can be raised more effectively due to better care and management.
6. When seeds are sown in seedbeds, their germination percentage increases, and the vigour of the seedlings also improves.
7. The management of seedlings can be done in a better way with minimum care, cost, and maintenance as the nursery area is small.
8. Manipulation of growing conditions for plants becomes easy.

Course Outcome:

1. Better and uniform crop growth can be obtained in the main field by selecting vigorous and healthy seedlings.
2. Off-season sowing of seeds becomes possible, which ultimately results in fetching more returns.
3. The seed requirement of nursery-raised crops is less as compared to direct seed sowing of the same crop due to better management.
4. Sowing seeds in a nursery allows additional time for doing preparatory tillage in the main plot. Harvesting of the previous crop can also be prolonged if needed.
5. Management of insect pests, diseases, and weeds is easy in a nursery

UNIT I: Nursery:

Definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

UNIT II: Seed:

Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, genetic erosion - Seed production technology- seed testing and certification.

UNIT III: Vegetative propagation:

Air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium, and planting of cuttings - Hardening of plants - greenhouse - mist chamber, shed root, shade house, and glasshouse.

UNIT IV: Gardening:

Definition, objectives, and scope - different types of gardening - landscape and home gardening parks and its components - plant materials and design - computer applications in landscaping- Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.

UNIT V:

Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of Different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures;

Seed 

Suggested Readings

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
5. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
6. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.

Seed ①

COURSE CODE NO.: FTB 306:

(AEC-V)

Side ✓

COURSE CODE NO.: FTB 307:

(AEC-VI)

Seed (D)

**B. Sc. (Hons) FOUR YEARS (EIGHT SEMESTERS), CBCS SCHEME (NEP-2020)
SUBJECT: FOOD TECHNOLOGY (HONS) SECOND YEAR, CBCS SCHEME
SEMESTER-IV**

**COURSE CODE NO.: FTB 401: TECHNOLOGY OF FRUITS, VEGETABLES AND PLANTATION
CROP (CORE-7 Major VII)**

Course Objective:

1. To provide technical and scientific cultivation practices of different fruit and plantation crops.
2. To provide field knowledge and acquaint the students with practical field

Course Outcome:

1. To impart knowledge of different methods of fruits and vegetable processing.
2. To learn about processing of various spices, tea, coffee and cocoa.

Unit I: Introduction:

Importance of fruits and vegetable, history and need of preservation, reasons of spoilage, method of preservation (short & long term).

Canning and Bottling of Fruits and Vegetables: Selection of fruits and vegetables, process of canning, factors affecting the process- time and temperature, containers of packing, lacquering, syrups and brines for canning, spoilage in cannedfoods.

Unit II: Fruits Beverages:

Introduction, Processing of fruit juices (selection, juice extraction, deaeration, straining, filtration and clarification), preservation of fruit juices (pasteurization, chemically preserved with sugars, freezing, drying, tetra-packing, carbonation), processing of squashes, cordials, nectars, concentrates and powder

Unit III: Jams, Jellies and Marmalades:

Introduction, Jam: Constituents, selection of fruits, processing & technology, Jelly: Essential constituents (Role of pectin, ratio), Theory of jelly formation, Processing & technology, defects in jelly, Marmalade : Types, processing & technology, defects.

Pickles, Chutneys and Sauces: Processing, Types, Causes of spoilage in pickling

Unit IV Tomato Products:

Selection of tomatoes, pulping& processing of tomato juice, tomato puree, paste, ketchup, sauce and soup

Dehydration of Foods and Vegetables: Sun drying & mechanical dehydration, process variation for fruits and vegetables, packing and storage

Unit V: Spices:

Processing and properties of major and minor spices, essential oils & oleoresins, adulteration
Tea, Coffee and Cocoa: Processing, Variety and Products

Suggesting Readings:

1. Girdharilal, Siddappaa, G.S and Tandon, G.L.1998. Preservation of fruits & Vegetables,ICAR, New Delhi
2. W B Crusess.2004. Commercial Unit and Vegetable Products, W.V. Special Indian Edition, Pub: Agrobios India
3. Manay, S. & Shadaksharaswami, M.2004. Foods: Facts and Principles, New Age Publishers



4. Ranganna S.1986. Handbook of analysis and quality control for fruits and vegetable products, Tata Mc Graw-Hill publishing company limited, Second edition.
5. Srivastava, R.P. and Kumar, S. 2006 . Fruits and Vegetables Preservation- Principles and Practices. 3rd Ed. International Book Distributing Co.

TECHNOLOGY OF FRUITS, VEGETABLES AND PLANTATION CROPS Practical's:

1. Estimation of total soluble solids (TSS).
2. Estimation of pH and acidity of products.
3. Estimation of brix: acidity ratio
4. Estimation of ascorbic acid and effect of heat treatment on it.
5. To study the steps of can making process.
6. Preparation and evaluation of pectin products.
7. Adulteration of spices.
8. Dehydration of fruits and vegetables.
9. Rehydration of fruits and vegetables.

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**COURSE CODE NO.: FTB 402: TECHNOLOGY OF DAIRY AND SEA FOOD
(CORE- 8, Major-VIII)**

Course Objective:

1. To illustrate the technologies of processing of milk and milk products.
2. To describe the different physico-thermal properties and their applications.
3. To elucidate the thermal processing of milk and quality changes therein.
4. To explain the hygiene and sanitation practices in milk plant

Course Outcome:

After the completion of the course, the students will be able to:

1. Understand the processes related to storage, processing and distribution of milk and milk Products.
2. Perceive the different properties of milk and milk products.
3. Apprehend the thermal processing of milk.
4. Grasp the technology of fat rich dairy products.
5. Comprehend the technology of condensed milk, dried milk, cheese, yoghurt and indigenous products will be understood.
6. Have knowledge regarding hygiene and sanitation practices in the milk and milk products industry.

Unit I: Introduction:

Status of fishery industry in India

Chilling and Freezing of fish: Relationship between chilling and storage life, MAP, general aspects of freezing, freezing systems (air blast freezing, plate or contact freezing sprayer immersion freezing, freezing on board, onshore processing, changes in quality in chilled and frozen storage, thawing.

Unit II: Fish Curing and Smoking:

Drying and salting of fish, water activity and shelf-life, salting process, salting methods (brining, pickling, kench curing, Gaspé curing), types of salts, dried and salted fish products- pindang, fish wood, dried shrimp; Preservation by smoking, smoke production, smoke components, quality, safety and nutritive value of smoked fish, processing and equipment, pre-smoking processes, smoking process control. Traditional chimney kiln, modern mechanical fish smoking kiln, examples of smoked and dried products

Canning of fish: Principles of canning, classification based on pH groupings, effect of heat processing on fish, storage of canned fish, pre-process operations, post process operations, cannery operations for specific canned products. (Tuna, Mackerel, Sardine).

Unit III: Fishery by-products:

Surimi- Introduction, fish muscle proteins, the surimi process, traditional and modern surimi production lines, quality of surimi products, comparison of surimi and fish mince products.

Fish protein concentrates (FPC), fish protein extracts (FPE), fish protein hydrolysis (FPH)

Fermented fish: Flowchart of Indigenous products- Fish sauce and Paste Concept of other Sea foods: Crabs, lobsters, prawns, shrimps, shell- fish.

Seal 

Unit IV: Physical properties of milk:

Color, taste, pH and buffering capacity, refractive index, viscosity, surface tension, freezing, boiling point, specific heat, OR, electrical conductivity.

Lactose: Lactose (alpha and beta forms and their differences)Significances of lactose in dairy industry.

Milk fat: Composition and structure, factors affecting melting point, boiling point, solubility and Refractive Index, fat constants (saponification value, iodine value, RM value, Polenske value, peroxide value), Chemical reactions of fat (hydrolysis, auto-oxidation), condition favouring auto-oxidation, prevention, measurement of auto-oxidation

Unit V: Protein and Enzymes

General structure, amphoteric nature, difference between casein and serum protein, different types of casein (acid and rennet), uses of casein, fractionation of protein

Enzymes- catalase, alkaline phosphatase, lipases and proteases

Market milk industry and milk products: Systems of collection of milk Reception, Platform testing, various stages of processing:

- Filtration, Clarification
- Homogenization
- Pasteurization

Description and working of clarifier, cream separator, homogenizer and plate heat exchanger. Flow diagram of following milk products:

Butter, ghee, flavored milk, yoghurt, dahi, shrikhand, ice-cream, condensed milk, milk powder, hanna, paneer, cheese (cheddar).

Recommended Readings

1. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford.2007.
2. Hall GM, Fish Processing Technology, VCH Publishers Inc., NY, 1992
3. Sen DP, Advances in Fish Processing Technology, Allied Publishers Pvt. Limited2005
4. Shahidi F and Botta JR, Seafoods: Chemistry, Processing, Technology and Quality,Blackie Academic & Professional,London,1994
5. Webb and Johnson, Fundamentals of Dairy Chemistry, 3rd ed., CBS Publishers, New Delhi 1988

TECHNOLOGY OF DAIRY AND SEAFOOD**Practicals:**

- 2 To perform platform tests in milk. (Acidity, COB,MBRT, specific gravity, SNF)
- 3 To estimate milk protein by Folin method.
- 4 To estimate milk fat by Gerber method.
- 5 Preparation of flavoured milk/
- 6 Pasteurization of milk
- 7 To prepare casein and calculate its yield.
- 8 Quality evaluation of fish/prawn.
- 9 Subjective evaluation of Fresh Fish.
- 10 Cut out examination of canned fish.(Sardine, Mackerel, Tuna)
- 11 Fish product formulation/canning.

**COURSE CODE NO.: FTB 403: FOOD CHEMISTRY & ANALYTICAL INSTRUMENTATION
(MINOR-4)****Course objective:**

The objective of the course is to impart

1. Knowledge to students on principles and techniques of food analysis by using physical, chemical, biological and instrumental methods
2. To apply their knowledge and skills acquired to solve real-world problems associated with food analysis.

Course Outcome:

1. To educate students about the analysis of various foods and their standardization
2. To teach about sampling and preparation in food analysis.
3. To teach about physical and chemical methods, used for analysis of foods, such as, cereals, milk and milk products, fats and oils, food additives.

Unit I Carbohydrates:

Classification, properties and reactions of 1.Monosaccharides: Glucose & Fructose, 2. Oligosaccharides: Maltose, lactose, Sucrose- properties- crystallization and inversion, 3. Polysaccharides: starch: components of starch, gelatization, retrogradation, modified starch. Cellulose, hemicellulose, pectic substances, gums, dietary fiber

Unit II Proteins:

Introduction to food protein, structure of protein, classification of Proteins, amino acids, physico-chemical properties, denaturation, reactions, protein determination **Lipids:** Classification, fatty acids, saturated, unsaturated, polyunsaturated fatty acids, chemical properties, reactions, rancidity, auto-oxidation, antioxidants.

Unit III Water:

Introduction, physical & chemical properties of water, moisture in foods, methods of moisture determination, hydrogen bonding, Free & bound water

Pigments: Properties and Occurrence: Chlorophyll, Carotenoids, Flavanoids, Anthocyanins, Anthoxanthins, Myoglobin.

Enzymes: Introduction, Definition, Occurrence, Classification, Properties of Enzymes- Specificity, Factors affecting enzyme activity, Enzymes in food Industry.

Colloids: Colloidal chemistry, Properties of solutions, Sols & Suspensions, Food colloids.

Emulsions: Emulsion, Types, Emulsifying Agents

Unit IV: Instrumentation:

Calorimetry: Principles, Beer-Lambert's Law, Techniques and Instrumentation, Flurimetry.

Spectrophotometry: Principles, Instrumentation, Parts of Spectrophotometer Atomic Absorption Spectrophotometry

Unit V Chromatography:

Classification- Adsorption chromatography, Partition chromatography, Ion exchange, Paper chromatography, Column chromatography, Thin layer chromatography, Gas chromatography, High Pressure Liquid Chromatography. GCMS

Suggesting Readings:

1. Ranganna S 2001. Hand book of analysis and quality control of fruits and vegetable products Tata- McGraw- Hill. .
2. Meyer, L.H 1987 Food Chemistry CBS publishers. Belitz, H.D 1999 Food Chemistry Springer Verlag Fennema,OR. 1996 Food Chemistry Marcel Dekker.
3. Nielson S 1994 Introduction to Chemical Analysis of Foods Jones & Bartlett
4. Pomrenz Y & Meloan CE 1996 Food Analysis Theory and Practice CBS
5. Manay, N.S, Shadaksharaswamy, M., Foods: Facts and Principles New International Publishers
6. Miller, Dennis D. Food Chemistry John Wiley and sons
7. Wong, Dominic W.S Mechanism and Theory in Food Chemistry. CBS publishers.
8. Sharma B.K. 2004, Instrumental Methods of Chemical Analysis. Goel Publishing House, New Delhi.

FOOD CHEMISTRY & ANALYTICAL INSTRUMENTATION**Practicals:**

1. Determination of reducing sugar, total reducing sugar in honey/ jaggery / sugar (Lane & Eynone Method).
2. Determination of Fructose: glucose ratio in honey (Iodometry).
3. Determination of Gum Base Content in Bubble gum/ chewing gum/ Cocoa butter (soxhlet extraction method)
4. Detection and identification of synthetic food colours (Paper chromatographic method/ TLC)
5. Determination of Fat content in cocoa butter
6. Determination of acidity of extracted fat in cashewnuts / biscuits (Soxhlet extraction method)
7. Estimation of crude fibre in fruits Estimation of starch content in vegetables
8. Estimation of Protein (Colorimetric method) content in food Estimation of invert sugar in Jaggery / Honey
9. Test for chicory in coffee Determination of Peroxidase enzyme
10. Rehydration ratio of dried foods
11. Detection of adulterants in foods such as milk, honey etc.
12. Estimation of SO₂ in fruit products.
13. Estimation of purity of potassium metabisulphite
14. Qualitative determination of benzoic acid

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COURSE CODE NO.: FTB: 404: HERBAL TECHNOLOGY (GEC-4)**Course Objective:**

This subject gives the student the knowledge of basic understanding of the herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceuticals, etc. The subject also emphasizes Good Manufacturing Practices (GMP), patenting, and regulatory issues of herbal drugs

Course Outcome:

Upon completion of this course the student should be able to:

1. Understand raw material as a source of herbal drugs from cultivation to herbal drug product
2. Know the WHO and ICH guidelines for evaluation of herbal drugs
3. Know the herbal cosmetics, natural sweeteners, nutraceuticals
4. Appreciate patenting of herbal drugs, GMP.

UNIT I: Herbal medicines:

History and scope; definition of medical terms; the role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

UNIT II: Pharmacognosy

Systematic position medicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Gooseberry, and Ashoka

UNIT III: Phytochemistry

Active principles and methods of their testing - identification, and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on the nervous system), *Clerodendron phlomoides* (anti-rheumatic), and *Centella asiatica* (memory booster).

UNIT IV: Analytical pharmacognosy

Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds)

UNIT V:

Medicinal plant banks micropropagation of important species (*Withania somnifera*, neem, and tulsi- Herbal foods-future of pharmacognosy)

Suggested Readings

1. Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
2. The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.
3. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
4. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH publishing Co.

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5. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
6. Principles of Ayurveda, Anne Green, 2000. Thomsons, London.
7. Pharmacognosy, Dr.C.K.Kokate et al. 1999. Nirali Prakashan.

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**COURSE CODE NO.: FTB 405: FIELD PROJECT/INTERNSHIP/
COMMUNITY ENGAGEMENT AND SERVICES****Course Objective:**

8. Field project/Internships/Community engagements are designed to expand the depth and breadth of academic learning for you in your particular areas of study.
9. It is an opportunity for you to receive experience in applying theories learned in the classroom to specific experiences in the community and work world.
10. An internship can also heighten your awareness of community issues, motivate you to create opportunities, embrace new ideas, and give direction to positive change.
11. A successful internship can give you valuable information in making decisions about the direction of future studies or employment.
12. An internship is an opportunity to not only use and develop industry-related knowledge and skills, but also to enhance some of the skills that are transferable to any professional work setting.
13. This internship may be your first introduction to the world of work, or maybe you have been exposed to professionalism many times before.
14. No matter where your skills and understanding of professionalism lie, your internship is a chance to develop them even further.

Course Outcome:

By the end of the internship, our hope is that you will have:

- 12- Linked academic theory to practice in your discipline;
- 13- Applied your knowledge, skills, experience to a work environment;
- 14- Acquired new learning through challenging and meaningful activities;
- 15- Reflected on the content and process of the learning experience;
- 16- Advocated for your own learning in alignment with internship goals;
- 17- Demonstrated professional skills in the workplace;
- 18- Built and maintained positive professional relationships;
- 19- Demonstrated awareness of community and/or organizational issues;
- 20- Identified, clarified and/or confirmed professional direction as it relates to your academic studies and future career path;
- 21- Developed self-understanding, self-discipline, maturity and confidence;
- 22- Developed strong networking/mentoring relationships.

The students will be expected to undergo training/internship in forensic laboratories /Fields to get hands- on experience in the field of investigating a crime scene and to develop the analytical skills required for a forensic scientist. The report about the training/internship will be based on the work undertaken in Forensic Science Laboratory and the same will be evaluated. The training/internship should be undertaken during the vacation of



COURSE CODE NO.: FTB 406:

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COURSE CODE NO.: FTB 407:

(AEC-VIII)

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