



**AMITY UNIVERSITY**  
— R A J A S T H A N —

**Master of Science (Food Technology)**

**Programme Code: MSD**

**Duration – 2 Years Full Time**

**Programme Structure  
and  
Curriculum & Scheme of Examination  
With  
Choice Based Credit System (CBCS)  
2021**

**AMITY UNIVERSITY**  
**R A J A S T H A N**

## Credit Summary Sheet

<b>M. Sc. Food Technology</b>					
<b>Semester</b>	<b>CC</b>	<b>DE</b>	<b>VA</b>	<b>OE</b>	<b>Total</b>
<b>1</b>	17	3	4	-	26
<b>2</b>	18	3	4	3	30
<b>3</b>	18	3	4	3	30
<b>4</b>	30	-	-	-	30
<b>Total</b>	<b>84</b>	<b>09</b>	<b>12</b>	<b>09</b>	<b>116</b>

Note:- CC - Core Course, VA - Value Added Course, OE - Open Elective, DE - Domain Elective

<b>List of Open Electives from M. Sc. Food Technology</b>						
<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>	<b>Lectures (L) Hours Per Week</b>	<b>Tutorial (T) Hours Per Week</b>	<b>Practical (P) Hours Per Week</b>	<b>Credits</b>
<b>From M. Sc. Food Tech. –II Sem.</b>						
MSD203	Functional Foods and Nutraceuticals	CC	3	-	-	3
<b>From M. Sc. Food Tech.–III Sem.</b>						
MSD 303	Food Safety and Quality Management	CC	3	-	-	3

## **Program Learning Outcomes of Master of Science in Food Technology Program**

1. After completion of M.Sc. program, students will be having knowledge and skills of the technological and science base for the production, processing and preservation of foods.
2. Students will be able to elaborate methods to modify and control food quality and safety by means of chemical, microbiological and sensory analysis techniques.
3. Students will be capable to provide high-level research-based solution to food security problems by manipulating the Farm to fork multi-disciplinary approach.
4. Students will be able to choose and design technologies for the industrial manufacture of food products, with due regard to raw materials, energy, economics and sustainability in the system of industrial food technology and nutrition.

## Program Structure

M. Sc. Food Technology: I Semester						
Course Code	Course Title	Category	Lectures (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Credits
MSD101	Advance Fermentation Technology	CC	3	0	-	3
MSD102	Advance Food Chemistry and Nutrition	CC	3	-	-	3
MSD103	Instrumental Methods of Food Analysis	CC	3	1	-	4
MSD104	Advance Food Processing and Preservation Technology	CC	3	1	-	4
MSD121	Advance Fermentation Technology (Lab)	CC	-	-	2	1
MSD122	Advance Food Chemistry and Nutrition (Lab)	CC	-	-	2	1
MSD123	Instrumental Methods of Food Analysis (Lab)	CC	-	-	2	1
AND001	ANANDAM I	CC	-	-	-	2
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
MSD130	Cold Chain Management	DE	3	-	-	3
MSD131	IPR & Food regulatory affairs	DE				
MSD132	Industrial Safety & Hazards	DE				
BCS 111	Communicational Skills – I	VA	1	-	-	1
BSS111	Self-Development and Interpersonal Skills – I	VA	1	-	-	1
FLT 111 FLG 111 FLS 111 FLC 111	Foreign Language - I French German Spanish Chinese	VA	2	-	-	2
	<b>TOTAL</b>					<b>26</b>

M. Sc. Food Technology: II Semester						
Course Code	Course Title	Category	Lectures (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Credits
MSD201	Meat, Fish and Poultry processing Technology	CC	3	1	-	4
MSD202	Advance Cereal Processing	CC	3	-	-	3
MSD203	Functional Foods and Nutraceuticals	CC	3	-	-	3
MSD204	Advance Biostatistics for Food Technologists	CC	3	-	-	3
MSD205	Advance Food Engineering	CC	3	-	-	3
MSD221	Meat, Fish and Poultry processing Technology Lab	CC	-	-	2	1
MSD222	Advance Cereal Processing Lab	CC	-	-	2	1
AND002	ANANDAM II	CC	-	-	-	2
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
MSD230	Advance Flavor Chemistry and Technology	DE	3	-	-	3
MSD231	Food Rheology and texture	DE				
MSD232	Advance Nanotechnology and its Applications in Food Industry	DE				
MSD233	Research Methodology and Scientific Writing	DE				
<b>OE</b>	<b>Open Elective –I</b>		3	-	-	3
BCS 211	Communicational Skills - II	VA	1	-	-	1
BSS211	Self-Development and Interpersonal Skills - II	VA	1	-	-	1
FLT 211 FLG 211 FLS 211 FLC 211	Foreign Language – II French German Spanish Chinese	VA	2		-	2
	<b>TOTAL</b>					<b>30</b>

**Note:** After completion of the End Term Examination the students must compulsorily undergo Industrial Training of 6 weeks. The evaluation of this training would be carried out in III sem.

## M. Sc. Food Technology: III Semester

Course Code	Course Title	Category	Lectures (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Credits
MSD301	Processing of Foods of Plant Origin	CC	3	1	-	4
MSD302	Novel Food Packaging Technology	CC	2	-	-	2
MSD303	Food Safety and Quality Management	CC	3	-	-	3
MSD304	Advance Dairy Technology	CC	3	1	-	4
MSD305	Industrial training report	CC	-	-	-	2
MSD321	Processing of Foods of Plant Origin Lab	CC	-	-	2	1
MSD322	Novel Food Packaging Lab	CC	-	-	2	1
MSD 333	Advance Dairy Technology Lab	CC	-	-	2	1
AND003	ANANDAM III	CC	-	-	-	2
<b>DE Electives: Student has to select 1 course from the list of following DE electives</b>						
MSD330	Food Business Management	DE	3	-	-	3
MSD331	Food Toxicology	DE				
MSD332	Process Equipment Design and Plant Layouts	DE				
<b>OE</b>	<b>Open Elective-II</b>	<b>OE</b>	3	-	-	3
BCS 311	Communicational Skills - III	VA	1	-	-	1
BSS311	Self-Development and Interpersonal Skills - III	VA	1	-	-	1
FLT 311 FLG 311 FLS 311 FLC 311	Foreign Language - III French German Spanish Chinese	VA	2	-	-	2
<b>TOTAL</b>						<b>30</b>

## M. Sc. Food Technology: IV Semester

Course Code	Course Title	Category	Lectures (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Credits
MSD460	Major Project /Dissertation	CC	-	-	-	30
	<b>TOTAL</b>					<b>30</b>

# ADVANCED FERMENTATION TECHNOLOGY

**Course Code: MSD101**

**Credit Unit: 03**

## **Course Objective:**

The objective of the course is to apply the principles of biochemical engineering in large scale cultivation of microorganism for production of important products.

## **Course Contents**

### **Module I**

Advantage of bioprocess over chemical process. Basic principle in bioprocess technology. Major agro-industrial waste products used for fermentation, Media formulation sterilization, thermal death kinetics, batch and continuous sterilization system. Modern strain improvement techniques, Sterilization of Industrial Media, Air and Fermenter.

### **Module II**

**Transport phenomena in bioprocess** – Mass transfer, mass transfer co-efficient for gases and liquids. Rate of oxygen transfer. Determination of oxygen transfer coefficient. Rheological properties of inter-medium. Biological heat transfer, Heat transfer coefficients. Bioprocess control and monitoring variables such as temperature, agitation, pressure, pH etc.

### **Module III**

Kinetics of microbial growth, substrate utilization and product formation Batch, Fed-batch, CSTR types of reactors – CSTR, tower, airlift, bubble column, packed bed, immobilized cells, Control and monitoring, online and off-line control, Computers in bioprocess control systems. Solid state and submerged fermentation process.

### **Module IV**

**Industrial production of enzymes and biomolecules:** cellulase, amylase, protease; organic acids: citric acid, acetic acid, lactic acid; ethanol, biomass, antibiotics: classification, penicillins, tetracyclins, chloramphenicol; vitamins: B<sub>12</sub>, riboflavin, Production by batch, continuous and fed batch techniques, isolation, purification and characterization of biomolecules from fermentation media and storage.

### **Module V**

Biomass: Bakers and distillers yeast production using various raw materials, “bio” factors for growth, Crabtree effect, harvesting, different forms and uses. What are mushroom, different forms of common mushroom production from agro based raw materials and uses. Fermented milk products – Production, purification and packaging of Curd, Cheese, acidophilus milk, Yoghurt, Kefir, Single cell protein (SCP) production. Probiotics and prebiotics; Fermented foods based on milk, meat and vegetables; Fermented beverages.

## **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & References reading materials:**

### **Text:**

- F Stanbury, Allan Whitaker, Stephen J Hall , Principles of Fermentation Technology, Peter, Aditya Text Pvt. Ltd.
- Casida, Industrial Microbiology, New Age International
- Prescott and Dunn, Industrial Microbiology, C.B.S. Publishers
- J. Waites, Neil L. Morgan, John S. Rockey, Gary Higton, Industrial Microbiology: An Introduction, Michael Blackwell Science Ltd

### **References:**

- Bailley and Ollis, Biochemical Engineering, McGraw Hill Education
- Humphrey, Principles of Biochemical Engineering, Wiley-VCH.

# ADVANCED FOOD CHEMISTRY AND NUTRITION

**Course Code: MSD102**

**Credit Units: 03**

**Course Objective:**

To acquaint with properties, role of various constituents in foods, interaction and changes during processing and importance of various foods and nutrients in human nutrition.

**Course Contents**

**Module I**

Definition and importance of major food constituents, Importance of water in food, Phases of water, Role of water as a solvent in food systems, Concept of water activity and moisture migration.

**Module II**

Carbohydrates, proteins and lipids: classification, nomenclature, physical, chemical and functional properties and their structural correlations; Major types of starch, Process of starch gelatinization, Process of staling, Modified starches and other polysaccharides used in foods.

**Module III**

Lipids as emulsifiers, Amino acid and protein interaction, External factors that influence protein systems in foods, Protein modification, Fat replacers; Properties of minerals, vitamins, pigments, flavor components, Interaction of constituents in food systems; Changes during storage and processing; Browning reactions in foods. Auto-oxidation of lipids and rancidity.

**Module IV**

Food groups and their typical composition; essential nutrients- sources, functions, deficiency diseases; requirements and recommended dietary allowances; digestion, absorption, transport and metabolism of nutrients in human system;

**Module V**

Food allergy and intolerance, Allergens, toxins and anti-nutritional factors in foods

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

**Text & Reference reading materials:**

**Text:**

- Belitz HD. Food Chemistry. Springer Verlag.
- DeMan JM, Principles of Food Chemistry. AVI.
- Fennema OR, Food Chemistry. Marcel Dekker.
- Meyer LH, Food Chemistry. CBS.
- Swaminathan M, Essentials of Foods and Nutrition. Vol. II. Ganesh & Co.

# INSTRUMENTAL METHODS OF FOOD ANALYSIS

**Course Code: MSD103**

**Credits Unit: 04**

## Course Objectives:

Food analysis is an important component of food technology. This course is based on presenting the basic principles and practice of food analysis. We will be presenting information about how samples are taken, how it is analyzed, and what techniques are being used. The course will have four major components: 1) sample and sampling techniques, 2) spectrophotometric analysis of samples taken 3) chromatography based analysis of food samples, and 4) sample extraction for different techniques. This will include a discussion of principles of different analytical techniques and the recent advancement in food analysis with some case studies.

## Course Contents

### Module I

Sampling techniques; Water activity, its measurements and significance in food industry

### Module II

Spectroscopic techniques using UV/Vis, fluorescence, atomic absorption spectroscopy, polarimetry, refractometry (Application in Food Industry)

### Module III

Chromatographic techniques: Adsorption, column, partition, affinity, ion exchange, size exclusion, GC, GLC, HPLC, HPTLC, GCMS, LCMS and significance in food industry.

### Module IV

Electrophoresis, solid phase extraction, isoelectric focusing.

### Module V

Immunoassay techniques; biosensors; Enzyme linked immunosorbent assay (Application in Food Industry)

## Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## Text & Reference reading materials:

### Text Book:

- James CS (1998). Analytical chemistry of foods, Blackie Acad, UK.
- Winton, AL (1999). Techniques of food analysis, Allied Science Publication, New Delhi.
- Suzanne Nielson S (2003) Food analysis, Kluwer Academic Press, New York.
- Winton AL (1999) Techniques of food analysis, Allied Science, Official methods of analysis, Association of official analytical chemist USA.

### References:

- Song, DWS (1996) Mechanism and theory in food chemistry Champasian and Hall Inc. New York.

# ADVANCE IN FOOD PROCESSING AND PRESERVATION

**Course Code: MSD104**

**Credit Unit: 04**

## **Course Objective:**

To Emphasis the various properties of the raw material used in food processing, different processing technologies required in transforming them into quality food products and material handling equipment involved in food processing operations

## **Course Contents**

### **Module I**

**Modeling of Microbial Food Spoilages:** Microbial growth dynamics models, partial differentiation equation models, application of models in thermal preservation, Concept, mechanism of microbial destructions, equipments.

### **Module II**

**Membrane Technology:** Introduction to pressure activated membrane processes, performance of RO/UF and NF and industrial application

### **Module III**

**Supercritical Fluid Extraction:** Property of near critical fluids (NCF), solubility and efficiency of NCF extraction, equipment and experimental techniques used in NCF extraction and industrial application.

**Use of Microwave Energy in Foods:** Theory of microwave heating, dielectric properties of food materials, working principle of magnetron, microwave blanching, sterilization and finish drying

### **Module IV**

**Hurdle Technology:** Types of preservation techniques and their principles, concept of hurdle technology and its application.

**High Pressure Processing of Foods:** Concept of high pressure processing, quality changes, effects of pressure on microorganisms and its application in food processing

### **Module V**

**Ultrasonic in Food Processing:** Properties and generation of ultrasonic, ultrasonic imaging, application of ultrasonics as an analytical tool and processing techniques.

**Newer Techniques in Food Processing:** Application of technologies of high intensity light, pulse electric field, ohmic heating, smart packaging, fortification.

**Nanotechnology:** Principles, mechanism and applications in foods.

## **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & Reference reading materials:**

- Sivasankar, B. 2011. Food processing and preservation, Eastern Economy Edition, BHI Publishers, New Delhi.
- Shafiur Rahman, M. 2007. Handbook of Food Preservation, Second Edition. CRC Press, *Muscat, Sultanate of Oman*.
- Bhattacharya, S. 2015. Conventional and advanced food processing technologies. Chichester: Wiley-Blackwell.
- Fellows, P. 2016. Food processing technology. Kent: Woodhead Publishing/Elsevier Science.

## ADVANCED FERMENTATION TECHNOLOGY (LAB)

**Course Code: MSD 121**

**Credit Unit:01**

### **Course Objective:**

The objective of the course is to apply the principles of biochemical engineering in large scale cultivation of microorganism for production of important products.

### **Course Contents:**

#### **List of Practical's:**

1. Preparation of culture media for cultivation of specific microorganism
2. Isolation of microbes from air, soil and water samples
3. Identification by Simple staining.
4. Identification by differential Gram staining.
5. Identification by Lacto phenol cotton blue staining
6. Biochemical test – Indole test, methyl red test, voges proskauer test, citrate utilization, starch hydrolysis, protease, catalase test and oxidase test
7. Identification of microbes in water samples
8. Standard plate count
9. Presumptive and confirmed coli form test
10. BOD and COD

### **Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**Note:** Minor variation could be there depending on the examiner.

# ADVANCE FOOD CHEMISTRY AND NUTRITION (LAB)

**Course Code: MSD122**

**Credit Unit: 01**

## **Course Objectives:**

The objective of this course is to provide the practical exposure to the various chemical analysis methods to know the properties of food. Experiments are designed in such a way that students will carry out the sample extraction and then use the instruments for further analysis of particular analyte.

## **List of Practical's:**

1. Determination of moisture and ash content
2. Determination of protein and fat content
3. Determination of rancidity of oil
4. Determination of minerals (Ca, P, Fe)
5. Estimations of reducing and total sugars
6. Estimations of starch and crude fibre content
7. Determination of calorific value of foods.
8. Determination of BMI & BMR of subject.
9. Case studies for diagnosis of nutritional deficiencies / disorders in human beings.

## **Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**Note:** Minor variation could be there depending on the examiner.

# INSTRUMENTAL METHODS OF FOOD ANALYSIS (LAB)

**Course Code: MSD123**

**Credit Unit: 01**

**Course Objectives:**

The objective of this course is to provide the practical exposure to the students for handling various analytical instruments. Experiments are designed in such a way that students will carry out the sample extraction and then use the instruments for further analysis of particular analyte.

**List of Practical's:**

1. Determination of protein in given food sample using UV spectrophotometer.
2. Detection of food adulteration in food sample using nanotechnology based colorimetric methods.
3. Detection of glucose in given food sample using lateral flow based strips.
4. Estimation of water activity in food sample using water activity meter.
5. Determination of viscosity using viscometer.
6. To determine the color using lovibond tintometer.
7. Demonstration of HPLC and GLC.
8. Demonstration of Flame photometer.
9. Demonstration of electrophoresis.

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**Note:** Minor variation could be there depending on the examiner.

**Text & Reference reading materials::**

**Text Book:**

- Suzanne Nielson S (2003) Food analysis, Kluwer Academic Press, New York.
- Winton AL (1999) Techniques of food analysis, Allied Science, Official methods of analysis, Association of official analytical chemist USA.

**References:**

- Song, DWS (1996) Mechanism and theory in food chemistry Champasian and Hall Inc. New York.

# COLD CHAIN MANAGEMENT

**Course Code: MSD 130**

**Credit Units: 03**

## **Course Objectives:**

This course will review major aspects of cold chain management and frozen foods. The area of cold chain is growing worldwide and has emerged as a major trend in the food industry. This course is concentrated in the fundamentals facility storage and application technology for cold chain management. The course gives the knowledge of facilities for the cold chains. It enables the students to understand quality and safety aspects of frozen foods. The course gives the knowledge about various packaging material for frozen foods and packaging machinery.

## **Course Content**

### **Module I**

**Introduction to Frozen Food:** Introduction to technology of cold chain management, Market demand, current status and future scope of frozen foods. Cold chain integration and energy auditing.

### **Module II**

**Fundamentals of Freezing:** Glass transitions in frozen foods and biomaterials, Microbiology of frozen foods, Thermo physical properties of frozen foods, Freezing loads and Freezing time calculation, Innovations in freezing process

### **Module III**

**Facilities for the Cold Chain:** Freezing methods and equipment, Cold store design and maintenance, Transportation of frozen foods, Retail display equipment and management, Household refrigerators and freezers, Monitoring and control of the cold chain.

### **Module IV**

**Quality and Safety during cold chain:** Quality and safety of frozen meat and meat product, Quality and safety of frozen poultry and poultry products, Safety and quality of frozen fish, shellfish, and related products, Quality and safety of frozen vegetables and fruits, Quality and safety of frozen dairy products, Quality and safety of frozen ready meals, Quality and safety of frozen bakery products, Quality and safety of frozen eggs and egg products

### **Module V**

**Packaging of Frozen Foods:** Introduction to frozen food packaging, Plastic packaging of frozen foods, Paper and card packaging of frozen foods, Packaging of frozen foods with other materials, Packaging machinery

## **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & Reference reading materials:**

### **Text :**

- Quality of Frozen Foods, Erickson, M.C and Hung, Y.C International Thompson Publishing, Newyork
- Handbook of Frozen Foods, Isabel Guerrero Legaretta

### **Reference:**

1. Handbook of Frozen Food Processing and Packaging, Second Edition, Da-Wen Sun, CRC press
2. Managing Frozen foods, Kennedy Chris J CBS, New Delhi.

# IPR & DRUG REGULATORY AFFAIRS

**Course Code:** MSD131

**Credit Unit:** 03

**Course Objective:**

It will familiarize the students of the IPR issues and regulatory issues pertaining to health care industries. The unit will also cover the regulatory legislation and associated approvals and permissions required to conduct high-quality single-centre, national and international clinical trials. Ethical issues will be considered throughout the unit.

**Module I**

**(Intellectual Property Rights-I)**

Regulatory affairs and its importance.

General Principles of Intellectual Property: Copyright, Trademark, Inventions-Patentable, Geographical Indications, Industrial Designs, Integrated Circuits, Trade Secrets. Patents: need of patents, major types of patents, International registration of patents, patent term and extension The Patents Act, 1970 – Salient features.

**Module II**

**(Intellectual Property Rights-II)**

Organization: Intellectual Property Rights, World Trade Organization (WTO), World Intellectual Property Organization (WIPO), Paris Convention, Berne Convention, TRIPS Agreement, the Doha Declaration, Patent Cooperation Treaty (PCT), Madrid Protocol.

**Module III**

**(Drug Regulatory Affairs-I)**

New Drug Application: Steps involved in the development of new drug. New drug applications as per WHO guidelines and abbreviated NDA. Requirement and guidelines on clinical trials, Investigational New Drug Application(IND).

**Module IV**

**(Drug Regulatory Affairs-II)**

Generic Drug Products: Drug Regulations – IND and NDA, Drug Regulations – ANDA, Generic Drug Product Development, Generic Drug Product Approval, SUPAC.  
Introduction about GMP, cGMP, GLP, GCP, CDSCO, CPCSEA, US-FDA

**Module V**

**(Drug and Cosmetic Act)**

Introductory drugs Jurisprudence: Drugs & Cosmetic Act & Rules

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
<b>Weightage (%)</b>	15	5	10	10	10	50

**Text & Reference reading materials:**

1. Dr. N.S. Vyawahare and Sachin Itkar, (2011). Drug Regulatory Affairs, Nirali Prakashan
2. C.V.S. Subrahmanyam & J. ThimmaSetty, (2012). Pharmaceutical Regulatory Affairs, Vallabh Prakashan
3. Quality Assurance of Pharmaceuticals Vol I & II (1999). WHO publications
4. WIPO website study material
5. Nair, Kanakkan Raghavan Gangadharan, and Ashok Kumar, (1994), Intellectual property rights. No. 1. Allied Publishers.
6. Cell, I. P. R. (2002), "Intellectual property rights."
7. Yan, Huang. (1996), "Intellectual property rights."

# INDUSTRIAL SAFETY AND HAZARDS

**Course Code:** MSD132

**Credit Unit:** 03

## **Course Objective:**

Course addresses management and engineering design concepts required for process safety in chemical and biotechnology systems, with pharmaceutical manufacturing applications. Content focuses on sound engineering principles and practices as they apply to industrial situations, project design, risk mitigation, process and equipment integrity, and engineering codes and standards.

## **Course Contents**

### **Module I**

**Hazards:** Chemical hazards classification. Radiation hazards and control of exposure to radiation. Types of fire and fire prevention methods. Mechanical hazards. Electrical hazards

### **Module II**

**Psychology and Hygiene:** Industrial psychology Industrial hygiene. Safety in plant site selection and plant layout. Industrial lighting and ventilation. Industrial noise.

### **Module III**

**Occupational diseases and control:** Occupational diseases and prevention methods. Safe housekeeping, Instrumentation for safe operation. Personal protective equipments. Safety in chemical operations and processes.

### **Module IV**

**Management:** Safety organization – safety committee – safety education and training. Management process. Philosophy and need for Industrial safety. Role of Government in Industrial safety.

### **Module V**

**Laws:** Factory Act. ESI Act, Environmental Act. Workment - comperation Act. Advantages of adopting safety laws.

## **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
<b>Weightage (%)</b>	15	5	10	10	10	50

## **Text & Reference reading materials:**

### **Text:**

- Guide for Safety in the Chemical laboratory second edition, Manufacturing Chemists Allocation. Van vostrand Reinhold Company, New York.
- Anonymous (1972). Guide for Safety in the Chemical Laboratory , 2<sup>nd</sup> Ed., Van Nostrand Reinhold Co., Litton Educational Publishing, Inc., New York
- Fawcett, H.H. & Wood, W.S. (1982). Safety and Accident Prevention in Chemical Operation, 2<sup>nd</sup> Ed. John Wiley and sons, New York.

### **References:**

- Industrial Safety and Laws by Indian School of Labour Education, Madras.

# COMMUNICATION SKILLS – I

**Course Code: BCS111**

**Credit Unit:01**

**Course Objective:**

The Course is designed to give an overview of the four broad categories of English Communication thereby enhance the learners' communicative competence.

**Course Contents:**

**Module I: Listening Skills**

Effective Listening: Principles and Barriers  
Listening Comprehension on International Standards

**Module II: Speaking Skills**

Pronunciation and Accent  
Reading excerpts from news dailies & magazines  
Narrating Incident; Story telling.  
Extempore & Role Plays

**Module III: Reading Skills**

Vocabulary: Synonyms, antonyms, diminutives, homonyms, homophones  
Idioms & phrases  
Foreign words in English

**Module IV: Writing Skills**

Writing Paragraphs  
Précis Writing  
Letter writing  
Coherence and structure  
Essay writing

**Module V: Activities**

News reading  
Picture reading  
Movie magic  
Announcements

**Examination Scheme:**

Components	CT1	CT2	CAF	V	GD	GP	A
Weightage (%)	20	20	25	10	10	10	5

CAF – Communication Assessment File

GD – Group Discussion

GP – Group Presentation

**Text & Reference reading materials:**

- Working in English, Jones, Cambridge
- Business Communication, Raman – Prakash, Oxford
- Speaking Personally, Porter-Ladousse, Cambridge
- Speaking Effectively, Jermy Comfort, et.al, Cambridge

# **SELF DEVELOPMENT AND INTERPERSONAL SKILLS - I (SELF-DEVELOPMENT AND INTERPERSONAL SKILLS)**

**Course Code: BSS 111**

**Credit Unit:01**

**Course Objective:**

This course aims at imparting an understanding of:

Self and the process of self exploration

Learning strategies for development of a healthy self esteem

Importance of attitudes and their effect on work behaviour

Effective management of emotions and building interpersonal competence.

**Course Contents:**

**Module I: Understanding Self**

Formation of self concept

Dimension of Self

Components of self

Self Competency

**Module II: Self-Esteem: Sense of Worth**

Meaning and Nature of Self Esteem

Characteristics of High and Low Self Esteem

Importance & need of Self Esteem

Self Esteem at work

Steps to enhance Self Esteem

**Module III: Emotional Intelligence: Brain Power**

Introduction to EI

Difference between IQ, EQ and SQ

Relevance of EI at workplace

Self assessment, analysis and action plan

**Module IV: Managing Emotions and Building Interpersonal Competence**

Need and importance of Emotions

Healthy and Unhealthy expression of emotions

Anger: Conceptualization and Cycle

Developing emotional and interpersonal competence

Self assessment, analysis and action plan

**Module V: Leading Through Positive Attitude**

Understanding Attitudes

Formation of Attitudes

Types of Attitudes  
 Effects of Attitude on  
 Behaviour  
 Perception  
 Motivation  
 Stress  
 Adjustment  
 Time Management  
 Effective Performance  
 Building Positive Attitude

**Module VI: End-of-Semester Appraisal**

Viva based on personal journal  
 Assessment of Behavioural change as a result of training  
 Exit Level Rating by Self and Observer

**Examination Scheme:**

Components	SAP	A	Mid Term Test (CT)	VIVA	Journal for Success (JOS)
Weightage (%)	20	05	20	30	25

**Text & Reference reading materials:**

- Towers, Marc: Self Esteem, 1<sup>st</sup> Edition 1997, American Media
- Pedler Mike, Burgoyne John, Boydell Tom, A Manager’s Guide to Self-Development: Second edition, McGraw-Hill Book Company.
- Covey, R. Stephen: Seven habits of Highly Effective People, 1992 Edition, Simon & Schuster Ltd.
- Khera Shiv: You Can Win, 1<sup>st</sup> Edition, 1999, Macmillan
- Gegax Tom, Winning in the Game of Life: 1<sup>st</sup> Edition, Harmony Books
- Chatterjee Debashish, Leading Consciously: 1998 1<sup>st</sup> Edition, Viva Books Pvt. Ltd.
- Dr. Dinkmeyer Don, Dr. Losoncy Lewis, The Skills of Encouragement: St. Lucie Press.
- Singh, Dalip, 2002, Emotional Intelligence at work; First Edition, Sage Publications.
- Goleman, Daniel: Emotional Intelligence, 1995 Edition, Bantam Books
- Goleman, Daniel: Working with E.I., 1998 Edition, Bantam Books.

# FRENCH – I

**Course Code: FLT 111**

**Credit Unit:02**

**Course Objective:**

To familiarize the students with the French language

- with the phonetic system
- with the syntax
- with the manners
- with the cultural aspects

**Course Contents:**

**Module A: pp. 01 to 37: Unités 1, 2, Unité 3 Objectif 1,2**

Only grammar of Unité 3: objectif 3, 4 and 5

**Contenu lexical: Unité 1 : Découvrir la langue française : (oral et écrit)**

1. se présenter, présenter quelqu'un, faire la connaissance des autres, formules de politesse, rencontres
2. dire/interroger si on comprend
3. Nommer les choses

**Unité 2: Faire connaissance**

1. donner/demander des informations sur une personne, premiers contacts, exprimer ses goûts et ses préférences
2. Parler de soi: parler du travail, de ses activités, de son pays, de sa ville.

**Unité 3: Organiser son temps**

1. dire la date et l'heure

**Contenu grammatical:**

1. organisation générale de la grammaire
2. article indéfini, défini, contracté
3. nom, adjectif, masculin, féminin, singulier et pluriel
4. négation avec « de », "moi aussi", "moi non plus"
5. interrogation : Inversion, est-ce que, qui, que, quoi, qu'est-ce que, où, quand, comment, quel(s), quelle(s)  
Interro-négatif : réponses : oui, si, non
6. pronom tonique/disjoint- pour insister après une préposition
7. futur proche

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References reading materials:**

- le livre à suivre: Campus: Tome 1

# GERMAN – I

**Course Code: FLG 111**

**Credit Unit:02**

**Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language. To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany.

**Course Contents:**

**Module I: Introduction**

Self introduction: heissen, kommen, wohnwn, lernen, arbeiten, trinken, etc.

Vocabulary: Numbers, months, fruits, vegetables, food items, verbs, etc.

All personal pronouns in relation to the verbs taught so far.

Greetings: Guten Morgen!, Guten Tag!, Guten Abend!, Gute Nacht!, Danke sehr!, Danke!, Vielen Dank!, (es tut mir Leid!),

Hallo, wie geht's?: Danke gut!, sehr gut!, prima!, ausgezeichnet!,  
Es geht!, nicht so gut!, so la la!, miserabel!

**Module II: Interviewspiel**

To assimilate the vocabulary learnt so far and to apply the words and phrases in short dialogues in an interview – game for self introduction.

**Module III: Phonetics**

Sound system of the language with special stress on Diphthongs

**Module IV: Countries, nationalities and their languages**

To make the students acquainted with the most widely used country names, their nationalitie and the language spoken in that country.

**Module V: Articles**

The definite and indefinite articles in masculine, feminine and neuter gender. All Vegetables, Fruits, Animals, Furniture, Eatables, modes of Transport

**Module VI: Professions**

To acquaint the students with professions in both the genders with the help of the verb “sein”.

**Module VII: Pronouns**

Simple possessive pronouns, the use of my, your, etc.

The family members, family Tree with the help of the verb “to have”

**Module VIII: Colours**

All the color and color related vocabulary – colored, colorful, colorless, pale, light, dark, etc.

**Module IX: Numbers and calculations – verb “kosten”**

The counting, plural structures and simple calculation like addition, subtraction, multiplication and division to test the knowledge of numbers.

“Wie viel kostet das?”

**Module X: Revision list of Question pronouns**

W – Questions like who, what, where, when, which, how, how many, how much, etc.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References reading materials:**

- Wolfgang Hieber, Lernziel Deutsch

- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

# SPANISH – I

**Course Code: FLS 111**

**Credit Unit:02**

**Course Objective:**

To enable students acquire the relevance of the Spanish language in today's global context, how to greet each other. How to present / introduce each other using basic verbs and vocabulary

**Course Contents:**

**Module I**

A brief history of Spain, Latin America, the language, the culture...and the relevance of Spanish language in today's global context.

Introduction to alphabets

**Module II**

Introduction to '*Saludos*' (How to greet each other. How to present / introduce each other).

Goodbyes (*despedidas*)

The verb *llamarse* and practice of it.

**Module III**

Concept of Gender and Number

Months of the years, days of the week, seasons. Introduction to numbers 1-100, Colors, Revision of numbers and introduction to ordinal numbers.

**Module IV**

Introduction to *SER* and *ESTAR* (both of which mean To Be).Revision of '*Saludos*' and '*Llamarse*'. Some adjectives, nationalities, professions, physical/geographical location, the fact that spanish adjectives have to agree with gender and number of their nouns. Exercises highlighting usage of *Ser* and *Estar*.

**Module V**

Time, demonstrative pronoun (*Este/esta, Aquel/aquella* etc)

**Module VI**

Introduction to some key AR /ER/IR ending regular verbs.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References reading materials:**

- Español, En Directo I A
- Español Sin Frontera

# CHINESE – I

**Course Code: FLC 111**

**Credit Unit:02**

**Course Objective:**

There are many dialects spoken in China, but the language which will help you through wherever you go is Mandarin, or Putonghua, as it is called in Chinese. The most widely spoken forms of Chinese are Mandarin, Cantonese, Gan, Hakka, Min, Wu and Xiang. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

**Course Contents:**

**Module I**

Show pictures, dialogue and retell.

Getting to know each other.

Practicing chart with Initials and Finals. (CHART – The Chinese Phonetic Alphabet Called “Hanyu Pinyin” in Mandarin Chinese.)

Practicing of Tones as it is a tonal language.

Changes in 3<sup>rd</sup> tone and Neutral Tone.

**Module II**

Greetings

Let me Introduce

The modal particle “ne”.

Use of Please ‘qing’ – sit, have tea ..... etc.

A brief self introduction – Ni hao ma? Zaijian!

Use of “bu” negative.

**Module III**

Attributives showing possession

How is your Health? Thank you

Where are you from?

A few Professions like – Engineer, Businessman, Doctor, Teacher, Worker.

Are you busy with your work?

May I know your name?

**Module IV**

Use of “How many” – People in your family?

Use of “zhe” and “na”.

Use of interrogative particle “shenme”, “shui”, “ma” and “nar”.

How to make interrogative sentences ending with “ma”.

Structural particle “de”.

Use of “Nin” when and where to use and with whom. Use of guixing.

Use of verb “zuo” and how to make sentences with it.

**Module V**

Family structure and Relations. Use of “you” – “mei you”., Measure words Days and Weekdays.

Numbers.

Maps, different languages and Countries.

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References reading materials:**

- “Elementary Chinese Reader Part I” Lesson 1-10

# MEAT, FISH AND POULTRY PROCESSING TECHNOLOGY

**Course Code: MSD201**

**Credit Unit: 04**

## Course Objectives:

To give knowledge about structure, composition and nutritive value of meat, fish, egg and poultry; scientific slaughtering of animals, post mortem changes in them; handling, storage and transportation of fish, and processing of meat, fish and poultry products.

## Course Contents:

### Module I

**Introduction:** Overview of Meat, Fish and Poultry Industry in India; Structure, composition and nutritive value of meat, fish and poultry products

### Module II

**Meat Technology:** Slaughter – house layout and management; Pre-slaughter practices for meat animals, pre-mortem and post-mortem examination; Scientific slaughter, handling and evaluation of carcass; Post-mortem changes and eating qualities of meat tissues, cutting and packaging meat; Refrigeration, freezing, canning and freeze drying of meat; curing and smoking of meat, changes during cooking of meat; prepared meat products like salami, kebabs, sausages, sliced, minced, corned; intermediate moisture and dried meat products; meat plant hygiene – GMP and HACCP; Packaging of meat products.

### Module III

**Fish Technology:** Types of fish; post-mortem changes; Handling storage and transportation of fish; Curing, smoking, drying, freezing and canning of fish and marine products, grading and preservation of shell fish; pickling and preparation of fish protein concentrate, fish oil and other by products.

### Module IV

**Poultry Products:** Pre-slaughter care and handling of birds; ante- and post – mortem examination of birds; Scientific slaughter; Preparation of poultry products and their preservation;

### Module V:

**Technology of Egg:** Interior qualities of eggs- grading, handling, packaging and transportation; Functional properties of eggs; Microbial spoilage; Preservation and maintenance of eggs; Freezing, dehydration and pickling of eggs Whole egg powder, Egg yolk products, their manufacture, packaging and storage.

## Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## Text & References reading materials:

- Jhari Sahoo, Textbook on Meat, Poultry and Fish Technology
- NPCS Board of Consultants & Engineers, The Complete Technology Book on Meat, Poultry and Fish Processing.
- Gracy, JF. Thornton's Meat Hygiene. ELBS Publishers, London

# TECHNOLOGY OF CEREAL, PULSES AND OILSEEDS

**Course Code- MSD202**

**Credit Unit: 03**

**Course Objective:**

To impart knowledge about physical structure and chemical composition of major food grains of India, milling of cereals and pulses, bakery products and processing of oil seeds for oil and proteins and their utilization.

**Course Content:**

**Module I**

Current status and future scenario of world wheat production and uses. Criteria of wheat quality– physical and chemical. Chemical composition of wheat grain and its relation to processing quality. Molecular basis of wheat grain hardness/softness. Wheat milling – general principle, cleaning, conditioning and milling systems. Flour streams and extraction rates. Criteria of flour quality. Functionality of wheat proteins, carbohydrates and lipids in bakery products.

**Module II**

Dough testing apparatus such as recording dough mixers. Bread making processes: functions of ingredients/additives such as fat, emulsifiers, oxidants, reducing agents, conditioners. Bread faults and remedies. Technology of biscuit, cake, cookie and cracker manufacture. Technology of pasta products.

**Module III**

Rice grain structure and chemical composition. Milling of rice: Modern rice milling unit operations – dehusking, paddy separation, polishing and grading. Factors affecting rice yield during milling. By- products of rice milling and their utilization. Cooking quality of rice. Parboiling of rice- traditional and modern methods. Changes during parboiling. Advantages and disadvantages of parboiling. aging of rice - quality changes; Rice convenience foods- precooked rice, canned rice, expanded rice, rice based infant food formulas, rice puddings and breads, rice cakes, rice noodles and fermented foods. processed products based on rice.

**Module IV**

Chemical, technological and nutritional aspects of sorghum, oats and millets. Coarse grain based processed foods. Wet and dry milling of corn. Corn products and their uses. Malting of barley steeping, germination and drying. Classification of malt products, nutritive value and food applications of malt. Extrusion technology.

**Module V**

Pulses: Composition and importance in Indian diet. Dal milling and processing of pulses. Antinutrients in pulses. protein concentrates and isolates; Oilseeds: Conditioning and oil extraction, significance of oil seeds processing in India, expeller pressing and solvent extraction of oil, oil refining. Processing of oils and fat.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

**Text & References reading materials:**

- Khatkar, B.S. (2010). Baking Science and Technology. Arihant Prakashan Pvt Ltd., New Delhi.
- Samuel, A.M. (2014). The Chemistry and Technology of Cereals as Food and Feed: CBS Publication, New Delhi.
- Khan, K. & Shewry, P. R. (2009). Wheat: Chemistry and Technology: St. Paul, U.S.A.
- Champagne, E.T. (2004). Rice: Chemistry and Technology(3rd ed.): AACC, USA.
- Dendy, D. A. V. & Dobraszczyk, B. J. (2001). Cereals and Cereal Products: Chemistry and Technology: Aspen, Maryland.
- Pomeranz, Y. (1998). Wheat: Chemistry and Technology (3rd ed.): AACC, USA

# FUNCTIONAL FOODS AND NUTRACEUTICALS

**Course Code- MSD203**

**Credit Unit: 03**

**Course Objective:**

To teach basic understanding of the concepts of nutraceutical and functional food with specific emphasis for exploitation of traditional system of medicine as well as the need for changing trends in the nutraceutical Industry.

**Course Content:**

**Module I**

Defining nutraceutical & functional foods, nature, type & scope of nutraceutical & functional foods. Nutraceutical & functional food applications and their health benefits, nutraceutical compounds and their classification based on chemical and biochemical nature with suitable and relevant description. Nutraceutical for special situation such as cancer, heart disease, stress, osteoporosis, hypertension etc.

**Module II**

Classifying nutraceuticals Organisational models for Nutraceuticals. Food source – Plant: Soya, olive oil, plant sterol, tea, grape vine, garlic, capsicum, dietary fibre and other fruits. Animal: Milk and products, meat, fish. Microbial probiotics. Cereal products as functional foods – oats, wheat bran, rice bran etc. Functional vegetable products, oil seeds and sea foods. Coffee, tea and other beverages as functional foods/drinks and their protective effects.

**Module III**

Regulation of dietary supplements – Types – in born errors of metabolism, - obesity, neurological disorder, diabetes mellitus, hypertension vitamin A deficiency, PEM Instant foods and formulas supplement soups, Herbal and functional food beverages and sports.

**Module IV**

Effect of processing, storage and interaction of various environmental factors on the potentials of such foods. Formulation of functional foods containing nutraceuticals – stability and analytical issues, labelling issues

**Module V**

Marketing and regulatory issues for nutraceutical & functional foods. Recent developments and advances in the area of nutraceutical & functional foods.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

**Text & References reading materials:**

- Mazza. G. 1988. Functional foods – biochemical and processing aspects, technomic Publ. Lancaster USA.
- Kirk, R.S. 1999. Pearson’s composition and analysis of foods. Wesley Longman Inc. California, USA.
- Wildman, R.E.C. 2007. Handbook of nutraceutical & functional foods.
- Official methods of analysis 2003. Association of official analytical chemist, USA.
- Mary, K. Schmidl and Theodore, P. Labuza 2000. Essentials of Functional Foods, Culinary and hospitality industry.

## ADVANCED BIOSTATISTICS FOR FOOD TECHNOLOGISTS

**Course Code: MSD204**

**Credit Unit: 03**

**Course Objective:**

The course aims to develop competency and expertise in the application of statistical methods applied to biological data obtained in experimental techniques.

**Course Contents:**

**Module I:**

Measures of Central Tendency (Mean, Median, Mode), Measures of dispersion (Range, Mean Deviation, Standard Deviation, Quartile Deviation), combined mean and variance, covariance, Graphs (Bar Chart, Pie Chart, Box Plot, Histogram, Ogive, scatter plot)

**Module II**

Probability (Addition and Multiplication Theorem), Binomial, Poisson and Normal distribution. Correlation and linear regression. Measures of Central tendency; Dispersion, Skewness and Kurtosis; Binomial and Normal Distributions.

**Module III**

Inferential statistics: Formulation of Hypothesis (One-tailed & Two-tailed), Type I and Type II errors, power of a test, Significance of a test & P-value testing.

**Module IV**

Hypothesis Testing (students T-test, Z-test,  $\chi^2$ , F test, Chi-square test). Analysis of variance (ANOVA)

**Module V**

Applications of statistical methods using statistical software.

**Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

**Text & References reading materials:**

**Text:**

- Biostatistics: A foundation for analysis in the Health Sciences, W.W Daniel. Publisher: John Wiley and Sons.
- Biostatistics, P.N Arora and P.K Malhan. Publisher: Himalaya Publishing House.

**References:**

- Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee .Publisher: Elsevier.
- Biostatistics: A foundation for analysis in the Health Sciences, W.W Daniel. Publisher: John Wiley and Sons.
- Statistical Methodology, S.P Gupta. Publisher: S. Chand & Co.
- Biostatistics: A manual of Statistical Methodology for use in Health, Nutrition and Anthropology, K. Visweswara Rao. Publisher: Jaypee Brothers.
- Fundamentals of Mathematical Statistics, S.C Gupta and V.K Kapoor. Publisher: S. Chand & Co.
- Statistical Analysis, Kaushal, T.L. Publisher: Kalyani Publishers.

# ADVANCE FOOD ENGINEERING

**Course Code: MSD205**

**Credit Units: 03**

## **Course Objective:**

The overall aim of this course is to enable you to develop and gain further understanding of basics of food engineering through the investigation of machines being used in food industry with a direct emphasis of their application to real-world situations in the field of food engineering.

## **Course Contents:**

### **Module I**

Introduction - System, Thermodynamic properties, Density, Concentration, Moisture Content, Temperature, Pressure, Enthalpy, Conservation of Mass, Laws of Thermodynamics- Zeroth Law, First Law of Thermodynamics, Second Law of Thermodynamics, Heat and Work.

### **Module II**

Heat Transfer- Systems for Heating and Cooling, Plate Heat Exchanger, Tubular Heat Exchanger, Scraped- surface Heat Exchanger, Scraped-surface Heat Exchanger, Epilogue. Thermal Properties of Food- Specific Heat, Thermal Conductivity and Thermal diffusivity. Thermal Diffusivity - Conductive Heat Transfer, Convective Heat Transfer and Radiation Heat Transfer. Microwave Heating- Dielectric Properties, Conversion of Microwave Energy into Heat, Microwave Oven, Microwave Heating of Foods.

### **Module III**

Evaporation- Steam and its properties, vaporization, evaporation and boiling, external work and internal latent heat, Entropy and enthalpy, Types of Evaporators- Batch-Type Pan Evaporator, Natural Circulation Evaporators, Rising-Film Evaporator, Falling-Film Evaporator, Rising/Falling-Film Evaporator, Forced- Circulation Evaporator, Agitated Thin-Film Evaporator. Vapor Recompression Systems- Thermal Recompression, Mechanical Vapor Recompression.

### **Module IV**

Compressors- classification of air compressors, Types of Compressed Air in Food and Beverage Production- Contact, Non-Contact High-Risk, Non-Contact Low-Risk, challenges of compressed air use in the food and beverage industry, surging, chocking and stalling.

### **Module V**

Refrigeration- Selection of a Refrigerant, Components of a Refrigeration System- Evaporator, Compressor, Condenser and Expansion Valve, Bell-coleman cycle. Freezing Systems- Indirect Contact Systems and Direct-Contact Systems. Frozen-Food Properties - Density, Thermal Conductivity, Enthalpy, Apparent Specific Heat and Apparent Thermal Diffusivity.

## **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & References reading materials:**

### **Text:**

- R. Paul Singh and Dennis R. Heldman, "Introduction to Food Engineering", Academic Press.
- Yunus A Cengel, "Heat and Mass Transfer", Mc Graw Hills.
- D.S.Kumar, "Refrigeration and Air Conditioning", S.K. Kataria & Sons.
- D.S.Kumar, "Thermodynamics", S.K. Kataria & Sons.

### **References:**

- Cengel & Boles, "Thermodynamics", Tata McGraw Hill

# MEAT, FISH AND POULTRY PROCESSING TECHNOLOGY (LAB)

**Course Code: MSD 221**

**Credit Unit: 01**

## **List of Practical's:**

1. Preparation of meat cuts,
2. Determination of yield of meat
3. Preservation by dehydration of fish and meat
4. Canning and curing of meat
5. Freezing of meat / poultry / fish
6. Preparation of meat / poultry / fish products
7. Evaluation of external and internal quality of eggs
8. Grading, coating and thermos-stabilization of eggs
9. Visit to a slaughter house.

## **Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

## **Text & References reading materials:**

- Processed Meats; Pearson AM & Gillett TA; 1996, CBS Publishers.
- Meat; Cole DJA & Lawrie RA; 1975, AVI Pub.
- Egg and poultry meat processing; Stadelman WJ, Olson VM, Shemwell GA & Pasch S; 1988, Elliswood Ltd.

## ADVANCE CEREAL PROCESSING (LAB)

Course Code : MSD 222

Credit Unit : 01

### List of Practical's:

- 1) Physico-chemical characteristics like test-weight, gluten content, etc
- 2) Milling of wheat
- 3) Milling characteristics of corn
- 4) Preparation of bread / test-baking
- 5) Preparation of buns / cakes / pizza, etc
- 6) Preparation of biscuits / cookies etc
- 7) Preparation of extruded products
- 8) Cooking quality of rice
- 9) Pre-treatment and milling of pulses
- 10) Extraction of oil from oilseeds
- 11) Preparation of breakfast cereals

### Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

### Text & References reading materials:

- Altschul. Processed Plant Food Stuffs
- Matz, MA. Cookie and Cracker Technology
- Dubey, SC. Basic Baking: Science and Craft
- Pyler, EJ. Baking Science and Technology
- Scott. Flour Milling Process

# ADVANCE FLAVOR CHEMISTRY AND TECHNOLOGY

**Course Code- MSD230**

**Credit Unit: 03**

## **Course Objective:**

To acquaint with production trends, structure, composition, quality evaluation and processing technologies for product development and value addition of various cereals, pulses and oilseeds.

## **Course content**

### **Module I**

Introduction: Status and scope of spice and flavour processing industries in India; Spices, Herbs and seasonings: sources, production, selection criteria; flavours: commercially available materials, classification on the basis of origin, physical characteristic.

### **Module II**

Basics of flavour, smell and taste sensation. Principal types of flavorings used in foods, natural flavoring substances, Flavour constituents from Onion, garlic, cheese, milk, meat, vegetables, fruits; Flavour constituents of wine, coffee, tea, chocolate, spices and condiments.

### **Module III**

Nature-identical flavoring substances. Artificial flavoring substances. adulteration, Flavour emulsions, Flavours production in fermented foods, Off-flavours in foods. Flavour chemical components (buttery : Diacetyl, Acetylpropionyl, Acetoin, Banana: Isoamyl acetate, Bitter almond, Cherry: Benzaldehyde, cinnamon: Cinnamaldehyde, fruity: Ethyl propionate, etc. ). Food acids their tastes and flavours (Glutamic acid salts, Glycine salts, Guanylic acid salts, acetic acid, malic acid etc).

### **Module IV**

Sensory evaluation of flavours, selection of flavourist, flavours and legal issues, Methods of flavour extraction, isolation, separation; Distillation, solvent extraction, enzymatic extraction, static headspace, dynamic headspace etc.; Flavour web and flavor profile analysis.

### **Module V**

Spices and flavour quality evaluation: Criteria for assessment of flavour quality; identification of natural food flavours; methods of flavour evaluation (chemical, instrumental, sensory). Principles and techniques of flavour encapsulation, types of encapsulation; Factors affecting stabilization of encapsulated flavour and their applications in food industry. Legal standards for flavouring materials and flavours.

## **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & References reading materials:**

- Source book of flavor by Reineccius,G, CBS.
- Handbook of Spices by Peter K.V.2001, Woodhead Publishers,UK.
- Food Flavours by Morton,I.D., Macleod ,A.J, AVI Publishers.
- Spices and Condiments by Pruthi, J.S., 1976, NBT India.
- Spice Statistics by Spices Board 2007, GOI, Cochin.

# FOOD RHEOLOGY AND TEXTURE

**Course Code: MSD231**

**Credit Unit: 03**

**Course Objective:** To understand the concept rheology and texture of food and types of rheological behavior. To describe the rheological and textural properties food along with the measurement methods. To understand different models and tests related to food rheology and to gain knowledge regarding various instruments used in determination of food rheology.

## **Module I**

Food rheology: definition, importance, scope, theoretical aspects; Food texture: definition and importance; types of stress and strain and viscosity.

## **Module II**

Relevance of rheological properties of food and determination and measuring methods: destructive and non-destructive measurements, creep recovery and stress relaxation, dynamic mechanical tests, modeling food texture: introduction, factor affecting texture of foods, models to predict texture.

## **Module III**

Rheological properties of fluid and semi-solid food: classification, factors affecting viscosity, flow of material-Newton's law of viscosity, viscous fluids (Newtonian fluids, non-Newtonian fluids), plastic fluids (Bingham plastic, non-Bingham plastic fluids), thixotropic behaviour, fluid behavior in steady- shear flow: time dependent and time independent material function, viscosity measurement- capillary flow viscometers, orifice type viscometers, falling ball viscometers, rotational viscometers- concentric cylinder (coaxial rotational) viscometers, cone and plate viscometers, parallel plate viscometers, single-spindle viscometers (brookfield viscometer).

## **Module IV**

Rheological properties of fluid food: deformation of material, viscoelastic behavior, Failure and glass transition in solid foods: failure in solid foods, glass transition of solids foods (measurement, factors affecting, importance), Texture of foods: compression, snapping-bending, cutting shear, puncture, penetration, texture profile analysis, dough testing instruments.

## **Module V**

Scientific development of rheology in food industry, practical applications of rheological concepts in food products, measuring consumer perception of texture of food, Texture analyser and Texture profile analysis.

## **Examination Scheme:**

<b>Components</b>	<b>CT</b>	<b>Attendance</b>	<b>Assignment/ Project/Seminar/Quiz</b>	<b>Viva</b>	<b>Class test</b>	<b>EE</b>
<b>Weightage (%)</b>	15	5	10	10	10	50

## **Text & References reading materials:**

- Rao, M. A., Rizvi, S. S. H. and Datta A. K. 2005. Engineering Properties of Foods: CRC Press.
- Heldman, D. R. (2007). Food Process Engineering: AVI Publications.
- Rao, M. A. (2007). Rheology of Fluid and Semisolid Foods: Principles and Applications (2 ed.): Springer, USA.

# ADVANCE NANOTECHNOLOGY AND ITS APPLICATIONS IN FOOD INDUSTRY

**Course Code: MSD232**

**Credit Unit: 03**

## **Course Objective:**

The objective of the course is to study the application of nanotechnology in various industries of food, agriculture, packaging and identify environmental and safety issues in nanomaterials.

## **Course Contents**

### **Module I**

Basics of nanotechnology and nanostructures in food: Evolution of new technologies in the food sector, Public perception of nanotechnology food products, Nanomaterials for food applications-Nano-sized food ingredients and additives, Naturally occurring food nano substances and nanostructure.

### **Module II**

Bioavailability - nanocrystalline food ingredients - nano emulsions - nano-engineered protein fibrils as ingredient building blocks, preparation of food matrices - concerns about using nanotechnology in food production

### **Module III**

Nanotechnology in food processing and food safety and bio-security – Electrochemical sensors for food analysis and contaminant detection.

### **Module III**

Nanotechnology in food production: food and new ways of food production - efficient fractionation of crops efficient product structuring -optimizing nutritional values - applications of nanotechnology in foods: sensing and encapsulation.

### **Module IV**

Nanotechnology in food packaging: - physical properties of packaging materials - strength - barrier properties, light absorption – structuring of interior surfaces - antimicrobial functionality - visual indicators – quality assessment - food safety indication - product properties - information and communication technology - sensors - radiofrequency identification technology, risks - consumer and societal acceptance.

### **Module V**

Nanotechnology in environmental and health effects: environmental pollutants in air, water, soil, hazardous and toxic wastes - application of nanotechnology in remediation of pollution in industrial and waste water treatment – drinking water and air/gas purifications - the challenge to occupational health and hygiene, toxicity of nanoparticles, effects of inhaled nanosized particles, skin exposure to nanoparticles.

## **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & References reading materials:**

- Brown, P and Stevens, K. 2006. Nanofibers and Nanotechnology in Textiles. Woodheadpublication, London.
- Jennifer K and Peter V. 2006. Nanotechnology in agriculture and food production, Woodrow Wilson International Center.
- Lynn J., Frewer, Willehm Norde, R. H., Fischer and Kampers, W. H. 2011. Nanotechnology in the Agri-food sector, Wiley-VCH Verlag.

- Brown, P.J and K. 2007. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge.
- Chaudry, Q. and Castle, R. 2010. Watkins Nanotechnologies in Food, RSC Publications

# RESEARCH METHODOLOGY AND SCIENTIFIC WRITING

Course Code: MSD233

Credit Unit: 03

## Theory

### Course Objective:

To develop understanding of information and library science research issues through review of journal articles, and critical group discussions of methods. The main objectives for this course are to develop familiarity with information and library science-oriented problems, an understanding of research methods in the food science domain, critical thinking and evaluation skills and presentation and summarization skills.

### Course Contents:

#### Module I: Introduction

Introduction: Science, Scientific Field and Biological research. Role of a researcher in different stages of a project, Routes to research funding (academic and commercial)

#### Module II Research Methodology

Research – Definition – Importance and Meaning of research – Characteristics of research – Types of Research – Steps in research – Identification, Selection and formulation of research problem – Research questions – Research design – Formulation of Hypothesis – Review of Literature.

#### Module III: Computing skills for scientific research

Web browsing for information search; search engines and their mechanism of searching; hidden Web and its importance in scientific research; internet as a medium of interaction between scientists; effective email strategy using the right tone and conciseness.

#### Module IV Scientific writing

Type of Articles (review, letters etc). Scientific paper format (Abstract, Introduction, Materials and Methods, Results, Discussion). Writing, evaluating, presenting and publishing the results of scientific research in the academic press (journals, conferences etc). Choosing the appropriate journal (Sources, Information, Instructions to authors, peer review system).

#### Module V Bibliometrics and Publication ethics

Bibliometrics (journal citation analysis, impact factor, *h*- index etc.), ethical scientific writing and Plagiarism.

### Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	30	50

### Text & References:

#### Text:

- Statistical Methods By S.P. Gupta

#### References:

- Research Methodology Methods and Techniques by C.R. Kothari
- Statistics(Theory and Practice) by B.N. Gupta
- Research Methodology Methods and statistical Techniques by Santosh Gupta
- Scientific journals and magazines

## COMMUNICATION SKILLS - II

**Course Code: BCS211**

**Credit Unit: 01**

**Course Objective:**

To enrich the understanding of English language and communication, structure, style, usage, and vocabulary for global business purposes.

**Course Contents:**

**Module I: Fundamentals of Communication**

Role and purpose of communication: *7 C's of communication*

Barriers to effective communication

Enhancing listening

Forms of Communication: one-to-one, informal and formal

**Module II: Verbal Communication (Written)**

Business Letter

Social correspondence

Writing resume and Job applications

**Module III: Speaking skills**

Conversational English

Guidelines to give an effective presentation

Activities to include:

Presentations by students

Just a minute

**Examination Scheme:**

Components	CT1	CT2	CAF	V	GD	GP	A
Weightage (%)	20	20	25	10	10	10	5

CAF – Communication Assessment File

GD – Group Discussion

GP – Group Presentation

**Text & References reading materials:**

- Business Communication, Raman – Prakash, Oxford
- Textbook of Business Communication, Ramaswami S, Macmillan
- Speaking Personally, Porter-Ladousse, Cambridge

# **SELF DEVELOPMENT AND INTERPERSONAL SKILLS - II (BEHAVIOURAL COMMUNICATION AND RELATIONSHIP MANAGEMENT)**

**Course Code: BSS211**

**Credit Unit: 01**

**Course Objective:**

This course aims at imparting an understanding of:

Process of Behavioural communication

Aspects of interpersonal communication and relationship

Management of individual differences as important dimension of IPR

**Course Contents:**

**Module I: Behavioural Communication**

Scope of Behavioural Communication

Process – Personal, Impersonal and Interpersonal Communication

Guidelines for developing Human Communication skills

Relevance of Behavioural Communication in relationship management

**Module II: Managing Individual Differences in Relationships**

Principles

Types of issues

Approaches

Understanding and importance of self disclosure

Guidelines for effective communication during conflicts

**Module III: Communication Climate: Foundation of Interpersonal Relationships**

Elements of satisfying relationships

Conforming and Disconfirming Communication

Culturally Relevant Communication

Guideline for Creating and Sustaining Healthy Climate

**Module IV: Interpersonal Communication**

Imperatives for Interpersonal Communication

Models – Linear, Interaction and Transaction

Patterns – Complementary, Symmetrical and Parallel

Types – Self and Other Oriented

Steps to improve Interpersonal Communication

**Module V: Interpersonal Relationship Development**

Relationship circle – Peer/ Colleague, Superior and Subordinate

Initiating and establishing IPR

Escalating, maintaining and terminating IPR

Direct and indirect strategies of terminating relationship

Model of ending relationship

**Module VI: End-of-Semester Appraisal**

Viva based on personal journal

Assessment of Behavioural change as a result of training

Exit Level Rating by Self and Observer

**Examination Scheme:**

<b>Components</b>	<b>SAP</b>	<b>A</b>	<b>Mid Term Test (CT)</b>	<b>VIVA</b>	<b>Journal for Success (JOS)</b>
<b>Weightage (%)</b>	20	05	20	30	25

**Text & References reading materials:**

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Simons, Christine, Naylor, Belinda: Effective Communication for Managers, 1997 1<sup>st</sup> Edition Cassell
- Harvard Business School, Effective Communication: United States of America
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.

## FRENCH - II

**Course Code: FLT 211**

**Credit Unit: 02**

**Course Objective:**

- To enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French.
- To make them learn the basic rules of French Grammar.

**Course Contents:**

**Module A: pp.38 – 47 : Unité 3 : Objectif 3, 4, 5, 6**

**Module B: pp. 47 to 75 Unité 4, 5**

**Contenu lexical:**

**Unité 3: Organiser son temps**

1. donner/demander des informations sur un emploi du temps, un horaire SNCF – Imaginer un dialogue
2. rédiger un message/ une lettre pour ...
  - i) prendre un rendez-vous/ accepter et confirmer/ annuler
  - ii) inviter/accepter/refuser
3. Faire un programme d'activités  
imaginer une conversation téléphonique/un dialogue  
Propositions- interroger, répondre

**Unité 4: Découvrir son environnement**

1. situer un lieu
2. s'orienter, s'informer sur un itinéraire.
3. Chercher, décrire un logement
4. connaître les rythmes de la vie

**Unité 5: s'informer**

1. demander/donner des informations sur un emploi du temps passé.
2. donner une explication, exprimer le doute ou la certitude.
3. découvrir les relations entre les mots
4. savoir s'informer

**Contenu grammatical:**

1. Adjectifs démonstratifs
2. Adjectifs possessifs/exprimer la possession à l'aide de :
  - i. « de »
  - ii. A+nom/pronom disjoint
3. Conjugaison pronominale – négative, interrogative - construction à l'infinitif
4. Impératif/exprimer l'obligation/l'interdiction à l'aide de « il faut... »/ «il ne faut pas... »
5. passé composé
6. Questions directes/indirectes

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References reading materials:**

- le livre à suivre: Campus: Tome 1

## GERMAN – II

**Course Code: FLG 211**

**Credit Unit: 02**

### **Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Introduction to Grammar to consolidate the language base learnt in Semester I

### **Course Contents:**

#### **Module I: Everything about Time and Time periods**

Time and times of the day.

Weekdays, months, seasons.

Adverbs of time and time related prepositions

#### **Module II: Irregular verbs**

Introduction to irregular verbs like to be, and others, to learn the conjugations of the same, (fahren, essen, lessen, schlafen, sprechen und ähnliche).

#### **Module III: Separable verbs**

To comprehend the change in meaning that the verbs undergo when used as such

Treatment of such verbs with separable prefixes

#### **Module IV: Reading and comprehension**

Reading and deciphering railway schedules/school time table

Usage of separable verbs in the above context

#### **Module V: Accusative case**

Accusative case with the relevant articles

Introduction to 2 different kinds of sentences – Nominative and Accusative

#### **Module VI: Accusative personal pronouns**

Nominative and accusative in comparison

Emphasizing on the universal applicability of the pronouns to both persons and objects

#### **Module VII: Accusative prepositions**

Accusative prepositions with their use

Both theoretical and figurative use

#### **Module VIII: Dialogues**

Dialogue reading: 'In the marketplace'

'At the Hotel'

### **Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

### **Text & References reading materials:**

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2

## SPANISH – II

**Course Code: FLS 211**

**Credit Unit: 02**

**Course Objective:**

To enable students acquire more vocabulary, grammar, Verbal Phrases to understand simple texts and start describing any person or object in Simple Present Tense.

**Course Contents:**

**Module I**

Revision of earlier modules.

**Module II**

Some more AR/ER/IR verbs. Introduction to root changing and irregular AR/ER/IR ending verbs

**Module III**

More verbal phrases (eg, Dios Mio, Que lastima etc), adverbs (*bueno/malo, muy, mucho, bastante, poco*). Simple texts based on grammar and vocabulary done in earlier modules.

**Module IV**

Possessive pronouns

**Module V**

Writing/speaking essays like my friend, my house, my school/institution, myself....descriptions of people, objects etc, computer/internet related vocabulary

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References reading materials:**

- Español, En Directo I A
- Español Sin Fronteras

## CHINESE – II

Course Code: FLC 211

Credit Unit: 02

### Course Objective:

Chinese is a tonal language where each syllable in isolation has its definite tone (flat, falling, rising and rising/falling), and same syllables with different tones mean different things. When you say, “ma” with a third tone, it mean horse and “ma” with the first tone is Mother. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. **Course Contents:**

#### Module I

Drills, Practice reading aloud  
Observe Picture and answer the question.  
Tone practice.  
Practice using the language both by speaking and by taking notes.  
Introduction of basic sentence patterns.  
Measure words.  
Glad to meet you.

#### Module II

Where do you live?  
Learning different colors.  
Tones of “bu”  
Buying things and how much it costs?  
Dialogue on change of Money.  
More sentence patterns on Days and Weekdays.  
How to tell time. Saying the units of time in Chinese. Learning to say useful phrases like – 8:00, 11:25, 10:30 P.M. everyday, afternoon, evening, night, morning 3:58, one hour, to begin, to end ..... etc.  
Morning, Afternoon, Evening, Night.

#### Module III

Use of words of location like-li, wai hang, xia  
Furniture – table, chair, bed, bookshelf,.. etc.  
Description of room, house or hostel room.. eg what is placed where and how many things are there in it?  
Review Lessons – Preview Lessons.  
Expression ‘yao’, ‘xiang’ and ‘yaoshi’ (if).  
Days of week, months in a year etc.  
I am learning Chinese. Is Chinese difficult?

#### Module IV

Counting from 1-1000  
Use of “chang-chang”.  
Making an Inquiry – What time is it now? Where is the Post Office?  
Days of the week. Months in a year.  
Use of Preposition – “zai”, “gen”.  
Use of interrogative pronoun – “duoshao” and “ji”.  
“Whose”??? Sweater etc is it?  
Different Games and going out for exercise in the morning.

#### Module V

The verb “qu”, Going to the library issuing a book from the library, Going to the cinema hall, buying tickets  
Going to the post office, buying stamps, Going to the market to buy things.. etc, Going to the buy clothes .... Etc.  
Hobby. I also like swimming, Comprehension and answer questions based on it.

#### Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

#### Text & References:

- “Elementary Chinese Reader Part I” Lesson 11-20.

# PROCESSING OF FOODS OF PLANT ORIGIN

**Course Code: MSD301**

**Credit Unit: 04**

## **Course Objective:**

To impart knowledge about post-harvest handling, storage and transportation of fresh fruits and vegetables; minimal processing; thermal processing, freezing and other methods of processing and processed fruit and vegetable products.

## **Course Contents**

### **Module I**

Introduction: Role and Status of Post Harvest Technology, Fruits and vegetables as living products: Chemical composition; pre and post harvest changes, maturity standards for storage, desirable characteristics of fruits and vegetable of processing. Pre-processing; Post harvest handling of fresh fruits and vegetables: Packaging, storage, transportation and marketing. Minimal processing.

### **Module II**

Fruit and vegetable juices: Preparation of juice, syrups, squashes, cordials, and nectars; concentrations and drying of juice, packaging and storage and Concentrations and powders; fortified and soft drinks. Preservation by freezing: General methods for freezing of fruits and vegetables; problem relating to storage of frozen products.

### **Module III**

Dehydration of fruits and vegetables: Methods; packaging, storage, Quality control Storage of fresh fruits and vegetables: Containers: tin, glass and other packaging materials used in fruits and vegetables preservations. Canning and bottling; Quality of raw materials, preparation of materials, syrups and brines, effect of canning and bottling on nutritive value, spoilage of canned foods, detection and control.

### **Module IV**

Pickles and chutneys: Preparation of various types of pickles-theory and practice; preparation of sauces and chutneys; problems relating to the shelf life of pickles and chutneys; quality control. Tomato products: Preparation of various tomato products, food standards and quality control. Pectin: Raw materials; processes and uses of pectin; products based on pectin manufacture and quality control.

### **Module V**

Preservatives and additives used in fruit and vegetable preservation, Fermented fruit beverages (wine and vinegar). General methods of preparation, food standards and quality control. Utilization of waste from fruit and vegetables processing plant, Tea, Coffee and Cocoa Production and Manufacturing Technology of non alcoholic beverages Practical Preparation of tomato products (Sauces, Soup, ketch up, ) Preparation of marmalade, Pickles, Jam, Jelly and fruit candy. Determination of pectin and chemical preservatives in fruits and vegetables products.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & References reading materials:**

- Srivastava R.P. and Kumar S. Fruit and vegetable preservation: principles and practices. CBS publishers.
- Morris, TN. Principles of Fruit Preservation. Biotech Books, Delhi.
- Pantastico, E. B. Post Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables. AVI Publishing Co. Inc, Westport.
- Rydstm Heele, S, Post Harvest Physiology and Pathology of Vegetables. Marcel Dekker.

# NOVEL FOOD PACKAGING TECHNOLOGY

**Course Code: MSD302**

**Credit Unit: 02**

**Course Objective:** To understand the role of packaging in the whole food chain from “the field to consumer’s table”. To study the active role of different novel packaging technologies effect on processing, preservation and in retaining safety and quality of foods throughout distribution chain.

## Course Contents

### Module I

Role of packaging in the food chain, active and intelligent packaging techniques, current use of novel packaging techniques, oxygen, ethylene and other scavenging technologies.

### Module II

Antimicrobial food packaging and factors affecting effectiveness of antimicrobial packaging, Non-migratory bioactive polymers (NMBP), Time-temperature indicators, use of freshness indicators in packaging.

### Module III

Modified atmosphere packaging (MAP), Novel MAP applications for fresh prepared produce, effect of MAP on nutritional quality and microbial safety of MAP, Novel packaging and particular products, Legislative issues relating to active and intelligent packaging, Recycling packaging materials, Green plastics for food packaging.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## Text & Reference reading materials:

- A Rajja 2003. Novel Food Packaging Techniques. Woodhead publishing in Food Science and Technology CRC Press.
- Frank AP and Heather YP 1992. A Handbook of Food Packaging. Springer Science.

# FOOD SAFETY AND QUALITY MANAGEMENT

**Course Code: MSD303**

**Credit Unit: 03**

## Course Objectives:

To educate the student about safety and quality related aspects of food in industry as well as in public domain. The course aims to provide knowledge about the regulatory authorities at national and international level which regulate the food business and ensure supply of safe and nutritious food to consumers. Various terminology related to the food safety will be taught to the students.

## Course Contents

### Module I:

**Introduction:** Concept of food safety and quality, Food adulteration and contamination, Responsibility of food safety. Indian Scenario of Food Safety, Recent food safety issues at national and international level

### Module II

**Food safety Hazards and Food borne diseases:** Food safety hazards (Biological, Chemical and Physical Hazards), Food borne diseases, Food spoilage, food poisoning, food infections, prevention of Food safety hazards through Hazards Analysis and Critical Control Point (HACCP) and Good Practices

### Module III

**Food safety regulation in India :** Introduction to Food Safety Act - 2006 and Food safety and Standards Authority of India, Food safety standards regulations 2011, Food Surveillance, Food Recall, PFA, FPO, MMPO, MPO, BIS, AGMARK standard.

### Module IV

**International food safety regulatory framework :** International Organization for Standardization (ISO), Codex, ISO standards (ISO 22000, 9000, 14000), US Food and Drug Administration and Food Safety at European Union, Harmonization of Food Safety Regulations

### Module V

**Initiatives of FSSAI:** Eat Right India, FoSTaC, Food Fortification, Detect Adulteration with Rapid Test (DART), Clean Street Food, BHOG (Blissful Hygienic Offering to God), Food Safety on Wheels, Food Smart Consumer, Codex, Diet for Life etc.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## Text & Reference reading materials:

- Make it safe: a guide to food safety, CSIRO Food and Nutritional Sciences Publisher.
- Richard Lawley, Laurie Curtis & Judy Davis. (2008). The Food Safety Hazard Guidebook. RSC Publisher. Cambridge, UK.
- Cynthia A. Roberts (2001). The food safety information handbook. CRC. New, Delhi.

## Web Reference:

1. <https://fssai.gov.in/>

# ADVANCE DAIRY TECHNOLOGY

**Course Code: MSD304**

**Credit Unit: 04**

## **Course Objective:**

To impart knowledge about processing and preservation of milk and its products and legislation for the quality control of milk and milk products.

## **Course Contents**

### **Module I**

Present status of milk & milk products in India and abroad; market milk. -Composition of milk of various species, quality evaluation and testing of milk, procurement, transportation and processing of market milk. Physicochemical properties of milk. Pasteurization, sterilization, homogenization and UHT processing of milk. Cleaning & sanitization of dairy equipment, Special milks such as flavoured, sterilized, recombined & reconstituted toned & doubletoned.

### **Module II**

Membrane processing of milk: types of membranes, principle of operation, applications of reverse osmosis, ultrafiltration and microfiltration. Technology of cream production: Cream separator; Ripening of cream; Types of butter, composition and production methods, nutritive value, defects - their causes and prevention. Production of butter, oil / ghee. Technology of milk powders (WMP, SMP): composition, nutritive value, process of manufacture, defects - their causes and prevention, Instantization of milk powder.

### **Module III**

Technology of Milk products: Cheese- classification, composition, nutritive value, process of manufacture of cheddar, mozzarella, cottage and processed cheese, defects - their causes and prevention. Frozen milk products (Ice cream) - composition, nutritive value, process of manufacture, defects (their causes and prevention). Indigenous milk products: khoa, rabri, channa, paneer, shrikhand, milk-based sweets etc. Utilization of milk industry by- products-importance/need and food applications.

### **Module IV**

Technology of fermented milk products: Methods for manufacture, packaging, storage and marketing, i.e., dahi, cultured butter milk, yoghurt, acidophilus milk, kumiss, kefir, etc.

### **Module V**

Milk and milk products standards and legislations in India, Grading of milk and criterion of grading. Dairy plant sanitation- hygiene in dairy industry, different types of cleansing and sanitizing agents, their applications, cleaning systems (cleaning in place, central cleaning system, self-contained cleaning system). Newer concepts in dairy products- cream powder, sterilized cream, butter spread, butter powder, cheese spread, caseinates, WPC, lactose powder.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & References reading materials:**

- Sukumar, De. 1980. Outlines of Dairy Technology: Oxford University Press, Delhi.
- Byron, H. W., Arnold, H. J. and John, A. A. 1987. Fundamentals of Dairy Chemistry (2nd ed.): CBS, Delhi.
- Wong, N. P. 1988. Fundamentals of Dairy Chemistry (3rd ed.): VNR, New York.

# INDUSTRIAL TRAINING EVALUATION

**Course Code: MSD 305**

**Credit Units: 02**

## **Objectives of the Industrial Training include:**

- To give students the opportunity to apply the knowledge and skills they have acquired on campus in a real-life work situation.
- To provide students with opportunities for practical, hands-on learning from practitioners in the students' areas of specialization.
- To expose students to a work environment, common practices, employment opportunities and work ethics in their relevant field.
- To enhance the employability skills of the students.
- To provide opportunities for students to be offered jobs in the organizations in which they undergo their Industrial Training.

## **STUDENT**

The student is responsible to ensure that all matters relating to the Industrial Training Programme are conducted in an ethical, conscientious, trustworthy and committed manner.

### **Before Industrial Training**

- To apply for a suitable Industrial Training, submit an application form through the Officer (Training/ Training and placement) to the organization concerned one semester before the Industrial Training Programme commences.
- Submit one copy of the offer letter for the Industrial Training to the Head of the department or Faculty coordinator (Industrial Training). Students are not allowed to change their Industrial Training after obtaining the approval and confirmation from the Industry.
- To complete the Industrial Training placement process within the specified time based on the Industrial Training Programme schedule.
- To ensure that the Industrial Training is not performed in a family-owned company so as to avoid conflict of interest.

### **During Industrial Training**

- Once the student has reached the training place, he / she must send a mail to the Faculty coordinator (Industrial Training / Department) / Head of the department or Officer (Training/ Training and placement) that he / she has joined the training from \_\_\_\_\_ in the industry (Name) and forward his / her contact nos., E-mail ID and the contact nos. of the company representative.
- During the training, students will be given 3-4 practical problems by the industry in which they are undergoing training. In case the industry do not give them the problems, the students will themselves formulate minimum three problems and maximum four problems and carry out detailed study on them and recommend the optimum solution based on their theory knowledge.
- To maintain discipline and abide by all rules and regulations enforced by the organization and to ensure FULL attendance during the Industrial Training duration.
- To carry out the Industrial Training in an ethical and professional manner and to uphold the reputation of Amity University, Rajasthan at all times.
- To maintain confidentiality and to not disseminate / share any information related to the organization to third parties.

- To be responsible for maintaining the security of properties belonging to the organization.

### **ASSESSMENT COMPONENTS**

Assessment within the Industrial Training context aims to evaluate the student's work quality and appropriateness to the field of study with reference to the learning outcomes of the Industrial Training Programme. Students should be evaluated by Faculty coordinator (Industrial Training/ Department). Evaluation methods used may consist of the following:

- Industrial Training report
- Presentation by the student

### **DISCIPLINARY PROCEDURES DURING INDUSTRIAL TRAINING PROGRAMME**

Within the training period, the student is wholly responsible to the organisation where he or she has been placed. This means that the student must observe specified office hours, and must adhere to all rules and regulations of the organisation, just like the other staff within the organisation, during the entire training period.

### **DEPARTMENTAL REPORT**

When the training of the student in a particular department/ section/ shop of an industry is completed, he / she should write departmental report. Report should include description of the department/ Section/ Shop, the processes and procedures followed in it. Individual items of equipment, special attachment, indigenously adopted tools should be described. Personnel & any other human resource features should be highlighted. Drawings, sketches, specification of equipment, used, should be given wherever essential. The report should also contain entire studies & discussions carried out by the students in addition to what he/ she has observed during his / her day to day work. The departmental report should be signed by the student and also by his officer-in-charge of that department/ section/ shop.

#### **The report must include the following:**

- The basic history/introduction of the industry.
- The sequence of operations followed/ systems introduced for the production.
- The layout of various workshop/floors or the labs and admin section of the industry.
- The major equipment used for the production/ computer configuration required for the loading the used software's.
- The infrastructure available.
- The movement of material (raw, semi-finished and finished product), not applicable in case of software industry.
- The formulation of 3 to 4 practical problems.
- Data required for formulating the problems.
- Analysis of the data, steps required and commands used in case of software industry.
- Suggestions made based on the analysis of the data.
- Recommendations.
- Certificate from the industry for the period of training undergone.
- The final report must be at-least 25 to 30 pages for the student undergoing 45 days training. In case no. of students undergoing training in the same industry are more than one, each student will prepare his/ her report separately.

#### **The Layout Guidelines for the Project File & Project Report**

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points) Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

## **FORMAT OF INDUSTRIAL TRAINING REPORT**

The following titles must be incorporated in the final industrial training report:

- Preface/Acknowledgement
- Certificate with Signatures and Seal of the Industry Person
- Contents/Index
- Introduction about the Industry
- Training Schedule
- Work Done / Observations
- Specific Assignment / Project Handled
- Learning after Training
- Summary

## **EVALUATION THROUGH SEMINAR PRESENTATION**

The students will present his report through seminar, which will be held by an expert committee constituted by the concerned department as per norms of the institute. The evaluation through seminar presentation will be based on the following criteria.

- Quality of material presented.
- Effectiveness of presentation.
- Depth of knowledge and skills.

**Upon completion of these programmes, students are expected to demonstrate the following graduates attributes:**

- Engineering Knowledge
- Problem analysis
- Design/ development of solutions
- Conduct investigations of complex problems
- Modern tool usage, The engineer and society
- Individual and Team Work
- Communication and Project Management and Finance.

### **Text & References:**

- Industrial Microbiology by Brinton M Miller & Warren Litsky. MGH.

### **Examination Scheme:**

<b>Dissertation</b>	<b>50</b>
<b>Viva Voce</b>	<b>50</b>
<b>Total</b>	<b>100</b>

## PROCESSING OF FOODS OF PLANT ORIGIN (LAB)

Course Code: MSD 321

Credit Unit: 01

### List of Practical's:

1. Canning of fruits and cut-out test for canned fruits
2. Canning of vegetables and cut-out test for canned vegetables
3. Dehydration of fruits / vegetables and evaluation of dried products
4. Freezing of fruits / vegetables and evaluation of frozen products
5. Preparation of jam / jelly / marmalade / preserve and its evaluation
6. Preparation of fruit beverage and its evaluation
7. Preparation of fruit chutney / pickle and its evaluation
8. Preparation and evaluation of tomato sauce / ketchup
9. Testing of vinegar
10. Minimal processing of fruits / vegetables.
11. Preparation of cheese, candy and preserve
12. Visit to food processing industry

### Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

PR – Performance

WT – Written Test

LR – Lab Record

### Text & References reading materials:

- Food Preservation and Processing, Manoranjan Kalia & Sangita Sood.
- Food Science, N. N. Potter, C B S Publishers & Distributors.

## Novel Food Packaging (LAB)

**Course Code: MSD322**

**Credit Unit: 01**

### Course Objectives:

The objective of this course to provide practical knowledge of various recent techniques and developments in food packaging sector. To illustrate fundamental understanding of food packaging techniques used in industries.

### List of Practical's:

1. Identification of different type of packaging material and testing of properties of different packaging materials (paper, plastic, biodegradable, glass and metal)
2. Study of symbols and labels used on food packages and study of intelligent packaging
3. Vacuum packaging and nitrogen filled packaging
4. Form-fill- seal packaging
5. Retort pouching
6. Determination of changes in packaged foods
7. Development of biodegradable package
8. Preparation and application of edible coatings
9. Comparative evaluation of different packages for foods
10. Estimation of shelf life of food under different packaging materials.

### Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

**Note:** Minor variation could be there depending on the examiner.

## ADVANCE DAIRY TECHNOLOGY (LAB)

**Course Code: MSD 323**

**Credit Unit: 01**

**Course Objectives:**

Imparting knowledge about the general methods of quality evaluation, testing and processing fresh milk and milk products. Outcome The students shall be able to assess the quality of milk and milk products and to develop various milk products.

**List of Practical's:**

1. Sampling of milk, platform tests
2. Determination of specific gravity, milk fat, SNF and TS percentage in milk
3. Cream separation and standardization of milk and cream
4. Preparation of toned/humanized/fortified/reconstituted/flavoured milk
5. Preparation and grading of butter
6. Preparation of cheese
7. Preparation of channa and paneer
8. Preparation of Khoa / ghee
9. Preparation of ice-cream
10. Preparation of indigeneous milk product – shrikhand / kalakand / milk-cake
11. Visit to a dairy plant producing condensed milk / milk powder

**Examination Scheme:**

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

PR – Performance

WT – Written Test

LR – Lab Record

**Note:** Minor variation could be there depending on the examiner.

**Text & References reading materials:**

- Sukumar, De. 1980. Outlines of Dairy Technology: Oxford University Press, Delhi, India
- Rangappa, K. S. 1975. Indian Dairy Products. Asia Publishing House, Bombay, India
- Marshall, R.T. 1992. Standard Methods for the determination of Dairy Products. 16<sup>th</sup> ed. Publ. American Public Health Association.

**Web Reference:**

- [https://old.fssai.gov.in/Portals/0/Pdf/Draft\\_Manuals/MILK\\_AND\\_MILK\\_PRODUCTS.pf](https://old.fssai.gov.in/Portals/0/Pdf/Draft_Manuals/MILK_AND_MILK_PRODUCTS.pf)

# FOOD BUSINESS MANAGEMENT

**Course Code: MSD330**

**Credit Unit: 03**

## **Course Objective**

The objective of this course is to have understanding of marketing and management of food and agribusiness. It discusses the various approaches necessary for the students to enhance their capability as efficient managers in food and agribusiness.

## **Course Contents**

### **Module I**

**Introduction:** Introduction to marketing and management. Marketing concepts and marketing systems and its functions. Link between agriculture and food industry, Introduction to marketing boards, co-operatives and others. Market liberalization, its role, strategies, impact and economics.

### **Module II**

**Marketing management, strategies, planning and control:** Introduction to strategy, policy, planning and control. Marketing planning process, monitoring and evaluation. International Marketing and International Trade; Composition & direction of Indian exports; International marketing environment; Exports-Direct exports, indirect exports, Licensing, Joint Ventures, Direct investment & internationalization process; Deciding marketing Programme; Product, Promotion, Price, Distribution Channels; Deciding the Market Organization; World Trade Organization (WTO).

### **Module III**

**New product development and buyer behavior:** Need, objectives and process for new product development. Factors impact buyer behavior and market segmentation. Commodity and its marketing, stages and challenges in commodity marketing, product and its definitions, product line, brand, product management models.

### **Module IV**

**Pricing management, channel management and physical distribution:** Objectives, strategies, types and decisions of commodity, breakeven analysis, pricing, cost, revenue and supply relationship. Channel management, middleman and their role, distribution channels, concept and its technological advancements. Warehouse, inventory, logistics and transport management.

### **Module V**

**Marketing communication, research, cost and margins:** Nature, objectives and factors of marketing communication. Advertisement, sales promotion, sales force, agents, promotions and budget for communication of commodity. Purpose and steps involved in market research. Objectives and structure of marketing cost and margins.

## **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & References reading materials:**

- David D. Van Fleet, Ella W. Van Fleet, and George J. Seperich. (2014), Agribusiness: Principles of Management. Cengage Learning, New York.
- Freddie Barnard, Jay Akridge, Frank Dooley, John Foltz (2012). Agribusiness Management. Fourth edition, Routledge, New York.
- I.M. Crawford. (1997). Agricultural and food marketing management. Food and Agriculture Organization of the United Nations. Rome. ISBN 92-851-

# FOOD TOXICOLOGY

**Course Code: MSD331**

**Credit Unit: 03**

**Course Objective:** To study of toxicants found in foods by providing the general principles of toxicology and their application to topics of major interest for human health including methods for food safety assessment and biochemical and physiological mechanisms of action of food toxicants. By developing an understanding of foodborne intoxications and infections and of diseases linked to foods applying the principles to the prevention of foodborne disease.

## **Module I**

Definition of toxicology and food toxicology, scope and diversity of food toxicology, Biological factors that influence toxicology, General principle of toxicology: phases of toxicological effects and dose-response relationship, Types of membrane transport. Categories of toxicology. classification of food toxicants, methods used in safety evaluation-risk assessments.

## **Module II**

Toxicants and allergens in foods derived from plants, animals, marine, algae & mushroom; Microbial toxins; Food Poisoning; Food borne infections and disease. Factors that influence toxicity: Diet and Biotransformation: effect of micronutrient changes; effect of macronutrient changes, Gender and Age, Species, Potential toxic effects of normal dietary constituents

## **Module III**

Determination of toxicants in foods: Qualitative and Quantitative analyses of toxicants in foods; Biological determination of toxicants: acute toxicity, genetic toxicity, subchronic toxicity and chronic toxicity

## **Module IV**

Toxicants found in the foods with their adverse effects, mode of action and clinical symptoms: Bacterial toxins; animal and plant toxins; toxicity of nutrients; toxins from fungi adverse effects; mode of action and clinical symptoms; food borne viruses and factors that increase the risks of food borne infections; sea food toxins and poisoning, Food toxicology aspects of pesticides and industrial contamination, food additives: colour, flavour, preservatives, antioxidants and sweeteners agents, Toxicants formed during food processing (nitrosamines, acrylamide, benzene, dioxins and furans; persistent organic pollutants).

## **Module V**

Epidemiology in food and nutritional toxicology, Food safety assessment: compliance with regulations, emerging food safety issues in a modern world.

### **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

### **Text & Reference reading materials:**

- Deshpande SS.2002. Handbook of food toxicology. CRC Press.
- Shibamoto T and Bjeldanes LF. 2009. Introduction to Food Toxicology Second Edition. Food Science and Technology International Series.
- Stanley T Omaye. 2004. Food and Nutrition Toxicology. CRC Press.

# PROCESS EQUIPMENT DESIGN AND PLANT LAYOUTS

**Course Code: MSD332**

**Credit Unit: 03**

## **Course Objective:**

To give knowledge about materials of construction for food equipments / accessories, design consideration and design of some food processing equipments. To impart knowledge about plant design considerations, feasibility study, plant location, food plant lay out, process selection, facilities and aggregate planning, financial analysis, process flow analysis and decision analysis.

## **Course Contents**

### **Module I**

**Materials for fabrication:** Material selection in design of food processing equipments – their classification and properties; Creep phenomenon; Corrosion and its effect on material properties

### **Module II**

**Design of Food Handling and Processing Equipments:** Application of design engineering to food processing equipments; Design parameters, codes and material selection., Design of equipments used in handling of foods; Design of heat exchangers; Design of pressure vessels, extruders and other food processing equipments. Optimization of designs for process efficiency, energy and cost.

### **Module III**

**Plant Design Concepts and Plant Location:** Food plant design concepts and general design considerations; Plant location – location factors and their interaction with plant location, location theory models, computer aided selection of location.

### **Module IV:**

**Feasibility Report and Process Flow Chart:** Feasibility analysis and preparation of feasibility report; Factors affecting plant size and their interactions, estimation of break-even and economic plant size; Process design – process flow charts, computer – aided development of flow charts; Equipment selection including economic analysis of equipment alternatives.

### **Module V:**

**Food Plant Layout :** Layout of food plants (including computer aided) and evaluation; Layout symbols; Planning and design of service facilities, human resources, product packaging and marketing systems; Hygienic design aspects and workers' safety; Functional design of plant building and selection of building materials. Estimation of capital investment; Analysis of plant costs and profitabilities; Management techniques in plant design including application of network analysis; Preparation of plant design report

## **Examination Scheme:**

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	Viva	Class test	EE
Weightage (%)	15	5	10	10	10	50

## **Text & References reading materials:**

- Chemical Engineers' Handbook. McGraw Hill Book Co. Inc, New York.
- O.P. Khanna, Production Engineering, and Industrial Management.
- Moore, Plant Layout and Design
- Peterse and Timmerhaus, Plant Design for Chemical Engineering.
- Rase and Barrow, Project Engineering, of Process Plant.
- Farrall, Engineering For Dairy and Food Products.

## COMMUNICATION SKILLS - III

**Course Code: BCS311**

**Credit Units: 01**

**Course Objective:**

To initiate the learners with the basic mechanics of writing skills and facilitate them with the core skills required for communication in the professional world.

**Course Contents:**

**Module I: Mechanics and Semantics of Sentences**

Writing effective sentences

Style and Structure

**Module II: Developing writing skills**

Inter - office communication: Business Letter; E mails; Netiquette

Intra – office communication: Memos, Notices, Circulars, Minutes

Report Writing

**Module III: Business Presentations**

Planning, design and layout of presentation

Information Packaging

Audience analysis

Audio visual aids

Speaking with confidence

Case Studies

**Examination Scheme:**

<b>Components</b>	<b>CT1</b>	<b>CT2</b>	<b>CAF</b>	<b>V</b>	<b>GD</b>	<b>GP</b>	<b>A</b>
<b>Weightage (%)</b>	20	20	25	10	10	10	5

CAF – Communication Assessment File

GD – Group Discussion

GP – Group Presentation

**Text & References:**

- Krishnaswamy, N, Creative English for Communication, Macmillan
- Raman Prakash, Business Communication, Oxford.

# **SELF DEVELOPMENT AND INTERPERSONAL SKILLS - III (LEADING THROUGH TEAMS)**

**Course Code: BSS311**

**Credit Units: 01**

**Course Objective:**

This course aims to enable students to:

Understand the concept and building of teams

Manage conflict and stress within team

Facilitate better team management and organizational effectiveness through universal human values.

**Course Contents:**

**Module I: Teams: An Overview**

Team Design Features: team vs. group

Effective Team Mission and Vision

Life Cycle of a Project Team

Rationale of a Team, Goal Analysis and Team Roles

**Module II: Team & Sociometry**

Patterns of Interaction in a Team

Sociometry: Method of studying attractions and repulsions in groups

Construction of sociogram for studying interpersonal relations in a Team

**Module III: Team Building**

Types and Development of Team Building

Stages of team growth

Team performance curve

Profiling your Team: Internal & External Dynamics

Team Strategies for organizational vision

Team communication

**Module IV: Team Leadership & Conflict Management**

Leadership styles in organizations

Self Authorized team leadership

Causes of team conflict

Conflict management strategies

Stress and Coping in teams

**Module V: Global Teams and Universal Values**

Management by values

Pragmatic spirituality in life and organization

Building global teams through universal human values

Learning based on project work on Scriptures like Ramayana, Mahabharata, Gita etc.

**Module VI: End-of-Semester Appraisal**

Viva based on personal journal

Assessment of Behavioural change as a result of training

Exit Level Rating by Self and Observer

**Examination Scheme:**

<b>Components</b>	<b>SAP</b>	<b>A</b>	<b>Mid Term Test (CT)</b>	<b>VIVA</b>	<b>Journal for Success (JOS)</b>
<b>Weightage (%)</b>	20	05	20	30	25

**Text & References:**

- Organizational Behaviour, Davis, K.
- Hoover, Judith D. Effective Small Group and Team Communication, 2002, Harcourt College Publishers
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- Dick, Mc Cann & Margerison, Charles: Team Management, 1992 Edition, viva books
- J William Pfeiffer (ed.) Theories and Models in Applied Self Development and Interpersonal Skills, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers

## FRENCH - III

**Course Code: FLT311**

**Credit Units: 02**

**Course Objective:**

To provide the students with the know-how

- To master the current social communication skills in oral and in written.
- To enrich the formulations, the linguistic tools and vary the sentence construction without repetition.

**Course Contents:**

**Module B: pp. 76 – 88 Unité 6**

**Module C: pp. 89 to103 Unité 7**

**Contenu lexical: Unité 6: se faire plaisir**

1. acheter : exprimer ses choix, décrire un objet (forme, dimension, poids et matières) payer
2. parler de la nourriture, deux façons d'exprimer la quantité, commander un repas au restaurant
3. parler des différentes occasions de faire la fête

**Unité 7: Cultiver ses relations**

1. maîtriser les actes de la communication sociale courante  
(Salutations, présentations, invitations, remerciements)
2. annoncer un événement, exprimer un souhait, remercier, s'excuser par écrit.
3. caractériser une personne (aspect physique et caractère)

**Contenu grammatical:**

1. accord des adjectifs qualificatifs
2. articles partitifs
3. Négations avec de, ne...rien/personne/plus
4. Questions avec combien, quel...
5. expressions de la quantité
6. ne...plus/toujours - encore
7. pronoms compléments directs et indirects
8. accord du participe passé (auxiliaire « avoir ») avec l'objet direct
9. Impératif avec un pronom complément direct ou indirect
10. construction avec « que » - Je crois que/ Je pense que/Je sais que

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- le livre à suivre : Campus: Tome 1

## GERMAN - III

**Course Code: FLG311**

**Credit Units: 02**

**Course Objective:**

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

**Course Contents:**

**Module I: Modal verbs**

Modal verbs with conjugations and usage

Imparting the finer nuances of the language

**Module II: Information about Germany (ongoing)**

Information about Germany in the form of presentations or “Referat”– neighbors, states and capitals, important cities and towns and characteristic features of the same, and also a few other topics related to Germany.

**Module III: Dative case**

Dative case, comparison with accusative case

Dative case with the relevant articles

Introduction to 3 different kinds of sentences – nominative, accusative and dative

**Module IV: Dative personal pronouns**

Nominative, accusative and dative pronouns in comparison

**Module V: Dative prepositions**

Dative preposition with their usage both theoretical and figurative use

**Module VI: Dialogues**

In the Restaurant,

At the Tourist Information Office,

A telephone conversation

**Module VII: Directions**

Names of the directions

Asking and telling the directions with the help of a roadmap

**Module VIII: Conjunctions**

To assimilate the knowledge of the conjunctions learnt indirectly so far

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

## SPANISH – III

**Course Code: FLS311**

**Credit Units: 02**

**Course Objective:**

To enable students acquire knowledge of the Set/definite expressions (idiomatic expressions) in Spanish language and to handle some Spanish situations with ease.

**Course Contents:**

**Module I**

Revision of earlier semester modules

Set expressions (idiomatic expressions) with the verb *Tener, Poner, Ir...*

Weather

**Module II**

Introduction to *Gustar...* and all its forms. Revision of *Gustar* and usage of it

**Module III**

Translation of Spanish-English; English-Spanish. Practice sentences.

How to ask for directions (using *estar*)

Introduction to IR + A + INFINITIVE FORM OF A VERB

**Module IV**

Simple conversation with help of texts and vocabulary

En el restaurante

En el instituto

En el aeropuerto

**Module V**

Reflexives

**Examination Scheme:**

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- Español, En Directo I A
- Español Sin Fronteras -Nivel Elemental

## CHINESE – III

**Course Code: FLC311**

**Credit Units: 02**

### **Course Objective:**

Foreign words are usually imported by translating the concept into Chinese, the emphasis is on the meaning rather than the sound. But the system runs into a problem because the underlying name of personal name is often obscure so they are almost always transcribed according to their pronunciation alone. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

### **Course Contents:**

#### **Module I**

Drills, Dialogue practice, Observe picture and answer the question.  
Introduction of written characters.  
Practice reading aloud  
Practice using the language both by speaking and by taking notes.  
Character writing and stroke order

#### **Module II**

Measure words  
Position words e.g. inside, outside, middle, in front, behind, top, bottom, side, left, right, straight.  
Directional words – beibian, xibian, nanbian, dongbian, zhongjian.  
Our school and its different building locations.  
What game do you like?  
Difference between “hii” and “neng”, “keyi”.

#### **Module III**

Changing affirmative sentences to negative ones and vice versa  
Human body parts.  
Not feeling well words e.g. ; fever, cold, stomach ache, head ache.  
Use of the modal particle “le”  
Making a telephone call  
Use of “jiu” and “cal” (Grammar portion)  
Automobiles e.g. Bus, train, boat, car, bike etc.  
Traveling, by train, by airplane, by bus, on the bike, by boat etc.

#### **Module IV**

The ordinal number “di”, “Mei” the demonstrative pronoun e.g. mei tian, mei nian etc., use of to enter to exit  
Structural particle “de” (Compliment of degree), Going to the Park.  
Description about class schedule during a week in school.  
Grammar use of “li” and “cong”.  
Comprehension reading followed by questions.

#### **Module V**

Persuasion-Please don't smoke.  
Please speak slowly  
Praise – This pictorial is very beautiful  
Opposites e.g. Clean-Dirty, Little-More, Old-New, Young-Old, Easy-Difficult, Boy-Girl, Black-White, Big-Small, Slow-Fast ... etc.  
Talking about studies and classmates  
Use of “it doesn't matter”  
Enquiring about a student, description about study method.  
Grammar: Negation of a sentence with a verbal predicate.

**Examination Scheme:**

<b>Components</b>	<b>CT1</b>	<b>CT2</b>	<b>C</b>	<b>I</b>	<b>V</b>	<b>A</b>
<b>Weightage (%)</b>	20	20	20	20	15	5

C – Project + Presentation

I – Interaction/Conversation Practice

**Text & References:**

- “Elementary Chinese Reader Part I, Part-2” Lesson 21-30

# PROJECT

**Course code: MSD 460**

**Credit Units: 30**

## **GUIDELINES FOR PROJECT FILE**

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

### **In general, the File should be comprehensive and include**

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

### **Report Layout**

The report should contain the following components:

#### ➤ **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

#### ➤ **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

#### ➤ **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

#### ➤ **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

#### ➤ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

#### ➤ **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

#### ➤ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a

lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in “point” form.

➤ **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

➤ **Future prospects**

➤ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➤ **References/ Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

**Examples**

**For research article**

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, 8 (suppl 1): 116–117.

**For book**

Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), 7: 63-67

**ASSESSMENT OF THE PROJECT FILE**

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following **assessment objectives**:

**Range of Research Methods used to obtain information**

**Execution of Research**

**Data Analysis**

Analyse Quantitative/ Qualitative information

Control Quality

**Draw Conclusions**

**Examination Scheme:**

Project Report	50
Viva Voce	50

<b>Total</b>	<b>100</b>
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