



आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश
IFTM University, Moradabad, Uttar Pradesh
NAAC ACCREDITED

**SCHOOL OF BIOTECHNOLOGY
IFTM UNIVERSITY**

www.iftmuniversity.ac.in

**Study & Evaluation Scheme of
Bachelor of Science (Food Technology)
Session 2021-2022**

Programme:	Bachelor of Science (Food Technology)
Course Level:	UG Degree
Duration:	Three Years (Six semesters) Full Time
Medium of Instruction:	English
Maximum required attendance:	75%
Maximum Credits:	138

Programme Outcomes (POs)

Students completing this programme will be able to:

- This programme will generate skilled learners for food preservation, maintaining the quality and nutritional values for food Industries.
- Skilled in food fermentation, students can hold the position in production/ quality control in various food Industries.
- Acquainting knowledge in Food Safety and Regulatory Act, students will be able to do the technical documentation of product and process and will work as a Food Safety advisor or expert.
- Knowledge of food nutritional value and its importance, students can work as a nutritional and diet expert.

IFTM UNIVERSITY, MORADABAD
COURSE STRUCTURE
B.Sc. (BIOTECHNOLOGY/MICROBIOLOGY/FOOD TECHNOLOGY)
First Semester
(Effective from 2021-22)

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
									Mid Sem Exam		
			L	T	P						
THEORY											
1.	BSB-101	Principles of Biotechnology	3	1	0	20	10	30	70	100	4
2.	BSB-102	Biodiversity and Systematic	3	1	0	20	10	30	70	100	4
3.	PSD-101	Professional Skill Development I	3	1	0	20	10	30	70	100	4
4.	BCS-104	Fundamentals of Computers	3	1	0	20	10	30	70	100	4
5.	BCH-106	Organic Chemistry	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
6.	BSB-154	Computer	0	0	2	20	10	30	70	100	1
7.	BSB-156	Organic Chemistry	0	0	2	20	10	30	70	100	1
8.	GP-101	General Proficiency	0	0	0	0	0	100	-	100	1
		Total Credit	15	5	4			310	490	800	23

IFTM University, Moradabad
Bachelor of Sciences (B.Sc.), Programme
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(Effective from 2021-22)

BSB-101: PRINCIPLES OF BIOTECHNOLOGY

Objective(s): The objectives of this course:

- Let the student learn the basics of the biotechnology from the beginning till its advancement.
- Make student understand applications of biotechnology in the different domains of allied sciences
- Introducing students with, biochemistry, genomics, proteomics and molecular markers, microbiology and their role for mankind.
- Make them understand the technical, professional and anthropogenic aspects of this subject area.

UNIT I: (10 Sessions)

Introduction to Biotechnology: Historical perspectives; Biotechnology and Society; Biotechnology in India and global trends; Application in health, food, medicine and agriculture; Bioethics in biotechnology; GMOs and biosafety issues.

UNIT II: (8 Sessions)

Biomolecules: Structure and function of biomolecules- Carbohydrates, Proteins, Lipids, Nucleic acids; Classification of Enzymes; Purification and characterization of enzymes from natural sources. Comparison of chemical and enzyme catalysis.

UNIT III: (8 Sessions)

Cell Biology & Microbiology: Cell theory; Cell Structures (Prokaryotes and eukaryotes); Origin of microbiology; Study of Microbes, Classification of microbes; Microbial Culture Techniques; Application of microbiology.

UNIT IV: (8 Sessions)

Genetic Engineering: Tools of rDNA Technology; Introduction of Recombinant DNA into host cells, screening techniques for Identification of Recombinants; Polymerase Chain Reaction (PCR); Genome Sequencing Projects (Human Genome Project).

UNIT V: (6 Sessions)

Bioinformatics: Introduction and application. Biological databases (nucleotide and protein data bases, Structure databases) and data retrieval system (ENTREZ, SRS, DBGET). Sequence and molecular file formats.

Course Outcomes:

Students completing this course will be able to:

- Provide education that leads to comprehensive understanding of the principles and practices of biotechnology.
- Empower students with the ability to think and solve problems in the field of biotechnology.
- Ensure students are able to effectively communicate with biotech and other interdisciplinary professionals.

Suggested Readings:

1. W. J. Thieman & M. A. Palladino, Introduction to Biotechnology, 2nd Edn., Pearson Education Limited, 2019.
2. H. K. Das, TextBook of Biotechnology, 4th Edn., Wiley India Pvt. Ltd., 2010.
3. B. D. Singh, Biotechnology, Kalyani Publishers, 2008.
4. R. C. Dubey, TextBook of Biotechnology, S. Chand Pvt. Limited, 2006.

Website Sources:

- <https://onlinecourses.nptel.ac.in/>
- <https://www.wikipedia.org/>
- <https://library.nitrkl.ac.in/>

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BSB-102: BIODIVERSITY AND SYSTEMATICS

Objective(s): The objectives of this course:

- Provide a comprehensive introduction to all areas of systematic biology, from species description to phylogeny reconstruction.
- Develop understanding for ecosystem, its components, role and importance.
- Develop the concept of biodiversity and conservation of ecosystem.
- Let the learners know the importance of museum sciences, and the role of systematic in conservation biology.
- Define different stages of growth, its effect on society and population density are also described to correlate the biological systems.

UNIT I: **(8 Sessions)**

Biodiversity & Population Dynamics: Biodiversity – Concept of diversity, species, ecosystem; genetic; Population Dynamics- Population density & relative abundance, Population age distribution, Growth forms & carrying capacity.

UNIT II: **(8 Sessions)**

Ecosystem, Biodiversity & Biogeography: Concept of species, Ecosystem; Habitat & niche, Ecological equivalence, biological clock, Basic behavioral patterns; Biodiversity & major biomes of world; Biogeography- a comprehensive account of flora and fauna in different bio-geographical region.

UNIT III: **(8 Sessions)**

Conservation of Biodiversity: Importance,—Conservation strategies; *in situ* and *ex situ* methods-advantages, limitations and applications; Conservation laws, policies and organizations.

UNIT IV: **(8 Sessions)**

Threats to Biodiversity: Natural and anthropogenic threats to biodiversity; Human-Animal conflict with special reference to elephants and tigers; IUCN Threat Categories-Red Data Book; Wildlife exploitation - Species extinctions. Susceptibility for Extinction, Endangered and endemic species of India; Impact of over-harvesting and Climate change on biodiversity; Causes and Impacts of Invasive species to biodiversity.

UNIT V: **(8 Sessions)**

Biosystematics: Analysis of Biodiversity- Biodiversity indices, Mathematical modeling for analysis of population variation.

Course Outcomes:

Students will be able to understand:

- The concept of biodiversity, population density and age distribution.
- The component part of ecosystem, their habitat and behavioral pattern.
- Tools and techniques to practice biological systematic.
- Analysis of Biodiversity and modeling of population variations.

Suggested Readings:

1. Albert E, Radford, Gloria May, Adell, Fundamentals of Plant Systematics, First Ed. Harper & Raw, 1986.
2. Naik, V.N. Taxonomy of Angiosperms. Second Ed Tata McGraw Hill, New Delhi. 1984.

3. Thomas M. Smith and Robert Leo Smith. Elements of Ecology, 8th Edition. Benjamin Cummings.2012.
4. Freeman & Herron. Evolutionary Analysis, 3rd Edition.Pearson.2007.
5. M.P. Singh, B.B. Singh, B.S. Singh and Soma Dey. Plant Biodiversity and Taxonomy, First Ed. Daya Publishing House. 2002.

Websites Sources:

- <https://www.environment.gov.au/biodiversity/conservation>
- <https://www.conserve-energy-future.com/biodiversity-conservation-types-importance-methods.php>
- <https://sites.nicholas.duke.edu/ecologyapp/modules/population-dynamics/>
- http://ib.berkeley.edu/courses/ib200a/ib200a_sp2010/lect/ib200a_lect16a_Lindberg_biological_systematics.pdf

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(Effective from 2021-22)

PSD-101: PROFESSIONAL SKILL DEVELOPMENT-I

Course Objectives: The objectives of this course are:

- To develop knowledge and understanding of grammar.
- To develop abilities to make use of the grammar in own writing English.
- To increase understanding and recall of what is read and listen including facts and main idea.
- To enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing resume, bio-data, letters and applications of different kinds.
- To develop all the four skills of English language.

UNIT I: **(8 Sessions)**

Basic Applied Grammar and Usage

The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech. **Noun:** Kinds; Gender; Case; Number; Usage. **Pronouns:** Definition; Kinds; Usage. **Adjectives:** Kinds, Degrees of Comparison, Transformation of Degrees. **Determiners:** Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. **Articles:** Kinds, Articles and Number system, Articles and Gender system, Omission of Articles, Repetition of Articles. **Verbs:** Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage

UNIT II: **(8 Sessions)**

Basic Applied Grammar Continued

Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. **Adverbs:** Kinds and Usage. **Prepositions:** Kinds and Usage. **Conjunctions:** Kinds; Usage. **Interjections:** Definition; Usage.

UNIT III: **(8 Sessions)**

Clauses and Phrases, Tenses, Active and Passive Voice, Direct and Indirect Speech

UNIT IV **(6 Sessions)**

Précis Writing: Techniques of Précis Writing; examples. **Paragraph Writing:** Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. **Reading Comprehension. Listening Comprehension.**

UNIT V **(8 Sessions)**

Writing of Resume, Bio-Data. Writing of Letters and Applications: Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment.

Course Outcomes:

Students completing this course will be able to:

- Write paragraph, gist or abstract/précis of the passage in their own words/language, resume, bio-data, letters and applications of different kinds.
- Use targeted grammatical structures meaningfully and appropriately in oral and written production.
- Enhance competence in the four modes of literacy: writing, speaking, reading & listening.
- Understand and recall facts and main idea.

Suggested Readings:

1. Remedial English Language by Malti Agarwal, Krishna Publications, Meerut.
2. Professional Communication by Malti Agarwal, Krishna Publications, Meerut.
3. High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Website Sources

- www.wikipedia.com
- www.englishgrammar.org
- www.usingenglish.com
- www.grammarly.com

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BCS-104: FUNDAMENTAL OF COMPUTERS

Objective(s): The objectives of this course:

- Introduces the concepts of computer basics & programming with particular attention to Engineering examples.
- Make the learners understand about C programming language.
- Understand the fundamental parts of programming language, so that the students will have a basic concept for understanding and using other programming language.

UNIT I: (8 Sessions)

Introduction to Computer: Definition of computer, characteristics of computer, Applications of computer, Generations of computers, Types of computers, Block diagram of computer, CPU, ALU, Control Unit, Software, Hardware, Operating system, BIOS.

UNIT II: (8 Sessions)

Input-Output devices & Number System: Keyboard, Mouse, Scanner, touch screen, MICR, OCR, OMR and Barcode Reader; Monitor, Printer, Speaker, and Projector; Binary, Octal, Decimal, Hexa decimal and its conversion. Compliments: 1's compliment, 2's compliment, 9 compliments. BCD. Binary addition, Binary Subtraction

UNIT III: (8 Sessions)

Memory: Memory Hierarchy, Main Memory, RAM, ROM (PROM, EPROM, EEPROM), Volatile Memory, Non-Volatile Memory, Flash Memory, Cache memory, hit, miss, Associate memory Magnetic disk, Magnetic tapes, virtual memory, Bus structure, network topology, Serial communication

UNIT IV: (8 Sessions)

Languages: High level Language, Low level Language, Compiler, Interpreter, Assembler, Linker, Loader, Flow Chart, Algorithm; Introduction to C-data types, variables, C Libraries, Structure of program, Arithmetic operators, Logical operators, Relational Operators, Unary operators; Conditional Statements-IF, If- Else statement, Nested if statement; Looping Statement- For Loop, Do-While loop, While Loop. Nested loop, Continue and Break Statement.

UNIT V: (8 Sessions)

C Language and Internet: Array-One dimensional array, multi-dimensional array; Function- call by value, call by reference, nesting of function, recursion, structure; Introduction to internet- Concept of Internet, Basics of E-mail, World Wide Web (WWW), web browsers, Understanding URL, search engine, E-Commerce, Surfing the web

Course Outcome:

On completion of the course students will be able to:

- Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming
- Write, compile and debug programs in C language and use different data types for writing the programs.
- Design programs connecting decision structures, loops and functions.
- Explain the difference between call by value and call by address.
- Understand the dynamic behavior of memory by the use of pointers.
- Use different data structures and create or manipulate basic data files and developing applications for real world problems.

Suggested Reading:

1. P. K. Sinha, Fundamentals of Computers, BPB Publications
2. E. Balagurusamy (2008), Computing Fundamentals And C Programming, Tata McGraw-Hill
3. Yashwant Kanitkar, Let Us C, BPB Publications
4. Rajeshree R Khande and Manisha Maddel ; Internet Programming & Industrial Law; Vision Publications, Pune.

Website Sources:

- swayam.gov.in
- onlinecourses.nptel.ac.in
- <https://www.geeksforgeeks.org/>
- https://www.tutorialspoint.com/computer_fundamentals/index.htm

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BCH-106: ORGANIC CHEMISTRY

Objective(s): The objectives of this course:

- Impart knowledge of basic principles of organic chemistry, and it will also provide the important topics in Organic chemistry functional groups including (alkanes, cycloalkane compounds, phenols etc.
- Help students to gain experience to predict the functional group transformations, simple reaction mechanisms, and the synthesis of organic molecules by multi-step synthesis strategies.
- Help students to understand the reaction mechanism.

UNIT I: **(8 Sessions)**

Structure and Bonding: Hybridizations, Bond lengths and bond angles, bond energy: Localized and delocalized chemical bond, van-der Waals interactions, inclusion compounds, clathrates, charge transfer complex, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

UNIT II: **(8 Sessions)**

Types of Reagents and Reactions: Electrophiles and nucleophiles. Types of organic reactions. Energy consideration. Reactive intermediates-carbocations, carbanions, free radicals and carbenes. Methods of determination of reaction mechanism.

UNIT III: **(8 Sessions)**

Stereochemistry: Conformations with respect to ethane, butane and cyclohexane; Interconversion of Wedge Formula; Newman, Sawhorse and Fischer representations; Concept of chirality; Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism; D and L; cis - trans nomenclature; CIP Rules.

UNIT IV: **(8 Sessions)**

Alkanes and Cycloalkanes: IUPAC nomenclature, classification, isomerism in alkanes, sources, and methods of preparation (with special reference to Wurtz, Kolbe, Coreyhouse, reactions and decarboxylation of carboxylic acids. Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes. **Cycloalkanes:** Nomenclature, methods of preparations, chemical reactions. Bayer's strain theory and its limitations. ring strain in cyclopropane and cyclobutanes. Theory of stainless rings.

UNIT V: **(8 Sessions)**

Alcohols, Phenols and Ethers: Alcohols- Preparation of 1°, 2° and 3° alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters, Reactions-with sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO₄, acidic dichromate, conc. HNO₃). Oppeneauer Oxidation; Diols- Oxidation of diols; Pinacol-Pinacolone rearrangement.

Course Outcomes:

At the end of the course the students will be able to:

- Tell fundamental principles of organic chemistry that include chemical bonding, nomenclature, structural isomerism, stereochemistry, chemical reactions and mechanism.
- Understand nucleophile and electrophile groups and their properties.
- Name the functional groups and different class of organic compounds.
- Recognize the basic practical skills for the synthesis and analysis of organic compounds like alcohol, ethers, phenols etc.
- Justify a reasonable mechanism for a chemical reaction.

Suggested Readings:

1. R. T. Morrison & R. N. Boyd, Organic Chemistry, 7th Edn, Prentice Hall, 2005.
2. A.I. Vogel, Vogel's Textbook of Practical Organic Chemistry, 5th Edn, Longman Publishers, 1998.
3. A. Bahl, Advanced Organic Chemistry, S Chand & Company Limited, 2010.

Website Sources:

- <https://ncerthelp.com/>
- <https://ocw.mit.edu/courses/chemistry/>
- <https://www.clearitmedical.com/>
<https://www.cliffsnotes.com/study-guides/chemistry/>

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(Effective from 2021-22)
Computer (BSB-154)

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and don't	
4.	About Equipment's and Accessories: Principle and Working	
5.	To create personal letter	Experiment 1
6.	To create simple newsletter:	Experiment 2
7.	To create a resume	Experiment 3
8.	To create a cover page of a project report:	Experiment 4
9.	To create a simple presentation on hardware, software:	Experiment 5
10.	To create a worksheet with 4 columns, enter 10 records and find the sum of all columns:	Experiment 6
11.	To create a report containing the pay details of the employee	Experiment 7
12.	To create a student result sheet	Experiment 8
13.	To create a pie chart for a sample data and give legends	Experiment 9
14.	To create simple table for result processing	Experiment 10

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Organic Chemistry (BSB-156)

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and don't	
4.	About Equipment's and Accessories: Principle and Working	
5.	To find out the strength in gms/liter of the given solution of sodium hydroxide with the help of standard oxalic acid solution	Experiment 1
6.	To determine the alkalinity in the given water sample by neutralization titration.	Experiment 2
7.	To determine the melting point of an organic compound containing C, H and O only.	Experiment 3
8.	To determine the melting point of an organic compound containing nitrogen.	Experiment 4
9.	To determine the melting point of an organic compound containing nitrogen and sulphur	Experiment 5
10.	To decolourise and crystallize the given organic compound using Charcoal	Experiment 6
11.	To purify the sample of benzoic acid using water as a solvent by recrystallization method.	Experiment 7

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COURSE STRUCTURE
B.Sc. (BIOTECHNOLOGY/MICROBIOLOGY/FOOD TECHNOLOGY)
(Effective from 2021-22)

Second Semester

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
									End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	BSB-201	Animal Science	3	1	0	20	10	30	70	100	4
2.	BSB-202	Plant Science	3	1	0	20	10	30	70	100	4
3.	BSB-203	Introduction to Microbiology	3	1	0	20	10	30	70	100	4
4.	BSB-204	Environmental Studies	3	1	0	20	10	30	70	100	4
5.	BCH-204	Physical Chemistry	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
6.	BSB-253	Animal Science & Plant Science	0	0	2	20	10	30	70	100	1
7.	BSB-254	Introduction to Microbiology	0	0	2	20	10	30	70	100	1
8.	GP-201	General Proficiency	0	0	0	0	0	100	-	100	1
		Total Credit	15	5	4			310	490	800	23

IFTM University, Moradabad
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BSB-201: ANIMAL SCIENCE

Objective(s): The objectives of this course are to:

- Understand the animal kingdom.
- Understand the taxonomic position of Protozoa to Chordates.
- Understand the general characteristics of animals belonging to protozoa to Chordates.
- Understand the body organization, origin and evolutionary relationship of different phylum.
- Understand the morphology and physiology of humans.

UNIT I: **(8 Sessions)**

Taxonomy & Classification: General principle of taxonomy and animal classification. Salient features and outline classification of invertebrates and vertebrates.

UNIT II: **(8 Sessions)**

Invertebrates: General characters of protozoa and human disease, type study of *Paramecium caudatum*; Origin of Metazoan metamerism and symmetry; General characters of Porifera; General characters of Coelentrata; General characters of Platyhelminthes, type study of *Taenia* and their parasitic adaptations; General character of phylum Annelids, type study of Leech; General characters of Mollusk, type study of *Pila globosa*; General character of Arthropoda and Echinodermata, external features of star fish.

UNIT III: **(8 Sessions)**

Vertebrates: Outline classification and characteristic features of phylum Chordata and class Mammalia.

UNIT IV: **(8 Sessions)**

Human Physiology I: Digestive System, Respiratory system, excretory system, Circulatory system- activity of the heart, Blood- composition and function, blood clotting mechanism; Human reproductive system.

UNIT V: **(8 Sessions)**

Human Physiology II: Nervous system- Structure of a typical neuron, conduction of nerve impulse, resting potential; Endocrine system, Muscular system-ultrastructure and chemical composition of skeletal muscle, mechanism of muscle contraction.

Course Outcomes:

Students completing this course will be able to:

- Understand the world of animals. How few animals cause diseases?
- What are the differences between chordates and non-chordates?
- Understand human physiology and how energy production happens.

Suggested Readings:

1. R. L. Kotpal. Modern Textbook of Zoology Invertebrate, 11th Edn., Rastogi Publications, 2014.
2. R. L. Kotpal. Modern Textbook of Zoology Vertebrate. 4th Edn., Rastogi Publications, 2015.
3. Dhama & Dhama, Invertebrate Zoology, 5th Edn., S. Chand Publication, 2006.
4. Dhama & Dhama, Chordata Zoology, R. Chand Publication, 2006.
5. Jordan & Verma, Invertebrate Zoology, S. Chand Publication, 2008.
6. Jordan & Verma, Chordate Zoology, S. Chand Publication, 2007.
7. R. A. Agarwal, Animal Physiology, S. Chand Publication, 2014.

Website Sources:

- <https://onlinecourses.nptel.ac.in/>
- <https://www.wikipedia.org/>
- <https://www.ncbi.nlm.nih.gov/books>
- <https://www.shapeoflife.org/>

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BSB-202: PLANT SCIENCE

Objective(s): The objectives of this course:

- Enables the students to understand the plant structure and physiology.
- Provides the basic knowledge of classification and taxonomy in plant kingdom, distribution, reproduction and their economic importance.

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BSB-202: PLANT SCIENCE

Objective(s): The objectives of this course:

- Enables the students to understand the plant structure and physiology.
- Provides the basic knowledge of classification and taxonomy in plant kingdom, distribution, reproduction and their economic importance.

UNIT I: **(8 Sessions)**

Algae: General features, classification, distribution, range of thallus organization, reproduction, economic importance of algae, general characters of *Chlamydomonas*, Cyanobacteria- heterocyst, general characters of *Nostoc*.

UNIT II: **(8 Sessions)**

Fungi: General features, classification, distribution, range of thallus organization, reproduction, parasexual cycle and economic importance fungi, general characters of *slime mold*, lichens and its types.

UNIT III: **(8 Sessions)**

Bryophyta: General features, classification, distribution, range of thallus organization, reproduction, economic importance of bryophyte, general characters of *Riccia*, *Marchantia* and *Anthoceros*.

UNIT IV: **(8 Sessions)**

Pteridophyta: General features, classification, structure, reproduction, stellar evolution, heterospory and seed habit, economic importance of Pteridophytes, general characters of *Selaginella*.

UNIT V: **(8 Sessions)**

Gymnosperms & Angiosperms: General features, outline classification, structure, reproduction, Alternation of generation, structure of a flower, life cycle of angiosperm and economic importance.

Course Outcomes:

The students should be able to:

- Identify the distinguishing anatomical features of various parts of plant.
- Ascertain what taxa commonly seen plants belong to.
- Appreciate the plethora of plant secondary metabolites and its benefits.
- Apply the knowledge in Agri-biotech areas such as - biofertilizers, biopesticide etc.

Suggested Readings:

1. V. J. Chapman and D. J. Chapman, The Algae. 2nd edition, Palgrave Macmillan; 1973 edition, January 14, 2014.
2. Ganguli and Kar, College Botany Vol. I and II, 6th revised edition, New Central Book Agency; 1 January, 2011.
3. V. Singh, P.C. Pande & D.K. Jain. A Text Book of Botany, 4th edition, Rastogi Publication, 2008-2009.
4. N.S. Subrahmanyam, Modern Plant Taxonomy, 1st edition Vikas Publishing House, 1997.
5. A Text Book of Botany, V. Singh, P.C. Pande & D.K. Jain, Rastogi Publication.
6. H. D. Kumar. Introductory Phycology, 2nd edition, Affiliated East-west press Pvt Ltd, 1999.

Website Sources:

- http://www.brainkart.com/subject/Plant-Biology_229/
- <http://www.plantcell.org/content/teaching-tools-plant-biology>
- <https://www.easybiologyclass.com/plant-physiology-free-lecture-notes-online-tutorials-lecture-notes-ppts-mcqs/>

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(Effective from 2021-22)

BSB-203: INTRODUCTION TO MICROBIOLOGY

Objective(s): The objectives of this course:

- Give a general introduction to the field of microbiology and investigate the amazing diversity of microbial life.
- Learn about the significant roles that microbes play in health, food, and the environment.
- Describe the key differences between the five groups of microbes.
- Explain how microbes replicate and why environmental conditions affect where they live.

UNIT I: (8 Sessions)

Introduction to Microbiology: History, scope and development of Microbiology; Applications of Microbiology in human welfare. Development of Microbiology in India & Abroad- Antony van Leeuwenhoek, Alexander Fleming, Edward Jenner, Louis Pasteur, Robert Koch, Selman Waksman, Joseph Lister, M.S. Swaminathan, T.S. Sadasivan and C.V. Subramaniam; Physical and chemical methods of sterilization; Pure Culture Techniques.

UNIT II: (8 Sessions)

Diversity of Microbial World A: Classification, general characteristics and structure of Bacteria- (eubacteria & archaebacteria), *Cyanobacteria*, *Actinomycetes*, *Mycoplasma*, *Rickettsia* & *Chlamydia* with emphasis on function of each part & components.

UNIT III: (8 Sessions)

Diversity of Microbial World B: Classification, general characteristics, structure with emphasis on *Mucor*, *Rhizopus*, *Puccinia*, *Cercospora*, *Aspergillus*, *Penicillium* *Alternaria* and *Curvularia*, function of each part & components of cell. Reproduction & economic importance of Fungi.

UNIT IV: (8 Sessions)

Diversity of Microbial World C: Classification, general characteristics and structure of Viruses (Prions, Virions, Virusoids & Viroids) Virus host, General features of virus reproduction. DNA & RNA Viruses with the example of T4, TMV & Pox Virus.

UNIT V: (8 Sessions)

Growth and growth measurement: Definition of growth, mathematical expression of growth. Growth curve, Growth yield, Effect of nutrient concentration on growth. Factors affecting growth: nutrients, temperature, oxygen, pH, osmotic pressure. Measurement of growth by measuring cell number, cell mass and cell activity Cell count, direct and indirect method, turbidometric method. Plate count method, membrane filter count method, dry weight and wet weight method by measurement of cellular activity. synchronous culture, continuous culture and batch culture.

Course Outcomes:

Students completing this course will be able to:

- Gain knowledge about principle and application of various types of Microscopy.
- Classify and explain the structure and general characteristics of Microorganisms.
- Prepare various Bacteriological, Algal, and Fungal Media.

Suggested Readings:

1. M. J. Pelczar, E. C. S. Chan & N. R. Krieg, Microbiology, 5th Edn.; Tata McGraw Hill Publishing, 2003.

2. D. R. Harper, Viruses Biology, Applications, and Control, 3rd Edn., Garland Science Tylor & Fransic Group, 2012.
3. P. D. Sharma, 2nd Edn. Microbiology, Rastogi Publications, 2005.
4. R. C. Dubey & D. K. Maheshwari, A Text Book of Microbiology, 1st Edn.; S. Chand and Company Ltd., 2004.
5. H. C. Dubey, A Textbook of Fungi, Vikas Publishing House, 2005.
6. Vashistha, A Textbook of Fungi, S. Chand and Company Ltd., 2003

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- <https://library.nitrkl.ac.in/>
- <https://ecoursesonline.iasri.res.in/>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Biotechnology/ Microbiology/ Food Technology I Year (II Semester)
(Effective from 2021-22)

BSB-204: ENVIRONMENTAL STUDIES

Objective(s): The objectives of this course:

- Develop understanding of how science and the scientific method work to address environmental problems.
- Make the student become familiar with the Earth's major systems (ecosystems and biogeochemical cycles),
- Acknowledge how environment functions and how they are affected by human activity (population growth, air, water and soil pollution, ozone depletion, global warming, and solid waste disposal).
- Let students will learn about the interaction of human society (urban sprawl, energy use/generation, resource consumption and economics) with the Earth's systems.

UNIT I: (8 Sessions)

Environmental Sciences: Introduction, definition, Scope, Importance, Need for Public Awareness; Natural Resources: Renewable and non-renewable resources; Biogeochemical Cycles, Ecological Succession, Ecological pyramids.

UNIT II: (8 Sessions)

Concept of an Ecosystem: Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Food chains and food webs. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean).

UNIT III: (8 Sessions)

Environmental Pollution: Pollutants, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution; Solid waste management: Causes, effects and control measures of urban and industrial wastes.

UNIT IV: (8 Sessions)

Biodiversity: Biogeographical classification of India, Hot-spots of biodiversity, Biodiversity at global, national and local levels, Value of biodiversity- consumptive use, productive uses, social, ethical aesthetic and option values, Threats to biodiversity- habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: *In-situ* and *Ex-situ* conservation of biodiversity,

UNIT V: (8 Sessions)

Global Phenomenon & Their Management: Global warming, acid rains, depletion of ozone layer, population growth, population explosion-family welfare program and human rights, Biofertilizers, Biopesticides, vermicomposting.

Course Outcomes:

Students completing this course will be able to:

- Understand the Environment and ecology and its significance for mankind.
- Gain in-depth knowledge on natural processes that sustain life, and govern economy.
- Predict the consequences of human actions on the web of life, global economy and quality of human life.

- Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
- Acquire values and attitudes towards understanding complex environmental-economic-social challenges, and participating actively in solving current environmental problems and preventing the future ones.
- Understand how nature makes the balance through resistance and resilience.
- Adopt sustainability as a practice in life, society and industry.

Suggested Reading:

1. S. K. Dhameja, Environmental Studies, S. K. Kataria & Sons, 2014.
2. J. Ingram, P. Ericksen, D. Liverman, Food Security and Global Environmental Change, Taylor & Francis, 2012.
3. S. S. Deswal, Environmental Engineering, Dhanpat Rai Publications, 2001.
4. I. S. Thakur, Environmental Biotechnology: Basic Concepts and Applications, I.K. International Publishing House Pvt. Limited, 2011.
5. D. D. Chiras, Environmental Science, 10th Eds., Jones & Bartlett Learning, 2014.

Website Sources:

- <https://www.edx.org/course/subject/environmental-studies>.
- <https://online-learning.harvard.edu/subject/environmental-science>
- <https://www.coursera.org/browse/physical-science-and-engineering/environmental-science-and-sustainability>
- <https://nptel.ac.in/course.html>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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(Effective from 2021-22)

BCH-204: PHYSICAL CHEMISTRY

Objective(s): The objectives of this course:

- Familiarize students with modern concepts and tools in physical chemistry that are applied to many areas of chemical research.
- Make students gain an insight into the various concepts related to physical chemistry like types of reactions, dynamics of reactions, chemistry of solutions etc.
- Recognize the Modern techniques that can be imparted to analyze chemical systems.

UNIT I: (8 Sessions)

Introduction: Reversible and irreversible reactions, chemical equilibrium, law of mass action, Le-Chatelier's principle.

UNIT II: (8 Sessions)

Solution: Concentration of solution; normality, equivalent weight, molarity, formality, molality, solutions of gases in liquids, mole fraction, colligative properties, abnormal molecular weights, Van't Hoff factor.

UNIT III: (8 Sessions)

Acids & Bases: Ionization, strong and weak electrolytes, concept of acid and bases, dissociation of acid and base in water, strength of acids and bases, Ionic product of water, the pH scale.

UNIT IV: (8 Sessions)

Laws of Thermodynamics: First, second and Zeroth law of thermodynamics, entropy, enthalpy, Gibb's free energy. Order of reactions, first, second and zero order reactions, catalysts.

UNIT V: (8 Sessions)

Colloidal & Electrochemistry: True solution, colloidal solution and suspension, types of colloidal systems, classification of colloids, properties of colloids, coagulation, protective colloids, electrolysis, electrochemical cells, electrode potentials, electrochemical series.

Course Outcomes:

After completing this course students will be able to:

- Explain the basic principles of solutions and properties of solutions.
- Identify the strong, weak acids and bases and their pH.
- Explain the processes taking place in solution and at interfaces.
- Describe different orders of chemical reactions and their measurements.
- Experimentally determine certain physical variables.
- Apply calculation in solving physical and chemical problems.

Suggested Readings:

1. K. J. Laidler, Chemical Kinetics, Pearson Education Society, 1987
2. P. C. Rakshit, Physical Chemistry, Sarat Book House, 2014.
3. B.R. Puri, L.R. Sharma, M.S. Pathania, Principles of Physical Chemistry, Vishal Publishing Company, 2008.
4. P. W. Atkins & J. dePaula, Physical Chemistry, 8th Edn W. H. Freeman Publishing Co., 2006.

Website Sources:

- <https://www.askiitians.com/revision-notes/chemistry>
- <https://ocw.mit.edu/courses/chemistry/5-62-physical-chemistry>
- <http://www.colby.edu/chemistry/PChem/Lecture1.html>
- https://www.internetchemistry.com/chemistry/physical_chemistry.htm

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Biotechnology/Microbiology/Food Technology I Year (II Semester)
(Effective from 2021-22)

BSB-253 Animal Science & Plant Science

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Identification and study of invertebrate specimens of the following phylum Porifera, Coelentrata, Platyhelminthes, Annelida	Experiment 1
6.	Identification and study of invertebrate specimens of the following phylum Arthropoda, Mollusca, Echinodermata	Experiment 2
7.	Study of prepared slides of <i>Euglena</i> , <i>Paramecium</i> , <i>Vorticella</i> , <i>Trypanosoma</i> & <i>Noctiluca</i>	Experiment 3
8.	Identification and study of vertebrate specimens of the following phylum Amphibia, Reptilia, Aves and Mammal	Experiment 4
9.	To dissect out the nervous system of <i>Prawn</i> & <i>Scoliodon</i>	Experiment 5
10.	Identification and study of Cyanobacteria- <i>Nostoc</i> .	Experiment 6
11.	Identification and study of some algal forms: <i>Chlamydomonas</i> , <i>Volvox</i>	Experiment 7
12.	Identification and study of fungi- <i>Rhizopus</i> , <i>Agaricus</i>	Experiment 8
13.	Cut the T.S of given plant material (<i>Riccia/Marchantia</i> , <i>Marselia/Selaginella</i> , <i>Cycas/ Pinus</i>) and identify it with its morphological and anatomical features.	Experiment 9
14.	Describe given plant in semi-botanical language and also give the floral structure and formulae of it.	Experiment 10

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BSB-254 Introduction to Microbiology

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Microbiology Good Laboratory Practices and Biosafety.	Experiment 1
6.	To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter, micrometer [ocular and stage], haemocytometer) used in the microbiology laboratory.	Experiment 2
7.	Preparation of culture media (Nutrient Broth and Nutrient Agar) for bacterial cultivation.	Experiment 3
8.	Sterilization of medium and Glass ware using Autoclave and Hot Air Oven and assessment for sterility.	Experiment 4
9.	Sampling and quantification of microorganisms in air, soil and water	Experiment 5
10.	Isolation of bacteria [Streak plate, spread plate, pour plate, serial dilution].	Experiment 6
11.	Identification of microorganisms from the habitats [simple staining, differential staining, acid fast staining, capsule staining, spore staining and motility].	Experiment 7
12.	Observation of morphology - shape and arrangement of cells bacteria, phytoplanktons & zooplanktons.	Experiment 8

IFTM UNIVERSITY, MORADABAD
COURSE STRUCTURE
B.Sc. (FOOD TECHNOLOGY)
Third Semester

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
									End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	BSB-301	Modern Analytical Techniques	3	1	0	20	10	30	70	100	4
2.	BSB-302	Enzymology	3	1	0	20	10	30	70	100	4
3.	BFT-301	Principles of Food Processing	3	1	0	20	10	30	70	100	4
4.	BFT-303	Food Microbiology	3	1	0	20	10	30	70	100	4
5.	BFT-304	Foundation of Food and Nutrition	3	1	0	20	10	30	70	100	4
6.	EHU-301*	Disaster Management* (Audit paper)	3	0	0	20	10	30	70	100	0
PRACTICALS / PROJECT											
7.	BSB-351	Enzymology	0	0	2	20	10	30	70	100	1
8	BFT-351	Food Microbiology	0	0	2	20	10	30	70	100	1
9.	GP-301	General Proficiency	0	0	0	0	0	100	-	100	1
		Total Credit	18	5	4			310	490	800	23

*Internal Assessment (Audit Paper not added in total)

IFTM University, Moradabad
Bachelor of Sciences (B.Sc.), Programme
B.Sc. Biotechnology/Microbiology/Food Technology II Year (III Semester)
(Effective from 2021-22)

BSB-301: MODERN ANALYTICAL TECHNIQUES

Objective(s): The objectives of this course:

- Let the student acquire basic concepts, principles, and techniques of modern analytical techniques.
- Empower students with an analytical mind set and the abilities to solve diverse analytical problems in an efficient and quantitative way
- Make student learn the principle behind the basic techniques like chromatography, electrophoresis and their application in diverse fields.

UNIT I: **(8 Sessions)**

Concept of Good Laboratory Practices: Parts of GLP, Good Manufacturing Practices, Quality assurance and Quality Control, Steps of Analysis, Basic Aspects of Qualitative and Quantitative Analysis. Accuracy and Precision.

UNIT II: **(8 Sessions)**

Microscopy & Spectroscopy: Simple and Compound microscope; Overview of Electromagnetic spectrum; Beer-Lambert's Law: UV-Vis spectrophotometer, Colorimeter, Raman Effect, IR Spectroscopy- Their Instrumentation, Principle, Working and application

UNIT III: **(8 Sessions)**

Centrifugation: Theory and Principle of centrifugation, sedimentation, sedimentation rate, sedimentation coefficient. Use and design of different types of rotors, Types of centrifuges, Preparative and analytical centrifugation, Density gradient centrifugation (zonal and isopycnic), differential centrifugation.

UNIT IV: **(8 Sessions)**

Chromatography: Plate and Rate Theory, Principle of Chromatography, Chromatographic performance parameters, High performance liquid chromatography, adsorption chromatography, partition chromatography, Ion-exchange chromatography, molecular exclusion chromatography, affinity chromatography, normal and reverse phase chromatography.

UNIT V: **(8 Sessions)**

Electrophoresis: Theory of electrophoresis, General Principle, Native PAGE, SDS PAGE, Agarose gel electrophoresis, Iso-electric focusing, pulse gel electrophoresis, Capillary Electrophoresis.

Course Outcomes:

Students completing this course will be able to:

- Develop an understanding of the range and uses of analytical methods in chemistry.
- Establish an appreciation of the role of chemistry in quantitative analysis
- Develop an understanding of the broad role of the chemist in measurement and problem solving for analytical tasks.
- Provide an understanding of techniques employed for elemental and compound analysis.

Suggested Readings:

1. K. Wilson & J. Walker, Principles and Techniques of Biochemistry and Molecular Biology, 7th Edn., Cambridge University Press.

2. S. K. Sawhney & R. Singh, Introductory Practical Biochemistry, 2nd Edn., Alpha Science International, 2005
3. G. R. Chatwal & S. K. Anand, Instrumental Methods of Chemical Analysis, 5th Edn., Himalaya Publishing House, 2019.

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- <https://onlinecourses.nptel.ac.in/>
- <https://www.wikipedia.org/>
- <https://library.nitrkl.ac.in/>
- <https://onlinecourses.swayam2.ac.in/>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Biotechnology/Microbiology/Food Technology II Year (III Semester)
(Effective from 2021-22)

BSB-302: ENZYMOLOGY

Objective(s): The objectives of the course:

- Provide an insight into the fundamentals of enzyme structure, function and kinetics of enzymes.
- Explain how enzymes are able to increase speed of a biochemical reaction in sense of thermodynamics, kinetics and molecular interactions also it deals with current applications and future potential of enzymes.
- This will be helpful in developing concept for fermentation technology and downstream processing.

UNIT I: (8 Sessions)

Enzymes as Catalysts: Overview, historical background; Enzyme characteristics and properties; Coenzyme, Cofactor, Apoenzyme, Holoenzyme, Prosthetic group, Enzyme nomenclature & classification; Enzyme Isolation, Purification and Characterization.

UNIT II: (8 Sessions)

Mechanism of Enzyme Kinetics: Kinetics of single substrate reactions (Michaelis- Menten equation); Enzyme inhibition (Competitive, Non- competitive, Mixed); Two or more than two substrate kinetics.

UNIT III: (8 Sessions)

Enzyme Immobilization: Overview, Types of enzyme immobilization viz adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding - examples; Advantages and disadvantages of different Immobilization techniques; Overview of applications of immobilized enzyme systems

UNIT IV: (8 Sessions)

Enzyme Regulation: Methods of enzyme regulation- covalent modification and zymogen activation, Allosteric regulation Partial Proteolysis; Disulphide reduction.

UNIT V: (8 Sessions)

Applications of Enzymes: Application of enzyme in industries- Food, Beverages, Detergent, Textile, Leather, Agricultural and pharmaceutical.

Course Outcomes:

Students will be able to:

- Understand the enzyme kinetics.
- Use catalytic strategies in interpreting mechanisms of enzymatic action.
- Learn about the applications of some industrially used enzymes.

Suggested Readings:

1. A. Fersht, Structure and Mechanism in Protein Science, World Scientific, 2017.
2. N. Price & L. Stevens, Fundamentals of Enzymology, 2nd Edn., Oxford University Press, New York, NY.
3. T. Palmer, Understanding Enzymes, 2nd Edn., John Wiley & Sons, New York.
4. D. Voet & J. G. Voet, Biochemistry, John Wiley & Sons, New York, 2011.
5. G. Zubay, Biochemistry, 3rd Edn., Wm. C. Brown, Oxford, 1993.
6. J. M. Berg, J. L. Tymoczko & L. Stryer, Biochemistry, 7th Edn., W.H.Freeman, 2010.

Website Sources:

- <https://www.omicsonline.org/scholarly/enzyme-technology-journals-articles-ppts-list.php>
- <https://www.britannica.com/science/enzyme>
- <https://www.sciencedirect.com/book/9780444641144/advances-in-enzyme-technology>
- <http://www.biologydiscussion.com/enzymes/enzyme-technology/enzyme-technology-application-and-commercial-production-of-enzymes/10185>
- <http://www.biologymad.com/studentwork/12%20-%20etnotes.pdf>
- <https://www.kth.se/dib/enzyme-technology-1.783173>
- <http://www1.lsbu.ac.uk/water/enztech/whither.html>
- <https://bmcbiotechnol.biomedcentral.com/articles/sections/protein-and-enzyme-technology>
- <http://www.odofin.com/enzyme%20technology.htm>
- <https://www.thesciencenotes.com/enzyme-technology/>
- https://application.wiley-vch.de/books/sample/3527329897_c01.pdf

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology II Year (III Semester)
(Effective from 2021-22)

BFT-301: PRINCIPLES OF FOOD PROCESSING

Objective(s): The objectives of this course:

- To make students learn fundamentals of food processing and the relationships between scientific principles and preparation techniques.
- It also provides an insight of manufacturing industries that transforms animal, plant, marine resources finished value-added food products.

UNIT I: (8 Sessions)

Introduction to food processing: Historical development and scope of food processing; Aims and objectives of preservation & processing of foods, Characteristics of low moisture, intermediate moisture and high moisture foods; Classification of food based on pH; Causes of quality deterioration and spoilage of food.

UNIT II: (8 Sessions)

Preservation of foods by low temperatures: Introduction to refrigeration and freezing, Definition, Principle of freezing; Freezing curve; Changes occur during freezing; Types of freezing; Consideration relating to storage of foods at chilling temperatures, changes during thawing and its effect on foods, Controlled and Modified atmosphere storage of foods.

UNIT III: (8 Sessions)

Preservation of foods by high temperatures: Basic concepts in thermal destruction of microorganisms D, Z, F values. Thermal resistance of the microorganisms; Thermal processing- cooking, blanching, pasteurization and sterilization of foods; General process of canning of foods, Spoilage in canned foods.

UNIT IV: (8 Sessions)

Preservation of foods by water removal: Principles, Technological aspects and application of evaporative concentration process; Freeze concentration, freeze drying and membrane process for food concentrations. Drying and dehydration of foods.

UNIT V: (8 Sessions)

Preservation of foods by non-thermal methods: Principles, Technological aspects and application of sugar and salt, antimicrobial agents, Non-ionizing and ionizing radiations, pulse electric field, Hurdle technology, high pressure processing, ohmic heating in preservation of foods.

Course Outcomes:

Students completing this course will be able to:

- Identify and demonstrate the fundamentals of food processing and the relationship between scientific principles and cooking procedures.
- Understand the concepts and principles of processing techniques and the effects of processing parameters on product quality.

Suggested Readings:

1. Owen R. Fennema. Principles of food science. New York ; Basel : Dekker, 1975.
2. Potter, Norman N., Hotchkiss, Joseph H. Food Science. Fifth Edition, 2007.
3. V Kyzlink. Principles of food preservation. Amsterdam : Elsevier, 1990.
4. Shakuntala Manay N. foods facts and principles. New age International limited, Publishers: New Delhi: Third edition, 2010.

5. Dennis R. Heldman, Principles of Food Processing, 1997.

Website Sources:

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- <https://www.wikipedia.org/>
- <https://library.nitrkl.ac.in/>
- ecoursesonline.iasri.res.in

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology II Year (III Semester)
(Effective from 2021-22)

BFT-303: FOOD MICROBIOLOGY

Objective: The main objective of this course:

- Is to introduce knowledge of food composition and food processing methods essential in the control of microbial growth and food contamination along with different microorganisms and their importance in food microbiology.

UNIT I: (8 Sessions)

Introduction: Historical development and scope of food microbiology. Morphology, general characteristics and classification of microorganisms.

UNIT II: (8 Sessions)

Microbial growth: Growth of microorganisms- physiological and nutritional need, growth curve; pure culture techniques and maintenance of culture; role of intrinsic and extrinsic parameters that affect the microbial growth in foods.

UNIT III: (8 Sessions)

Contamination, spoilage and preservation of food products: Principle underlying spoilage and preservation of foods. Contamination, spoilage and preservation- cereal products, sugar products, fruit and vegetable products, meat products, fish and sea foods, egg and poultry products, dairy products, beneficial micro-organism in food fermentation.

UNIT IV: (8 Sessions)

Food borne diseases: Bacterial food poisoning and infection-*Clostridium perferinges*, *Vibrios*, *E.coli*, *B.cereus*, *Y.enterocolitica*, *campylobacter*, *Listeria monocystogenes*; Non-bacterial poisonings, infections and intoxications.

UNIT V: (8 Sessions)

Food safety and quality control: Importance and principles of food hygiene and sanitation; basic principles of food plant sanitation; indicators of food safety and quality; microbiological criteria of foods; legislation for food safety- HACCP and ISO systems.

Course Outcomes:

Students completing this course will be able to:

- Understand the significance of intrinsic and extrinsic factors on growth and response of microorganisms in foods.
- Recognize the characteristics of important pathogens and spoilage organisms in foods.
- Comprehend the importance of strategies used by the industry to ensure safe foods.

Suggested Readings:

1. Pelczar, Michael J., E. C. N. Chan, and Noel R. Krieg. *Microbiology*. Tata Mc- GrawHill, 1986.
2. James M. Jay, Martin J. Loessner, David A. Golden. *Modern Food Microbiology (Food Science Text Series) 7th Edition*. Springer, 1987.
3. William S. Frazier, Dennis C. Westhoff. *Food Microbiology*, Tata McGraw hill publications, 1988.
4. *Fundamental Food Microbiology* by Bibek Ray, Ph.D., Arun Bhunia, 2013
5. *Food Microbiology: An Introduction (ASM Books) 4th Edition* by Karl R. Matthews, Kalmia E. Kniel, Thomas J. Montville, 2017.

Website Sources:

- <https://onlinecourses.nptel.ac.in/>
- <https://www.wikipedia.org/>
- <http://ecoursesonline.iasri.res.in/>

IFTM University, Moradabad
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(Effective from 2021-22)

BFT-304: FOUNDATION OF FOOD AND NUTRITION

Objective: The main objective of this course:

- To utilize knowledge from foundational sciences as a basis for understanding the role of food and nutrients in health and disease.

UNIT I: (8 Sessions)

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: (8 Sessions)

Balanced Diet: Functions of food-physiological, psychological and social; Concept of Balanced Diet, Food Groups, Food Pyramid, Food Exchange List; Principles of Meal Planning; Factors affecting meal planning.

UNIT III: (8 Sessions)

Nutrients: Classification, digestion, absorption, functions, dietary sources, RDA, clinical manifestations of deficiency and excess 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, folate, vitamin B12 and vitamin C; Minerals – calcium, iron, iodine, fluorine and zinc.

UNIT IV: (8 Sessions)

Basics of Energy: Energy units - Kilocalories, Mega joules, determination of energy value of foods, using Bomb calorimeter, diagram of Bomb Calorimeter - gross calorific values, Physiological energy, value of foods, relation between oxygen used and calorific value

UNIT V: (8 Sessions)

Nutrition Improvement of Foods: Effect of processing on Nutritional quality of foods; Methods of enhancing the nutritional quality of foods- Enrichment and fortification.

Course Outcomes:

Students completing this course will be able to:

- Understand the relationship between food, nutrition and health.
- Understand digestion, absorption and function of various nutrients and their sources.
- Understand the functions of food.

Suggested 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. Sunetra Roday, Food Science Nutrition, Third Edition published in 2018.
4. Gopalan, C., (1990). NIN, ICMR. Nutritive Value of Indian Foods.
5. Wardlaw MG, Paul M Insel Mosby 1996). Perspectives in Nutrition, Third Edition.

Website sources:

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- ecoursesonline.iasri.res.in

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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(Effective from 2021-22)

EHU-301: DISASTER MANAGEMENT

Objective(s): The objectives of this course:

- Is to provide students an understanding to the concepts and aspects of disaster and its relationship with development.
- To ensure awareness of Disaster Risk Reduction (DRR) approaches among students.
- To assist students, develop ability to respond to their environment with potential response to disaster.

UNIT I: (8 Sessions)

Introduction to Disasters: Definition- Disaster, Hazard, Vulnerability, Resilience, Risks; Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc.; Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc.; Differential impacts- in terms of caste, class, gender, age, location, disability; Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II: (8 Sessions)

Approaches to Disaster Risk Reduction: Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness; Community based DRR (Disaster Risk Reduction), Structural-nonstructural measures; Roles and responsibilities of community: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders

UNIT III: (8 Sessions)

Inter-Relationship between Disasters and Development: Factors affecting Vulnerabilities, impact of Development projects such as dams, embankments, changes in Land-use etc.; Climate Change Adaptation-IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources; Role of international cooperation's in Disaster Management

UNIT IV: (8 Sessions)

Disaster Risk Management in India: Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management; Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation; Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V: (8 Sessions)

Disaster Management: Applications, Case Studies and Field Works: The project /fieldwork are meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located. A few ideas or suggestions are discussed below:

Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM plans and community based disaster preparedness plans. Information on these would be available with the district collector or Municipal corporations.

Teachers could ask students to explore and map disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teacher could work on ways of addressing these vulnerabilities, preparing plans and consultation with local administration or NGOs.

Students could conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings, training in first aid.

Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work.

The suggested topics for Project work for student could be as follows:

- Monitoring and evaluation plan for disaster response
- Low cost Home based water purification methods
- Planning Nutrition intervention programmes
- Safety tips before during and after earthquake, cyclone, floods and fire accidents.
- Mock Drills
- Major disasters in India
- Disaster Management in India
- Flood affected areas and damages in India
- Heat waves in India
- Earth quakes in India
- Historical Tsunamis in India
- Nuclear emergence
- Traffic accidents in India
- Train Accidents
- Major disease outbreak
- Disaster management structure in India
- Precaution, mitigation of disaster in India
- Warning system in India to prevent disaster
- Bhopal gas tragedy
- Kutch earth quake
- Tsunami (2004)
- Kosi Calamity 2008
- Mayapuri radiation exposure Delhi (2010)
- Mock exercises

Course Outcome: The students will be able to:

- Identify the nature and causes of disaster.
- Apply the disaster risk reduction mechanism.

Suggested Readings:

1. SatishModh, Introduction to Disaster Management, Macmillan Publisher India Ltd
2. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
3. Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
4. Damon P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann,
5. Singhal J.P. "Disaster Management", Laxmi Publications. ISBN-10: 9380386427 ISBN-13: 978-9380386423
6. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., ISBN-10: 1259007367, ISBN-13: 978-1259007361]
7. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
8. KapurAnu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi.
9. Carter, Nick. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
10. Cuny, F. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development.
11. Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009.

12. Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
Indian Journal of Social Work.
13. Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April.

Website Sources:

- https://www.physio-pedia.com/Disaster_Management
- <http://www.ifrc.org/en/what-we-do/disaster-management>
- <http://www.wcpt.org/disaster-management/what-is-disaster-management>
- en.wikipedia.org

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Biotechnology/Microbiology/Food Technology II Year (III Semester)
(Effective from 2021-22)

BSB-351 Enzymology

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Introduction to Enzymology Laboratory.	Experiment 1
6.	Extraction of enzyme from plant source.	Experiment 2
7.	To determine the effect of temperature on the rate of enzyme action.	Experiment 3
8.	To determine the effect of pH on the rate of enzyme action.	Experiment 4
9.	To determine the effect of substrate concentration on the rate of enzyme action.	Experiment 5
10.	To determine the effect of enzyme concentration on the rate of enzyme action.	Experiment 6
11.	Extraction of pure amylase enzyme and its mode of action on substrate (starch).	Experiment 7
12.	Immobilization of amylase enzyme.	Experiment 8

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology II Year (III Semester)
(Effective from 2021-22)

BFT-351 Food Microbiology

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	To understand the basic microbiology laboratory practices and equipments	Experiment 1
6.	To clean and sterilize all glassware's.	Experiment 2
7.	To prepare and sterilize nutrient media.	Experiment 3
8.	To prepare bacterial smear.	Experiment 4
9.	Enumeration (counting) of bacterial colonies by plate count or serial dilution agar plate technique.	Experiment 5
10.	To perform gram's staining of Bacteria.	Experiment 6
11.	To prepare slant (slope) and stabs.	Experiment 7
12.	To streak agar petriplate using culture.	Experiment 8

IFTM UNIVERSITY, MORADABAD
COURSE STRUCTURE
B.Sc. (FOOD TECHNOLOGY)
(Effective from 2021-22)
Fourth Semester

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
									End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	BFT-401	Principles of Food Preparation	3	1	0	20	10	30	70	100	4
2.	BFT-402	Food Engineering	3	1	0	20	10	30	70	100	4
3.	BFT-403	Technology of Cereals, Pulses and Oil Seeds	3	1	0	20	10	30	70	100	4
4.	BFT-404	Food Chemistry I	3	1	0	20	10	30	70	100	4
5.	BMA-409	Introductory Biostatistics	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
6.	BFT-451	Food Technology	0	0	2	20	10	30	70	100	1
7.	BFT-452	Food Chemistry	0	0	2	20	10	30	70	100	1
8.	GP-401	General Proficiency	0	0	0	0	0	100	-	100	1
Total Credit			15	5	4			310	490	800	23

Note: Industrial training of 4-6 weeks after IV semester which will be evaluated in V semester

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology II Year (IV Semester)
(Effective from 2021-22)

BFT-401: PRINCIPLES OF FOOD PREPARATION

Objective: The main objective of this course:

- Is to impart the knowledge of fundamental and basic concepts of culinary techniques, cooking methods, heat transfer, sanitation, safety, nutritional value of various food products.

UNIT I: (8 Sessions)

Methods of Cooking: Basic methods of cooking, Conduction, convection, radiation, Microwave cooking, cooking media- air, water, steam, fat. Introduction to cookery terms.

UNIT II: (8 Sessions)

Cereals: Effect of heat on cereals, Bakery foods- Bread, Cakes, types of icings, pizza base, biscuits, cookies, rusk, and pastry. Roles of ingredients, faults and remedies, leavening agents, Methods of making dough; Breakfast cereals.

UNIT III: (8 Sessions)

Pulses: Types of pulses, Ways of using pulses- cooking, soaking, germination, fermentation, Enhancement of nutritive value by these processes Fermented foods like Idli, dhokla, soy products.

UNIT IV: (8 Sessions)

Vegetables and fruits: Quality, care in storage, Nutritive value of various types of fruits and vegetables, Effect of heat, acid and alkali on pigments, Effect of cooking on nutritive value of fruits and vegetables, Brief description of various fruits and vegetable products and their nutritional quality.

UNIT V: (8 Sessions)

Milk and Beverages: Effect of heat on milk, Preparation of milk products and nutritional values of- Ghee, Butter, Rabri, khoa, chhanna, paneer, Ice cream- roles of ingredients, method of preparation, defects. Beverages: Tea, Coffee, Cola drinks- Types available, processing, associated health benefits and risks.

Course Outcomes:

Students completing this course will be able to:

- Identify and apply scientific principles of food selection and preparation in order to retain nutritive value and produce quality food products.
- Describe and demonstrate accurate food preparation and standardized food measurements.
- Prepare and handle food using safe, sanitary practices.
- Analyze the basic food science principles that affect the outcome of the finished food product.

Suggested Readings:

1. Charley, H. Food Science, 2nd edition, 1982.
2. Anandalakshmi, Basic Food Preparation, Lady Irwin College, 1989.
3. De Sukumar, Outlines of Dairy Technology, Oxford University Press, Oxford. 2007.
4. Swaminathan, M. Food Science, Chemistry and Experimental Foods, 2nd ed, 1987.
5. Manay NS & Shadakshaswamy M, Food Facts and Principles, New Age International, 2004.

Website Sources:

- <https://onlinecourses.nptel.ac.in/>
- <https://www.wikipedia.org/>
- <http://ecoursesonline.iasri.res.in/>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology II Year (IV Semester)
(Effective from 2021-22)

BFT-402: FOOD ENGINEERING

Objective(s): The objectives of this course:

- Is to introduce students with Food engineering which is a multidisciplinary subject which combines food sciences, microbiology, food processing and food technology.
- This applies engineering combined with the knowledge of product properties by developing processes and equipment to convert agricultural raw materials and ingredients into safe food for consumers.
- The main focus was on food preservation and stabilization, whereas trends now are on diversity, health, taste, and sustainable production.

UNIT I: **(8 Sessions)**

Introduction: Concept of Unit operation, Units and dimensions, Unit conversions, dimensional analysis, Principle and equipments used in food industry; Law of thermodynamics, Mass and Energy Balance. Design of food plant; Important considerations for designing of food plants.

UNIT II: **(8 Sessions)**

Fluid flow in food processing: Liquid transport system, properties of liquids, Newton's law of viscosity, properties of Newtonian and non-Newtonian fluids, flow characteristics, Reynolds no, Bernoulli's equation, principle of flow measurement devices.

UNIT III: **(8 Sessions)**

Refrigeration and Freezing: Basic Concept of refrigeration and freezing, Classification and selection of a refrigerant, Description of a vapor compression Refrigeration, Types of freezers- plate, spiral, fluidized, cryogenic; Application of Frozen food storage in food processing industry.

UNIT IV: **(8 Sessions)**

Heat and Mass Transfer: Thermal Properties of Food, Modes of heat transfer- Conduction, Convection and Radiation; Fick's law of diffusion, Heat transfer equipment- Heat exchangers.

UNIT V: **(8 Sessions)**

Steam, Evaporation and Dehydration: Generation of steam, Classification of boilers, Construction and functions of fire tube and water tube boilers, boiling point elevation, Type of evaporators and evaporation process; Basic Drying Process and types of driers; Determination of moisture content.

Course Outcomes:

Students completing this course will be able to:

- Recognize the basic concept of plant layout and design including the basic understanding of the equipment layout, ventilation and the choice of material used for construction.
- Develop the design parameters for a bioreactor.
- Evaluate the importance of design considerations in a fermentation plant design project and examine scale up operations.

Suggested Readings:

1. Fellow P. Food processing technology. VCH Ellis Horwood, 2009.
2. Rao DG. Fundamentals of food engineering. PHI Learning Private Ltd. 2010

3. Singh RP and Heldman DR. Introduction to food engineering. Academic press, 4th edition, 2009.
4. Rao C G Essentials of food process engineering. B S publications 2009
5. K.M. Sahay and KK Singh. Unit operations of agricultural processing, Second Edition, 2004.

Website Sources:

- <https://onlinecourses.nptel.ac.in/>
- <https://www.wikipedia.org/>
- <https://www.ncbi.nlm.nih.gov/books>
- <http://ecoursesonline.iasri.res.in/>
- <https://nzifst.org.nz/resources/unitoperations/introduction2.htm>
- <https://library.nitrkl.ac.in/>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology II Year (IV Semester)
(Effective from 2021-22)

BFT-403: TECHNOLOGY OF CEREALS, PULSES AND OIL SEEDS

Objective: The main objective of this course:

- Is to enable the students to understand and acquaint with production trends, structure, composition, quality evaluation and processing technologies for product development and value addition of various cereals, pulses and oilseeds.

UNIT I: **(8 Sessions)**

Wheat: Types, structure of wheat grain, chemical composition; physicochemical properties; milling, flour grade, flour treatments (bleaching, maturing), flour for various purposes, technology of dough development.

UNIT II: **(8 Sessions)**

Rice: Chemical composition; grain structure; physicochemical properties, milling (mechanical & solvent extraction); parboiling, ageing of rice; utilization of by-products

UNIT III: **(8 Sessions)**

Coarse grains: Corn - Milling (wet and dry), cornflakes. Barley- Milling, Malting, Processing of beer. Oats – Milling (oatmeal, oat flour & oat flakes). Sorghum, Pearl Millet, finger millet – Milling.

UNIT IV: **(8 Sessions)**

Pulses: Composition of pulses; Milling of pulses-dry milling; Wet milling, Improved milling method; Pulse based food products; Anti nutritional factors of pulses.

UNIT V: **(8 Sessions)**

Oil seeds: Composition of oilseeds; Extraction of oil from -groundnut, sunflower, soybean and coconut; Oil refining process; Sources of protein (defatted flour, protein concentrates and isolates), properties and uses, protein texturization, fiber spinning.

Course Outcomes:

Students completing this course will be able to:

- Understand the basic composition and structural components of food grains.
- Aware the importance of physico-chemical properties of food grains.
- Understand the basics of milling operations for food grains.

Suggested Readings:

1. Kent, Technology of Cereal, 5th Ed. Pergamon Press, 2003
2. Marshall, Rice Science and Technology, Wadsworth Ed., Marcel Dekker, New York, 1994
3. Chakraverty, A.: Post Harvest Technology of Cereals, Pulses and Oilseeds. Oxford and IBH Publishing Co, Calcutta (1995).
4. Karel Kulp and Joseph P Pante: Hand Book Of Cereal Science and Technology Mercel Dekkar USA (2000).
5. J. Smartt: Tropical Pulses Longman Group Ltd. London (1980).

Website Sources:

- <http://www.egyankosh.ac.in/>
- <https://www.wikipedia.org/>
- <http://ecoursesonline.iasri.res.in/>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B. Sc. Food Technology II Year (IV Semester)
(Effective from 2021-22)

BFT-404: FOOD CHEMISTRY-I

Objective(s): The objective of this course:

- Describes chemical composition, structure, biochemistry and quality of important foods: fruit, vegetables, meat/fish, bread, milk.
- Explores the quality degrading processes in foods, Food microbiology, food hygiene and food borne illness.

UNIT I: (8 Sessions)

Water: Definition, Composition of food, Definition of water in food, Structure of water and ice; Types of water, Interaction of water with solutes, Sorption phenomenon, Water activity and packaging, Water activity and spoilage.

UNIT II: (8 Sessions)

Lipids: Classification of lipids, Characteristics, 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, rancidity, lipolysis, flavor reversion.

UNIT III: (8 Sessions)

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

UNIT IV: (8 Sessions)

Carbohydrates: Classification (mono, oligo and poly saccharides), Structure of important polysaccharides (starch, glycogen, cellulose, pectin, hemicellulose, gums), Chemical reactions of carbohydrates, Modified celluloses and starches.

UNIT V: (8 Sessions)

Vitamins: Structure, Importance and Stability, Water soluble vitamins, Fat soluble vitamins, Flavour: Definition and basic tastes, Chemical structure and Flavour enhancers.

Course outcomes:

Students will be able to:

- Explain properties and reactions of carbohydrates, lipids and proteins during storage and processing of food.
- Influence the quality and properties of the food.
- Explain the importance of water for stability and quality of foods.

Suggested 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, New York, 1980

Websites Sources:

- <https://www.cdc.gov/foodsafety/>
- <https://libguides.reading.ac.uk/food/websites>
- <http://www.fao.org/home/en/>

IFTM University, Moradabad
Bachelor of Sciences (B.Sc.), Programme
B.Sc. Biotechnology/Microbiology/Food Technology II Year (IV Semester)
(Effective from 2021-22)

BMA – 409: INTRODUCTORY BIOSTATISTICS

Objective: - The objectives of the course:

- To learn Biostatistics for designing data collection plans, analyze data appropriately and interpret and draw conclusions from those analyses.
- Is to help in learning advance statistical science and its application in problems of human health and disease.
- Is advancing statistics and analyzing data for research problems.

UNIT I: **(10 Sessions)**

Introduction to Biostatistics: Definition, Statistical method biology measurement, Kinds of biological data, Function of statistics and limitation of statistics, Application of biostatistics, Role of biostatistics in modern research, Parametric and non-parametric methods (Tests).

UNIT II: **(5 Sessions)**

Collection of data: Presentation of data classification and tabulation, Type of representation (graphic-bar diagram, pie-diagram, Curves and basic concept of calculus), Sampling and sampling design.

UNIT III: **(5 Sessions)**

Measures of central tendencies: Mean, Median, Mode, Geometric mean, Measure of dispersion, Variability and changes, Deviation- Quartile deviation, Mean deviation, Standard deviation, Standard error, Coefficient of variations.

UNIT IV: **(8 Sessions)**

Different Test: Test of hypothesis, Test of significance, t-test, Chi-square test, F-test and ANOVA with numerical.

UNIT V: **(12 Sessions)**

Probability theory: Probability theory of random experiment and associated sample space, Events, Definition of probability, Algebra of events, Addition and multiplication theorems on probability (without proof), Probability distribution, Binomial distribution, Poisson distribution and Normal distribution and their applications in biostatistics.

Course Outcomes:

The students will be able to:

- Demonstrate knowledge of the properties of parametric, semi-parametric and nonparametric testing procedures in Biostatistics.
- Remember restate the principal concepts about biostatistics and collect data relating to variable which will be examined.
- Understand and interpret the concepts of descriptive statistics from these data.
- Understand and be able to address ethical, regulatory and practical aspects of human subjects research including human subjects protections.
- Be capable of self-directed learning of unfamiliar statistical methods and written and oral presentation of results/findings.

Suggested Readings:

1. George W and Willian G., Statistical Methods, IBH Publication
2. Zar J. Biostatistics, Prentice Hall, London.

3. R. Rangaswami, A Text Book of Agricultural Statistics, New Age International Publication, New Delhi.
4. B. K. Mahajan: Methods in Biostatistics.
5. S.C. Gupta & V.K. Kapoor: Fundamentals of Applied Statistics: Sultan Chand & Sons, New Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B. Sc. Food Technology II Year (IV Semester)
(Effective from 2021-22)
BFT-451: Food Technology

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Orientation to working in a food analysis laboratory	Experiment 1
6.	To understand the concept of shelf life	Experiment 2
7.	To study blanching process	Experiment 3
8.	Identification of different types of packaging materials used in food industry	Experiment 4
9.	To perform the adulteration test for different foods (milk, coffee)	Experiment 5
10.	To study the concept of asepsis	Experiment 6
11.	Estimation of pH of different food samples	Experiment 7
12.	To study pasteurization and sterilization of foods	Experiment 8

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B. Sc. Food Technology II Year (IV Semester)
(Effective from 2021-22)
BFT-452: Food Chemistry

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Preparation of standard solution.	Experiment 1
6.	Estimation of moisture content in the given food samples by hot air oven.	Experiment 2
7.	To determine the casein content of a given milk samples	Experiment 3
8.	To determine the percent of free fatty acid and acid value of given fats and oils sample.	Experiment 4
9.	To determine the smoke point of given fats and oils sample.	Experiment 5
10.	Estimation of flour pigments with respect to carotenoids in the given samples.	Experiment 6
11.	Determination of inactivation of spoilage enzyme (Catalase, Peroxidase, Polyphenol oxidase) in a given food samples.	Experiment 7
12.	To determine the non-enzymatic browning in given food samples.	Experiment 8

IFTM UNIVERSITY, MORADABAD
COURSE STRUCTURE
B.Sc. (FOOD TECHNOLOGY)
(Effective from 2021-22)
Fifth Semester

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Sem Exam	AS +AT	Total	End Sem Exam		
			L	T	P						
THEORY											
1.	BFT-501	Techniques in Food Analysis	3	1	0	20	10	30	70	100	4
2.	BFT-502	Food Industry By-products & Waste Utilization	3	1	0	20	10	30	70	100	4
3.	BFT-503	Food Safety and Microbial Standards	3	1	0	20	10	30	70	100	4
4.	BFT-504	Fat Rich and Traditional Dairy Products	3	1	0	20	10	30	70	100	4
5.	BFT-505	Food Packaging Technology	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
6.	BFT-551	Dairy Product	0	0	2	20	10	30	70	100	1
7.	BFT-552	Industrial Training (Evaluation & Viva Voce)	0	0	2	-	-	100	-	100	1
8.	GP-501	General Proficiency	0	0	0	0	0	100	-	100	1
		Total Credit	15	5	4			380	420	800	23

IFTM University, Moradabad
Bachelors of Science (B.Sc.), Program
B.Sc. Food Technology III Year (V Semester)
(Effective from 2021-22)

BFT-501: TECHNIQUES IN FOOD ANALYSIS

Objective: The main objective of this course:

- Is to help students gain knowledge about various procedures, techniques, instruments and national and international rules and regulations that are relevant in food industry.

UNIT I: **(8 Sessions)**

Sampling and Sampling Techniques: Statistical tests and Error Analysis: Accuracy, precision, classification of errors; minimization of errors; Sampling and sample treatment– different methods of sampling; factors involved in effective sampling.

UNIT II: **(8 Sessions)**

Composition analysis of food: Principles and analysis of- Moisture, total solids, Ash, Fat, Protein, Carbohydrate, Vitamin; Traditional method of mineral analysis.

UNIT III: **(8 Sessions)**

Spectrophotometer: Spectrophotometry: fundamental laws of photometry, Colorimetric analysis, fluorometric analysis, UV-Visible spectrophotometry.

UNIT IV: **(8 Sessions)**

Chromatography: Principle, classification, separation techniques (Elution, frontal and displacement analysis), Column chromatography, thin layer chromatography, paper chromatography, gas chromatography, HPLC.

UNIT V: **(8 Sessions)**

Food quality testing and evaluation: Sensory evaluation-introduction, panel screening, Sensory and instrumental analysis in quality control.

Course Outcomes:

Students completing this course will be able to:

- Understand why there is need of food analysis and what parameters are generally analyzed.
- Understand why and how government controls quality of food.
- Understand several commonly employed techniques of food analysis.

Suggested Readings:

1. Gaithersburg, AOAC International. Official methods of analysis of AOAC International. 17th ed., USA, Association of Analytical Communities, 2003.
2. Yolanda Picó, The Chemical Analysis of Foods, first ed., Academic Press, 2012.
3. M.L Leo, Handbook of Food Analysis, third ed., CRC Press, 2015.
4. G. Linden, Analytical Techniques for Foods and Agricultural Products, PCH, 1995.
5. S.S. Nielsen, Introduction to Chemical Analysis of Foods, 2002.
6. Y. Pomrenz, C.E. Meloan, Food Analysis-Theory and Practice, third ed., Springer, 2002.
7. S. Ranganna. Handbook of Analysis and Quality Control for Fruit and Vegetable Products, Second ed., Tata-McGraw-Hill, 2001.

Website Sources:

- <https://www.wikipedia.org/>
- <https://www.ncbi.nlm.nih.gov/books>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B.Sc. Food Technology III Year (V Semester)
(Effective from 2021-22)

BFT-502: FOOD INDUSTRY BY-PRODUCTS & WASTE UTILIZATION

Objective(s): The objectives of the course:

- Is to make the students understand about the sources and nature of wastes obtained from food industries and the ways to convert it into valuable products.
- Will help to understand the properties of different kind of waste generated in food industry.
- To understand the recovery of by-products to health beneficial product and economic benefit to labor, stakeholder and country.

UNIT I: (8 Sessions)

Waste related to food industry: Classification and characterization of food industrial wastes from fruit and vegetable processing industry, beverage industry, fish, meat and poultry industry, sugar industry and dairy industry; Waste disposal methods – physical, chemical and biological; Economical aspects of waste treatment and disposal; ways of reuse of food wastes.

UNIT II: (8 Sessions)

Waste water treatment: For sustainable treatment of food industrial wastewater; brewery and winery wastewater treatment: some focal points of design and operation application of UASBR for canning industry, Fixed bed loop reactor for alcohol industries.

UNIT III: (8 Sessions)

Utilization of By-Products and Waste from Animal, meat, poultry and fish processing industries: Nutritive value of meat by-products, utilization of blood and blood plasma in food, medicinal and pharmaceutical uses of blood; utilization of gelatin from hide and skin, bones, glands and organs, poultry by-products and fish waste .

UNIT IV: (8 Sessions)

Utilization of Plant By-Products: Recovery of proteins, dietary fibers, antioxidants, and colorants; Utilization of sugarcane by-products: Uses of Bagasse, Molasses, Press mud, Trash, Tops and leaves.

UNIT V: (8 Sessions)

By-products of Dairy Industry and their utilization: Skim milk and its by-products (casein, caseinates, milk protein hydrolysates) butter milk, whey and its by-products, ghee residue.

Course Outcomes:

Students completing this course will be able to:

- Various types of by products and waste generated by the food industry.
- By-products of dairy industry, Classification, Principle and method of utilization.
- Understand the legal and statutory requirements for food waste handling, treatment and disposal.

Suggested Readings:

1. K. Kristbergsson, Utilization of By-Products and Treatment of Waste in the Food Industry, Springer Science Business Media, 2007.
2. V. Oreopoulou, W. Russ, Utilization of By-Products and Treatment of Waste in the Food Industry, 2007 ed., Springer, 2009.
3. H.W. Ockerman, L. Conly, Hansen Animal By-Product Processing & Utilization, first ed., CRC Press, 1999.

4. A.V. Delgado, C.de Armas Casanova Sugar Processing and By-products of the Sugar Industry, FAO Agriculture service bulletin, FAO, 2001.
5. C. Lim, D.J. Sessa, Nutrition and Utilization Technology in Aquaculture, Amer Oil Chemists Society, 1995.

Website Sources:

- <https://www.wikipedia.org/>
- <https://library.nitrkl.ac.in/>
- ecoursesonline.iasri.res.in
- <https://www.icar.org.in/>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
B. Sc. Food Technology III Year (V Semester)
(Effective from 2021-22)

BFT-503: FOOD SAFETY AND MICROBIAL STANDARD

Objective(s): The objectives of this course:

- Is to study the scope of food microbes and pathogenicity in context of food by learning their features and mode of infection.
- Will let the students recognize various techniques for enumeration and control of microbes in food.

UNIT I: (8 Sessions)

Introduction: Definition, Types of hazards, biological, chemical, physical hazards; Factors affecting Food Safety; Importance of Safe Foods; Microbiology terms applied to food safety.

UNIT II: (8 Sessions)

Food in relation to disease: Types – food borne infections, food borne intoxications and toxic infections; naturally occurring in food Endogenous toxin, exogenous toxin; Microbial toxins- Bacterial and Mold toxin produced during processing and storage; Methods for identification of food borne pathogens.

UNIT III: (8 Sessions)

Safety of major food products: Safety of products- fruits and vegetables, nut, Berry, cereals, dairy, meat, fish and sea foods.

UNIT IV: (8 Sessions)

Hygiene and Sanitation in Food Service Establishments: Introduction, Sources of contamination, Control methods using physical and chemical agents, Waste Disposal, Pest and Rodent Control, Personnel Hygiene, Food Safety Measures.

UNIT V: (8 Sessions)

Risk Analysis, Interventions and Regulations: Food Risk Analysis, Sensory evaluation of food quality, Quality factor for consumer safety, Food Regulation in the India, Role of Different Regulatory Agencies of the world

Course Outcomes:

Students are expected to understand:

- Major chemical and biochemical (enzymatic) reactions that influence food quality with emphasis on food industry applications.
- To understand how the properties of different food components and interactions among these components modulate the specific quality attributes of food systems.
- To understand the principles that underlies the biochemical/enzymatic techniques used in food analysis
- Have knowledge on and be able to use food regulations.

Suggested Readings:

1. O.A.Oyarzable, S. Backert, Microbial Food Safety: An Introduction, 2012 ed., Springer.
2. M.J. Pelczar, K. Chan, Microbiology, fifth ed., Tata McGRAW-Hill, 1998.
3. R E Hester , R M Harrison et al., Food Safety and Food Quality, first ed., Royal Society of Chemistry, 2001.
4. R.S. Igoe, Dictionary of Food and Ingredients, Fifth ed., Springer, 2011.

5. G.Tucker, Food Biodeterioration and Preservation, Second ed., Wiley-Blackwell, December 2016.
6. D. H. Watson, Food Chemical Safety, First ed., CRC Press, 2001.
7. B. Shivasankar, Food Processing and Preservation, PHI Learning Pvt. Ltd, 2004.

Websites Sources:

- <https://www.cdc.gov/foodsafety/>
- <https://libguides.reading.ac.uk/food/websites>
- <http://www.fao.org/home/en/>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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(Effective from 2021-22)

BFT-504: FAT RICH AND TRADITIONAL DAIRY PRODUCTS

Objective(s): The objectives of this course:

- To introduce the student about the basic component of food technology that specifically deals with the processing, storage, packaging, distribution and transportation of the dairy products.
- Also deal with the use of knowledge of food-chemistry and microbiology, to enhance nutrition in milk and its related products.

UNIT I: **(8 Sessions)**

Cream: Definition & Legal standards, Methods of separation, Efficiency of cream separation and factors affecting it; control of fat concentration in cream. Neutralization, standardization, pasteurization and cooling of cream.

UNIT II: **(8 Sessions)**

Butter: Introduction to the butter-making process; batch and continuous methods. Technology of butter manufacture; over-run in butter; packaging and storage.

UNIT III: **(8 Sessions)**

Khoa: Classification of types, standards methods of manufacture, mechanization and preservation factors affecting yield of khoa. Physicochemical changes during manufacture and storage of khoa; packaging.

UNIT IV: **(8 Sessions)**

Chhana: Product description, Standards method of manufacture, packaging and preservation. Paneer: Product description standards method of manufacture packaging and preservation. Physicochemical changes during manufacture and storage.

UNIT V: **(8 Sessions)**

Ghee: Methods of ghee making-batch and industrial processes, innovations in ghee production, procedure, packaging and preservation of ghee.

Course Outcomes:

Students completing this course will be able to:

- Understand the chemistry of milk constituents.
- Explain how dairy products are made and the key functions of the processing steps involved in it.

Suggested Readings:

1. De Sukumar, Outlines of Dairy Technology, Oxford University Press, 1991
2. P.Walstra, Dairy Technology: Principles of Milk Properties and Processes, First ed., CRC Press, 1999.
3. P. Walstra, P. Walstra, J.T. M. Wouters, T.J. Geurts, Dairy Science and Technology, Second ed., CRC Press, 2005.
4. R.K. Robinson, Modern dairy Technology (vol.I and II), 1994 ed., Springer, 2012.
5. Rosenthal, Milk and Milk products, VCH Publications, 1991.
6. B. Shivasankar, Food Processing and Preservation, First ed., PHI Learning Pvt. Ltd, 2002.

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- <http://ecoursesonline.iasri.res.in/>

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Bachelor of Science (B.Sc.), Programme
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BFT-505: FOOD PACKAGING TECHNOLOGY

Objective(s): The objectives of this course:

- Provide a perspective for understanding about modern food packaging materials and methods used in food industries.
- To understand the various properties of food packaging materials.
- To select suitable packaging material for different food substances.

UNIT I: (8 Sessions)

Packaging developments: An historical perspective; Definitions and basic functions of packaging; The value of packaging to society; Packaging strategy, Packaging design and development, Packaging specifications and standards.

UNIT II: (8 Sessions)

Packaged product quality and shelf life: Factors affecting product quality and shelf life; Chemical/biochemical processes Oxidation, Enzyme activity; Microbiological processes; Physical and physico-chemical processes; Migration of components from packaging to foods.

UNIT III: (8 Sessions)

Logistical packaging for food marketing systems: Functions of logistical packaging; Logistics activity-specific and integration issues; Distribution performance testing; Packaging Systems-Aseptic packaging, active food packaging, controlled and modified atmospheric packaging.

UNIT IV: (8 Sessions)

Metal and Glass packaging material: Overview of market for metal cans; Container designs; Raw materials for can-making; Can-making processes (DRD) cans (DWI) cans; End-making processes; Coatings, film laminates and inks; Internal corrosion & External corrosion. Packaging of food in glass containers: Glass packaging; Attributes of food packaged in glass containers; properties of glass; glass container manufacture process.

UNIT V: (8 Sessions)

Plastics and Paper packaging material: Use of plastics in food packaging; Manufacture of plastics packaging; Types of plastic used in packaging, Polyethylene, (PP), (PET or PETE), (PEN), (PVC), (PS) (SB), (EVOH); Coating of plastic films – types and properties; Printing and labeling of rigid plastic containers, Food contact and barrier properties. Paper: Types, paper products- paper bags, cartons, drums and molded paper container; Functional properties of paper.

Course Outcomes:

Students completing this course will be able to:

- Describe the role and function of packaging materials used for a range of consumer food needs and wants.
- Measure and evaluate the chemical, physical and mechanical properties of packages and packaging.
- Relate the properties of food packages to conversion technologies, processing and packaging technologies and user requirements including safety, convenience and environmental issues.
- Analyze the principles and practices of laminates, active packaging materials and edible films.

Suggested Readings:

1. F.A. Paine, H.Y. Paine, A Handbook of Food Packaging, Second ed., Springer, 1993.

2. A.Emblem, H. Emblem, Packaging Technology: Fundamentals, Materials and Processes, Woodhead Publishing Ltd, 2012.
3. Richard Coles, Derek McDowell, Mark J. Kirwan, Food Packaging Technology, 2003.
4. Gordon L. Robertson, Food Packaging Principles and Practice, 2013.
5. G.A. Giles, Food Packaging Technology, Global Pack Management, GlaxoSmithKline, Blackwell publishers, CRC press. 2003.

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IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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BFT-551: Dairy Product Lab

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	To detect various adulterants present in milk using specific biochemical tests	Experiment 1
6.	To prepare casein and calculate percent of wet and dry yield	Experiment 2
7.	Determine of Specific Gravity of Milk	Experiment 3
8.	To produce yoghurt	Experiment 4
9.	To produce paneer and calculate the percentage of paneer yield	Experiment 5
10.	Determination of Activity (Titrable Acidity) of Milk	Experiment 6
11.	Detection of microorganisms in milk samples by MBRT TEST (Methylene blue reduction test)	Experiment 7
12.	To study the use of various Detergents and Sanitizers in Dairy plant	Experiment 8

IFTM UNIVERSITY, MORADABAD
COURSE STRUCTURE
B.Sc. (FOOD TECHNOLOGY)
(Effective from 2021-22)
Sixth Semester

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
			L	T	P	Mid Sem Exam	AS +AT	Total	End Sem Exam		
THEORY											
1.	BFT-601	Food Fermentation Technology	3	1	0	20	10	30	70	100	4
2.	BFT-602	Food Chemistry II	3	1	0	20	10	30	70	100	4
3.	BFT-603	Technology of Meat, Poultry & Eggs	3	1	0	20	10	30	70	100	4
4.	BFT-604	Project Management and Entrepreneurship	3	1	0	20	10	30	70	100	4
5.	BFT-605-607	Departmental Elective	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
6.	BFT-651	Food Fermentation Technology	0	0	2	20	10	30	70	100	1
7.	BFT-652	Food Quality Analysis	0	0	2	20	10	30	70	100	1
8.	GP-501	General Proficiency	0	0	0	0	0	100	-	100	1
		Total Credit	15	5	4			310	490	800	23

IFTM UNIVERSITY, MORADABAD
COURSE STRUCTURE
B.Sc. (FOOD TECHNOLOGY)
(Effective from 2021-22)
Sixth Semester

LIST OF DEPARTMENT ELECTIVES

S.No.	Course Code	Course Name
1	BFT-605/606/607	Food Quality Management/Food Quality Testing and Evaluation/ Food Product Development and Evaluation

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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(Effective from 2021-22)

BFT-601: FOOD FERMENTATION TECHNOLOGY

Objective: The main objective of this course

- Is to cater to the needs of the students of Food technology for practical as well as theoretical knowledge so that they can thrive well in the Food industries where fermentation is the fundamental process.

UNIT I: (5 Sessions)

Microbes in food fermentation: History and development of industrial fermentation; Microbial culture- bacteria, yeast and mold; Media composition, Types of Raw Material, Inoculums, Maintenance and strain development; benefits of fermented food.

UNIT II: (5 Sessions)

Microbial Production of enzymes: Amylase lipase, protease, pectinase, lactase and cellulose.

UNIT III: (5 Sessions)

Dairy and Dairy product: Production of cheese, yogurt, soya sauce, butter milk, bread, fermented fish & pickle.

UNIT IV: (5 Sessions)

Alcoholic Beverages: Industrial production process for beer & wines, Distilled alcoholic product (spirit) - whisky, Brandy, rum, vodka, gin, Champagne.

UNIT V: (5 Sessions)

Production of organic acids and amino acids: Organic acids- vinegar, lactic acid; amino acids- tryptophan, glutamic acid; production of Baker's Yeast, Single cell protein (SCP).

Course Outcomes:

Students completing this course will be able to:

- Understand theoretically how to isolate and maintain industrially important strain of any microorganism. Also, how to initiate any fermentation process
- Understand basics of production of several industrially important fermented products like wine, cheese and vinegar.

Suggested Readings:

1. P.F. Stanbury, A. Whitaker, S.J. Hall, Principles of Fermentation Technology, Third revised ed., Butterworth-Heinemann Ltd, 2016.
2. J.E. Bailey, F. David, Biochemical Engineering fundamentals, Second ed., 2010.
3. A.H. Patel, Industrial Microbiology. MacMillan Publishers. 2015.

Website Sources:

- <https://www.wikipedia.org/>
- <https://www.ncbi.nlm.nih.gov/books>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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BFT-602: FOOD CHEMISTRY II

Objective: The main objective of the course:

- Is to explain about the chemistry of the principal components of foods, their properties and interactions, and the changes that occur during processing, storage, and utilization.

UNIT I: (5 Sessions)

Minerals: Macro, micro and trace elements, distribution in body and Metabolic role of minerals, sources, bioavailability, requirement and deficiency disorders, Factors affecting enhancing/inhibiting absorption of Calcium, Phosphorus, Iron, Iodine. Toxic metals.

UNIT II: (5 Sessions)

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

UNIT III: (5 Sessions)

Browning Reactions in Food: Enzymatic browning; Non-Enzymatic browning- Maillard reaction, Caramelization reaction, Ascorbic acid oxidation

UNIT IV: (5 Sessions)

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

UNIT V: (5 Sessions)

Physio-chemical and nutritional changes occurring during food processing treatments: Drying and dehydration; Irradiation; Freezing and refrigeration; Canning.

Course Outcomes:

Students completing this course will be able to:

- Understand the chemical function and properties of major food components.
- Know the physicochemical mechanisms responsible for food functionality and will be able to use their knowledge of Food Chemistry to control the consequences of the reactions.

Suggested Readings:

1. deMan, M. John, Principles of Food Chemistry, Third ed., Springer, 2013.
2. Desrosier, W. Norman, Desrosier, N. James, The technology of food preservation, Fourth ed., Westport, Conn, AVI Pub. Co, 1977.
3. Fennema, R. Owen, Food Chemistry, Third ed., Marcell Dekker, New York, 1996.
4. Fuller, Gordon W, New Product Development from Concept to Marketplace, CRC Press, 2004.
5. J. Robert, O.E. Whitehurst, Enzymes in Food Technology, Second ed., 2002.

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- <https://www.ncbi.nlm.nih.gov/books>
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BFT-603: TECHNOLOGY OF MEAT, POULTRY & EGGS

Objective(s): The objectives of this course:

- To enable the students to understand about Composition, nutritive value of meat, poultry and fish, processing technology of meat, poultry and fish, Meat products, eggs.
- To make students understand about how to process meat, poultry and fish, preparation of different types of products from meat, poultry and fish.

UNIT I: **(8 Sessions)**

Livestock and poultry population in India: Development of meat and poultry industry in India and its need in nation's economy; Glossary of live market terms for animals and birds; Meat quality: Effects of feed, breed and environment on production of meat animals and their quality.

UNIT II: **(8 Sessions)**

Slaughter process and quality management: Slaughter, inspection and grading, Antemortem examination of meat animals, slaughter of buffalo, sheep/goat, poultry, pig A Generic HACCP model, dressing of carcasses, post-mortem examination of meat; Meat Quality-color, flavor, texture, Water-Holding Capacity (WHC), Emulsification capacity of meat.

UNIT III: **(8 Sessions)**

Preservation of meat: Refrigeration and freezing, thermal processing- canning of meat, retort pouch, dehydration, irradiation, and RTE meat products, meat curing; Sausages- processing, types and defects.

UNIT IV: **(8 Sessions)**

Egg Industry and Egg Production Practices: The egg industry, its techniques of working, general management, structure, composition and nutritive value of egg and its products.

UNIT V: **(8 Sessions)**

Preservation of eggs: Refrigeration and freezing, thermal processing, dehydration, coating; Quality identification of shell eggs: Factors affecting egg quality and measures of egg quality.

Course Outcomes:

Students completing this course will be able to:

- Be able to understand and identify the specific processing technologies used for meat and such foods and the various products derived from these materials.
- Be able to understand and apply the techniques of artificial incubation of eggs, the management of the rearing environment, the laying hens of laying hens and chicken meat.

Suggested Readings:

1. Lawrie R A, Lawrie's Meat Science, 5thEd, Woodhead Publisher, England, 1998.
2. Parkhurst&Mountney, Poultry Meat and Egg Production, CBS Publication, New Delhi, 1997.
3. Pearson & Gillet Processed Meats, 3 Ed, CBS Publication, New Delhi, 1997.
4. Shai Barbut, Poultry Products Processing, CRC Press 2005.
5. Stadelman WJ, Owen J Cotterill Egg Science and Technology, 4th Ed. CBS Publication New Delhi, 2002.

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- <http://ecoursesonline.iasri.res.in/>

IFTM University, Moradabad
Bachelor of Science (B.Sc.), Programme
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(Effective from 2021-22)

BFT-604: PROJECT MANAGEMENT AND ENTREPRENEURSHIP

Objective(s): The main objectives of this course:

- It will enable the students to learn about project management, its method and to develop skills on project planning, analysis implementation and control, manage financial risk, to gain acumen, insight and through knowledge relating to the various aspects of corporate finance, emerging financial services and their regulatory frameworks which, they can implement if they want to become a successful Entrepreneur in future.

UNIT I: **(8 Sessions)**

Concept of Entrepreneurship: Definition of Entrepreneurship given by various economists - the ideal definition–The conceptual model of Entrepreneurship given by John Kao. Views given by Schumpeter Walker & Drucker on Entrepreneurship

UNIT II: **(8 Sessions)**

Small Business: Definition of Small Business - Composition of Small Business -Economic Contribution of Small Business. Strategic Planning for Small Business -Steps in Strategic Planning -Develop a clear Mission Statement -Assess Organization Strengths - Conduct a thorough Market Segment Analysis -Analyse Competitors - Create Company Goals -Formulate Strategic Options and Select appropriate Strategies

UNIT III: **(8 Sessions)**

Introduction-Project: Definition, features, types, infrastructure creation-a special type of projects, significance of infrastructure in economic development, bottlenecks in the infrastructure creation, Project Identification: Idea generation, Project screening, Feasibility study. The advantages and disadvantages of starting your business –The advantages and disadvantages of buying all existing

UNIT IV: **(8 Sessions)**

Arrangement of funds: Traditional sources of financing–Equity shares, preference shares, Debentures/bonds, loan from financial institutions- Loan syndication and consortium finance; Alternative sources of financing- Foreign Issue, FDI & FII, ECB, Private equity, Securitization, BOT projects, PPP, Venture capital / Incubation fund, Franchising etc; Role played by various Financial Institutions like IDBI, ICICI and IFCI.

UNIT V: **(8 Sessions)**

Special Role played by SIDBI and Commercial Banks: Approval of term loan applications by Commercial Banks–How to decide about a suitable agency for assistance Role played by SFCR and NSIC; Project Implementation: Project contracts – Principles, practical aspects of contacts, legal aspects of project management, global tender, Negotiation for projects, Project insurance, Human resource management, network analysis.

Course Outcomes:

Students completing this course will be able to:

- Understand the role of entrepreneur and what qualities he/she should possess.

- Implement the theories into practical which making an enterprise.
- Work on the building up a big enterprise.

Suggested Readings:

1. Scarborough and Zimmerer, Effective Small Business Management, Seventh ed., Pearson, 2002.
2. Pickle and Abrahamson, Small Business Management, Fifth ed., John Wiley & Sons, 1990.
3. J. Kao, Creativity & Entrepreneurship.
4. Gupta and Srinivasan, Entrepreneurial Development, 2015 ed., Sultan Chand & Sons, 2015.
5. V. Desai, Dynamics of Entrepreneurial Development & Management, Fifth ed., Himalaya Publishing House, 2012.
6. P. Chandra, Projects planning analysis selection implementation & review, Eighth ed., McGraw Hill Education India Private Limited, 2014.

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IFTM University, Moradabad
Bachelors of Science (B.Sc.), Program
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BFT-605: FOOD QUALITY MANAGEMENT

Objective: The main objective of this course:

- Is to provide an opportunity to learn food quality management system and to learn international food laws and quality standards.

UNIT I: (8 Sessions)

Introduction to food quality management: Definition, quality concepts, quality, quality perception, quality attributes, safety, health, sensory, shelf life, convenience, extrinsic attributes, factors affecting food behavior. Quality in the Agri- food production chain-Techno- managerial approach, food quality relationship and food quality management functions.

UNIT II: (8 Sessions)

Food contamination: Contamination in Food- Physical, chemical (heavy metals, pesticide residues, antibiotics, veterinary drug residues, dioxins, environmental pollutants, radionuclides, solvent residues, chemicals) Natural toxins; Contaminants formed during processing – nitrosamines, acrylamide etc. natural food contaminants and contaminants from packaging materials.

UNIT III: (8 Sessions)

Food Additives: Chemical, technological and toxicological aspects; Risk assessment studies- Safety and quality evaluation of additives and contaminants, Antioxidants - mechanism of action, natural and synthetic anti-oxidants, technological aspect of antioxidants; Sweeteners- classification- natural and artificial, chemistry, technology and toxicology, consideration for choosing sweetening agents; Colors- classification- natural, artificial, and natural identical, FD&C Dyes and Lakes.

UNIT IV: (8 Sessions)

Basic principles and application of processing techniques: Microwave processing, high fructose corn syrup, extrusion cooking, vacuum evaporation, cryogenic freezing, reverse osmosis, electrodialysis, ultrafiltration, supercritical fluid extraction, fat mimetics, flavour encapsulation, use of nanotechnology in foods etc.

UNIT V: (8 Sessions)

Food Laws, standards and regulations: History, National and International laws & Regulations: FSSAI, USFDA, EU, Codex alimentarius, ISO Series, HACCP; World Trade Organization- (Sanitary and Phyto Sanitary agreement (SPS), Technical Barriers in Trade (TBT); Standards of Identity, Standards of Quality, Standards of fill of the container-

Course Outcomes:

Students completing this course will be able to:

- Understand why there is need of food quality management and what parameters are generally analyzed.
- Understand why and how government controls quality of food.

Suggested Readings:

1. Pie P.A. Luning, W.J. Marcelis, Food Quality Management Technological and Managerial principles and practices, Wageningen, 2002.
2. Brannen et al., Food Additives, Second ed., T & F India, 2016.

3. H.J Heinz, D.A. Shapton, Principles and Practices for the safe processing of Foods, Butterworth-Heinemann, 2002.
4. DeMan, Principles of Food Chemistry, 3rd ed., Springer, 2007.
5. ternel A, Luning, Willem J. Marcelis, Food Quality Management Technological and Managerial principles and practices, Wageningen, 2009.

Website Sources:

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BFT-606: FOOD QUALITY TESTING AND EVALUATION

Objective(s): The main objective of this course:

- To understand different aspects of sensory science and its application.
- To understand basic quality attributes of foods in raw as well as processed form.
- To learn various systems of objective and subjective evaluation and their application in industry

UNIT I: (8 Sessions)

Introduction to quality attributes: Appearance, flavor, textural factors and additional quality factors; Concept and Importance of Food; Appearance, Sensory Assessment of Appearance- panel selection, screening and training; Physical requirement for food appearance, types of sensory test, Appearance Scales.

UNIT II: (8 Sessions)

Taste: Introduction; organs involved in taste perception- tongue, papillae, taste buds, salivary glands; mechanism of taste perception; chemicals responsible for sweet, salt, sour, and bitter taste their structure and chemical dimensions; Factors affecting taste quality; reaction time and factors affecting it absolute and recognition threshold taste abnormalities.

UNIT III: (8 Sessions)

Olfaction: Introduction and definition, anatomy of nose, mechanism of odour perception; Prerequisites for odour perception, odour classification, chemical specificity of odour; measurement of odour using different techniques – primitive, double tube; olfactometer, Elseberg techniques, Wenzel's olfactometer, sniffing, merits and demerits of each methods, olfactory abnormalities.

UNIT IV: (8 Sessions)

Colour: Introduction to natural and synthetic colours; functions of colour in foods, Optical aspect of colour, perception of colour; objective evaluation, colour measurement using different systems- Munsell colour system, CIE colour system, qualitative and quantitative analysis of colour, reflectance spectrophotometry and Colorimetry.

UNIT IV: (8 Sessions)

Texture: Introduction, Definition and classification of texture profile; Subjective evaluation, phases of oral processing; Objective analysis, rheological methods of texture measurement including rheological models; Measurement of texture in various food groups viz. cereals, dairy, fruits and vegetables, meat and meat products.

Course Outcomes:

Students completing this course will be able to:

- Account for the most common methods used for consumer-targeted sensory evaluations.
- Interpret the evaluation techniques and tests used in analyzing food quality

Suggested readings:

1. Amerine, Pangborn & Roessler, Principles of sensory evaluation of food, Academic Press, London, 1965.
2. DeMan, 3rd edition, Principles of Food Chemistry, Springer, 2007.
3. Meilgard, Sensory evaluation Techniques, 3rd ed CRC Press LLC, 1999.
4. Yeshajahu Pomeranz & Clifton E. Meloan, Food Analysis & Theory & Practice, 1st Indian ed. CBS Publisher & Distributors, New Delhi, 2002.

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IFTM University, Moradabad
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BFT-607: FOOD PRODUCT DEVELOPMENT AND EVALUATION

Objective(s): The main objective of this course:

- To understand the different aspects of the product development process from a food science perspective.
- To integrate food science concepts into the development of a food product in a group setting.
- To become familiar with science and business strategies to develop successful, safe, quality food products.
- Provide students with a basic understanding of the product development process in the commercial food industry.

UNIT I: **(8 Sessions)**

Introduction to Product Development: Concept of product development; product success and failure; factors for success; process of product development, managing for product's success; product development program; Legal aspects of new product launch.

UNIT II: **(8 Sessions)**

Product Development Process: The product development process- product strategy, product design and process development, product commercialization, product launch and evaluation, knowledge for conversion of product concept to new product.

UNIT III: **(8 Sessions)**

Market Research/Trends & Product Categories: Ideation and Product Positioning; Research methodology; Fundamental Entrepreneurship; SCAMPER model

UNIT IV: **(8 Sessions)**

Food Ingredients & Specifications & Food Safety and Regulations: Product validation Techniques; Compilation Process of Documented data; Food Safety Norms; Participatory Stakeholders and Organization.

UNIT V: **(8 Sessions)**

Product Formulation and Prototypes Product Labeling, Pricing: Phenomena of Prototyping; Test Recipe Procedure; Sensory Test Methods; Pilot Batching.

Course Outcomes:

Students completing this course will be able to:

- Understand the complexities/intricacies governing the development of new and improved products for the food industry.
- Understand food regulations and apply safety measures to ensure the safety of new products.
- Be aware of the variety of product testing protocols available to evaluate food product quality and consumer acceptance.

Suggested readings:

1. Clarke & Wright W. 1999. Managing New Product and Process Development. Free Press.
2. Earle R, Earle R & Anderson A. 2001. Food Product Development. Woodhead Publ.
3. Fuller 2004. New Food Product Development - from Concept to Market Place. CRC.

Website sources:

- <https://onlinecourses.nptel.ac.in/>
- <https://www.wikipedia.org/>
- ecoursesonline.iasri.res.in

IFTM University, Moradabad
Bachelors of Science (B.Sc.), Program
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(Effective from 2021-22)

BFT-651: Food Fermentation Technology

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	To produce yoghurt from milk.	Experiment 1
6.	To produce cottage cheese from milk.	Experiment 2
7.	To produce the lactic acid from whey.	Experiment 3
8.	To produce the Citric acid from whey with sugars and additives by <i>Aspergilllls niger</i> .	Experiment 4
9.	To produce the Sauerkraut by using microorganisms.	Experiment 5
10.	To produce the Wine for Grape juice	Experiment 6
11.	To produce the natural Ginger Beer.	Experiment 7
12.	To produce the amylase by using <i>Aspergillus Niger</i> by fermentative method.	Experiment 8

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BFT-652: Food Quality Analysis

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	To determine the Diastatic activity of Honey.	Experiment 1
6.	Determination of Total Fat by Manual Extraction.	Experiment 2
7.	To find out the moisture content from a given food sample by lab oven method.	Experiment 3
8.	To find out the ash in the given food sample.	Experiment 4
9.	Determination of Niacin by Colorimetric method.	Experiment 5
10.	Vitamin C analysis in juices by Titration method.	Experiment 6
11.	To find out the amount of total carbohydrates in a given food sample.	Experiment 7
12.	To find out the amount of crude fiber in a given food sample.	Experiment 8