

**CURRICULUM FOR  
DIPLOMA OF  
ASSOCIATE ENGINEER  
IN  
FOOD PROCESSING  
&PRESERVATION  
TECHNOLOGY  
(3-YearsCourse)**

## **DAE FOOD PROCESSING AND PRESERVATION TECHNOLOGY SCHEME OF STUDIES**

### **FIRST YEAR**

			<b>T</b>	<b>P</b>	<b>C</b>
Gen	111	Islamiat/Pakistan Studies	1	0	1
Eng	112	English	2	0	2
Comp	122	Computer Applications	1	3	2
Ch	123	Applied Chemistry	2	3	3
Phy	113	Applied Physics	2	3	3
Math	123	Applied Mathematics-I(Paper A+B)	3	0	3
MTF	111	Engineering Drawing	0	3	1
MTF	121	Workshop Practice	0	3	1
FPPT	113	Introduction to Food Science	2	3	3
FPPT	133	Fundamental of Food processing & Preservation	2	3	3
<b>Total</b>			<b>15</b>	<b>21</b>	<b>22</b>

### **SECOND YEAR**

			<b>T</b>	<b>P</b>	<b>C</b>
Gen	211	Islamiat/Pakistan Studies	1	0	1
Mgm	221	Business Management and Industrial Economics	1	0	1
Math	233	Applied Mathematics-II(Paper A+B)	3	0	3
FPPT	213	Fruit and Vegetable Processing Technology	2	3	3
FPPT	223(Rev.)	Cereal and Baking Technology	2	3	3
FPPT	233(Rev.)	Dairy Processing Technology	2	3	3
FPPT	242	Oil and Fat Processing Technology	1	3	2
FPPT	252	Sugar and Confectionery Technology	1	3	2
FPPT	273	General & Food Microbiology	2	3	3
FPPT	283	Food Chemistry & Instrumentation	2	3	3
<b>Total</b>			<b>17</b>	<b>24</b>	<b>24</b>

### **THIRD YEAR**

			<b>T</b>	<b>P</b>	<b>C</b>
Gen	311	Islamiat/Ethics and Pakistan Studies	1	0	1
Mgm	321	Business Communication	1	0	1
Mgm	311	Industrial Mgmt. and Human Relations	1	0	1
FPPT	314	Meat Poultry and Fish Technology	3	3	4
FPPT	323(Rev.)	Beverages Processing Technology	2	3	3
FPPT	332	Food Packaging	1	3	2
FPPT	382	Quality Control	1	3	2
FPPT	392	Waste Management	1	3	2
FPPT	353	Food Engineering	2	3	3
FPPT	362	Special Project	0	6	2
FPPT	372	Food Plant Layout and Hygiene	1	3	2
<b>Total</b>			<b>14</b>	<b>27</b>	<b>23</b>

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## **SUBJECTS**

## **PG.NO.**

### **FIRSTYEAR**

Gen 111	Islamiat/Pakistan Studies	3
Eng 112	English	12
Comp 122	Computer Applications	14
Ch 123	Applied Chemistry	19
Phy 113	Applied Physics	27
Math 123	Applied Mathematics-I(Paper A+B)	36
MTF 111	Engineering Drawing	38
MTF 121	Workshop Practice	40
FPPT 113	Introduction to Food Science	42
FPPT 133	Fundamental of Food processing & Preservation	47

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Mgm 221	Business Management and Industrial Economics	61
Math 233	Applied Mathematics-II(Paper A+B)	66
FPPT 213	Fruit and Vegetable Processing Technology	72
FPPT 223	Cereal and Baking Technology	78
FPPT 233	Dairy Processing Technology	84
FPPT 242	Oil and Fat Processing Technology	92
FPPT 252	Sugar and Confectionery Technology	97
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### **THIRD YEAR**

Gen 311	Islamite/Ethics and Pakistan Studies	114
Mgm 321	Business Communications and Tech. Writing	120
Mgm 311	Industrial Mgmt. and Human Relations	124
FPPT 314	Meat Poultry and Fish Technology	130
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**DAE Technology**

## اسلامیات / مطالعہ پاکستان

ٹی پی سی	GEN III	حصہ اول اسلامیات
1 0 1		حصہ دوم مطالعہ پاکستان
کل وقت: 20 گھنٹے	سال اول	موضوعات حصہ اول اسلامیات
		کتاب و سنت

### (ا) قرآن مجید

- 1- تعارف قرآن مجید 2- نزول قرآن 3- مکی و مدنی سورتوں کی خصوصیات 4- وحی کی اقسام 5- پندرہ منتخب آیات مع ترجمہ
  - 1.1 تنالوا البر حتی تنفقوا مما تحبون
  - 1.2 واعتصموا بحبل اللہ جمیعاً ولا تفرقوا
  - 1.3 ولا یجبر منکم شیطان قوم علی ان لا تعدلوا
  - 1.4 ان اللہ یامرکم ان تودوا الامانات الی اهلها
  - 1.5 ان اللہ یامر بالعدل والاحسان
  - 1.6 ان الصلواتہ تنہی عن الفحشاء والمنکر
  - 1.7 لقد کان لکم فی رسول اللہ سوة حسنة
  - 1.8 ان اکرمکم عند اللہ اتقاکم
  - 1.9 وما آتاکم الرسول فخرزوا وما نہی عنہوا نتهوا
  - 1.10 ولو فو بالعهد
  - 1.11 وما شروہن بالمعروف
  - 1.12 یمحق اللہ الربو ویربب الصمدقات
  - 1.13 واصبر علی ما اصابک
  - 1.14 وقولوا قولا سدیداً
  - 1.15 ان الدین عند اللہ الاسلام
- (ب) سنت
  - 1- سنت کی اہمیت
  - 2- دس منتخب احادیث مع ترجمہ و تشریح

## DAE Technology

- 1- انما الاعمال بالنيات
- 2- اعمىتم لا تم مكارم الاخلاق
- 3- لا يوم من احدكم حق يحب الاخيه ما يحب لنفسه
- 4- لمسلم من سلم المسلمون من سبهم المسمون من لسانه وبيده
- 5- في امنت بالله مسلم استقم
- 6- حيركم خيركم ذالہ
- 7- سبب المسلم فسوق وقتاله كفر
- 8- احو من احو المؤمن
- 9- كل المسلم على المسلم حرام بيمعه وماله وفرقه
- 10- ائنه المنفق ثلاث اذاحديث كذب واقاوت من خان واناو فناخلف

### دين اسلام

- 2.1 ہمام کے بنیادی مقصد کن وضاحت اور انسان کی اخروی و اتمانی زندگی پر ان کے اثرات
- 1- تودید
- 2- رسالت
- 3- آخرت
- 4- ملاکے
- 5- اسطقی شب
- 2.2 عملوات

- 1- نماز 2- روزہ 3- حج 4- زکوٰۃ
- مدرجہ بالا عملوات کی اہمیت و فضیلت، تکمیل اور انسان کی اخروی و معاشرتی زندگی پر ان کے اثرات

مدرسہ کی مقاصد

۱- قرآن مجید

- عمومی مقصد: طالب علم یہ سمجھنے کے قابل ہو کہ اسلام کی تعلیمت کا اصل سرچشمہ قرآن مجید ہے  
 خصوصاً مقصد: طالب علم اس قابل ہو جائے گا کہ
- ۱۰ قرآن مجید کی تشریح کر سکے
  - ۱۱ قرآن مجید کے نزول کی صورت بیان کر سکے
  - ۱۲ قرآن مجید کی کسی رفتی سورتوں کی پہچان کر سکے
  - ۱۳ منتخب آیات کا ترجمہ و تشریح کر سکے
- عمومی مقصد: یہ سمجھنے کے قابل ہو جائے گا کہ منتخب قرآنی آیات کے ذریعے اسلامی اقدار کا مفہوم کیا ہے  
 قرآنی آیات کا ترجمہ و تشریح کر سکے
- ۱۴ قرآنی تعلیمت کی روشنی میں اپنی اور معاشرتی اصلاح کر سکے

۲- سنت

- عمومی مقصد: طالب علم سنت نبوی کی اہمیت اور ضرورت کو اچھی طرح سمجھنے کے قابل ہو جائے گا  
 خصوصاً مقصد:
- ۱۵ سنت کی تشریح بیان کر سکے
  - ۱۶ سنت کی اہمیت و ضرورت کی وضاحت کر سکے
  - ۱۷ سنت کی روشنی میں مسوود حسنہ پر عمل کر سکے
- ۳- منتخب احادیث نبویہ

- عمومی مقصد: احادیث کی روشنی میں اخلاقی اقدار سے سمجھنے حاصل کر سکے  
 خصوصاً مقصد: احادیث کا ترجمہ و تشریح کر سکے  
 رسول اللہ ﷺ کے مسوود حسنہ کا پورا، کاملہ مدعا ہو سکے

## DAE Technology

دین اسلام  
عمومی مقاصد: دین اسلامی کے بنیادی مقاصد اور عبادت کے بارے میں جان سکنے اور بیان کر سکنے  
خصوصی مقاصد  
لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکنے  
اسلام کے بنیوی مقاصد کی اہمیت بیان کر سکنے  
اسلام کے بنیوی مقاصد سے انسان کی انفرادی و اجتماعی زندگی پر پڑنے والے اثرات بیان کر سکنے  
عبادت کے لفظی و اصطلاحی معنی بیان کر سکنے  
عقیدے اور عبادت کا فرق بیان کر سکنے  
عبادت (نماز، روزہ، حج، زکوٰۃ) کے فوری، انکلات اور ہنسلی زندگی پر ان کی اثرات بیان کر سکنے  
اسلامی مقاصد و عبادت کے مطابق اپنی زندگی ڈھل کر ایک اچھا مسلمان بن سکنے

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اغیر مسلم طلباء کے لئے)

GEN III

نصاب اختلاقیات سائنسوں  
حصہ دوم ملاحظہ پاکستان

نئی نئی  
1 0 1  
کل وقت - 20 گھنٹے

موضوعات

اختلاقیات کی تعریف اور اہمیت  
اختلاقیات کا معیار (لائون: شکل، الحی کتب)  
سندرجہ اہل الخلق کی وضاحت

- ☆ دولت الہیہ
- ☆ وقار داری
- ☆ نظم و ضبط
- ☆ راست گوئی
- ☆ صبر و استقلال
- ☆ جوصلہ مندی
- ☆ وقت کی پابندی
- ☆ سفلی
- ☆ اعجاز
- ☆ پابندی احرام
- ☆ مصلحت



## DAE Technology

نصاب اخلاقیات (سولہ لائن)

تدریسی مقاصد

- عمومی مقاصد: اعلیٰ تعلقات کی وجہ سے اہلی ترقی میں تامل قدر لٹھہ کر سکتے  
خصوصی مقاصد: طالب اس علم سے لہرا تہیں ہو گا کہ
- ۱۶ موضوعات کا مطلب بیان کر سکتے
  - ۱۷ عملی زندگی سے مشابہ کی نشاندہی کر سکتے
  - ۱۸ اپنی شخصیت اور معاشرے پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقہ بیان کر سکتے
  - ۱۹ وراثت داری کی اہمیت بیان کر سکتے
  - ۲۰ وفا داری کی اہمیت بیان کر سکتے
  - ۲۱ لکھم و ضبط کی فلاحیت بیان کر سکتے
  - ۲۲ صدق بیان کی ضرورت بیان کر سکتے
  - ۲۳ حوصلہ مندی کے فوائد بیان کر سکتے
  - ۲۴ ریخت کی پابندی کے فوائد بیان کر سکتے
  - ۲۵ صفائی اور باہمی اختیار سے حسن کلر کردگی کو بیان کر سکتے
  - ۲۶ مصلحت کے فوائد بیان کر سکتے

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صفحہ نمبر	موضوعات	نصابہ: سہ ماہی (Sem I)	کل وقت 12 گھنٹے
1	حکومتِ فدرل: مسلمان قوم میں آزادیِ نگرانی تاریخ مسلمانوں میں سیاسی آزادی کی اہمیت اور ضرورت۔ ذاتی و جمعی غلامی کے تفصیلات		
2	نظریہ پاکستان		
3	قیام پاکستان کی اساس (ذین اسلام) قیام پاکستان کی غرض، غرضت نظریہ پاکستان کی وضاحت۔ نظریہ پاکستان اور صرفہ اقبال اور قائد اعظم کے ارشادات کی مدد سے اس میں		
4	نظریہ پاکستان کا تاریخی پسو		
5	محمد بن قاسم کی فتوح، محمد یوسف خان اور شاہ ولی اللہ کی تبلیغی خدمات سید احمد شہید کی تحریکِ مجاہدین		
6	قلمی تحریکیں		
7	علی گڑھ - تحریکِ اصلاحیہ - (پروفیسر - مدرسہ اعلیٰ علم - (سندھ) اسلامیہ کالج، ایفٹو) انجمنِ ترقی اسلام (ایفٹو)		

## DAE Technology

مطالعہ پاکستان (حصہ دوم)

مدرسہ مقاصد

حریت فکر:

عمومی مقصد

طالب علم یہ جان لے کہ اسلام میں اور مسلمان قوم میں آزادی فکری کیا اہمیت ہے

خصوصی مقاصد

☆ حریت فکر کا معنی و مفہوم بیان کر سکے

☆ آزادی فکری اہمیت بیان کر سکے

☆ خصوصاً "اسلام میں آزادی اظہار رائے" کی اہمیت بیان کر سکے

☆ ذہنی غلامی کے قومی سطح پر نقصانات کے بیان کر سکے

☆ بدسلطانی غلامی قومی سطح پر نقصانات بیان کر سکے

نظریہ پاکستان

عمومی مقصد:

نظریہ پاکستان (دوین اسلام) سے پوری طرح واقفیت ہو جائے

خصوصی مقاصد:

☆ نظریہ کی تعریف بیان کر سکے اور اس کی وضاحت کر سکے

☆ نظریہ پاکستان کی تعریف کر سکے اور اس کا مفہوم بیان کر سکے

☆ علامہ اقبال اور قائد اعظم کے فرمودات کی روشنی میں نظریہ پاکستان بیان کر سکے

نظریہ پاکستان کا تاریخی پہلو

عمومی مقصد

☆ نظریہ پاکستان کے تاریخی پس منظر سے واقفیت حاصل کر سکے

خصوصی مقاصد:

☆ محمد بن قاسم کے بارے میں بیان کر سکے

## DAE Technology

- ۶۱۔ محمد بن قاسم کے ہندوستان پر حملہ کی وجہ بیان کر سکتے
- ۶۲۔ محمد بن قاسم کے ہندوستان پر حملہ کے اثرات بیان کر سکتے
- ۶۳۔ بیان کر سکتے کہ ہندوستان میں ہندو مسلم دو قومی نظریے کا نکلنا آغاز کیا ہے
- ۶۴۔ محمد الف ثانی کی علمی خدمات بیان کر سکتے
- ۶۵۔ شہد ولی اللہ کی علمی خدمات بیان کر سکتے
- ۶۶۔ محمد الف ثانی اور شہد ولی اللہ نے جو تبلیغ دین اور مسلمانوں میں سیاسی شعور پیدا کیا اسے بیان کر سکتے

### علمی تحریکیں

- ۶۷۔ علمی مقصد
- ۶۸۔ برصغیر کی علمی تحریکوں سے آگاہی حاصل کر سکتے
- ۶۹۔ قصوں سے مقصد:
- ۷۰۔ علی گڑھ - راجہ بندہ - ترویج العلماء مدرسہ السلام، اسلامیہ کالج - ایچ این حنیفہ اسلام کے تعلیم کے ذریعہ سیاسی شعور مسلمانوں میں پیدا کیا اسے بیان کر سکتے
- ۷۱۔ آزادی ہند کے سلسلہ میں تحریک مہندیوں کی خدمات بیان کر سکتے

## Eng-112 ENGLISH

### Total contact hours

Theory	64	T	P	C
Practical	0	2	0	2

**AIMS** At the end of the course, the students will be equipped with cognitive skill to enable them to present facts in a systematic and logical manner to meet the language demands of dynamic field of commerce and industry for functional day-to-day use and will inculcate skills of reading, writing and comprehension.

### COURSE CONTENTS

#### ENGLISH PAPER "A"

##### 1. PROSE/TEXT 16 hrs

1.1 First eight essays of Intermediate. English Book-II

##### 2. CLOZE TEST 4 hrs

1.2 A passage comprising 50-100 words will be selected from the text. Every 11<sup>th</sup> word or any word for that matter will be omitted. The number of missing word will range between 5-10. The chosen word may or may not be the one used in the text, but it should be an appropriate word.

#### ENGLISH PAPER "B"

##### 3. GRAMMAR 26 hrs

3.1 Sentence Structure.

3.2 Tenses.

3.3 Parts of speech.

3.4 Punctuation,

3.5 Change of Narration.

3.6 One word for several

3.7 Words often confused

##### 4. COMPOSITION 8 hrs

4.1 Letters/Messages

4.2 Job application letter

4.3 For character certificate/for grant of scholarship

4.4 Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles

4.5 Essay writing

4.6 Technical Education, Science and Our life, Computers,

Environmental Pollution, Duties of a Student. 4 hrs

##### 5. TRANSLATION 6 hrs

5.1 Translation from Urdu into English.

For Foreign Students: A paragraph or a dialogue.

### RECOMMENDED BOOKS

1. Technical English developed by Mr. Zia Sarwar, Mr. Habib-ur –Rehman, Evaluated by Mr.Zafar Iqbal Khokhar, Mr. Zahid Zahoor, Vol - I, National Book Foundation

**INSTRUCTIONAL OBJECTIVES**

**PAPER-A**

**1. DEMONSTRATE BETTER READING, COMPREHENSION AND VOCABULARY**

- 1.1 Manipulate, skimming and scanning of the text.
- 1.2 Identify new ideas.
- 1.3 Reproduce facts, characters in own words
- 1.4 Write summary of stories

**2. UNDERSTAND FACTS OF THE TEXT**

- 2.1 Rewrite words to fill in the blanks recalling the text.
- 2.2 Use own words to fill in the blanks.

**PAPER-B**

**3. APPLY THE RULES OF GRAMMAR IN WRITING AND SPEAKING**

- 3.1 Use rules of grammar to construct meaningful sentences containing a subject and a predicate.
- 3.2 State classification of time, i.e. present, past and future and use verb tense correctly in different forms to denote relevant time.
- 3.3 Identify function words and content words.
- 3.4 Use marks of punctuation to make sense clear.
- 3.5 ' Relate what a person says in direct and indirect forms.
- 3.6 Compose his writings.
- 3.7 Distinguish between confusing words.

**4. APPLY THE CONCEPTS OF COMPOSITION WRITING TO PRACTICALSITUATIONS**

- 4.1 Use concept to construct applications for employment, for character certificate, for grant of scholarship.
- 4.2 Define and write telegrams, cablegrams and radiograms, telexes, facsimiles
- 4.3 Describe steps of a good composition writing.
- 4.4 Describe features of a good composition.
- 4.5 Describe methods of composition writing.
- 4.6 Use these concepts to organize facts and describe them systematically impractical situation;

**5. APPLIES RULES OF TRANSLATION**

- 5.1 Describe confusion.
- 5.2 Describe rules of translation.
- 5.3 Use rules of translation from Urdu to English in simple paragraph and sentences.

## Comp-122 COMPUTER APPLICATIONS

### Total contact hours

Theory	32Hour
Practical	96Hours
<b>Pre-requisite</b>	None

TPC  
1 3 2

**AIMS** This subject will enable the student to be familiar with the operation of a computer. He will also learn DOS, BASIC language and word processing to elementary level.

Micro-

### COURSE CONTENTS

- 1. ELECTRONIC DATA PROCESSING (EDP) 6Hours**
  - Basic of computers
  - Classification of computers
  - Block diagram of a computer system
  - Binary number system
  - BIT, BYTE, RAM, ROM, EPROM, EROM
  - Input and output devices
  - Secondary storage media details
  - Processors and types
  - Using computer for system software
  - Using computers for application software.
  - Common types of software and their application.
  
- 2. DISK OPERATING SYSTEM (DOS) 6Hours**
  - 2.1 Internal commands
  - 2.2 External commands
  - 2.3 Batch files
  - 2.4 Advance features.
  
- 3. BASIC LANGUAGE 10Hours**
  - Introduction to high level languages
  - Introduction to BASIC
  - REM statement
  - Assignment statement
  - Input statement
  - Read-Data statement
  - IF-THEN statement
  - IF-THEN ELSE statement
  - FOR-NEXT statement

DIMstatement  
LPRINTstatement  
STOPstatement  
END statement  
LogicofaBASICProgramme  
RunningaBASICProgramme  
SavingandRetrievingaProgramme  
Advancefeatures

**4. WORDPROCESSING**

**7Hours**

Starting wordprocessorsession  
Openingadocument  
Savingadocument  
Endingwordprocessorsession(Temporarily)  
Retrievingadocument  
Spellcheck  
Marginsandtabsetting  
AligningParagraph  
Printingadocument  
Advancefeatures

**5. COMPUTERGRAPHICINBASIC**

**3hours**

Graphicfundamentals  
Pointsandlines  
Dotsinspace  
Alighteningblot  
Shapes  
Expandingcirclesandrectangles

**RECOMMENDED BOOKS**

1. RonS.Gottfrid,Programming withBASIC,
2. AnyWordProcessorLatestRelease(e.g.,Word,Word-Perfectetc).
3. ABC'SofDOS (latestrelease).
4. JuddRobbins,MasteringDOS6.0and6.2



## Comp-122 COMPUTER APPLICATIONS

### INSTRUCTIONAL OBJECTIVES

#### 1. UNDERSTAND ELECTRONIC DATA PROCESSING (EDP).

- Describe basics of computers.
- Enlist different classification of computers.
- Explain block diagram of a computer system.
- Describe binary number system.
- State the terms used in computers such as BIT, BYTE, RAM, ROM, EROM, EPROM.
- Identify input and output devices.
- Describe secondary storage media.
- Explain processor.
- Name different types of processors.
- Explain the use of computer for system software.
- Explain the use of computer for application software.
- Enlist common types of software and their application.
- Explain various application of above softwares mentioned in 1.12

#### 2. UNDERSTAND DISK OPERATING SYSTEM (DOS).

- Explain the use of various internal command of DOS.
- Explain the use of various external command of DOS.
- Describe batch files.
- Identify advanced features

#### 3. UNDERSTAND BASIC LANGUAGE.

- Explain high level languages.
- Explain Basic language.
- Describe Rem statement
- Describe assignment statement
- Explain Input statement
- Explain Read-Data statement
- Explain If-Then Statement
- Explain If-then-Else Statement
- Explain For-Next Statement
- Explain DIM Statement
- Explain LPRINT statement
- Explain stop statement
- Explain end Statement
- Describe Logic of Basic program
- Describe running a Basic Program
- Describe saving & retrieving Basic Program
- Describe some Advance features of Basic program

#### **4. UNDERSTAND WORD PROCESSING SESSION**

- 4.1. Describe word-processing
  - Name command to be entered on Dos-prompt to load word-processor
  - Identify initials screen
  - Describe the command to open a document
  - Describe the procedure for naming the document
  - Explain importance of giving extension to a document
  - Describe saving and retrieving a document
  - Explain importance of saving the work at regular intervals
  - State temporarily ending word-processing session & document retrieval
  - State procedure to re-enter word processor
  - State procedure to re-open the document and editing
  - Describe spell-check facility
  - Describe Margins & Tab Setting
  - Describe to align paragraph
  - Describe Re-editing techniques
  - Describe procedure to set-up printer
  - Describe command for printouts
  - Explain multiple-copy printout procedure
  - Explain some advance features
  - Describe procedure of condensed printing
  - Describe procedure for change of fonts

#### **5. UNDERSTAND PROGRAMMING INSTRUCTIONS FOR COMPUTER GRAPHIC IN BASIC LANGUAGE**

- Identify graphic fundamentals in basic language
- Explain to draw points and lines
- Explain to draw dot in space
- Explain to draw lighting blot
- Explain to draw shapes
- Explain to draw expanding circles and rectangles

## Comp-122 COMPUTER APPLICATIONS

### LIST OF PRACTICALS

96 hours

#### DOS

- 1 Identify keyboard, mouse, CPU, disk drives, disks, monitor & printer
- 2 Practice for booting up of a computer system with DOS system disk and power off system at DOS prompt
- 3 Practice for CLS, VER, VOL, DATE & TIME commands
- 4 Practice for COPY, REN commands
- 5 Practice for DEL, TYPE, PATH, PROMPT, COPYCON, MD, CD, RD commands
- 6 Practice of the practicals at S.No. 3, 4, 5
- 7 Practice for FORMAT command with /s, /4, /u switches
- 8 Practice for DISKCOPY, DISKCOMP commands
- 9 Practice for SCANDISK, XCOPY, DELTREE, TREE, LABEL commands
- 10 Practice for PRINT, UNDELETE commands
- 11 Practice for the practicals at S.No. 8, 9, 10, 11
- 12 Practice for creating a batch file

#### BASIC

- 1 Practice for loading & unloading BASIC software and identify role of function keys in Basic
- 2 Identify role of various keys in continuation with ALT key in BASIC programming
- 3 Practice for CLS, LOAD, SAVE, FILE, RENUM command by loading any existing BASIC Program
- 4 Practice for editing any existing BASIC Program
- 5 Prepare BASIC Program to display sum of two numbers using INPUTS
- 6 Prepare BASIC Program to display sum of two numbers using READ-DATA
- 7 Prepare BASIC Program to multiply two numbers
- 8 Prepare BASIC Program to calculate Area of Rectangle, when length and width are given
- 9 Prepare BASIC Program to calculate area of a circle when radius/diameter is given
- 10 Prepare very simple BASIC Programs using IF-THEN-ELSE and FOR-NEXT statement
- 11 Identify DIM statement
- 12 Practice for LPRINT statement for various Program hard-copy output

#### WORD PROCESSING

- 1 Practice for loading & unloading a word processor
- 2 Practice for creating document & saving it
- 3 Practice for spell-check facility of the word-processor
- 4 Practice for editing an existing document
- 5 Practice for various word-processing Menu Options
- 6 Practice for printing a document
- 7 Practice for margin and TAB setting and document alignment
- 8 Practice for some advance features

## Ch-123 APPLIED CHEMISTRY

### Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

**AIM** After studying this course the students will be able to:

- Understand the significance and role of chemistry in the development of modern technology.
- Know the basic principles of chemistry as applied in the study of this technology.
- Understand the scientific methods for production, properties and use of materials of industrial and technological significance.
- Gain skill for efficient conduct of practical in a chemistry lab.

### COURSE CONTENTS

- 1. INTRODUCTION** **3 hours**  
Scope and significance.  
Orientation with reference to this technology.  
Terms used & units of measurements in the study of chemistry.
- 2. FUNDAMENTAL CONCEPTS OF CHEMISTRY** **3 hours**  
Symbols, valency, radicals, formulas.  
Chemical reactions and their types.
- 3. ATOMIC STRUCTURE.** **4 hours**  
Sub-atomic particles.  
Architecture of atoms of elements, Atomic No. and Atomic Weight.  
Periodic classification of elements and periodic law.
- 4. CHEMICAL BOND** **3 hours**  
Nature of chemical bond.  
Electrovalent bond with examples.  
Covalent bond (polar and non-polar) sigma and pi bonds with examples.  
Coordinate bond with examples.
- 5. GASES AND LIQUIDS** **4 hours**  
Liquid and gaseous state.  
Liquids and their general properties (density, viscosity, surface tension, capillary action etc).  
Gases and their general properties.  
Gas laws (Boyle's law, Charles' law, and Graham's law of diffusion etc.).  
Problems involving gas laws.

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|------------|--|----------------|
| <b>6.</b>  | <b>WATER.</b><br>Chemical nature and properties.<br>Impurities.<br>Hardness of water (types, causes and removal).<br>Scales of measuring hardness (degrees Clark, French, ppm, mg per liter).<br>Boiler feedwater, scales and treatment.<br>Sea-water desalination, sewage treatment.<br>Sterilization of water. | <b>4 hours</b> |
| <b>7.</b>  | <b>ACIDS, BASES AND SALTS.</b><br>Definitions with examples.<br>Properties, their strength, basicity and acidity,<br>Salts and their classification with examples.<br>pH-value and scale.  | <b>3 hours</b> |
| <b>8.</b>  | <b>OXIDATION AND REDUCTION.</b><br>The process, definition and scope with examples.<br>Oxidizing and Reducing agents.<br>Oxides and their classifications.   | <b>3 hours</b> |
| <b>9.</b>  | <b>NUCLEAR CHEMISTRY.</b><br>Introduction and.<br>Radioactivity (alpha, beta and gamma rays)<br>Half-life process.<br>Nuclear reaction and transformation of elements.<br>Radiations and Food preservation.  | <b>3 hours</b> |
| <b>10.</b> | <b>CORROSION.</b><br>Introduction with causes.<br>Types of corrosion.<br>Rusting of iron<br>Protective measures against corrosion.   | <b>3 hours</b> |
| <b>11.</b> | <b>FOOD PRESERVATIVES</b><br>Nature of food preservatives.<br>Some important food preservatives.<br>Classification of preservatives.<br>Uses of preservatives.   | <b>3 hours</b> |
| <b>12.</b> | <b>ALLOYS.</b><br>Introduction with need.<br>Preparation and properties.<br>Some important alloys and their composition.<br>Uses.  | <b>3 hours</b> |

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|------------|--|----------------|
| <b>13.</b> | <b>CHEMICAL ASPECTS OF FOOD.</b><br>Introduction.<br>Essential food ingredients<br>Carbohydrates<br>Proteins<br>Fats.  | <b>4 hours</b> |
| <b>14.</b> | <b>PLASTICS AND POLYMERS.</b><br>Introduction.<br>Polymerization and its mechanism.<br>Synthetic fibers.<br>Uses of polymers.                                  | <b>3 hours</b> |
| <b>15.</b> | <b>DYES AND COLOURS.</b><br>General Introduction.<br>Chemical nature of dye-stuffs.<br>Classification of dyes and their uses.<br>Colouring agents for food.    | <b>3 hours</b> |
| <b>16.</b> | <b>POLLUTION.</b><br>The problems and its dangers.<br>Causes of environmental pollution.<br>Common pollutants.<br>Remedies to combat the hazards of pollution. | <b>3 hours</b> |
| <b>17.</b> | <b>INTRODUCTION TO ORGANIC CHEMISTRY.</b><br>Introduction and significance.<br>Classification of organic compounds.<br>Nomenclature of organic compounds.      | <b>3 hours</b> |
| <b>18.</b> | <b>CARBOHYDRATES.</b><br>Introduction.<br>Classification.<br>Properties and uses.  | <b>3 hours</b> |
| <b>19.</b> | <b>PROTEINS.</b><br>Introduction.<br>Chemical nature and sources.<br>Properties and uses.  | <b>3 hours</b> |
| <b>20.</b> | <b>FATS AND OILS.</b><br>Introduction.<br>Chemical nature.<br>Sources and properties.<br>Importance as food.   | <b>3 hours</b> |

**INSTRUCTIONAL OBJECTIVES**

1.      **UNDERSTAND THE SCOPE, SIGNIFICANCE AND ROLE OF THE SUBJECT.**  
Define chemistry and its terms.  
Define units of measurements in the study of chemistry.  
Explain the importance of chemistry in various fields of specialization.  
Illustrate the role of chemistry in this technology.
  
2.      **UNDERSTAND LANGUAGE OF CHEMISTRY AND CHEMICAL REACTIONS.**  
Define symbol, valency, radical, formula with examples of each.  
Write chemical formula of common compounds.  
Define chemical reaction and equations.  
Describe types of chemical reactions with examples.  
List chemical formula of common substances used in the respective subject.
  
3.      **UNDERSTAND THE STRUCTURE OF ATOMS AND ARRANGEMENT OF SUB ATOMIC PARTICLES IN THE ARCHITECTURE OF ATOMS.**  
Define atom.  
Describe the fundamental subatomic particles  
    Distinguish between atomic No., mass No. and between isotope and isobars.  
Explain the arrangements of electrons in different shells and subenergy levels.  
Explain the grouping and placing of elements in the periodic table.  
State the periodic law of elements.  
Describe the trend properties of elements based on their position in the periodic table.  
Describe general characteristics of a period and a group.

- 4. UNDERSTAND THE NATURE OF CHEMICAL BONDS.**  
 Define chemical bond.  
 Describe the nature of chemical bond.  
 Differentiate between electrovalent and covalent bonding.  
 Explain the formation of polar and nonpolar sigma and pi-bond with examples.  
 Explain the nature of coordinate bond with examples.
- 5. UNDERSTAND THE STATES OF MATTER AND APPLY GAS LAWS TO SOLVE ALLIED PROBLEMS.**  
 Describe the liquid and gaseous states of matter.  
 Describe the general properties of liquid.  
 Describe the general properties of gases.  
 State Boyle's law, Charles' law, Graham's law of diffusion, Dalton's law of partial pressure.  
 State the mathematical forms of these laws  
 Derive gas equation.  
 Solve problems on gas laws and gas equations.
- 6. UNDERSTAND CHEMICAL NATURE OF WATER.**  
 Describe the chemical nature of water with its formula.  
 Describe the general impurities present in water.  
 Explain the causes and methods to remove hardness of water.  
 Express hardness in different units like mg/per litre, p.p.m, degrees clark and degrees french.  
 Describe the formation and nature of scales in boiler feedwater.  
 Explain the method for the treatment of scales.  
 Explain the sewage treatment and desalination of sea water.  
 Describe methods of sterilization of water.
- 7. UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS.**  
 Define acids, bases and salts with examples.  
 Describe general properties of acids and bases.  
 Define and differentiate between acidity and basicity and use the terms.  
 Define salts and give their classification with examples.  
 Explain pH value of solution and pH scale.
- 8. UNDERSTAND THE PROCESS OF OXIDATION AND REDUCTION.**  
 Define oxidation.  
 Explain the oxidation process with examples.  
 Define reduction.  
 Explain reduction process with examples.  
 Define oxidizing and reducing agents and give at least six examples of each.  
 Define oxides.



Classify the oxides with examples.

9. **UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY.**
  - Define nuclear chemistry and radioactivity.
  - Differentiate between alpha, beta and gamma particles.
  - Explain half-life process.
  - Explain at least six nuclear reactions resulting in the transformation of some elements.
  - Give six important uses of isotopes.
  - Explain the use of radiations in food preservation.
  
10. **UNDERSTAND THE PROCESS OF CORROSION WITH ITS CAUSES AND TYPES.**
  - Define corrosion.
  - Describe different types of corrosion.
  - State the causes of corrosion.
  - Explain the process of rusting of iron.
  - Describe methods to prevent/control corrosion.
  
11. **UNDERSTAND THE CHEMICAL NATURE AND USE OF IMPORTANT PRESERVATIVES USED IN FOOD INDUSTRY.**
  - Define a preservative.
  - List some important preservatives with their chemical formula.
  - Explain general uses of preservatives.
  - Classify food preservatives.
  - Explain action and specific use of some preservative agents.
  
12. **UNDERSTAND THE NATURE OF ALLOYS OF ALLOYS USED IN RESPECTIVE TECHNOLOGY**
  - Define alloy.
  - Explain methods for the preparation of alloys.
  - Describe important properties of alloys.
  - Explain common properties and uses of alloys.
  
13. **UNDERSTAND THE NATURE OF FOOD.**
  - Define food.
  - Describe food ingredients like carbohydrates, proteins and fats.
  - Explain importance, properties and uses of food ingredients.
  
14. **UNDERSTAND THE NATURE OF PLASTICS AND POLYMERS.**
  - Define plastics and polymers.
  - Explain the mechanism of polymerization.
  - Explain the preparation and uses of synthetic fibre.
  - List some important synthetic fibers used in textile industry.

- 15. UNDERSTANDTHECHEMICALNATUREOFDYESANDCOLOURS.**  
 Definedyesandcolours.  
 Describechemicalnatureofthedyestuffs.  
 Classifydyesandstatetheiruses.  
 Enlistthecolouringagentsforfood.
- 16. KNOWTHENATUREOFPOLLUTION.**  
 Definepollution(air,water,food).  
 Describecausesof environmentalpollution.  
 Enlistsomecommonpollutants.  
 Describethodstopreventpollution.
- 17. UNDERSTANDTHENATUREANDSIGNIFICANCEOFFORGANICCHEMISTRY.**  
 Defineorganic chemistry.  
 Statetheusesoforganic chemistryinmodernworld.  
 Classifytheorganiccompounds.  
 Explainfunctionalgroup.  
 NameorganiccompoundsonthebasisofI.U.P.A.C.system
- 18. UNDERSTANDCARBOHYDRATESASACHEMICALCLASS**  
 Definecarbohydratesandgiveexamples.  
 Explaintheirstructure.  
 Classifycarbohydrates.  
 Statesomeimportantchemicalandphysicalproperties.  
 Give usesofcarbohydrates.
- 19. EXPLAINTHECHEMICALNATURE,IMPORTANCEANDUSESOFPROTEINS.**  
 Defineproteinandciteexampleswithsources.  
 Defineaminoacidsandgiveexamples.  
 ExplainsomeimportantChemicalandPhysicalpropertiesofproteins.  
 Explainusesasfoodingredients.
- 20. EXPLAINTHECHEMICALNATUREANDUSEOFFATSANDOILS.**  
 Definefatandoilwithexamples.  
 Describechemicalnatureandsourcesoffatsandoils.  
 Differentiatefatsfromoils.  
 Givesome importantphysicalandchemicalpropertiesoffats.  
 Explaintheiruseandsignificanceasfood.

## LIST OF PRACTICALS

1. To introduce the common apparatus, glassware and chemical reagents used in the chemistry lab.
2. To purify a chemical substance by crystallization.
3. To separate a mixture of sand and salt.
4. To find the melting point of substance.
5. To find the pH of a solution with pH paper.
6. To separate a mixture of inks by chromatography.
7. To determine the coefficient of viscosity of benzene with the help of Ostwald viscometer.
8. To find the surface tension of a liquid with a stalagmometer.
9. To perform electrolysis of water to produce Hydrogen and Oxygen.
10. To determine the chemical equivalent of copper by electrolysis of  $\text{CuSO}_4$ .
11. To get introduction with the scheme of analysis of salts for basic radicals.
12. To analyse 1st group radicals ( $\text{Ag}^+$ - $\text{Pb}^{++}$ - $\text{Hg}^+$ ).
13. To make practice for detection 1st group radicals.
14. To get introduction with the scheme of II group radicals.
15. To detect and confirm II-A radicals ( $\text{Hg}^{++}$ ,  $\text{Pb}^{++++}$ ,  $\text{Cu}^+$ ,  $\text{Cd}^{++}$ ,  $\text{Bi}^{++++}$ ).
16. To detect and confirm II-B radicals ( $\text{Sn}^{+++}$ ,  $\text{Sb}^{+++}$ ,  $\text{As}^{+++}$ ).
17. To get introduction with the scheme of III group radicals ( $\text{Fe}^{+++}$ - $\text{Al}^{+++}$ ,  $\text{Cr}^{+++}$ ).
18. To detect and confirm  $\text{Fe}^{+++}$ ,  $\text{Al}^{+++}$  and  $\text{Cr}^{+++}$ .
19. To get introduction with the scheme of IV group radicals.
20. To detect and confirm  $\text{An}^{++}$  and  $\text{Mn}^{++}$  radicals of IV group.
21. To detect and confirm  $\text{Co}^{++}$  and  $\text{Ni}^{++}$  radicals of IV group.
22. To get introduction with the Acid Radical Scheme.
23. To detect dilute acid group.
24. To detect and confirm  $\text{CO}_3^{--}$  and  $\text{HCO}_3^-$  radicals.
25. To get introduction with the methods/apparatus of conducting volumetric estimations.
26. To prepare standard solution of a substance.
27. To find the strength of a given alkali solution.
28. To estimate  $\text{HCO}_3^-$  contents in water.
29. To find out the %age composition of a mixture solution of  $\text{KNO}_3$  and  $\text{KOH}$  volumetrically.
30. To find the amount of chloride ions ( $\text{Cl}^-$ ) in water volumetrically.

## RECOMMENDED BOOKS

1. Text Book of Intermediate Chemistry (Part I and II)
2. Sh. Atta Mohammad, Ilmi Applied Science.
3. J.N.Reddy, Polytechnic Chemistry, Tata Mc-Graw Hill Co., New Delhi.
4. Qammar Iqbal, Chemistry for Engineers and Technologists.

## Phy-113 APPLIED PHYSICS

### Total Contact Hours

Theory	64	T	P	C
Practicals	96	2	3	3

**AIMS:** The students will be able to understand the fundamental principles and concept of physics, use these to solve problems in practical situations/technological courses and understand concepts to learn advance physics/technical courses.

### COURSE CONTENTS

- 1 MEASUREMENTS. 2Hours.**
  - Fundamental units and derived units
  - Systems of measurement and S.I. units
  - Concept of dimensions, dimensional formula
  - Conversion from one system to another
  - Significant figures
- 2 SCALARS AND VECTORS. 4Hours.**
  - Revision of head to tail rule
  - Laws of parallelogram, triangle and polygon of forces
  - Resolution of a vector
  - Addition of vectors by rectangular components
  - Multiplication of two vectors, dot product and cross product
- 3 MOTION 4Hours.**
  - Review of laws and equations of motion
  - Law of conservation of momentum
  - Angular motion
  - Relation between linear and angular motion
  - Centripetal acceleration and force
  - Equations of angular motion
- 4 TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA. 4Hours.**
  - Torque
  - Centre of gravity and centre of mass
  - Equilibrium and its conditions
  - Torque and angular acceleration
  - Rotational inertia
- 5 WORK, POWER & ENERGY. 5Hours.**
  - Work
  - Power
  - Energy & its type.

5.3.1 Kinetic Energy (K.E), Potential Energy (P.E)  
Law of Conservation of Energy.

<b>6.</b>	<b>FRICTION.</b> Friction, Types of Friction, Limiting Friction, Angle of Friction. Laws of Friction. Advantages & Disadvantages of Friction.	<b>4Hours</b>
<b>7</b>	<b>WAVE MOTION.</b> Review Hook's law of elasticity Motion under an elastic restoring force Characteristics of simple harmonic motion S.H.M. and circular motion Simple pendulum Waveform of S.H.M. 7.7 Resonance 7.8 Transverse vibration of a stretched string	<b>5Hours</b>
<b>8</b>	<b>SOUND.</b> Longitudinal waves Intensity, loudness, pitch and quality of sound Units of Intensity of level and frequency response of ear Interference of sound waves, silence zones, beats Acoustics Doppler effect.	<b>5Hours</b>
<b>9</b>	<b>LIGHT.</b> Review laws of reflection and refraction, Image formation by lenses Optical instruments Wave theory of light Interference, diffraction, polarization of light waves	<b>3Hours</b>
<b>10</b>	<b>OPTICAL FIBER.</b> Optical communication and problems Review total internal reflection and critical angle Structure of optical fiber Fiber material and manufacture Optical fiber-uses.	<b>4Hours</b>
<b>11</b>	<b>LASERS.</b> Corpuscular theory of light Emission and absorption of light Stimulated absorption and emission of light Laser principle	<b>3Hours</b>

	11.5 Structureandworkingoflasers	
	11.6 Typesoflaserswithbrief description.	
	11.7 Applications(basicconcepts)	
<b>12</b>	<b>HEAT.</b>	<b>4hours.</b>
	12.1 Reviewofcalorimetryandgaslawsandmodeoftransferof heat	
	12.2 Thermalexpansionofsolids,liquidsandgases	
	12.3 Heatoffusion,vaporization	
	12.4 Lawofcooling	
	12.5 Thermoelectricity	
	12.6 Thermocouple.	
<b>13</b>	<b>THERMODYNAMICS.</b>	<b>4Hours</b>
	Heatenergyandinternalenergy	
	Firstlawofthermodynamics&applications	
	Efficiencyof heatengine	
	Secondlawofthermodynamics(bothstatements)	
	Heatengineandrefrigerator.	
<b>14</b>	<b>MODERNPHYSICS</b>	<b>5Hours</b>
	RelativeMotion	
	EinsteinPostulates	
	BlackBodyRadiation's	
	Photo-electricEffect	
	x-rays,Production,Propertiesanduses.	
<b>15</b>	<b>MAGNETICMATERIALS.</b>	<b>2Hours</b>
	Magnetism	
	Domainstheory	
	Para,diaandferromagnetismandmagneticmaterials	
	B.H.curveandhystericloop.	
<b>16</b>	<b>SOLIDSTATEPHYSICS</b>	<b>6Hours</b>
	crystallinestructureofsolids	
	Bandtheoryofsolids	
	Conductors,semiconductors,insulators	
	P-typeandN-typematerials	
	P-NjunctionandP-Njunctionasadiode	
	Semiconductordevices:-	
	Lightemittingdiodes	
	Photodiodes	
	Solarcell	

## RECOMMENDED BOOKS

- 1 Fundamentals of Physics Vol-I and II for intermediate classes
- 2 Farid Khawaja, Fundamentals of Physics Vol-I and II
- 3 Wells and Slusher, Schaum's Series Physics.
- 4 Nelson and Obyorn, Advanced Level Practical Physics
- 5 Mehboob Illahi Malik and Inam-ul-Haq, Practical Physics
- 6 Wilson, Lasers-Principles and Applications
- 7 M. Aslam Khan and M. Akram Sandhu, Experimental Physics Note Book

**INSTRUCTIONAL OBJECTIVES**

**1      USE CONCEPTS OF MEASUREMENT TO PRACTICAL SITUATIONS AND TECHNOLOGICAL PROBLEMS.**

Write dimensional formulae for physical quantities  
Derive units using dimension equations  
Convert a measurement from one system to another  
Use concepts of measurement and Significant figures in problem solving.

**2      USE CONCEPTS OF SCALARS AND VECTORS IN SOLVING PROBLEMS INVOLVING THESE CONCEPTS.**

Explain laws of parallelogram, triangle and polygon of forces  
Describe method of resolution of a vector into components  
Describe method of addition of vectors by head & tail rule  
Differentiate between dot product and cross product of vectors  
Use the concepts in solving problems involving addition, resolution and multiplication of vectors.

**3      USE THE LAW OF CONSERVATION OF MOMENTUM AND CONCEPTS OF ANGULAR MOTION TO PRACTICAL SITUATIONS.**

Use law of conservation of momentum to practical/technological problems.  
Explain relation between linear and angular motion  
Use concepts and equations of angular motion to solve relevant technological problems.

**4      USE CONCEPTS OF TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA TO PRACTICAL SITUATION/PROBLEMS.**

Explain Torque  
Distinguish between Centre of gravity and centre of mass  
Explain rotational Equilibrium and its conditions  
Explain Rotational Inertia giving examples  
Use the above concepts in solving technological problems.

**5      APPLY CONCEPT OF WORK, POWER AND ENERGY TO PRACTICAL SOLUTIONS AND TECHNOLOGICAL PROBLEMS**

Explain work and derive expressions in different conditions  
Explain power, I.H.P, B.H.P  
Solve technological problems relating to work and power  
Explain energy and its types and various sources  
Explain and derive the expression for K.E & P.E and interconversion.  
Solve problem  
Law of conservation of momentum



- 6 UNDERSTAND THE CONCEPT OF FRICTION AND APPLY TO SOLVE THE TECHNOLOGICAL PROBLEMS**  
 Describe friction and how it is developed  
 Describe static and dynamic friction, coefficient of friction, limiting friction and angle of repose  
 Explain the laws of friction  
 Describe advantages and disadvantages of friction  
 Use the above concepts in solving the technological problems
- 7 USE CONCEPTS OF WAVE MOTION IN SOLVING RELEVANT PROBLEMS.**  
 Explain Hook's Law of Elasticity  
 Derive formula for Motion under an elastic restoring force  
 Derive formulae for simple harmonic motion and simple pendulum  
 Explain waveform with reference to S.H.M. and circular motion  
 Explain Resonance  
 Explain Transverse & longitudinal waves.  
 Use the above concepts and formulae of S.H.M. to solve relevant problems.
- 8 UNDERSTAND CONCEPTS OF SOUND.**  
 Explain the concepts: Intensity, loudness, pitch and quality of sound  
 Explain units of Intensity level and frequency response of ear  
 Explain phenomena of silence zones, beats  
 Explain Acoustics of buildings  
 Explain Doppler effect giving mathematical expressions and its application
- 9 USE THE CONCEPTS OF GEOMETRICAL OPTICS TO LENSES.**  
 Explain laws of reflection and refraction and draw the images by ray diagrams  
 Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. microscopes, telescopes, cameras.  
 Understand wave theory of light  
     Explain wave theory of light  
     Explain phenomena of interference, diffraction, and polarization of light waves  
     Describe uses of polarization
- 10 UNDERSTAND THE STRUCTURE, WORKING AND USES OF OPTICAL FIBER.**  
 Explain the structure of the Optical Fiber  
 Explain its principle of working  
 Describe use of optical fiber in industry and medicine.
- 11 UNDERSTAND THE STRUCTURE, WORKING AND USES OF LASERS.**  
 Explain the stimulated emission of radiation  
 Explain the laser principle  
 Describe the structure and working of lasers  
 Distinguish between types of lasers  
 Describe the applications of lasers in the fields mentioned in the course contents.

- 12 UNDERSTAND CONCEPTS OF HEAT.**  
 Explain calorimetry and modes of transfer of heat  
 Explain Gas laws giving mathematical expressions  
 Explain Thermal expansion of solids, liquids and gases  
 Distinguish between heat of fusion, vaporization  
 Explain Law of cooling and describe latent heat  
 Explain basic concepts of Thermoelectricity  
 Describe Thermocouple, giving its principle, structure and working.
- 13 UNDERSTAND LAWS OF THERMODYNAMICS.**  
 Distinguish between heat energy and internal energy  
 Explain first law of thermodynamics giving its applications by defining Isothermal and adiabatic process  
 Explain second law of thermodynamics describing alternate statements  
 Distinguish between work of heat engine and refrigerator.
- 14 UNDERSTAND THE CONCEPT OF MODERN PHYSICS.**  
 Describe Einstein postulates  
 Describe relativistic motion  
 Describe blackbody radiation  
 Describe the Photoelectric effect  
 Explain the production, properties and uses of X-rays
- 15 UNDERSTAND BASIC CONCEPTS AND CLASSIFICATION OF MAGNETIC MATERIALS.**  
 Explain domain theory of magnetism  
 Distinguish between para, dia and ferromagnetism and magnetic materials  
 Distinguish between B and H  
 Describe B.H. Curve  
 Describe hysteresis loop.
- 16 UNDERSTAND BASIC CONCEPTS OF SOLID STATE PHYSICS.**  
 Explain crystalline structure of solids  
 Describe band theory of solids  
 Distinguish between conductors, semiconductors and insulators  
 Describe semiconductors giving examples with reference to their structure  
 Distinguish between P-type and N-type materials Explain working of P-N junction as a diode  
 Explain working of solar, cell light emitting diodes and photodiodes

**Phy-113      APPLIED PHYSICS**

**LIST OF PRACTICALS.**

- 1 Find the volume of a given solid cylinder using vernier callipers.
- 2 Find the area of cross-section of the given wire using micrometer screw gauge.
- 3 Prove that force is directly proportional to (a) mass, (b) acceleration, using fletcher's trolley.
- 4 Verify law of parallelogram of forces using Graves-sands apparatus.
- 5 Verify law of triangle of forces and Lami's theorem
- 6 Determine the weight of a given body using
  - a) Law of parallelogram of forces
  - b) Law of triangle of forces
  - c) Lami's theorem
- 7 Find Young's Modulus of Elasticity of a metallic wire.
- 8 Verify Hook's Law using helical spring.
- 9 Study resonance of air column in resonance tube and find velocity of sound.
- 10 Find the frequency of the given tuning fork using resonance tube.
- 11 Find velocity of sound in rod by Kundt's tube.
- 12 Find the refractive index between glass and air by prism.
- 13 Find focal length of converging lens by displacement method.
- 14 Find focal length of diverging lens using converging lens.
- 15 Find angular magnification of an astronomical telescope.
- 16 Find angular magnification of a simple microscope (magnifying glass)
- 17 Determine the specific heat of lead shots.
- 18 Find the coefficient of linear expansion of a metallic rod.
- 19 Find the heat of vaporization.
- 20 To find the co-eff. of friction between glass and wood by using incline plane.
- 21 Study an optical fiber.

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## Math-123 APPLIED MATHEMATICS-I

<b>Total Contact Hours</b>		T	P	C
Theory	96	3	0	3
Practical	Nil			

**AIMS** After completing the course, the students will be able to solve problems of Algebra, Trigonometry, Vectors, Boolean Algebra, Complex numbers and Analytic Geometry, develop skills in the use of mathematical instruments and acquire mathematical clarity and insight in the solution of technical problems.

### COURSE CONTENTS

- 1. QUADRATIC EQUATIONS** **6 hours**
  - 1.1 Standard Form
  - 1.2 Solution
  - 1.3 Nature of roots
  - 1.4 Sum and product of roots
  - 1.5 Formation
  - 1.6 Problems
  
- 2. BINOMIAL THEOREM** **6 hours**
  - 2.1 Factorials
  - 2.2 Binomial expression
  - 2.3 Binomial co-efficient
  - 2.4 Statement
  - 2.5 The general term
  - 2.6 The binomial series
  - 2.7 Problems.
  
- 3. PARTIAL FRACTIONS** **6 hours**
  - 3.1 Introduction
  - 3.2 Linear distinct factors case I
  - 3.3 Linear repeated factors case II
  - 3.4 Quadratic distinct factors case III
  - 3.5 Quadratic repeated factors case IV
  - 3.6 Problems
  
- 4. FUNDAMENTALS OF TRIGONOMETRY** **6 hours**
  - 4.1 Angles
  - 4.2 Quadrants
  - 4.3 Measurements of angles
  - 4.4 Relation between sexagesimal and circular system
  - 4.5 Relation between length of a circular arc and the radian measure of its central

4.6	angle Problems	
<b>5.</b>	<b>TRIGONOMETRIC FUNCTIONS AND RATIOS</b>	<b>6 hours</b>
5.1	Trigonometric functions of any angle	
5.2	Signs of trigonometric functions	
5.3	Trigonometric ratios of particular angles	
5.4	Fundamental identities	
5.5	Problems	
<b>6.</b>	<b>GENERAL IDENTITIES</b>	<b>6 hours</b>
6.1	The Fundamental Law	
6.2	Deductions	
6.3	Sum and difference formulae	
6.4	Double angle identities	
6.5	Half angle identities	
6.6	Conversion of sum or difference to products	
6.7	Problems	
<b>7.</b>	<b>SOLUTION OF TRIANGLES</b>	<b>6 hours</b>
7.1	The law of Sines	
7.2	The law of Cosines	
7.3	Measurement of heights and distances	
7.4	Problems	
<b>8.</b>	<b>VECTORS AND PHASORS</b>	<b>12 hours</b>
8.1	Scalars and Vectors	
8.2	The unit Vectors $i, j, k$	
8.3	Direction Cosines	
8.4	Dot product	
8.5	Cross product	
8.6	Analytic expressions for dot and cross products	
8.7	Phasors	
8.8	Significance of $j$ operator	
8.9	Different forms	
8.10	Algebraic operations	
8.11	Problems	
<b>9.</b>	<b>COMPLEX NUMBERS</b>	<b>9 hours</b>
9.1	Introduction and properties	
9.2	Basic operations	
9.3	Conjugate	
9.4	Modulus	

- 9.5 Different forms  
9.6 Problems
- 10. BOOLEAN ALGEBRA AND GATE NETWORKS 15 hours**
- 10.1 Concept and basic laws  
10.2 Sums of product and product of sums  
10.3 Binary, decimals and octals, presentation of decimal numbers in BCD  
10.4 Interconversion of numbers  
10.5 OR Gates and AND Gates  
10.6 Logical Expressions and their simplification  
10.7 Demorgan's theorems  
10.8 NAND Gates and NOR Gates  
10.9 Problems
- 11. PLANE ANALYTIC GEOMETRY AND STRAIGHT LINE 6 hours**
- 11.1 Coordinate system  
11.2 Distance formula.  
11.3 Ratio formulas.  
11.4 Inclination and slope of line.  
11.5 Slope formula.  
11.6 Problems.
- 12. EQUATIONS OF THE STRAIGHT LINE 6 hours**
- 12.1 Some important forms  
12.2 General form  
12.3 Angle formula.  
12.4 Parallelism and perpendicularity  
12.5 Problems
- 13. EQUATIONS OF THE CIRCLE. 6 hours**
- 13.1 Standard and Central forms of equation.  
13.2 General form of equation.  
13.3 Radius and coordinates of center.  
13.4 Problems

#### **RECOMMENDED BOOKS**

1. Applied Mathematics Math-123, by Nasir -ud-Din Mahmood, Sana-ullah Khan, Tahir Hameed, Syed Tanvir Haider, Javed Iqbal, Vol - I, National Book Foundation

**INSTRUCTIONAL OBJECTIVES**

**1.2 USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATION**

- 1.1 Define a standard quadratic equation.
- 1.2 Use methods of factorization and method of completing the square for solving the equations.
- 1.3 Derive quadratic formula.
- 1.4 Write expression for the discriminant.
- 1.5 Explain nature of the roots of a quadratic equation.
- 1.6 Calculate the sum and product of the roots.
- 1.7 Form a quadratic equation from the given roots.
- 1.8 Solve problems involving quadratic equations.

**2. APPLY BINOMIAL THEOREM FOR THE EXPANSION OF BINOMIAL AND EXTRACTION OF ROOTS.**

- 2.1 State binomial theorem for positive integral index.
- 2.2 Explain binomial coefficients:  
(n,0), (n,1).....(n,r)....., (n,n)
- 2.3 Derive expression for the general term.
- 2.4 Calculate the specified terms.
- 2.5 Expand a binomial of a given index.
- 2.6 Extract the specified roots.
- 2.7 Compute the approximate value to a given decimal place.
- 2.8 Solve problems involving binomials.

**3. APPLY DIFFERENT METHODS FOR RESOLVING A SINGLE FRACTION INTO PARTIAL FRACTIONS USING DIFFERENT METHODS**

- 3.1 Define a partial fraction, a proper and an improper fraction.
- 3.2 Explain all the four types of partial fractions.
- 3.3 Set up equivalent partial fractions for each type.
- 3.4 Explain the methods for finding constants involved.
- 3.5 Resolve a single fraction into partial fractions.
- 3.6 Solve problems involving all the four types.

**4. UNDERSTAND THE SYSTEMS OF MEASUREMENT OF ANGLES.**

- 4.1 Define angles and the related terms.
- 4.2 Illustrate the generation of an angle.
- 4.3 Explain sexagesimal and circular systems for the measurement of angles.
- 4.4 Derive the relationship between radian and degree.
- 4.5 Convert radians to degrees and vice versa.

- 4.6 Derive a formula for the circular measure of a central angle.
  - 4.7 Use this formula for solving problems.
- 5. UNDERSTAND BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRIC FUNCTIONS.**
- 5.1 Define the basic trigonometric functions/ratios of an angle as ratios of the sides of a right triangle.
  - 5.2 Derive fundamental identities.
  - 5.3 Find trigonometric ratios of particular angles.
  - 5.4 Draw the graph of trigonometric functions.
  - 5.5 Solve problems involving trigonometric functions.
- 6. USE TRIGONOMETRIC IDENTITIES IN SOLVING TECHNOLOGICAL PROBLEMS.**
- 6.1 List fundamental identities.
  - 6.2 Prove the fundamental law.
  - 6.3 Deduce important results.
  - 6.4 Derive sum and difference formulas.
  - 6.5 Establish half angle, double and tripple angle formulas.
  - 6.6 Convert sum or difference into product and vice versa.
  - 6.7 Solve problems.
- 7. USE CONCEPT, PROPERTIES AND LAWS OF TRIGONOMETRIC FUNCTIONS FOR SOLVING TRIANGLES.**
- 7.1 Define angle of elevation and angle of depression.
  - 7.2 Prove the law of sines and the law of cosines.
  - 7.3 Explain elements of a triangle.
  - 7.4 Solve triangles and the problems involving heights and distances.
- 8. UNDERSTAND PRINCIPLES OF VECTORS AND PHASORS**
- 8.1 Define unit vectors  $i, j, k$ .
  - 8.2 Express a vector in the component form.
  - 8.3 Explain magnitude, unit vector, direction cosines of a vector.
  - 8.4 Explain dot product and cross product of two vector.
  - 8.5 Deduce important results from dot and cross product.
  - 8.6 Define phasor and operator  $j$ .
  - 8.7 Explain different forms of phasors.
  - 8.8 Perform basic Algebraic operation on phasors.
  - 8.9 Solve problems on phasors.



**9. USE PRINCIPLES OF COMPLEX NUMBERS IN SOLVING TECHNOLOGICAL PROBLEMS.**

- 9.1 Define a complex number and its conjugate.
- 9.2 State properties of complex numbers.
- 9.3 Give different forms of complex numbers.
- 9.4 Perform basic algebraic operations on complex numbers.
- 9.5 Solve problem involving complex numbers.

**10. SOLVE TECHNICAL PROBLEMS USING PRINCIPLES OF BOOLEAN ALGEBRA**

- 10.1 Explain fundamental concepts of boolean algebra
- 10.2 Explain binary numbers, octal numbers, decimal numbers and their interconversion.
- 10.3 Explain digital addition and multiplication and its applications to OR gates and AND Gates
- 10.4 Illustrate complimentation and inversion
- 10.5 Evaluate logical expression
- 10.6 List basic Laws of Boolean Algebra
- 10.7 Explain De-Morgan's theorem
- 10.8 Explain basic duality of boolean algebra
- 10.9 Derive boolean expression
- 10.10 Explain combination of GATES
- 10.11 Illustrate sum of products and product of sum
- 10.12 Derive product of sum expression
- 10.13 Explain NAND Gates and NOR Gates
- 10.14 Use the map methods for simplifying expressions
- 10.15 Explain sub-cubes and covering

**11. UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY 11.1 Explain the**

- rectangular coordinate system.
- 11.2 Locate points in different quadrants.
  - 11.3 Derive distance formula.
  - 11.4 Describe the ratio formula
  - 11.5 Derive slope formula
  - 11.6 Solve problems using the above formulae.

**12. USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.**

- 12.1 Define equation of a straight line.
- 12.2 Derive slope intercept and intercept forms of equations of a straight line.
- 12.3 Write general form of equations of a straight line.
- 12.4 Derive an expression for angle between two straight lines.
- 12.5 Derive conditions of perpendicularity and parallelism of two straight lines.
- 12.6 Solve problems using these equations/formulae.

**13. SOLVE TECHNOLOGICAL PROBLEMS USING EQUATIONS OF CIRCLE**

- 13.1 Define a circle.

- 13.2 Describe standard, central and general forms of the equation of a circle.
- 13.3 Convert general form to the central form of equation of a circle.
- 13.4 Deduce formula for radius and coordinates of the center of a circle.
- 13.5 Derive equation of the circle passing through three points.
- 13.6 Solve problems involving these equations.

## MTF111 ENGINEERING DRAWING

### Total Contact Hours

Theory	0	T	P	C
Practical	96	0	3	1

**AIM:** To acquaint the students with the basic knowledge and practice in engineering drawing necessary for a food technologist to communicate meaningfully with equipment and plant designer

### LIST OF PRACTICALS

1. Introduction and importance of the course
2. Lettering and practice from A-Z in capital slants
3. Lettering and practice from A-Z in capital verticals
4. Lettering and practice from A-Z in small cases vertical
5. Lettering and practice from A-Z in small cases slants
6. Practice in lettering and figures
7. Familiarization with drawing instruments
8. Use of drawing instruments in simple part drawing
9. Practice in alphabet of lines
10. Drawing of a simple part to show the use of engineering lines
11. Simple geometry construction of acute, obtuse, straight, reflex and right angles
12. Geometrical figure i.e. polygons, circles, inscribed and circumscribed
13. Types and construction of ellipses in various modes i.e. simple, tangent, and parallelogram methods
14. Introduction to geometrical solids, cubes, prisms, pyramids and cones
15. Conic sections: circle, ellipse, parabola, hyperbola
16. Construction of parabola by basic and tangent methods
17. Introduction to dimensioning
18. Practice in dimensioning in a simple part drawing
19. Projection and projector
20. Introduction to 3-dimensional figures, i.e. block, V-block, cylinder
21. Introduction to picture plan
22. Introduction to dihedral angle - placement of object in first and third angle
23. Orthographic projections with the help of drawing of a simple object - glass box method
24. Practice in drawing an object
25. Drawing of a slotted block
26. Drawing of a gland for a stuffing box
27. Introduction to pictorial drawing
28. Pictorial block
29. Isometric, oblique and perspective projections
30. Isometric scale and isometric drawings of a V-block
31. Pictorial and orthographic drawings of different machine parts
32. Terminology and types of threads
33. Drawing of a square thread single and double start
34. Drawing of a square and hexagonal nut and bolt

### RECOMMENDED BOOKS

1. A.C. Parkinson, First Year Engineering Drawing
2. Luzadar, Fundamentals of Engineering Drawing

## MTF121      WORKSHOP PRACTICE

### Total Contact Hours

Theory	0	T	P	C
Practical	96	0	3	1

**AIM:** To equip the students with the basic knowledge of workshop practice necessary for smooth running of food machinery and equipment.

### LIST OF PRACTICALS

#### Metal Work-Shop Orientation

1. Laying out and measuring tools
2. Use of measuring instruments and gauges
3. Use of micrometer
4. Use of vernier caliper
5. Metal sawing practice
6. Use of chisels,
7. Chipping straight grooves in steel
8. Metal filling practice
9. Pipe threading practice
10. Drilling holes with hand, portable electric and electric drill press
11. Use of screw pitch gauge for checking number of threads on nuts and bolts
12. Making stud bolts and nuts
13. Practice on riveting
14. Practice of grinding drill bits
15. Practice on sheet metal
16. Making of paper weight, hammer, and square piece according to size, legs of inside caliper

#### Welding-Shop Orientation

1. Familiarization and use of gas welding plant
2. Familiarization and operation of arc welding plant
3. Soldering and brazing materials

#### Machine Shop-Shop Orientation

1. Practice of using measuring scales in
2. Practice of fixing job, cutting tool on lathe and taking simple cuts
3. Grinding practice of lathe tools
4. Grinding practice of drills
5. Practice of simple and step turning
6. Practice of knurling
7. Practice of drilling reaming on lathe
8. Simple boring practice
9. Tap turning practice by the use of tool post and tail stock
10. Practice of cutting simple screw threads on lathe

11. Practice of cutting internal threads
12. Practice of rapid and plain indexing
13. Indexing practice in spur gear cutting

#### **RECOMMENDED BOOKS**

1. Luding, Metal Work
2. R.E. Smith, Forging and Welding Part I,
3. H.D. Burghardt, Machine Tool Operation Part I,

**FPPT-113**

**INTRODUCTION TO FOOD SCIENCE**

**Total contact hours**

Theory	64Hours	<b>T</b>	<b>P</b>	<b>C</b>
Practical	96Hours	2	3	3

**AIM** The student will be able to attain the knowledge of basic food science and technology and visualize the need and importance of the subject.

**COURSE CONTENTS**

- 1. INTRODUCTION** **8Hours**  
Food Science  
Food Technology  
Food Processing and Preservation  
Differentiation between Food Science and Technology  
Inter-disciplinary relationship  
Career opportunities
- 2. FOOD SOURCES AND SUPPLY IN PAKISTAN** **3hours**
- 3. DEVELOPMENTS IN FOOD INDUSTRY** **4hours**  
Food preservation in ancient/ prehistoric times  
Developments in other techniques
- 4. FOOD INDUSTRY IN PAKISTAN** **4hours**
- 5. SIGNIFICANCE OF FOOD SCIENCE & TECHNOLOGY** **4hours**  
Regulating food supply  
Consumer convenience  
Economic gains
- 6. FOOD CONSTITUENTS** **14hours**  
Water  
Proteins  
Lipids  
Carbohydrates  
Vitamins  
Minerals  
Other constituents (color, flavor, organic acids, toxicants)
- 7. CLASSIFICATION OF FOODS** **7hours**  
Based on origin  
Based on perishability  
Based on pH value

- 8. FOOD SPOILAGE** **12hours**  
Spoilage of stablefoods  
Spoilage of semi-perishablefoods  
Spoilage of perishablefoods  
Spoilage agents  
Spoilage byautolysis
- 9. SPOILAGEAGENTS** **8hours**  
Enzymes  
Microorganisms  
Factors affectinggrowth of microorganisms  
Insects,rodentsandbirds  
Physical factors

**INSTRUCTIONAL OBJECTIVES**

On completion of this course, the students will be able to;-

**1. UNDERSTAND THE ROLE OF FOOD SCIENCE, TECHNOLOGY AND RELATED DISCIPLINES**

Define Food Science, Food Technology, Food Processing and Preservation

Differentiate between Food Science and Technology.

Explain relationship of food science with other disciplines, physics, chemistry, biology, engineering and computer science.

Explain career opportunities in food industry, food service organizations, teaching institutions, research organizations and other potential openings.

**2. KNOW THE FOOD SOURCES AND SUPPLY IN PAKISTAN**

Explain food and its supply in Pakistan

Food related nutrition and health conditions.

**3. UNDERSTAND THE DEVELOPMENTS IN FOOD INDUSTRY**

Describe the developments in food processing and preservation in ancient/

prehistoric/modern times.

Describe the developments in techniques like cold storage, freezing, drying

and dehydration flour milling, dairy, irradiation etc.

**4. KNOW THE FOOD INDUSTRY IN PAKISTAN**

Name the location and distribution of the following industry in Pakistan.

Fruit and vegetable processing, Beverage industry, Wheat and grain milling industry, Baking industry, Snack food industry, Vegetable ghee and oil industry, Sugar industry, Confectionery industry, Dairy industry, Ice cream manufacturing, Meat & poultry processing, Fish processing.

**5. UNDERSTAND THE SIGNIFICANCE OF FOOD SCIENCE & TECHNOLOGY**

Describe the significance of food science and technology in regulating food supply

Explain consumer convenience

Explain the economic gains to general public and government.



## 6. UNDERSTAND THE FOOD CONSTITUENTS

Define water and the nature of water in food.

Describe the role of water in foods and human body.

Classify carbohydrates.

Discuss role of carbohydrates in human nutrition.

Define proteins and its importance.

Describe the formation and function of protein.

Define lipids and its application.

Explain the application of lipids its nutritional significance

Describe the classification of vitamins with examples.

Define vitamins and role of vitamins in human nutrition.

6.13 Describe mineral elements in food and their importance in the body..

Explain the functions and types of colors.

What are flavors and state their functions.

Discuss various flavoring compounds in foods.

State the role of flavor enhancer in food.

Differentiate between various aromatic compounds components in foods.

Describe the nature of organic acids in foods and their functions.

Discuss toxicants present in food and their effects on the body.

## 7. UNDERSTAND THE CLASSIFICATION OF FOODS

List various classes of foods.

Enumerate classes of foods based on their origin

Classify food on perishability

Define stable, semi perishable and perishable foods

Classify food on the basis of pH value and explain each category in detail.

## 8. UNDERSTAND THE SPOILAGE OF FOODS

Define food deterioration and spoilage

Describe mode of spoilage of stable, semi perishable and perishable foods.

Explain autolysis. Give examples of spoilage by autolysis

Define enzyme. Give its classification and nomenclature.

Explain the uses of enzymes.

Describe factors affecting enzyme activity.

Develop relationship between enzymes and preservation.

Explain the microbial activities resulting in food spoilage

Describe how insects, rodents and birds deteriorate foods

Explain how physical factors cause deteriorative changes in foods.

## 9. UNDERSTAND CHARACTERISTICS OF SPOILAGE AGENTS

Enlist food spoilage agents

State the role of enzyme in food spoilage  
Name the microorganisms associated with food spoilage  
List factors effecting growth of microorganisms.  
Name important pests.

## **LIST OF PRACTICALS**

**96 hours**

1. Visit to food technology section of a national research institute.
2. Visit to food industry.
3. Visit to a cold storage.
4. Visit to food technology department of a university.
5. Visit to dehydration unit.
6. Visit to nuclear research facility in the region.

**FUNDAMENTAL OF FOOD PROCESSING AND PRESERVATION  
FPPT 133**

**Total contact hours**

Theory	64Hours	<b>T</b>	<b>P</b>	<b>C</b>
Practical	96 Hours	2	3	3

**AIM** The student will be able to understand and use the scientific basis of food Processing and preservation.

1. **PRINCIPLES OF FOOD PRESERVATION** **5 hours**  
 Prevention or delay of autolysis  
 Prevention or delay of microbial activity  
 Control of pest activities  
 Reduction in physical defects  
 Application of preservation techniques in food industry
  
2. **PREPARATORY OPERATIONS IN FOOD PROCESSING** **5 hours**  
 Handling and transportation of raw materials  
 Cleaning  
 Sorting and grading  
 Peeling, shelling, skinning,  
 Removal of inedible constituents  
 Size reduction,  
 Mixing, filtration,  
 Prevention of enzymatic browning
  
3. **USE OF HIGH TEMPERATURE** **8 hours**  
 Cooking  
 Blanching  
 Pasteurization  
 Sterilization and commercial sterilization  
 Canning
  
4. **USE OF LOW TEMPERATURE** **8 hours**  
 Equipment and procedure  
 Refrigeration systems  
 Use of above freezing temperature  
 Use of below freezing temperature
  
5. **REMOVAL OR BINDING OF MOISTURE** **8 hours**  
 Role of water in food  
 Forms of water in food  
 Advantages of dried foods  
 Sundrying  
 Dehydration  
 Evaporation and concentration  
 Freeze-drying

Dehydro-freezing  
Intermediate moisture food technology

- |           |   |                |
|-----------|---|----------------|
| <b>6.</b> | <b>USE OF CHEMICAL ADDITIVES</b><br>Definition<br>Functions of food additives<br>Chemical additives as nonpreservatives<br>Chemical additives as preservatives<br>Effectiveness of chemical preservatives<br>Food laws  | <b>8 hours</b> |
| <b>7.</b> | <b>USE OF FERMENTATIONS</b><br>Fermented foods<br>Objects of fermentation<br>Types of fermentation<br>Changes in foods  | <b>8 hours</b> |
| <b>8.</b> | <b>USE OF IRRADIATIONS</b><br>Units of measurement<br>Characteristics of electromagnetic waves<br>Sources of electromagnetic radiations<br>Use of ultraviolet radiation<br>Use of ionizing radiation<br>Commercial application of irradiation<br>Effect of irradiation on foods                           | <b>6 hours</b> |
| <b>9.</b> | <b>FOOD PACKAGING</b><br>Characteristics of a package<br>Packaging materials<br>Rigid and flexible metals<br>Glass<br>Flexible and rigid cellulose & plastics<br>Flexible and rigid paper products<br>Laminates and multilayer material<br>Protective packaging in tropical environments<br>Food labeling | <b>8 hours</b> |

## **RECOMMENDED BOOKS**

1. J.A. Awan,2005. FoodScienceandTechnology, Unitech Communications,Faisalabad.
2. J.A. Awan,2007. FoodProcessingand Preservation, Unitech Communications,Faisalabad.
3. N. N. Potter and J.H.Hotchkiss, 1995. FoodScience.The AVI PublishingCo.Inc.,Westport,Connecticut.
4. P.M. Gaman andK.B.Shrington,1981.An introduction toFood Science,NutritionandMicrobiology, Pergman Press, NewYork.
5. KeithProudlove, 1991.The ScienceandTechnologyof Foods, Forbes Publications,London.

## **PRACTICALMANUAL**

1. J.A. Awan andS. U. Rehman,2005.Food Analysis Manual, Unitech Communications,Faisalabad.
2. J.A. Awan andS. U. Rehman,2004.Food Preservation Manual, Unitech Communications, Faisalabad.

# **FPPT-133 FUNDAMENTAL OFFOOD PROCESSEING AND PRESERVATION**

## **INSTRUCTIONAL OBJECTIVES**

### **1. UNDERSTAND PRINCIPLES OF FOOD PRESERVATION**

Explain the principle of food preservation by preventing or delaying autolysis.

Explain the principle of food preservation by preventing or delaying microbial activity.

Explain the principles of food preservation by preventing or controlling pest activities.

Explain the principles of food preservation by preventing or reducing Physical defects.

### **2. UNDERSTAND PREPARATORY OPERATIONS IN FOOD PROCESSING**

Discuss technology of harvesting raw materials.

Enlist the preparatory operations performed during food processing

Explain handling and transportation of raw materials

Explain how cleaning of raw materials take place during processing.

Describe the categories of sorting and grading of raw materials with example.

Explain peeling, shelling, skinning and removal of inedible contents of Raw materials take place..

Discuss size reduction of raw material during processing and its importance in food industry.

Discuss the mixing unit operation during food processing

Describe filtration operation in food processing industry.

Explain how enzymatic browning is prevented through blanching and by use of chemicals.

### **3. UNDERSTAND USE OF HIGH TEMPERATURE IN FOOD PRESERVATION**

State main objectives of cooking

Describe blanching

Describe pasteurization

Differentiate between pasteurization, sterilization and commercial sterilization.

Explain the methods of pasteurization and sterilization.

Describe unit operations in canning.

Discuss the factors affecting heat processing of food during canning.

### **4. UNDERSTAND PRESERVATION BY USE OF LOW TEMPERATURE**

State objectives of cooling foods.

Diagrammatic representation of mechanical refrigeration system  
 Explain the use of above freezing temperature  
 Explain the principle and procedure of cold storage.  
 Discuss the factors affecting cold storage.  
 Explain the use of below freezing temperature  
 Describe types of freezers and methods of food freezing.  
 Explain the effect of low temperature on foods.  
 Explain the storage life of frozen foods.  
 State the effect of thawing on the quality of frozen foods.  
 Discuss the effect of freezing on microorganisms.

## **5. UNDERSTAND REMOVAL AND BINDING OF MOISTURE FOR FOOD PRESERVATION**

State the functions of water in food  
 Describe the methods of sun drying  
 Describe dehydration procedures and equipment.  
 Discuss special drying techniques.  
 Explain evaporation and concentration processes for food preservation  
 State procedure for freeze drying  
 Explain dehydrofreezing  
 Describe intermediate moisture foods technology.

## **6. UNDERSTAND THE APPLICATIONS OF CHEMICAL ADDITIVES**

Differentiate between chemical/food additive, food adulterant and food contaminant.  
 Explain the use of chemical additives for non preservative applications.  
 Explain the use of chemical additives for preservation of foods.  
 Explain the factors affecting the effectiveness of chemical preservatives.  
 Discuss how food laws aim in setting guidelines for the quality of processed foods.

## **7. UNDERSTAND THE USE OF FERMENTATION FOR PRESERVATION**

Define fermentation  
 List important fermented foods  
 Explain objectives of fermentation  
 List types of fermentations  
 Describe the use of alcoholic fermentations and its use in industry  
 Describe the production of vinegar by fermentation  
 Describe the use of lactic acid fermentations in industry  
 16.7 Explain the changes caused by desirable fermentations in foods.

## **8. UNDERSTAND THE USE OF IRRADIATIONS**



List the units of irradiation measurement  
Describe the characteristics of electromagnetic waves.  
Explain the sources of electromagnetic radiation.  
Describe the use of ultraviolet and ionizing radiation in food preservation.  
Discuss the commercial applications of irradiation.  
Explain the effect of irradiation of foods.

## **9. UNDERSTAND FOOD PACKAGING**

Define packing and packaging  
Differentiate between packing and packaging  
Explain reasons for packing foods  
Enlist important characteristics of a package  
Enlist types of packaging materials  
Identify and explain conventional packaging materials  
Identify and explain modern packaging materials  
Define aseptic packaging  
Explain the manufacture of aseptic packaging paper.  
Explain the working of aseptic filling machine (Tetra Pack)  
Classify into rigid and flexible  
Explain principle of package design  
Enlist the information considered mandatory to appear on the label of prepared food.  
Describe the characteristics and properties of rigid and flexible metals used as food packaging material.  
Discuss advantages and disadvantages of flexible metal contents in food packaging.

## **FUNDAMENTALS OF FOOD PROCESSING AND PRESERVATION**

### **LIST OF PRACTICALS**

**96 hours**

- 1- State the mode of food spoilage
- 2- Study the spoilage of foods by enzymes
- 3- Study the pasteurization of milk
- 4- Canning of some typical fruits
- 5- Canning of some seasonal vegetables
- 6- Cold storage of some fruits and vegetables
- 7- Freezing of difficult vegetables
- 8- Sun-drying of some fruits
- 9- Sun-drying of some vegetables
- 10- Dehydration of some fruits
- 11- Dehydration of selected vegetables
- 12- Use of evaporation for concentrating milk
- 13- Preservation of fruit juice by the use of chemical additives
- 14- Production of bread by alcoholic fermentation
- 15- Preservation of fruits by lactic acid fermentation

## اسلامیات / مطالعہ پاکستان

GEN 211

مضب (اسٹیل دوئم)

تعداد کول اسلامیات

تعداد سلاخہ پاکستان

ٹی ٹی ٹی  
1 0 1  
کل وقت: 20 گھنٹے

### موضوعات

- 1- سورۃ المؤمنین آیت تا آیہ آیات کا مع ترجمہ
- 2- دن تحب بحدیث مع ترجمہ و تفسیر
- 3- خیار کم من تعسیم القرآن و علمہ
- 4- لا ایمان لمن لا ایمانہ لہ ولا دین لمن لا عہدہ
- 5- ویاکم و لظن لن اظن اکرب الحدیث
- 6- من احدث فی امرنا بئنا لیس متہ فہورد
- 7- من حمل علیہ السلاح فلیس منا
- 8- لولو کافل البیتیم فی الجنۃ
- 9- لا ضرر ولا ضرار فی السلام
- 10- کلکم راع وکلکم مسؤل عن رعیتہ
- 11- 3- یرۃ طیبہ
- 12- مکی زندگی وادبہ بختہ ہجرت
- 13- نبی زندگی - مہافت - مشق دین - حج مکہ (اسباب و نتائج)
- 14- حضور ﷺ بحیثیت
- 15- خطبہ تجرہ لاراع
- 16- عصر کھل، سرپرہ، خلدان
- 17- اسلامی معاشرہ
- 18- کلام تعلیم اور ان کے مقصد، عدس و انصاف، امر بالمعروف، فی من انکر
- 19- جہاد - کسب طہار - سچو (امیت و فضیلت)
- 20- اسلامی ریاست کی تعریف - اسلامی ریاست کی خصوصیات - اسلامی حکومت کے فرائض - اسلامی طرز حکومت

## اسلامیات

### تدریس مقاصد

عمومی مقاصد بظاہر علم یہ جان سکے کہ آیات قرآنی کی روشنی میں مومن کے اوصاف کیا ہیں  
قرآن مجید

خصوصی مقاصد:

☆ قرآنی آیات کا ترجمہ بیان کر سکے

☆ قرآنی آیات کی تشریح کر سکے

☆ قرآنی آیات کی روشنی میں ایک مومن کے اوصاف بیان کر سکے

☆ قرآنی آیات میں بیان کردہ مومن کے اوصاف اپنے اندر پیدا کر سکے

احادیث نبویہ

☆ عمومی مقصد احادیث کی روشنی میں اسلامی اخلاقی اقدار (انفرادی و اجتماعی) سے آگاہ ہو سکے

خصوصی مقاصد:

☆ احادیث کا ترجمہ بیان کر سکے

☆ احادیث کی تشریح کر سکے

☆ احادیث کی روشنی میں اسلام کی اخلاقی اقدار کی وضاحت کر سکے

☆ ان احادیث کی دی گئی تعلیمات کے مطابق اپنی زندگی گزار سکے

سیرت طیبہ

☆ عمومی مقصد: حضور ﷺ کی سیرت طیبہ کے بارے میں جان سکے

خصوصی مقاصد:

☆ حضور ﷺ کی ابتدائی زندگی انحصار کے ساتھ بیان کر سکے

☆ حضور ﷺ کی ہجرت کا واقعہ بیان کر سکے

☆ حضور ﷺ کی مدنی زندگی انحصار سے بیان کر سکے

☆ حضور ﷺ کی بطور معلم خصوصیات بیان کر سکے

- ☆ حضور ﷺ کی بطور سربراہ خاتم ان بیان کر سکے
- ☆ اسلامی معاشرہ
- ☆ عمومی مقصد: اسلامی معاشرہ کی خصوصیات سے آگاہی حاصل کر سکے
- ☆ خصوصی مقاصد:
- ☆ اسلامی معاشرہ کا معنی و مفہوم بیان کر سکے
- ☆ اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے
- ☆ اسلامی معاشرہ میں عدل و احسان کی اہمیت بیان کر سکے
- ☆ تبلیغ کے لغوی معنی بیان کر سکے
- ☆ تبلیغ کی اہمیت و ضرورت بیان کر سکے
- ☆ جہد کے لفظی و اصطلاحی معنی بیان کر سکے
- ☆ جہد کی اہمیت بیان کر سکے
- ☆ جہد اور قتل میں فرق بیان کر سکے
- ☆ جہد کی مختلف اقسام بیان کر سکے
- ☆ انظر مسجد کی تعریف کر سکے

☆ مسجد کی سابقہ حیثیت کو بحال کرنے کے بارہ میں اقدامات کو بیان کر سکے

### اسلامی ریاست

- ☆ عمومی مقصد: اسلامی ریاست کی خصوصیات بیان کر سکے
- ☆ خصوصی مقاصد:
- ☆ ریاست کی تعریف بیان کر سکے
- ☆ اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کر سکے
- ☆ اسلامی ریاست کی خصوصیات بیان کر سکے
- ☆ اسلامی ریاست کے اغراض و مقاصد بیان کر سکے
- ☆ اسلامی ریاست کے قیام کیلئے جدوجہد کر سکے

## نصاب مطالعہ پاکستان

لی بی سی  
۱ ۵ ۱  
کل وقت: ۱۲ گھنٹے

سہ ماہی	☆
حصہ دوم	☆
<b>موضوعات</b>	
۱۰ ترقی نظریہ	☆
تحریک پاکستان	☆
انجین کانگریس	☆
مسلم لیگ	☆
تفسیر بنگلہ	☆
بیشاق کھنڈ	☆
تحریک خلافت	☆
سندھ تحریک	☆
تیلوینڈی	☆
سورپورٹ	☆
قوتِ عظیم کے چورہ نکلت	☆
شعبہ آلہ آباد	☆
انتخابات 1938 اور اشعلیٰ ہندو	☆
قور و لو پاکستان	☆

حصہ دوم

سزاخا پاکستان

تعمیر مقاصد

تحریک پاکستان

عمومی مقصد: قیام پاکستان کے سبب و محرکات کو بیان کر سکے

خصوصی مقاصد:

- ☆ قومیت کے مفہوم کو بیان کر سکے
- ☆ دو قومی نظریہ کی تعریف و توضیح کر سکے
- ☆ دو قومی نظریہ اہمیت بیان کر سکے
- ☆ ہندوستانی مسلمانوں کی عموماً کیوں کو بیان کر سکے
- ☆ قومی تشخص کو بھل رکھنے سے لئے مسلمان ہند کی مساوی بیان کر سکے
- ☆ آزادی ہند اور قیام پاکستان علامہ اقبال اور قائد اعظم کی مساوی بیان کر سکے
- ☆ قیام پاکستان سے مستقبل اسلامی مملکت کے قیام کے لئے مسلم عوام کی کوششوں کو بیان کر سکے
- ☆ مسلم لیگ کے قیام پاکستان کے لئے جدوجہد بیان کر سکے

(غیر مسلم طلباء کے لئے)

نی ڈی اے  
101  
کل وقت: 20 منٹ

نصاب امتلاقیات  
سال دوم

### موضوعات

معاشرتی قدر اور اخلاق اسلامیہ۔ قوم۔ قوی روح۔ شہری روح۔ صنعتی اور لڑائی کی روح۔ ضروریات۔ درجہ

- ☆ حقوق و فرائض
- ☆ قوت پرورش
- ☆ قوت ارادی
- ☆ لگن و جذبہ
- ☆ وسیع افکری
- ☆ بے غرضی
- ☆ مسئلہ دوستی
- ☆ سماجی شعور
- ☆ پس آزادی
- ☆ کمال فکری
- ☆ تعمیرات کو قبول کرنا
- ☆ خود شناسی



## **MGM221 BUSINESSMANAGEMENTANDINDUSTRIALECONOMICS**

### **TotalContactHours**

Theory	32	T	P	C
Practical	0	1	0	1

**AIMS** The students will be able to develop management skills, get acquainted the learner with the principles of management and economic relations and develop commercial/economic approach to solve the problems in the industrial set-up.

### **COURSE CONTENTS**

- 1. ECONOMICS** **2Hours**  
Definition: Adam Smith, Alfred Marshall, Prof. Robins.  
Nature and scope  
Importance for technicians.
- 2. BASIC CONCEPTS OF ECONOMICS** **1Hour**  
Utility  
Income  
Wealth  
Saving  
Investment  
Value.
- 3. DEMAND AND SUPPLY.** **2Hours**  
Definition of demand.  
Law of demand.  
Definition of supply.  
Law of supply.
- 4. FACTORS OF PRODUCTION.** **2Hours**  
Land  
Labour  
Capital  
Organization.
- 5. BUSINESS ORGANIZATION.** **3Hours**  
Sole proprietorship.  
Partnership  
Joint stock company.
- 6. ENTREPRENEURIAL SKILLS** **4Hours**  
Preparing, planning, establishing, managing, operating and evaluating relevant resources in small business.

Business opportunities, goal setting.  
Organizing, evaluating and analyzing opportunity and risk tasks.

- |            |   |                |
|------------|---|----------------|
| <b>7.</b>  | <b>SCALE OF PRODUCTION.</b><br>Meaning and its determination.<br>Large scale production.<br>Small scale production.         | <b>2 Hours</b> |
| <b>8.</b>  | <b>ECONOMIC SYSTEM</b><br>Free economic system.<br>Centrally planned economy.<br>Mixed economic system.                     | <b>3 Hours</b> |
| <b>9.</b>  | <b>MONEY.</b><br>Barter system and its inconveniences.<br>Definition of money and its functions.                            | <b>1 Hour</b>  |
| <b>10.</b> | <b>BANK.</b><br>Definition<br>Functions of a commercial bank.<br>Central bank and its functions.                            | <b>1 Hour</b>  |
| <b>11.</b> | <b>CHEQUE</b><br>Definition<br>Characteristics and kinds of cheque.<br>Dishonour of cheque.                                 | <b>1 Hour</b>  |
| <b>12.</b> | <b>FINANCIAL INSTITUTIONS</b><br>IMF<br>IDBP<br>PIDC  | <b>2 Hours</b> |
| <b>13.</b> | <b>TRADE UNION</b><br>Introduction and brief history.<br>Objectives, merits and demerits.<br>Problems of industrial labour. | <b>2 Hours</b> |
| <b>14.</b> | <b>INTERNATIONAL TRADE.</b><br>Introduction<br>Advantages and disadvantages.  | <b>2 Hours</b> |
| <b>15.</b> | <b>MANAGEMENT</b><br>Meaning<br>Functions   | <b>1 Hour</b>  |

- 16. ADVERTISEMENT** **2Hours**  
The concept, benefits and draw-backs.  
Principal media used in business world.
- 17. ECONOMY OF PAKISTAN** **1Hour**  
Introduction  
Economic problems and remedies.

**BOOKS RECOMMENDED**

1. Nisar-ud-Din, Business Organization, Aziz Publisher, Lahore
2. M. Saeed Nasir, Introduction to Business, Ilmi Kitab Khana, Lahore.
3. S.M. Akhtar, An Introduction to Modern Economics, United Limited, Lahore.

## **MGM-221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS.**

### **INSTRUCTIONAL OBJECTIVES**

- 1. UNDERSTAND THE IMPORTANCE OF ECONOMICS.**  
State definition of economics given by Adam Smith, Alfred Marshall and Professor Robins.  
Explain nature and scope of economics.  
Describe importance of study of economics for technicians.
- 2. UNDERSTAND BASIC TERMS USED IN ECONOMICS.**  
Define basic terms, utility, income, wealth, saving, investment and value.  
Explain the basic terms with examples
- 3. UNDERSTAND LAW OF DEMAND AND LAW OF SUPPLY.**  
Define Demand.  
Explain law of demand with the help of schedule and diagram.  
State assumptions and limitation of law of demand.  
Define Supply.  
Explain law of Supply with the help of schedule and diagram.  
State assumptions and limitation of law of supply.
- 4. UNDERSTAND THE FACTORS OF PRODUCTION**  
Define the four factors of production.  
Explain labour and its features.  
Describe capital and its peculiarities.
- 5. UNDERSTAND FORMS OF BUSINESS ORGANIZATION.**  
Describe sole proprietorship, its merits and demerits.  
Explain partnership, its advantages and disadvantages.  
Describe joint stock company, its merits and demerits.  
Distinguish public limited company and private limited company.
- 6. UNDERSTAND ENTERPRENEURIAL SKILLS**  
Explain preparing, planning, establishing and managing small business set up  
Explain evaluating all relevant resources  
Describe organizing analyzing and innovation of risk of task
- 7. UNDERSTAND SCALE OF PRODUCTION.**  
Explain scale of production and its determination.  
Describe large scale production and its merits.  
Explain small scale of production and its advantages and disadvantages.
- 8. UNDERSTAND DIFFERENT ECONOMIC SYSTEMS.**  
Describe free economic system and its characteristics.  
Explain centrally planned economic system, its merits and demerits.  
State mixed economic system and its features.
- 9. UNDERSTAND WHAT IS MONEY**

Define money  
Explain barter system and its inconveniences.  
Explain functions of money.

10. **UNDERSTAND BANK AND ITS FUNCTIONS.**  
Define bank.  
Describe commercial bank and its functions.  
State central bank and its functions.
11. **UNDERSTAND CHEQUE AND DISHONOR OF CHEQUE.**  
Define cheque.  
Enlist the characteristics of cheque.  
Identify the kinds of cheque.  
Describe the causes of dishonor of a cheque.
12. **UNDERSTAND FINANCIAL INSTITUTIONS.**  
Explain IMF and its objectives.  
Explain organisational set up and objectives of IDBP.  
Explain organisational set up and objectives of PIDC.
13. **UNDERSTAND TRADE UNION, ITS BACKGROUND AND FUNCTIONS.**  
Describe brief history of trade union.  
State functions of trade union.  
Explain objectives, merits and demerits of trade unions.  
Enlist problems of industrial labour.
14. **UNDERSTAND INTERNATIONAL TRADE.**  
Explain international trade.  
Enlist its merits and demerits.
15. **UNDERSTAND MANAGEMENT**  
Explain meaning of management.  
Describe functions of management.  
Identify the problems of business management.
16. **UNDERSTAND ADVERTISEMENT.**  
Explain the concept of advertisement.  
Enlist benefits and drawbacks of advertisement.  
Describe principal media of advertisement used in business world.
17. **UNDERSTAND THE ECONOMIC PROBLEMS OF PAKISTAN.**  
Describe economy of Pakistan.  
Explain economic problems of Pakistan  
Explain remedial measures for economic problems of Pakistan.

**MATH-233****APPLIED MATHEMATICS-II****Total Contact Hours**

Theory	96	T	P	C
Practical	0	3	0	3

**Pre-requisite:** Must have completed Mathematics-I.

**AIMS** At the end of the course, the students will be able to:

Solve problems of Calculus, Laplace Transformation and Fourier Series, and develop mathematical skills and logical perceptions in the use of mathematical instruments.

**COURSE CONTENTS**

1. **FUNCTIONS & LIMITS.** **6 hours**
  - Constant & Variable Quantities
  - Functions & their classification
  - The concept of Limit
  - Limit of a Function
  - Fundamental Theorems on Limit
  - Some important Limits
  - Problems
  
2. **DIFFERENTIATION** **6 hours**
  - Increments
  - Differential Coefficient or Derivative
  - Differentiation ab-initio or by first Principle
  - Geometrical Interpretation of Differential Coefficient
  - Differential Coefficient of  $X^n$  and  $(ax+b)^n$
  - Three important rules
  - Problems
  
3. **DIFFERENTIATION OF ALGEBRAIC FUNCTIONS** **9 hours**
  - Explicit Functions
  - Implicit Functions
  - Parametric forms
  - Problems
  
4. **DIFFERENTIATION OF TRIGONOMETRIC FUNCTIONS** **6 hours**
  - Differential Coefficient of  $\sin x$ ,  $\cos x$ ,  $\tan x$  from first principle.
  - Differential Coefficient of  $\operatorname{cosec} x$ ,  $\sec x$ ,  $\cot x$
  - Differential Coefficient of Inverse trigonometric functions.
  - Problems.

5. **DIFFERENTIATION OF LOGARITHMIC & EXPONENTIAL FUNCTIONS** 6 hours  
 Differentiation of  $\ln x$   
 Differentiation of  $\log_a x$   
 Differentiation of  $a^x$   
 Differentiation of  $e^x$   
 Problems
6. **RATE OF CHANGE OF VARIABLES** 6 hours  
 Increasing and decreasing functions  
 Maxima and Minima  
 Criteria for maximum & minimum values  
 Methods of finding maximum & minimum  
 Rate measure  
 Slope of a line  
 Velocity and acceleration  
 Problems
7. **INTEGRATION (SIMPLE BASIC RULES)** 9 hours  
 Concept  
 Fundamental Formulas  
 Important Rules  
 Problems
8. **METHODS OF INTEGRATION** 9 hours  
 Integration by substitution  
 Integration by parts  
 Problems
9. **DEFINITE INTEGRALS** 6 hours  
 Properties  
 Application to area  
 Problems
10. **DIFFERENTIAL EQUATIONS** 6 hours  
 Introduction  
 Order and Degree  
 First order Differential Equation of 1st degree.  
 Solution of problems  
 Problems
11. **LAPLACE TRANSFORMATIONS** 9 hours  
 Laplace Transformations  
 Inverse Laplace Transformations  
 Problems.

**12. FOURIERSERIES. 9hours**  
Introduction  
PeriodicFunctions  
EvenandOddFunctions  
Problems

**13. STATISTICS 9hours**  
Conceptofmean,medianandmode  
StandardDeviation  
Lawsofprobability  
Problems

**RECOMMENDED BOOKS**

1. Thomas Finny, Calculus and Analytic Geometry
2. Ghulam Yasin Minhas, Technical Mathematics Vol-I&II, Ilmi Kitab Khana, Lahore.
3. Riaz Ali Khan, Polytechnic Mathematic Series Voll&II, Majeed Sons, Faisalabad
4. Sana Ullah Bhatti, Calculus and Analytic Geometry, Punjab Text Book Board, Lahore.



**INSTRUCTIONAL OBJECTIVES**

1. **USE THE CONCEPT OF FUNCTIONS AND THEIR LIMITS IN SOLVING SIMPLE PROBLEMS.**
  - Define a function.
  - List all types of functions.
  - Explain the concept of limit and limit of a function.
  - Explain fundamental theorems on limits.
  - Derive some important limits.
  - Solve simple problems on limits.
  
2. **UNDERSTAND THE CONCEPT OF DIFFERENTIAL COEFFICIENT.**
  - Define differential coefficient.
  - Derive mathematical expression of a derivative.
  - Explain geometrically the meaning of differential Coefficient.
  - Differentiate  $ax^n$  and  $(ax+b)^n$ .
  - Solve problems of these formulas.
  
3. **USE RULES OF DIFFERENTIATION FOR SOLVING PROBLEMS OF ALGEBRAIC FUNCTIONS.**
  - Derive product rule, quotient rule and chain rule.
  - Interpret the chain rule.
  - Differentiate explicit and implicit functions.
  - Find derivatives of parametric forms of a function w.r.t another function, by rationalization.
  - Use these important rules to find derivatives of relevant functions.
  
4. **USE RULES OF DIFFERENTIATION TO SOLVE TRIGONOMETRIC FUNCTIONS.**
  - Differentiate from first principles  $\sin x$ ,  $\cos x$ ,  $\tan x$ .
  - Derive formulas for derivatives of  $\sec x$ ,  $\operatorname{cosec} x$ ,  $\cot x$ .
  - Find derivatives of inverse trigonometric functions.
  - Solve problems based on these formulas.
  
5. **USE RULES OF DIFFERENTIATION TO LOGARITHMIC AND EXPONENTIAL FUNCTIONS.**
  - Derive formulas for differential coefficients of logarithmic and exponential functions.
  - Solve problems using these formulae.
  
6. **UNDERSTAND RATE OF CHANGE OF ONE VARIABLE WITH ANOTHER**

Derive formulas for velocity, acceleration and slope of a line  
 Use derivative as a measure of rate of change.  
 Explain an increasing and a decreasing function.  
 Show graphically maxima and minima values and point of inflexion.  
 Explain criteria for finding maxima and minima.  
 Solve problems based upon these topics.

**7. USE PRINCIPLES OF INTEGRATION IN SOLVING RELEVANT PROBLEMS.**

Explain concept of integration.  
 Write basic theorems of integration.  
 Define fundamental formulas of integration.  
 List some important rules of integration.  
 Solve problems based on these rules.

**8. UNDERSTAND VARIOUS METHODS OF INTEGRATION**

List standard formulas of integration.  
 Integrate a function by substitution method.  
 Use method of integration by parts for finding integrals.  
 Employ these methods to solve problems.

**9. UNDERSTAND THE METHODS OF SOLVING DEFINITE INTEGRALS.**

Define definite integral.  
 List properties of definite integrals.  
 Use definite integral in the computation of areas.  
 Solve problems involving definite integrals.

**10. USE DIFFERENT METHODS OF INTEGRATION TO SOLVE DIFFERENTIAL EQUATIONS.**

Define a differential equation, its degree and order.  
 Explain method of separation of variables for solving differential equations of first order and first degree.  
 Solve differential equations of first order and first degree.

**11. USE LAPLACE AND INVERSE LAPLACE TRANSFORMATION FOR SOLVING PROBLEMS.**

Define Laplace and Inverse Laplace Transformation  
 List properties of Laplace Transformation  
 Solve problems using Laplace Transformations

**12. EXPAND FUNCTIONS USING FOURIER SERIES**

Define a Fourier series.  
 Write extended rule of integration by parts.  
 Illustrate periodic functions, even and odd functions.  
 Explain Fourier expansion and Fourier constants.

Expand the given functions of Fourier series.

**13. UNDERSTAND THE BASIC CONCEPTS OF STATISTICS**

Define mean, median and mode

Explain standard deviation

State laws of probability

Calculate the above mentioned quantities using the proper formula

**Total Contact Hours**

<b>Theory</b>	<b>64</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Practical</b>	<b>96</b>	<b>2</b>	<b>3</b>	<b>3</b>

**AIM:** At the end of the course, the students will be able to understand the technology involved in food and vegetable processing industry

- 1 INTRODUCTION 6 hours**

  - History and growth of fruits and vegetable
  - Physical properties of fruit and vegetables
  - Post harvest handling and changes
  - Types of storage
  - Composition and nutritional value
  - Introduction to fruit and vegetable processing industry
  - Texture of fruit and vegetable
  
- 2. PREPARATORY OPERATIONS 12 hours**

  - Preparatory operations
  - Receiving
  - Washing
  - Sorting, grading, and suitability
  - Size reduction
  - Blanching
  - Sulphiting / sulphuring
  - Extraction
  - Pulping
  - Sedimentation
  - Crystallization
  
- 3. PROCESSING 14 hours**

  - Canning
  - Dehydration
  - Pickling
  - Preserving by irradiation
  - Freeze dehydration (Lyophilization)
  
- 4. PRODUCTS 12 hours**

  - Beverages
  - Preserves
  - Sauces
  - Pickles
  - Soups

- |           |   |                |
|-----------|---|----------------|
| <b>5.</b> | <b>SPOILAGE</b><br>Processed fruits<br>Processed vegetables<br>Chemical changes             | <b>6 hours</b> |
| <b>6.</b> | <b>NUTRITION OF PROCESSED FOODS</b>   | <b>2 hours</b> |
| <b>7.</b> | <b>RECENT TRENDS</b><br>Functional foods<br>Manufacturing<br>Introduction to Nutraceuticals | <b>8 hours</b> |
| <b>8.</b> | <b>QUALITY CONTROL</b><br>Product quality   | <b>2 hours</b> |
| <b>9.</b> | <b>HYGIENE AND SANITATION</b><br>Personal hygiene<br>Plant sanitation<br>Waste management   | <b>2 hours</b> |

#### **RECOMMENDED BOOKS**

1. J.A Awan, 2007. Food Processing and Preservation, Unitech Communication, Faisalabad
2. L. Gindhari, G.S.Siddappa and G.L.Tandon, 1998. Preservation of Fruits and Vegetables. Publications and Information Division, Indian Council of Agricultural Research, New Dehli.
3. B.D. Micea, 1995. Fruit and Vegetable Processing. FAO Bulletin No. 199, FAO Rome.
4. J.A. Awan and S. U. Rehman, 2005. Food Analysis Manual, Unitech Communications, Faisalabad.
5. J.A. Awan and S. U. Rehman, 2004. Food Preservation Manual, Unitech Communications, Faisalabad.
6. J.G. Woodroof and B.S. Luh, 1975. Commercial Fruit Processing. AVI Publishing Company, Westport Connecticut.
7. B.S. Luh and J.G. Woodroof, 1982. Commercial Vegetable Processing. AVI Publishing Company, Westport Connecticut.

# **FOOD AND VEGETABLE PROCESSING TECHNOLOGY**

## **INSTRUCTIONAL OBJECTIVES**

At the end of the course, student will be able to

### **1. UNDERSTAND THE HISTORY AND GROWTH OF SELECTED FRUITS AND VEGETABLES.**

describe the physical properties of selected fruits  
Describe the physical properties of selected vegetables.  
Describe the post harvest handling and changes of fruits and vegetables.  
Describe the different types of storage of fruits and vegetables  
Describe the composition and nutritional value of fruits and vegetables  
Describe the present status of fruits and vegetable industry in the country  
Define texture.  
Describe the texture of fruits and vegetables.

### **2. UNDERSTAND THE PREPARATORY OPERATIONS OF FRUITS AND VEGETABLE**

Describe the importance of preparatory operations in the processing of fruits and vegetable.  
Enlist different preparatory operations  
Describe factors to be considered in the receiving of fruits and vegetable  
Describe the need for washing fruits and vegetable  
Enlist parameters for sorting and grading of fruits and vegetables  
Define size reduction  
Describe the importance of size reduction  
Define the blanching  
Describe the objectives and methods of blanching  
Describe the need for sulphiting  
Understand the extraction and pulping  
Differentiate between extraction and pulping  
Explain the sedimentation  
Define crystallization.

### **3. UNDERSTAND THE PROCESSING OF FRUITS AND VEGETABLE**

define canning  
Describe the history of canned food.  
Describe the unit operations in the canning of fruits and vegetables.  
Define dehydration describe the methods of dehydration

Describe the advantage of dehydration  
Define pickling  
Describe the method of pickling  
Define irradiation  
Effect of irradiation on fruits and vegetables  
Define freeze dehydration  
Describe the method and advantage of freeze dehydration in fruits and vegetables

#### **4. UNDERSTAND THE PRODUCTS OF FRUITS AND VEGETABLE**

define beverages  
describe the different types of beverages  
describe the nutritional value of different beverages  
define preserves  
describe the preparation of different preserves  
define sauces  
describe the preparation of different pickles  
define soups  
describe the use of soups in our diet

#### **5. UNDERSTAND THE SPOILAGE OF FRUITS AND VEGETABLE**

describe the spoilage of processed fruits  
Describe the factors involved in the spoilage of processed fruits.  
Describe factors involved in the spoilage of vegetables  
Describe chemical changes occurring in processed fruits and vegetables

#### **6. UNDERSTAND THE NUTRITION OF PROCESSED FRUITS AND VEGETABLES**

Describe the importance of nutritional value of processed fruits and vegetables  
Describe the nutritional value of selected processed fruits and vegetables.

#### **7. UNDERSTAND THE RECENT TRENDS**

Define the functional foods.  
Describe different types of functional foods  
Describe the manufacturing of functional foods  
Define nutraceuticals

## **8. UNDERSTANDTHEQUALITYCONTROL**

define quality and quality control

Describe the importance of quality controlling the product quality

Describe the techniques for controlling of products quality.

## **9. UNDERSTANDTHEHYGEINEAND SANITATION**

define hygiene and sanitation

define personal hygiene

describe the application of personal hygiene in the food industry.

define plant sanitation

describe the importance of plant sanitation in food industry.

describe how waste management helps in maintaining good sanitation in the food.



**FPPT213FRUITSANDVEGETABLEPROCESSING  
TECHNOLOGY**

**96 Hours**

**LISTOFPRACTICALS:**

1. Blanchingofapples
2. Blanchingofleafyvegetables
3. Pulpingofmango
4. Canning ofapples
5. Canning ofpeas
6. Preparationof apple jam
7. Preparationof orange marmalade
8. Visittobeverage plant
9. Preparationofmango juice
10. Preparationof lychee juice
11. Preparationofselectedfruits.
12. Drying ofseasonalvegetables
13. Preparationofmango pickels
14. Visitonuclearresearchfacilityforpurposeoffruits preservation

## FPPT223(Rev.) CEREAL and BAKING TECHNOLOGY

### Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

**AIM:** At the end of the course the students will be able to understand the technology involved in the processing of cereals.

### COURSE CONTENTS

#### 1. INTRODUCTION

**4 hours**

History and growth.  
Importance and production of cereal grains.  
Structure and composition of wheat grain.  
Structure and composition of rice grain.  
Structure and composition of maize grain.  
Grades and grading of Grains.

#### 2. STORAGE OF CEREALS

**4 hours**

Types of storage.  
Role of moisture.  
Functional changes.

#### 3. WHEAT MILLING

**20 hours**

Dry milling.  
Handling.  
Storage.  
Blending.  
Cleaning.  
    Tempering.  
Conditioning.  
Removal of impurities.  
Grinding process.  
    Types of grinding machines.  
    Extraction rates of flour.  
    Operation of roller mill.  
    Grinding system.  
    Reduction and tailings.  
    Sieving process.  
    Purification process.  
    Flour handling and storage.

- 4. AIR CLASSIFICATION AND FINE GRINDING 8 hours**  
 Whole wheat products.  
 Milling of soft and durum wheats..  
 Developments in milling of cereal grains.
- 5. RICE MILLING 6 hours**  
 Par boiling process.  
 Dry and wet milling of rice.
- 6. MAIZE PROCESSING 8 hours**  
 Milling of corn  
 Production of starch.  
 Production of oil.  
 Production of gluten.
- 7. BREAD 8 hours**  
 Types and formulation.  
 Ingredients.  
 Yeast function.  
 Breadmaking processes.  
 Baking process.
- 8. OTHER BAKED PRODUCT TECHNOLOGIES 6 hours**  
 Biscuits, cookies and crackers.  
 Cakes.  
 Wafers.  
 Extrusion technology

**BOOKS RECOMMENDED:**

- 1- R.C. Hosney, 1994. Principles of Cereal Science and Technology. American Association Cereal Chemists Inc., St. Paul, Minnesota.
- 2- N.L. Kent and A.D. Evers, 1994. Technology of Cereals, Pergamon Press, London.
- 3- AACC 2000. Approved Methods of American Association of Cereal Chemists. American Association of Cereal Chemists, Inc., St. Paul, Minnesota
- 4- W.J. Sultan, Practical Baking, AVI, Westport
- 5- E.S. Posner and A.N. Hibb, 1997. Wheat Flour Milling AACCI Inc. St. Paul, Minnesota.
- 6- E.J. Pyler, 1988. Baking Science and Technology, Sosland Pub. Company, Kansas.
- 7- S.P. Covensy Linda, 1998. Technology of Bread Making. Blackie Academic & Professional, London.
- 8- N. Almond, 1988. Biscuits Cookies and Crackers. Elsevier Applied Science, New York.

# **CEREAL PROCESSING TECHNOLOGY    FPPT223(Rev.)**

## **INSTRUCTIONAL OBJECTIVES**

At the end of course, student will be able to

### **1. DESCRIBE THE FUNDAMENTALS OF CEREALS**

describe history, growth and importance of cereal grains.  
explain structure and composition of wheat grain  
describe structure and composition of rice grain  
explain structure and composition of maize grain.  
describe grades and grading of cereal grains.

### **2. DESCRIBE STORAGE OF CEREALS, ROLE OF MOISTURE AND FUNCTIONAL CHANGES DURING STORAGE.**

enlist and describe types of storage for cereals.  
State role of moisture during storage of cereals  
Explain functional changes in cereals during storage.

### **3. EXPLAIN WHEAT MILLING PROCESS, SIEVING/PURIFICATION PROCESS AND FLOUR HANDLING.**

state dry milling of wheat.  
Explain handling, storage, blending and cleaning of wheat for milling. Being used in wheat milling.

Differentiate between tempering and conditioning of wheat grains.  
Explain grinding process and types of grinding machines  
Describe extraction rates of flour.  
State operation of roller mill.  
Define and explain grinding systems, reduction and tailings of wheat.  
Describe sieving and purification process of wheat.  
Explain handling and storage of flour.

**4. DESCRIBE WHEAT MILLED PRODUCTS, MILLING OF WHEAT, CORN, RICE AND DEVELOPMENTS IN MILLING OF CEREALS**

Enlist whole wheat products.

Explain milling of soft and durum wheat

Describe recent developments in milling of cereal grains

**5. DESCRIBE PARBOILING AND MILLING OF RICE**

State parboiling process

Describe dry and wet milling of rice.

**6. DESCRIBE PRODUCTS OF MAIZE PROCESSING.**

Define milling of corn.

Explain production of starch from maize

Describe extraction of oil from maize germ.

Describe production of gluten from maize.

**7. DESCRIBE TYPE, FORMULATION AND BREAD MANUFACTURING PROCESS.**

Enlist types of bread and describe their formulation/recipe.

Explain ingredients of bread and their functions.

Describe bread processing

Describe baking process in detail.

**8. EXPLAIN TECHNOLOGY OF BAKED PRODUCTS, PASTA, NOODLES AND EXTRUSION PRODUCTS.**

Describe technology of biscuits, cookies and crackers.

Define and explain cakes and wafers.

Describe the technology of extruded products.

**LIST OF PRACTICALS**

**96Hours**

- 1 Fat and solids determination in cereals.
- 2 Determination of pH, moisture, fiber and nitrogen in cereals.
- 3 Visit to a flour mill.
- 4 Visit to a modern rice mill.
- 5 Manufacture of leavened bread.
- 6 Baking of biscuits.
- 7 Determination of wet and dry gluten.
- 8 Manufacture of a drum-dried cereal.
- 9 Preparation of composite flour.
- 10 Visit to a baking industry.
- 11 Determination of test weight.
- 12 Preparation and sensory evaluation of cakes and cookies.
- 13 Preparation of vermicelli.
- 14 Grading of grains.
- 15 Demonstration of flour quality.
- 16 Determination of moisture in flour.
- 17 Determination of protein in flour.
- 18 Determination of pH and ash in flour.

## FPPT233(Rev.) DAIRY PROCESSING TECHNOLOGY

### Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

**AIM:** At the end of the course the students will be able to understand the technology involved in the processing of milk.

### COURSE CONTENTS

- 1. INTRODUCTION** **4 hours**
  - Dairy industry in Pakistan
  - History and growth of dairy industry
  - Production of milk in Pakistan
- 2. MILK SOURCES** **2 hours**
  - 2.1 Sources
  - 2.2 Production
  - 2.3 Handling
  - 2.4 Distribution
  - 2.5 Composition
- 3. DAIRY INDUSTRY IN PAKISTAN** **4 hours**
  - Method of procurement
  - Collection and Reception
  - Transportation
- 4. MILK PROCESSING** **10 hours**
  - Cream separation
  - Standardization
  - Homogenization
  - Pasteurization
  - UHT Technology
  - HTST Technology
  - Condensation
  - Unit operations in milk processing
  - Packaging
  - Recent advances
- 5. MILK PRODUCTS TECHNOLOGY** **6 hours**
  - Flavored milk
  - Evaporated milk



Powdered milk  
Butter  
Yoghurt  
Cheese  
Ice Cream  
Khoya

- 6. PROPERTIES OF MILK** **2 hours**  
Physical and Chemical properties of fresh milk  
Physical and Chemical properties of processed milk
- 7. CHEESE PROCESSING** **6 hours**  
Classification, Composition and chemistry of cheese  
Processing of cheddar, cottage, soft and Roquefort cheese  
Quality control in cheese making  
Discuss recent advances in cheese processing  
Packaging
- 8. CREAM AND ALLIED PRODUCTS PROCESSING** **6 hours**  
Classification and chemical composition of various types of creams  
Unit operations in processing of creams  
Quality control to reduce spoilage  
Recent advances in cream processing
- 9. YOGHURT** **6 hours**  
Chemistry and Microbiology of yoghurt  
Production of plain, fruit, frozen and flavored yoghurts  
Unit operations in processing of yoghurt  
Recent advances in yoghurt processing
- 10. BUTTER** **6 hours**  
Composition  
Processing of butter  
Evaluation of keeping quality
- 11. FROZEN MILK PRODUCTS AND ICE CREAM** **6 hours**  
Classification  
Composition  
Chemical nature  
Flavouring agents  
Additives  
Processing of ice creams  
Recent advances in ice cream processing technology

- 12. MILK BY-PRODUCTS** **2 hours**  
Utilization of whey, casein and butter milk
- 13. GENERAL** **4 hours**  
Quality control  
Packaging – faults, causes and remedies  
Plant hygiene and sanitation

**BOOKS RECOMMENDED:**

1. W.J. Harper and C.W. Hall, Dairy Technology and Engineering, AVI, Westport.
2. ALFA-LAVAL Dairy Handbook. Alfa-Laval Publications, Sweden.
3. Y.H. Hui, 1993. Dairy Science and Technology Handbook. VCH Publishers Inc., New York.
4. A.P.H.A. 1993. Standard Methods for the Examination of Dairy Products. Port City Press, Baltimore.
5. A.H. Varnam and J.P. Sutherland, 1994. Milk and Milk Products: Technology, Chemistry and Microbiology. Chapman and Hall, London.
6. P.F. Fox, T.P. Guinee, T.M. Cogon and P.L.H. McSweeney, 2000. Fundamentals of Cheese Science. Chapman and Hall, London.
7. A.Y. Tamime and R.K. Robinson, 1985. Yoghurt Science and Technology. Pergamon Press, Oxford.

# **DAIRY PROCESSING TECHNOLOGY**

## **INSTRUCTIONAL OBJECTIVES FPPT-233(Rev.)**

### **1. UNDERSTAND THE HISTORY AND GROWTH**

explain dairy industry in Pakistan  
describe history and growth of dairy industry  
explain production of milk in Pakistan

### **2. UNDERSTAND ABOUT MILK SOURCES**

explain sources of milk  
describe production and handling of milk  
explain distribution of milk  
describe the composition of milk

### **3. UNDERSTAND DAIRY INDUSTRY IN PAKISTAN**

what is milk procurement and explain methods of procurement  
describe collection and reception of milk  
explain transportation of milk

### **4. EXPLAIN THE MILK PROCESSING**

explain the separation process of milk  
describe the standardization of milk  
define and explain the homogenization of milk  
describe the pasteurization of milk  
enlist and describe the types of UHT milk  
define and explain the condensation process  
describe the unit operation involved in milk processing

defineandexplainthetetrapackmilkpackaging  
describetherecentdevelopmentsinmilkprocessing

## **5. EXPLAINMILKPRODUCTSTECHNOLOGY**

defineandexplaintheprocedureofflavouredmilk  
defineandexplaintheprocedureofevaporatemilk  
defineandexplaintheprocedureofmilkpowder  
defineandexplaintheprocedureofbutter  
defineandexplaintheprocedureofyoghurt  
defineandexplaintheprocedureoficecream  
defineandexplaintheprocedureofcheese  
defineandexplaintheprocedureofkhoya

## **6. DESCRIBEPROPERTIESOFMILK**

describethophysicalandchemicalpropertiesoffreshmilk  
Describethophysicalandchemicalpropertiesofprocessedmilk.

## **7. EXPLAINCHEESEPROCESSING**

explaintheclassificationofcheese  
describethecompositionandchemistryofcheese  
enlistthetypesofcheeseandtheremajordifferencesanddescrib  
eprocessingofmajor  
types  
explaintheroleofqualitycontrolincheseprocessing  
discussrecentdevelopmentincheeseprocessing

## **8. DESCRIBE CREAM AND ALLIED PRODUCTS PROCESSING**

describe the classification, chemical composition of various types of cream

describe the unit operation involved in processing of cream.

Explain the role of quality control to reduce the spoilage

Discuss the recent development in cream processing

## **9. YOGHURT PROCESSING**

define yoghurt and explain the chemistry and microbiological aspects

enlist types of yoghurt and describe their production

describe the unit operations involved in yoghurt processing

discuss recent development in yoghurt processing

## **10. DESCRIBE BUTTER PROCESSING**

explain the composition of butter

explain the processing of butter

explain the role of quality control in keeping quality

## **11. FROZEN MILK PRODUCTS AND ICE CREAM**

explain the classification of frozen products.

Describe the composition and chemical nature of ice cream

Describe the use of flavouring agents in frozen products

Enlist all additives used in frozen products and their significance.  
Explain the unit operation involved in frozen products processing  
Discuss the recent advances.

## **12. MILK BY PRODUCTS**

Discuss the utilization of whey, casein and buttermilk.

## **13. UNDERSTAND THE GENERAL ISSUES IN DAIRY PROCESSING**

Discuss the overall quality issues  
Discuss the faults, causes and remedies of packaging.  
Discuss the dairy plant hygiene and sanitation.

**FPPT 233(Rev.) DAIRY PROCESSING TECHNOLOGY**

**LIST OF PRACTICALS**

**96 hours**

1. Visit to a dairy farm
2. Visit to a milk processing plant
3. Solids not fat (SNF) determination in milk
4. Determination of pH, Specific gravity, acidity of raw and processed milk
5. Resasuring test for completeness of Pasteurization.
6. Spray drying of milk
7. Manufacture of yogurt
8. Pasteurization of milk
9. Preparation of butter
10. Preparation of cheese
11. Phosphate test
12. Determine total plate count and coliform in milk and milk products.
13. Preparation of flavored milk
14. Adulteration test of raw, milk.
15. Sensory evaluation of raw and processed milk.
16. Determination of cheese faults and grading methods

**Total Contact Hours**

<b>Theory</b>	<b>32</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Practical</b>	<b>96</b>	<b>1</b>	<b>3</b>	<b>2</b>

**AIM:** At the end of the course the students will be able to understand the technology involved in the processing and preservation of fats and oils.

**COURSE CONTENTS**

1. **INTRODUCTION** **4 hours**
  - History, growth and production
  - Lipids, oils and fats, ghee and wax
  - Importance
  - Sources
  - Uses
  
2. **EXTRACTION AND PROCESSING OF OILS AND FATS** **12 hours**
  - Processing of oilseeds
  - Rendering
  - Expression
  - Solvent
  - Degumming
  - Refining
  - Bleaching
  - Deodorization
  - Fractionation
  - Winterization
  - Hydrogenation
  - Interesterification
  - Esterification
  - Emulsification
  - Packaging
  
3. **CHARACTERISTICS OF OIL, FATS AND FATTY ACIDS** **3 hours**
  - Classification
  - Characteristics of edible oil, fats and fatty acids
  - Physical and chemical properties
  
4. **SPOILAGE** **3 hours**
  - Oxidative Rancidity
  - Hydrolytic Rancidity
  - Polymerization
  
5. **MANUFACTURING** **10 hours**



Manufacture of vegetable ghee and oil  
Manufacture of margarine  
Manufacture of by-products  
Manufacture of mayonnaise  
Manufacture of frying oils

**BOOKS RECOMMENDED:**

- 1- S.A. Termazi, Vegetable Oils and Fats, Ferozesons, Lahore
- 2- T.J. Weiss, Food Oils and Their Uses, AVI, Westport
- 3- Y.H. Hui, 1996. Bailey's Industrial Oils and Fat Products, Vol. 1-5. John Wiley and Sons Inc., New York
- 4- R.D. O'Brien, 2000. Fats and Oils Formulating and Processing for Application, 2<sup>nd</sup> ed., CRC Press, London.
- 5- AOAC, 2005. Official Methods of Analysis. Association of Official Analytical Chemists, Arlington.

**INSTRUCTIONAL OBJECTIVES**

On completion of this course, the students will be able to:

1. **UNDERSTAND THE BASICS OF OILS AND FATS**
  - Describe the history, growth and production of oil and fat industry
  - Classify and differentiate between Lipids, oil and fats, ghee and wax
  - Describe the important sources of oils and fats
  - Discuss the important uses of oils and fats
  - Explain the differences in chemical nature of oil and fat, ghee and waxes
  - Differentiate animal and plant fat
  
2. **UNDERSTAND THE EXTRACTION AND PROCESSING OF OIL AND FATS**
  - Explain the extraction of oil from oil seeds
  - Discuss rendering, expression and solvent extraction of oil
  - Enlist various machines used in extraction of oils
  - Describe various unit operations involved in processing of oil and fat
  - Describe refining of vegetable oils
  - Explain removal of free fatty acids
  - Explain elimination of coloring matter in oil
  - Discuss the enrichment of oil and ghee with vitamins
  - Explain how unsaturated fatty acids are changed to saturated fatty acids
  - Discuss the use of catalyst during hydrogenation
  - Explain the change from cis to Trans fatty acids during interesterification
  - Discuss anti-nutritive value of trans fatty acids
  
3. **UNDERSTAND THE CHARACTERISTICS OF OILS AND FATS**
  - Discuss the physical and chemical properties of oils and fats
  - Explain saturated and unsaturated fatty acids
  - Differentiate between cis and trans fatty acids
  
4. **UNDERSTAND THE SPOILAGE OF OILS AND FATS**
  - Explain oxidative and hydrolytic rancidity and its control
  - Define antioxidants and explain its mechanism
  - Explain polymerization
  - Explain changes during frying of oils

**5. MANUFACTURING OF OIL, FATS AND PRODUCTS**

Describe commercial manufacturing of vegetable ghee and oil

Differentiate between margarine and butter

Explain manufacturing of margarine and spreads

Explain the composition and processing steps of preparation of mayonnaise and salad oils

Explain the chemistry of frying

Identify oil and fat suitable for frying

Explain the problems of flavor deterioration in storage of oil and fat

Explain rendering of beef and mutton fat

**LIST OF PRACTICALS****96 hours**

- 1 Extraction of oils and fats
- 2 Determination of refractive index
- 3 Measurement of color
- 4 Determination of melting point of oil
- 5 Determination of melting point of butter
- 6 Determination of specific gravity
- 7 Determine the peroxide value of oil
- 8 Determine the saponification value of oil
- 9 Determine the iodine value of oil
- 10 Visit to oil and fat industry
- 11 Preparation of mayonnaise
- 12 Study role of emulsifying agents
- 13 Determine the quality of frying oils

**Total Contact Hours**

<b>Theory</b>	<b>32</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Practical</b>	<b>96</b>	<b>1</b>	<b>3</b>	<b>2</b>

**AIM:** At the end of the course the students will be able to understand the technology involved in the processing of sugar and confectionery.

**COURSE CONTENTS**

1. **GENERAL** **2 hour**  
 History and growth  
 Production statistics of sugar cane and sugar beet  
 Utilization of sugar  
 Composition and nutritional value
2. **INDIGENOUS TECHNOLOGY -- SUGAR PROCESSING** **2**  
**hours**  
 Small scale sugar production  
 Gur  
 Khund  
 Shakar
3. **SUGAR MANUFACTURING** **6 hours**  
 Unit operations  
 Juice extraction  
 Purification  
 Heating  
 Evaporation  
 Crystallization  
 Crystallization in motion
4. **REFINING** **10 hours**  
 Affination  
 Clarification  
 Carbonation  
 Sulphitation  
 Phosphitation  
 Crystallization  
 Centrifugation  
 Drying  
 Bagging  
 Storage

Factors affecting sugar processing  
Recent advances in sugar technology  
Packaging and storage of sugar  
4.14 Properties of sugar  
4.15 Quality control

5. **CONFECTIONERY** **12 hours**

Confectionery industry in Pakistan  
Ingredients & Classification, Composition and nutritional value  
Sugar confectionery: formulation and manufacture  
Processing of hardboiled sweets, toffee and fudge  
Formulation and manufacture processes of gums and jellies  
5.7. Formulation and manufacture of chocolate confectionery  
5.8. Quality control

**BOOKS RECOMMENDED:**

- 1 G.R.E. Lionnet, 1999. Sugar Technology for Students. Lang Fred, Durban.
- 2 E.B. Jackson, 1995. Sugar Confectionery Manufacture. 2<sup>nd</sup> ed. Balckie Academic and Professional Wester, Glassgow.
- 3 C. Chen, 2001. The Sugar Refining—A Manual for the Design and Refining Facilities, John Wiley and Sons, London.
- 4 W.P. Edwards, 2000. The Science of Sugar Confectionery, Royal Society of Chemistry, Cambridge

## **FPPT 252 SUGARS AND CONFECTIONERY TECHNOLOGY.**

### **INSTRUCTIONAL OBJECTIVES**

On completion of this course, the students will be able to:

#### **1. UNDERSTAND THE FUNDAMENTALS OF SUGAR INDUSTRY**

Describe the history and growth of sugar processing industry  
Describe the production statistics of sugar cane and sugar beet in Pakistan  
Enlist major items for utilization of sugar  
Explain the chemical composition and nutritional value of all sugar sources

#### **2. KNOW THE INDIGENOUS TECHNOLOGY**

Discuss the status of small scale sugar production in Pakistan  
Enlist the indigenous products and discuss their processing (gur, khund, shakar)

#### **3. UNDERSTAND MANUFACTURING OF SUGAR**

Discuss all the unit operations involved in sugar manufacturing

#### **4. UNDERSTAND THE REFINING PROCESS OF SUGAR.**

Define affination and its significance  
Define clarification and its role  
Define carbonation and its significance  
Define sulphitation, phosphitation.  
Explain process of crystallization  
What is the importance of centrifugation  
Explain the role of drying  
Define bagging, storage  
Discuss the factors affecting the processing of sugars  
Discuss the recent advances in sugar technology  
Discuss packaging and storage of sugar  
Describe properties of sugars  
Discuss the role of quality control in sugar industry

#### **5. UNDERSTAND THE PROCESSING OF CONFECTIONS..**

discuss the status of confectionary industry in Pakistan  
describe classification, composition and nutritional value  
discuss the formulation and manufacturing of sugar confectionary

describe the processing of hard boiled candies, toffee and fudges  
describe the processing of gums and jellies  
describe the processing of chocolate confectionary  
describe the role of quality control in confectionary industry.



## **FPPT 252 SUGARS AND CONFECTIONERY TECHNOLOGY**

### **LIST OF PRACTICALS**

**96 hours**

1. Analysis of sugar for TSS
2. Analysis of sugar for pH
3. Analysis of sugar for fiber
4. Analysis of sugar for ash
5. Analysis of sugar for polarization
6. Clarification of raw juice
7. Determine the density of juice by Picnometer
8. Determine the turbidity of juice by Turbidity meter
9. Determine total sugar of juice
10. Visit to sugar industry
11. Visit to confectionery unit
12. Preparation of candy, toffee and other sugar based confectionery
13. Determine inversion of sugar

**Total Contact Hours**

Theory	64	T	P	C
Practical	96		2	3 3

**AIM:** The student will be able to understand the basic principles of general and food microbiology and the harmful and beneficial effects of microbial activities during processing and preservation.

**COURSE CONTENTS**

- 1 INTRODUCTION TO MICROBIOLOGY 4 hours**

  - Scope of microbiology
  - Evolution of microbiology
  - Classification of microorganisms
  - Microorganisms important in food
  
- 2 CHARACTERISTICS OF MICROORGANISMS 6 hours**

  - Bacteria
  - Moulds
  - Yeasts
  - Viruses
  
- 3 MICROORGANISMS AND DISEASE 6 hours**

  - Pathogens, virulence and infection
  - Resistance and immunity
  - Food and water-borne diseases
  
- 4 FOOD AS A SUBSTRATE FOR MICROORGANISMS 8 hours**

  - Nutrients
  - Moisture
  - Hydrogen ion concentration (pH)
  - Oxidation reduction potential
  - Inhibitory substances and biological structure
  
- 5 CONTAMINATION OF FOODS DURING PROCESSING AND PRESERVATION 8 hours**

  - From green plants and fruits
  - From animals
  - From sewage
  - From soil

From water  
From air  
During handling and processing  
During preservation  
Harmful effects of microbes  
Beneficial effects of microbes

**6 GENERAL PRINCIPLES OF MICROBIAL SPOILAGE 8**  
**hours**

Microbial food spoilage  
Characteristics of some spoilage organisms  
Factors affecting kind and number of microorganisms in food  
Factors affecting the growth of microorganisms in food  
Chemical changes caused by microorganisms

**7 CONTROL OF MICROORGANISMS 8**  
**hours**

Fundamentals of microbial control  
Control by physical means  
Control by chemical agents  
Antibiotics and other chemotherapeutic agents

**8 PRODUCTION OF CULTURES FOR FOOD FERMENTATIONS 8**  
**hours**

General principles of culture preparation and maintenance  
Bacterial cultures  
Yeast cultures  
Mould cultures

**9 FOOD BORNE DISEASES**  
**8 hours**

Foodborne infections  
Foodborne intoxications  
Nonbacterial food poisoning

**RECOMMENDED BOOKS**

1. M.I. Pelezar, Jr. and R.D. Ried, Microbiology, McGraw Hill Book Co., New York
2. W.C. Frazier and D.C. Westhoff, 1988. Food Microbiology, McGraw Hill Book Co, New York.
3. J. M. Jay, Modern Food Microbiology, 1996. 5<sup>th</sup> ed. Food and Nutrition Press ISBN#0-412-076-918.
4. J.A. Awan and S.U. Rehman, Microbiology Manual, 2005. Unitech Communications Faisalabad.

**INSTRUCTIONAL OBJECTIVES**

On the completion of this course, the student will be able to:

**1. UNDERSTAND THE HISTORICAL DEVELOPMENT OF MICROBIOLOGY**

- Enlist earliest scientists who discovered Microbiology
- Describe the role of Leuwenhoek, Koch, Smith, Pasteur, Fleming and Lister
- Define cell
- Explain the difference between plant and animal cells with the help of diagrams
- Differentiate between prokaryotes and eukaryotes
- Define species, genus, tribe, family, order, class, phylum and kingdom
- Explain classification of microorganisms

**2. UNDERSTAND THE CHARACTERISTICS OF MICROORGANISMS**

- Define and identify different types of bacteria
- Describe the general characteristics of bacteria
- Enlist important genera of bacteria useful in food microbiology
- Explain the general characteristics of yeasts
- Discuss the yeasts of industrial importance
- Explain the general characteristics of moulds
- Differentiate between bacteria, yeast and mould
- State general characteristics of virus

**3. UNDERSTAND THE RELATIONSHIP OF MICROORGANISMS AND DISEASE**

- Define pathogens, virulence, infection, resistance and immunity
- Enlist types of immunity
- Explain beneficial role of immunity in nature
- Enlist different infectious diseases common in man

**4. UNDERSTAND ROLE OF FOOD AS A SUBSTRATE FOR MICROORGANISMS**

- Define pH
- Explain the importance of pH for the growth of microorganisms
- Describe the concept of water activity

Explain the mechanism of oxidation-reduction potential  
Discuss different inhibitory substances present in food  
Describe the importance of biological structure of food

**5 UNDERSTAND THE MECHANISM OF FOOD CONTAMINATION DURING FOOD PROCESSING AND PRESERVATION**

Identify species of microorganisms contaminating fruits and vegetables  
Enlist sources of contaminating microorganisms from animals  
Explain the mechanism of foods getting contaminated by sewage  
Describe contamination of foods from soil  
Discuss water as a source of contamination  
Explain how microorganism in air cause contamination of foods  
Discuss how contamination takes place during handling, processing and preservation of different food commodities and its control  
Explain the mechanisms, reactions and control of contamination.  
Explain major chemical changes during contamination.

**6 UNDERSTAND PRINCIPLES OF MICROBIAL SPOILAGE**

Define microbial spoilage  
List of types of microbial spoilage  
Classify foods on the basis of ease of spoilage  
List main groups of micro-organisms  
Explain the factors affecting the growth of microorganisms in food  
Describe the chemical changes caused by microorganisms in food

**7 UNDERSTAND CONTROL OF MICROORGANISMS**

State three principal reasons for practicing methods of microbial control  
State the physical methods applied to control microorganisms  
Enlist major groups of chemical antimicrobial agents  
Define antibiotics and chemotherapeutic agents  
Explain the function of antibiotics

**8 UNDERSTAND THE PRODUCTION OF CULTURES FOR FOOD FERMENTATIONS**

State general principles of culture maintenance and preparation  
Explain pure and mixed cultures  
Explain the use of bacterial cultures in food industry  
Explain the use of yeast for bread and malt beverages  
Explain the use of mould cultures for cheese production

**9 UNDERSTAND FOODS IN RELATION TO DISEASE**

Classify foodborne diseases  
Define food poisoning and infection

Give examples of bacteria for foodborne intoxications and infections  
Explain Botulism and Salmonellosis  
Describe non bacterial foodborne diseases  
Explain the significance of Aflatoxin

**FPPT 273**

**GENERAL AND FOOD MICROBIOLOGY**

**LIST OF PRACTICALS**

**96 hours**

- 1 Safety precautions in microbiology lab
- 2 Introduction to equipment in the microbiological lab
- 3 Demonstrate the use of microscope
- 4 Examination of plant and animal cells
- 5 Examination of yeasts, moulds and bacteria
- 6 Demonstrate the use of autoclave and hot air oven for sterilization
- 7 Preparation of culture media
- 8 Cultivation and isolation of bacteria
- 9 Examination of bacterial colonies
- 10 Determination of bacterial numbers
- 11 Staining reagents and procedures
- 12 Microbiological examination of important food microbes
- 13 Examination of spoiled canned foods for possible microorganisms
- 14 Find optimum growth temperature for an organism
- 15 Determination of microbial load in different food samples
- 16 Perform swab and dilution tests for assessing cleaning efficiency.
- 17 Visit to microbiology laboratory of a university / research institute
- 18 Visit to a food industry to observe role of microbiology

**Total Control Hours**

Theory	64	T	P	C
Practical	96	2	3	3

**AIM:** The student will be able to understand the food components in relation to food processing and preservation, and will be able to use the principles and procedures of analytical and instrumental techniques employed in food analysis.

**COURSE CONTENTS**

1. **WATER** **4 hours**
  - Nature in foods
  - Water activity and food spoilage
  - Physical and chemical properties
  - Hard and soft waters
  - Water treatment process
  - Effect of water quality on processed foods
  
2. **CARBOHYDRATES** **8 hours**
  - Classification
  - Chemical structure
  - Physical and chemical properties
  - Effect of processing
  - Qualitative tests for carbohydrates
  - Quantitative tests for sugars
  - Estimation of starch
  
3. **LIPIDS** **8 hours**
  - Classification
  - Fatty acids
  - Physical properties
  - Chemical properties
  - Autooxidation and rancidity
  - Functional properties in foods
  - Effect of processing
  - Physical constants of fat
  - Chemical constants of fat
  
4. **PROTEINS** **8 hours**
  - Classification
  - Amino acids
  - Physical and chemical properties
  - Functional properties in foods
  - Effect of processing
  - Quantitative determination of protein
  
5. **VITAMINS** **4 hours**

Classification  
Functional properties in foods  
Effect of processing  
Determination of Vitamin-C

- 6. OTHER CONSTITUENTS** **8 hours**  
Mineral elements  
Pigments  
Aromatic compound  
Antinutritional compounds  
Organic acids  
Enzymes
- 7. SAMPLING TECHNIQUES** **4 hours**  
Perfect and composite sample  
Sampling procedure  
Sampling instruments  
Sample grinding  
Sample storage
- 8. PROXIMATE ANALYSIS** **12 hours**  
Introduction  
Determination of moisture  
Determination of ash  
Determination of crude protein  
Determination of crude fat  
Determination of crude fiber  
Determination of nitrogen
- 9. PRINCIPLES OF INSTRUMENTATION** **4 hours**  
Introduction to  
Electromagnetic spectrum, Radiant energy, Light transmission  
Principles of emission and absorption of light, Absorption spectrum
- 10. INTRODUCTION TO INSTRUMENTAL TECHNIQUE** **4 hours**  
Introduction  
Principles and types of chromatography  
pH  
Polarimetry  
Refraction of light  
Flame-photometry



## RECOMMENDED BOOKS

1. J.A. Awan, 2005. Food and Nutrition, Unitech Communications, Faisalabad.
2. I.H. Meyer, 1976. Food Chemistry, Reinhold Publisher Corporation, New York.
3. F.A. Lec, 1982. Basic Food Chemistry, AVI Publishers, Westport.
4. O.R. Fennema, 1992. Food Chemistry, Marcel Dekker, Inc., New York.
5. T.P. Coultate, 1999. Food; The Chemistry of its Components. The Royal Society of Chemistry, Cambridge.
6. H.D. Belitz and W. Grosch, 1999. Food Chemistry. 2<sup>nd</sup> Ed. Springer-Verlag Heidelberg.
7. A.O.A.C. 2005. Official Methods of Analysis. 18<sup>th</sup> Ed. Association of Official Analytical Chemists, Arlington.
8. R.S. Kirk and R. Sawyer, 1991. Pearson's Composition and Analysis of Foods, 9<sup>th</sup> Ed. Longman, London.
9. Y. Pomeranz and C.E. Meloan, 1996. Food Analysis: Theory and Practice. 3<sup>rd</sup> Ed. CBS Publishers, New Delhi.
10. S.S. Nielson, 2003. Food Analysis Laboratory Manual. Chips Limited, USA. J.A. Awan and S. U. Rehman, 2005. Food Analysis Manual, Unitech Communications, Faisalabad.
11. G.T. Bender, 1987. Principles of Chemical Instrumentation. W.B. Saunders, London.
12. Iqtadar Ahmad Khalil and Fazil Manan, Chemistry I - Bio-analytical Chemistry.
13. H.H. Baner et al., Instrumental Analysis.

**INSTRUCTIONAL OBJECTIVES**

On completion of this course, the students will be able to:-

**1. UNDERSTAND THE NATURE AND PROPERTIES OF WATER**

- Explain the nature of water as it exists in foods
- Explain the relationship between water activity and food spoilage
- State the physical properties
- State the chemical properties
- Explain the nature of hard and soft waters
- Explain the role of hard and soft waters
- Describe the methods of water treatment
- Explain the role of water on the quality and shelf life of foods.

**2 UNDERSTAND THE NATURE AND PROPERTIES OF CARBOHYDRATES**

- Distinguish between various classes of carbohydrates
- Explain various physical properties of each
- Discuss the chemical structure of each
- Explain various chemical properties of each
- Discuss the role of physical and chemical properties in food processing
- Discuss the effect of processing on carbohydrates

**3. UNDERSTAND THE NATURE AND PROPERTIES OF LIPIDS**

- Describe the structure of fatty acids
- Explain the classifications
- Describe the physical properties
- Describe chemical properties
- Explain the functional properties
- Explain the effect of processing
- Explain deteriorative changes.

**4. UNDERSTAND THE NATURE AND PROPERTIES OF PROTEINS**

- Describe the structure of amino acids
- Explain classification
- Discuss physical properties
- Discuss chemical properties
- Explain Millard reaction
- Discuss functional properties of various proteins especially gluten,

casein

and albumin

Discuss effect of processing.

**5. UNDERSTAND THE NATURE AND PROPERTIES OF VITAMINS**

- Explain classification
- Discuss functions of fat-soluble vitamins in food processing
- Discuss functions of water-soluble vitamins in food processing
- Discuss effect of processing on their nature and properties

**6. UNDERSTAND THE NATURE AND PROPERTIES OF OTHER CONSTITUENTS**

- Describe effect of mineral elements on food
- Differentiate between types of pigments
- Differentiate between various aromatic compounds
- Describe anti-nutritional compounds in selected foods
- Describe the nature of organic acids in foods
- Describe the classification and properties of enzymes.

**7. UNDERSTANDS SAMPLING TECHNIQUES**

- Illustrate the significance of food analysis in food industry
- Define quantitative and qualitative analysis
- Define perfect and composite sample
- Explain sampling procedure and enlist sampling instruments
- Explain procedure for sample grinding
- Describe procedure for sample storage

**8. KNOW THE PROXIMATE ANALYSIS**

- Define proximate analysis
- State methods of analysis for moisture
- State methods of analysis for crude fat
- State methods of analysis for ash
- State methods of analysis for crude fiber
- State methods of analysis for nitrogen-free extract

**9. UNDERSTAND INSTRUMENTATION PRINCIPLES**

- Describe the importance, need and scope of instrumentation
- Define electromagnetic spectrum
- Define the nature of radiant energy
- Define transmission of light through solutions and solids
- Define transmission of white light
- State the principle of emission and absorption of light
- Describe the process of absorption by molecules
- Define absorption spectrum
- Define principles of spectrophotometry.

**10. UNDERSTAND INSTRUMENTAL TECHNIQUES**

- Illustrate the importance of instrumental techniques

State the principles of chromatography  
Enlist types of chromatography  
Describe HPLC, gas chromatography, TLC and paper chromatography  
State principles and application of pH meter  
Define polarized light  
Discuss principles and application of polarimeter  
Define refractive index  
Explain the working of refractometer  
Explain principles of flame photometry  
Describe instrumental methods for texture measurement  
Define viscosity  
Discuss measurement of viscosity

## LIST OF PRACTICALS

96 hours

- 1 Study water activity in foods
- 2 Visit to water treatment plant
- 3 Study the effect of reducing sugars on color of potato chips
- 4 Study the effect of reducing sugars and amino acid content on browning in potato chips
- 5 Preparation of invert sugar by acid hydrolysis
- 6 Acid hydrolysis of starch
- 7 Maillard reaction
- 8 Demonstration of heat denaturation of various proteins
- 9 Physical and chemical properties of lipids
- 10 Demonstration of effect of baking on browning and flavor
14. Determination of moisture by different methods
15. Determination of ash and mineral matter
16. Determination of insoluble solids (fiber)
17. Determination of reducing sugars
18. Determination of total sugars
19. Determination of acidity
20. Determination of benzoic acid
21. Determination of nitrite and nitrate
22. Determination of sodium, potassium and calcium by flame.
23. Physical and chemical analysis of fats and oils
24. Determination of vitamin C.
25. Visit to a research laboratory.



محل سوئم  
حصہ اول اسلامیات

### تدریس مقاصد

قرآن حکیم  
عمومی مقصد: منتخب سورتوں اور آیات کی روشنی میں اسلام کے بنیادی مقاصد اور عبادت جان سکے  
خصوصی مقصد: طالب علم اس نکل ہو جائے گا کہ  
سورۃ الفاتحہ، آیتہ الکرسی، سورۃ البقرۃ کی آخری آیات اور امن الرسول سے اور سورۃ المائدہ کا ترجمہ و تشریح کر سکے  
طالب علم درج ذیل کا مفہوم بیان کر سکے  
رب العالمین صرف اللہ تعالیٰ ہے  
اللہ رحم کرنے والا ہے  
قیامت کے دن پادشاہی اللہ کی ہوگی  
عبادت اور استغاثت کا حقہ اور صرف اللہ ہے  
طالب علم درج ذیل کا مفہوم بیان کر سکے  
اللہ پاک پر مہیب سے پاک ہے  
اللہ کے اسمائے حسنیٰ اور تعظیم ہیں  
تعلیم انبیاء پر ایمان لانا ضروری ہے  
رسول اللہ صلی اللہ علیہ وسلم پر ایمان لانا فرض ہے  
تعلیم حقیقی صرف اللہ کے لیے ہے  
اسلامی تعلیمات پر عمل کرنا منافی بہلا میں ہے  
کفر کو اللہ کی مدد کے بغیر شکست نہیں دی جا سکتی  
اللہ ایک ہے  
اللہ کسی کا متجان نہیں نہ اس کا کوئی شریک ہے  
منتخب احادیث  
عمومی مقصد: احادیث کی روشنی میں اسلامی تعلیمات پر عمل پیرا ہو سکے  
خصوصی مقصد:  
احادیث کا ترجمہ بیان کر سکے

اعلوت کی شرح کر کے

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اسلام کی اعلیٰ قدر کو ان کر مثالی معاشرہ بنانے



## مقاصد پاکستان (حصہ دوم) قیام پاکستان

### تدریس مقاصد

عمومی مقاصد: قیام پاکستان کے بعد درپوش مسائل سے آگاہی حاصل کرے اور بیان کرے  
خصوصی مقاصد:

- پانڈیری کمیشن تشکیل اور اس کے فرائض بیان کر سکے
- ریڈ کلف اور اس کے ایوارڈ کے بارے میں بیان کر سکے
- بنگل اور گلگت کی تقسیم کی وجوہات بیان کر سکے
- پنجاب کی تقسیم کی تفصیل بیان کر سکے
- مہاجرین کی آمد سے جو مسائل پیدا ہوئے انہیں بیان کر سکے
- ریاستوں کے علاقے کے بارے میں تفصیل بیان کر سکے
- ریاست جموں کشمیر کے بارے میں بیان کر سکے
- نئی پانی کے تنازعہ کو بیان کر سکے
- قرار داد مقاصد کی تفصیلات بیان کر سکے
- 22 ملامہ کے مختلف اسلامی نکات بیان کر سکے
- قیام پاکستان کے بعد نفاذ اسلام کی کوششوں کو بیان کر سکے
- پاکستان کے عمل وقوع اور اس کی جغرافیائی اہمیت بیان کر سکے
- پاکستان میں قدرتی وسائل (پتل، گیس، کوئلہ) کے بارے میں بیان کر سکے

## (غیر مسلم طلباء کے لئے)

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کل وقت: 20

Gen 3II

نصاب اختیارات  
سال سوئم  
موضوعات

اساس ذمہ داری

ثبیت زبان

عدل و انصاف

قوی خدمت کا جذبہ

ذکر و نظریہ پاکیزگی

احرام آدمیت

شائستگی

علوم و درگزر

بندوباری

خود انحصاری

اثر و نفع

پامعیت

اپنی ذات کی معرفت (بذریعہ ہم عمر طلباء اساتذہ اہم شخصیات اور)

(غیر مسلم طلباء کے لئے)

نصاب التلاقیات

سال سوئم

### تدریس مقاصد

- عمومی مقصد: ملکی ترقی کے لیے اعلیٰ اوصاف کے ساتھ بہتر طور پر ملک و ملت کی خدمت کر کے
- خصوصی مقاصد: طالب علم اس فنکار ہو گا کہ
- موضوعات کا مطلب بیان کر سکے
- عملی زندگی سے مثالوں کی نشاندہی کر سکے
- موضوعات کی اہمیت بیان کر سکے
- اپنی شخصیت اور معاشرے پر موضوعات کے مطابق اثرات پیدا کرنے کے طریقے بیان کر سکے
- عزت و انصاف کے ساتھ کام کر سکے
- عدل و انصاف سے اوارہ میں دفتر میں بہتر ماحول پیدا کر سکے
- ماحول کو اخلاقی طور پر پاکیزہ بنائے
- کارکنوں کی بہتر طور پر دل جوئی کر سکے
- کارکنوں میں اضافہ کر سکے
- باہمی احترام کی برکات سے استفادہ کر سکے

**MGM-321**

**BUSINESS COMMUNICATION**

T	P	C
1	0	1

**Total contact hours**

**Theory 32Hrs.**

**Pre-requisites:** The students shall already be familiar with the language concerned.

**AIMS** The course has been designed to enable the students to.

1. Develop communication skills.
2. Understand basic principles of good and effective business writing in commercial and industrial fields.
3. Develop knowledge and skill to write technical report with confidence and accuracy.

**COURSE CONTENTS**

- |   |               |
|---|---------------|
| <b>1. COMMUNICATION PROCESS.</b>  | <b>6Hours</b> |
| Purposes of communication<br>Communication process<br>Distortions in communication<br>Consolidation of communique<br>Communication flow<br>Communication for self development                   |               |
| <b>2. ORAL COMMUNICATION SKILLS.</b>  | <b>6Hours</b> |
| Significance of speaking.<br>Verbal and non-verbal messages.<br>Strategic steps of speaking.<br>Characteristics of effective oral messages.<br>Communication Trafficking.<br>Oral presentation. |               |
| <b>3. QUESTIONING SKILLS.</b>   | <b>3Hours</b> |
| Nature of question.<br>Types of questions.<br>Characteristics of a good question.<br>Questioning strategy   |               |
| <b>4. LISTENING SKILLS.</b>   | <b>5Hours</b> |
| Principles of active listening.<br>Skills of active listening.<br>Barriers to listening.<br>Reasons of poor listening.<br>Giving Feedback.  |               |

- |    |  |                |
|----|--|----------------|
| 5. | <b>INTERVIEWING SKILLS.</b><br>Significance of interviews.<br>Characteristics of interviews.<br>Activities in an interviewing situation<br>Types of interviews.<br>Interviewing strategy.  | <b>3 Hours</b> |
| 6. | <b>REPORT WRITING.</b><br>Goals of report writing<br>Report format.<br>Types of reports.<br>Report writing strategy.   | <b>3 Hours</b> |
| 7. | <b>READING COMPREHENSION.</b><br>Reading problems.<br>Four reading skills.   | <b>2 Hours</b> |
| 8. | <b>GROUP COMMUNICATION.</b><br>Purposes of conducting meetings.<br>Planning a meeting.<br>Types of meetings.<br>Selection of a group for meeting.<br>Group leadership skills.<br>Running a successful meeting.<br>Active participation techniques. | <b>4 Hours</b> |

**RECOMMENDED BOOKS**

1. Sh. Ata-ur-Rehman Effective Business Communication & Report Writing.
2. Ulman J.N. Could JR. Technical Reporting.

**MGM-321 BUSINESS COMMUNICATION  
INSTRUCTIONAL OBJECTIVES**

**1. UNDERSTAND THE COMMUNICATION PROCESS.**

- State the benefits of two-way communication.
- Describe a model of communication process.
- Explain the major communication methods used in organization.
- Identify the barriers to communication and methods of overcoming these barriers.
- Identify misconceptions about communication.

**2. UNDERSTAND THE PROCESS OF ORAL.**

- Identify speaking situations with other peoples.
- Identify the strategy steps of speaking.
- Identify the characteristics of effective speaking.
- State the principles of one-way communication.
- State the principles of two-way communication.
- Identify the elements of oral presentations skills.
- Determine the impact of non-verbal communication on oral communication.

**3. DETERMINE THE USES OF QUESTIONING SKILLS TO GATHER AND CLARIFY INFORMATION IN THE ORAL COMMUNICATION PROCESS.**

- Identify different types of questions.
- Determine the purpose of each type of question and its application.
- Identify the hazards to be avoided when asking questions.
- Demonstrate questioning skills.

**4. DEMONSTRATE THE USE OF ACTIVE LISTENING SKILL IN THE ORAL COMMUNICATION PROCESS.**

- State the principles of active listening.
- Identify skills of active listening.
- Identify barriers to active listening.
- State the benefits of active listening.
- Demonstrate listening skills.
- Explain the importance of giving and receiving feedback.

**5. Determine the appropriate interview type for the specific work-related situation and conduct a work-related interview.**

- State the significance of interviews.
- State the characteristics of interviews.
- Explain the activities in an interviewing situation.
- Describe the types of interviews.
- Explain the interviewing strategy.
- Prepare instrument for a structured interview.

**6. PREPARE A REPORT OUT-LINE, BASED ON SUBJECT MATTER AND AUDIENCE.**

Identify the different types of reports.  
Determine when to use an informal or formal report presentation.  
Identify the stages of planning a report.  
Identify the parts of a report and choose the parts appropriate for each type of report.  
Draft a report outline.

**7. DEMONSTRATE READING COMPREHENSION.**

Identify major reading problems.  
Identify basic reading skills.  
State methods of previewing written material.  
Identify methods of concentration when reading.  
Demonstrate reading comprehension.

**8. UNDERSTAND THE PRINCIPLES OF GROUP COMMUNICATIONS.**

State the purpose and characteristics of major types of meeting.  
Explain responsibilities of a meeting/committee.  
Identify problems likely to be faced at meeting and means to overcome these problems.  
Distinguish between content and process at meetings.  
Explain the key characteristics of a good group facilitator.

## **MGM-311 INDUSTRIAL MANAGEMENT AND HUMAN RELATIONS.**

<b>Total Contact Hours</b>		<b>T</b>	<b>P</b>	<b>C</b>
<b>Theory</b>	<b>32</b>	<b>1</b>	<b>0</b>	<b>1</b>

**AIMS** The study of this subject will enable the student to develop the management skill, acquaint him with the principles of management and human relations and develop psychological approach to solve the labour problems.

### **COURSE CONTENTS**

- 1. INDUSTRIAL PSYCHOLOGY. 2 Hours**  
History and definition.  
Nature and scope.
- 2. LEADERSHIP 1 Hour**  
Definition and types.  
2.3 Qualities of a good leader.
- 3. MOTIVATION 2 Hours**  
Definition.  
Types (Financial and nonfinancial motives).  
Conflict of motives.
- 4. MORALE 1 Hour**  
Importance.  
Development.  
Measurement.
- 5. HUMAN ENGINEERING. 1 Hour**  
Importance of human factor in industry.  
Man-machine system.  
Strategy for making allocation decisions.
- 6. INDUSTRIAL FATIGUE AND BOREDOM. 2 Hours**  
Definition and distinction.  
Psychological causes.  
Objective causes.  
Prevention
- 7. INDUSTRIAL ACCIDENTS 2 Hours**  
Psychological causes.  
Objective causes.  
Prevention



<b>8.</b>	<b>INDUSTRIAL PREJUDICE</b> Causes Remedies	<b>2 Hours</b>
<b>9.</b>	<b>PUBLIC RELATIONS.</b> Importance Functions	<b>2 Hours</b>
<b>10.</b>	<b>GUIDANCE AND COUNSELLING</b> Importance Choice of job. During service.	<b>2 Hours</b>
<b>11.</b>	<b>JOB EVALUATION</b> Importance Methods Job satisfaction Work simplification.	<b>2 Hours</b>
<b>12.</b>	<b>INDUSTRIAL MANAGEMENT</b> Introduction Functions of management. Subdivisions of management Objectives of industrial management.	<b>2 Hours</b>
<b>13.</b>	<b>PERSONNEL SELECTION.</b> Recruitment of employees. Training. Effects of training on production and product cost.	<b>2 Hours</b>
<b>14.</b>	<b>WORKING CONDITIONS.</b> Importance and consideration. Effects on efficiency and per unit cost.	<b>2 Hours</b>
<b>15.</b>	<b>TIME AND MOTION STUDY.</b> Concept and importance. Sequence of motion study. Principles of motion study. Step to time study. Determination of operations time.	<b>3 Hours</b>
<b>16.</b>	<b>QUALITY CONTROL.</b> Concept and advantages Methods.	<b>2 Hours</b>

**17. ROLE OF FOREMAN IN MANAGEMENT.**

**2 Hours**

Foreman's abilities.  
Duties and functions.

**BOOKS RECOMMENDED:**

1. C.S. Meyers, Industrial Psychology, Oxford University Press, London.
2. SmithWakley, Psychology of Industrial Behaviors, Mc-GrawHill, New York.
3. GhulamHussain, Nizamat-e-Sanaat Aur Insani Rawabat, Ilmi Kitab Khana, Urdu Bazar, Lahore.
4. AndrewR. Megill, The Process of Management William M NewMan.
5. Richard N Omen, Management of Industrial Enterprises.

## **MGM-311 INDUSTRIAL MANAGEMENT AND HUMAN RELATIONS.**

### **INSTRUCTIONAL OBJECTIVES**

At the completion of this course, the students will be able to:

- 1. KNOW INDUSTRIAL PSYCHOLOGY.**  
Describe brief history of industrial psychology.  
Describe in detail definition of industrial psychology.  
State nature and scope of industrial psychology.
- 2. KNOW LEADERSHIP.**  
Define leadership.  
Describe types of leadership.  
State qualities of a good leader.
- 3. UNDERSTAND MOTIVATION.**  
Define motivation.  
Describe financial and nonfinancial motives.  
Explain conflict of motives.
- 4. KNOW MORALE.**  
State importance of morale.  
Describe development of morale.  
State the method of measurement of morale.
- 5. UNDERSTAND HUMAN ENGINEERING.**  
Explain importance of human engineering in the industry.  
Explain man-machine system.  
Explain strategy for making allocation decisions.
- 6. UNDERSTAND INDUSTRIAL FATIGUE AND BOREDOM.**  
Define fatigue and boredom.  
Describe psychological causes of fatigue and boredom.  
Describe objective causes of fatigue and boredom.  
Explain measures to prevent fatigue and boredom.
- 7. UNDERSTAND INDUSTRIAL ACCIDENTS.**  
Explain psychological causes of industrial accidents.  
Explain objective causes of industrial accidents.  
Explain measures to prevent industrial accidents.
- 8. UNDERSTAND INDUSTRIAL PREJUDICE.**  
Define prejudice  
Explain causes of industrial prejudice.  
Explain remedies of industrial prejudice.

9. **UNDERSTAND THE SIGNIFICANCE OF PUBLIC RELATIONS.**  
 Explain importance of public relations.  
 Explain functions of public relations.
10. **UNDERSTAND THE NEED FOR GUIDANCE AND COUNSELING.**  
 State importance of guidance and counselling.  
 Explain the role of guidance and counselling in choosing the job.  
 Describe help of guidance and counselling during service.
11. **UNDERSTAND JOB EVALUATION.**  
 Explain importance of job evaluation.  
 Explain methods of job evaluation.  
 Explain job satisfaction.  
 Explain work simplification.
12. **UNDERSTAND INDUSTRIAL MANAGEMENT.**  
 Define management.  
 State functions of management.  
 Enlist subdivision of management.  
 Explain objectives of industrial management.
13. **UNDERSTAND TRAINING AND ITS EFFECTS.**  
 Describe the recruitment procedure of employees in an industrial concern.  
 Explain training.  
 Identify the kinds of training.  
 Explain the effects of training on production and product cost.
14. **UNDERSTAND THE EFFECT OF WORKING CONDITION ON EFFICIENCY.**  
 Explain importance of working condition.  
 Describe air-conditioning, ventilation, lighting and noise.  
 State the effects of good working conditions on efficiency and per unit cost.
15. **UNDERSTAND TIME AND MOTION STUDY.**  
 Explain the concept.  
 Describe the importance of work study.  
 Explain the sequence of motion study.  
 State the principles of motion study.  
 Describe the steps for carrying out time study.  
 Explain the method of determination of operations time.
16. **UNDERSTAND THE METHODS OF QUALITY CONTROL.**  
 Define quality control

State the advantages of quality control.

16.2 Explain methods of quality control.

**17. UNDERSTAND THE ROLE OF FOREMAN IN AN INDUSTRIAL UNDERTAKING.**

Explain ability of the foreman.

Enlist duties of foreman.

Describe functions of foreman as middle management.

**Total Contact Hours**

<b>Theory</b>	<b>96</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Practical</b>	<b>96</b>	<b>3</b>	<b>3</b>	<b>4</b>

**AIM:** The student will be able to understand the general principles of meat, poultry and fish processing technology.

**COURSE CONTENTS**

- 1. MEAT AND MEAT PRODUCTS PROCESSING 40 hours**

  - Types, composition
  - Slaughtering, cutting and dressing of animals
  - Postmortem changes
  - Composition and grading of meat
  - Processing and preservation
  - Canning
  - Freezing
  - Salting
  - Smoking
  - Dehydration
  - Spoilage and its control
  - Cooked meat products
  - Sausages
  - Cured and smoked meats
  - Reduced and low fat meat products
  - Canned meat formulations
  - Restructured meat products
  
- 2. POULTRY PROCESSING 30 hours**

  - Classes of poultry meat
  - Nutritive value of poultry meat
  - Commercial methods of slaughtering and dressing
  - Post slaughter handling
  - Storage and preservation of poultry meat
  - Freezing of poultry meat
  - Spoilage and its control
  
- 3. EGGS 10 hours**

  - Composition
  - Handling
  - Candling and washing
  - Coating

- 3.5 Packaging and storage
- 3.6 Egg processing
- 3.7 Spoilage and its control

**4. FISH**

**16 hours**

- 4.1 Fish industry in Pakistan
- 4.2 Fresh water and marine fish
- 4.3 Classification of fish meat
- 4.4 Quality characteristics
- 4.5 Commercial handling
- 4.6 Criteria for freshness
- 4.7 Fish processing
- 4.8 Canning
- 4.9 Freezing
- 4.10 Drying
- 4.11 Spoilage and its control

**RECOMMENDED BOOKS**

1. T.K. Govindon, 1985. Fish Processing Technology. Oxford and IBH Publishing Co. Pvt. Ltd. Calcutta.
2. G.J. Mountney, 1985. Poultry Product Technology. AVI Publishing Company Inc. Westport Connecticut.
3. A.M. Pearson & T.A. Gillet, 1996. Processed Meat. Chapman and Hall Washington.

**INSTRUCTIONAL OBJECTIVES**

**On completion of this course, the students will be able to:**

**1. UNDERSTAND MEAT AND MEAT PRODUCTS PROCESSING**

- Give the composition of beef and mutton
- Explain factors affecting the composition of muscle
- Explain slaughtering, cutting and dressing of animals
- Explain the composition and grading of meat in general
- Discuss processing and preservation of meat
- Explain the processes of canning and freezing
  - Describe special processing techniques for chilling, salting, brining, smoking, curing, drying, freezing and canning of meat
  - Explain the spoilage of meat and its control
  - Discuss how sausages are prepared
  - Explain how low fat meat products are produced
    - Explain the some formulation of canned meat products
    - Discuss the processing of restructured meat products
    - Enlist meat by-products
    - Describe preparation and utilization of meat by-products

**2. UNDERSTAND POULTRY PROCESSING**

- Describe commercial methods of dressing
- Explain post-slaughter handling and storage of poultry meat
- Give the composition and classification of poultry.
- Describe processing techniques for freezing and canning of poultry meat
- Discuss how to control spoilage
- Enlist poultry by-products
- Describe preparation and utilization of poultry by-products

**3. UNDERSTAND EGG PROCESSING**

- Explain nutritive value of eggs
- State methods of egg handling
- Explain grading of eggs
- Describe suitable storage techniques of egg
- Explain quality control in egg and egg products.

**4. UNDERSTAND FISH PROCESSING**

- 4.1 Describe commercial catching methods, handling and processing of fish
- 4.2 Discuss the criteria for freshness
- 4.3 Give the composition and classification of fish meat
- 4.4 Explain the processing of fish meat
- 4.5 Discuss how spoilage is controlled
- 4.6 Enlist fish by-products
- Describe preparation and utilization of fish by-products



**LIST OF PRACTICALS**

- 1 Visit to a slaughter house
- 2 Visit to a poultry farm
- 3 Visit to a fish harbor site
- 4 Identification of freshness of meat
- 5 Identification of freshness of poultry
- 6 Identification of freshness of fish
- 7 Identification of freshness of eggs
- 8 Preparation of sausages
- 9 Salting and freezing of fish
- 10 Preservation of poultry meat
- 11 Preservation of fish meat
- 12 Preservation of eggs
- 13 Preservation of meat by smoking and curing
- 14 Determination of chemical composition of meat
- 15 Meat preservation by canning
- 16 Meat preservation by freezing
- 17 Meat product preparation

## FPPT 323(Rev.) BEVERAGES PROCESSING TECHNOLOGY.

### Total Contact Hours

Theory	64	T	P	C
Practical	96	2	3	3

**AIM:** At the end of the course the students will be able to understand the processing and preservation technologies involved in the beverage industry

### COURSE CONTENTS

- 1. GENERAL 6 hour**
  - Introduction
  - History
  - Classification
  - Beverage industry in Pakistan
  - Nutritional status
- 2. INGREDIENTS FOR BEVERAGES PRODUCTION 16 hours**
  - Water, sources and purification
  - Types of water purification systems
  - Fruit pulps
  - Juices
  - Concentrates and other additives
  - Sweeteners
  - Sugar and artificial sweeteners
  - Colors
  - Flavors
  - Preservatives
- 3. BEVERAGES PROCESSING 30 hours**
  - Unit operations in production
  - Raw material handling and storage
  - Fruit based beverages
  - Types, composition and nutritional value
  - Nectar
  - Cordial
  - Squash
  - Syrup
  - Juice concentrates
  - Fruit flavored powders
  - Barley water
  - Carbonated beverages
  - Synthetic beverages

Lowcalorie beverages  
Drymixbeverages  
Formulations  
Tea processing  
Bottled water manufacturing  
Traditionalbeverages production  
Vegetable juice  
Trouble shootingin beverage industry  
Qualitycontrol inbeverage industry  
Plant sanitation  
Fermentedbeverages

4. **RECENTADVANCES IN BEVERAGE TECHNOLOGY 12 hours**

Recentdevelopments in beverage technology  
Role of bio technologyin beverage technology.  
Dietetic drinks  
Energydrinks

**BOOKS RECOMMENDED:**

- 1- A.J. Mitchell, 1990. FormulationandProduction ofCarbonated Soft Drinks. AVI PublishingCo IncWestPort,Connecticut.
- 2- A. G. H.Lee and J.R.Piggott, 1995. Fermented Beverage Production,Blackie Academic and Professional, London.

## FPPT 323(Rev.) BEVERAGES PROCESSING TECHNOLOGY.

### INSTRUCTIONAL OBJECTIVES

On completion of this course, the students will be able to:

#### 1. UNDERSTAND BEVERAGE INDUSTRY

Describe the history and growth of beverage industry  
Give a brief introduction to beverage industry in Pakistan  
Explain the classification of beverage industry as hot or cold, carbonated or non carbonated, alcoholic and nonalcoholic  
Explain the importance of beverages in various climatic conditions  
Explain the nutritional status of beverages

#### 2. UNDERSTAND THE INGREDIENTS USED IN BEVERAGES PRODUCTION

Explain the importance of water in beverage industry  
Discuss the different sources  
Explain Purification systems  
Discuss nutritional status of mineral water  
Explain each step of processing of mineral water and its standards  
Give brief introduction to fruit drinks as juices, sherbats, etc.  
Explain the composition of some common fruit juices  
Explain the processing of fruit juice  
Discuss the various steps in processing and the machinery involved in fruit drink preparation  
Explain the composition of some common vegetables (tomatoes, carrots, cucumber) suitable for juice making  
Explain the common steps used in processing of vegetable juice  
Describe how the enzymes are inactivated  
Discuss use of sugar and artificial sweeteners  
Explain the use of different flavours and colors and their chemical nature and function  
Explain the use of preservatives in increasing shelf life of beverages and juices  
Explain the harmful effects of beverages.

#### 3. UNDERSTAND THE TECHNOLOGY INVOLVED IN PROCESSING OF BEVERAGES

Explain each unit operation involved in production of beverages

Give detail of the technology involved in processing and the various machines used in beverage processing  
 Give a brief introduction and history of soft drink industry  
 Explain the variety of soft drinks as squashes, citrus drinks, lemonade and cordials  
 Explain the formulation and functions of ingredients used in common soft drinks.  
 Explain the role of the components of the soft drinks  
 Describe the kinds of additives used in beverages  
 Explain the enrichment of drinks  
 Describe the nutraceuticals  
 Explain history and production of tea and coffee.  
 Describe the varieties of tea and give differences in black, green, fruit, Chinese tea and herbal tea.  
 Describe the composition of various teas and also explain which component of the tea is useful  
 Explain the fermentation process in tea industry  
 Explain the chemical changes brought in and their effect on flavor and color of tea and coffee during processing  
 Give a review of troubleshooting in beverage industry  
 Discuss the processes involved in traditional beverage production  
 Discuss in details the quality control in beverage industry  
 Discuss the role of plant sanitation in beverage industry  
 Discuss raw material handling and storage of beverage industry.

#### **4. UNDERSTAND THE RECENT ADVANCES IN BEVERAGE TECHNOLOGY**

- 4.1 Discuss in detail the advancements made in beverage technology
- 4.2 Discuss the role of bio technology in advancement of beverage industry

**FPPT 323(Rev.) BEVERAGES PROCESSING TECHNOLOGY.**

**LIST OF PRACTICALS**

**96 hours**

- 1 Watertreatment
- 2 Preparation of fruit juices
- 3 Preparation ofvegetable juices
- 4 Preparation oftea
- 5 Preparation ofcarbonatedbeverages
- 6 Preparation ofnon-carbonatedbeverages
- 7 Preparation of fermented beverages
- 8 Chemicalanalysis ofbeverages
- 9 Visit tobeverage industry
- 10 Carbonation ofjuice
- 11 Bottling ofjuice
- 12 Determinationofwaterquality

**Total Contact Hours**

<b>Theory</b>	<b>32</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Practical</b>	<b>96</b>	<b>1</b>	<b>3</b>	<b>2</b>

**AIM:** The student will be able to understand various types of packaging material and their use in food processing and preservation industry.

**COURSE CONTENTS**

1. **INTRODUCTION** **4 hours**
  - Historical background
  - Reasons for packaging
  - Graphics and design
  
2. **FUNCTIONS OF PACKAGING** **10 hours**
  - Transportation
  - Protection
  - Identification
  - Nature of product
  
3. **TYPES OF PACKAGING** **10 hours**
  - Conventional
  - Modern
  - Aseptic packaging
  - Types of packaging materials
  - Principles of package design
  
4. **RECENT TRENDS IN PACKAGING** **8 hours**
  - Retortable packaging
  - Aseptic packaged food
  - Free oxygen scavenging packaging
  - Frozen food and oven proof trays
  - Gas exchange packaging
  - Vacuum packaging
  - Lamination and coating technology

## **RECOMMENDED BOOKS**

- 1 S. Sacharow and R.C. Griffin Jr., Principles of Food Packaging, AVI, Westport
- 2 R.C. Griffin and S. Scharow, Principles of Package Development, AVI, Westport
- 3 N.T. Crosby, Food Packaging Materials. Applied Science Publishers, London.
- 4 T. Kadoya, Food Packaging. Academic Press New York.



**INSTRUCTIONAL OBJECTIVES**

On completion of this course, the students will be able to:-

1. **UNDERSTAND HISTORY OF FOOD PACKAGING**
  - Define packing and packaging
  - Differentiate between packing and packaging
  - Describe historical background of food packaging
  - Explain reasons of packaging foods
  
2. **UNDERSTAND FUNCTIONS OF PACKAGING**
  - Enlist important functions of packaging
  - Describe functions of packaging
  - Explain the role of packaging as a means of identification, consumer appeal and information
  - Explain the effect of nature of product on marketing arrangements and form of packaging material.
  
3. **UNDERSTAND THE TYPES OF PACKAGING MATERIALS**
  - Enlist types of packaging materials
  - Describe properties of packaging materials
  - Identify conventional packaging materials
  - Explain conventional packaging materials
  - Identify modern packaging materials
  - Explain modern packaging materials
  - Define aseptic packaging
  - Explain the characteristics of aseptic packaging paper
  - Explain the working of aseptic filling machine (Tetra Pak)
  - Explain bag-in-box system of packaging
  - Enlist types of packages and classify them into rigid, semi-rigid and flexible
  - Explain principles of packaging designs used in food industry
  - Illustrate the economy of packaging
  - Describe the harmful effects of packaging materials.
  
4. **UNDERSTAND THE RECENT TRENDS IN PACKAGING**
  - Explain what are the various techniques of packaging
  - Explain Retortable packaging
  - Explain Aseptic packaged food
  - Explain Free oxygen scavenging packaging
  - Explain Frozen food and oven proof trays
  - Explain Gas exchange packaging
  - Explain Vacuum packaging
  - Explain Lamination and coating technology

**LIST OF PRACTICAL****96 hours**

1. Visit to a can manufacturing plant
2. Visit to a paper packaging production unit
3. Visit to a multi-layer packaging production unit
4. Visit to a glass manufacturing plant
5. Visit to a large food warehouse
6. Familiarization with can testing equipment
7. Examination of can seams
8. Examination of cans for defects
9. Collection of various types of packages and materials
10. Examine laminates
11. Read information on the label
12. Testing materials and packages
13. Preparation of tin can
14. Estimation of shelf life of fresh and preserved food using various packages
15. Prepare vacuum packaging of any food



**INSTRUCTIONAL OBJECTIVES**

On completion of this course, the students will be able to:

**1. INSTRUCTIONAL OBJECTIVES.**

Describe the concepts of quality control

Illustrate the needs of quality control and quality assurance

Differentiate between quality control and quality assurance

Discuss good practices in maintaining sanitation and hygiene

**2. UNDERSTAND THE METHODS OF SENSORY EVALUATION**

Define sensory evaluation

State the principles of sensory evaluation

Describe the methods of sensory evaluation

Give the purpose of panelists

**3. UNDERSTAND PHYSICAL AND CHEMICAL PARAMETERS**

Describe the physical parameters of foods

Describe the chemical parameters of foods

Discuss the effects of processing on physical and chemical properties of foods

**4. UNDERSTAND MICROBIOLOGICAL QUALITY OF FOODS**

Describe the microbiology of milk and juices

4.2 Explain the importance of HACCP in food industry

4.3 Explain the effect of employee's health on the quality of product.

**5. UNDERSTAND THE FUNCTION OF QUALITY CONTROL DEPARTMENT**

Explain the responsibilities of quality control department

Enlist functions of quality control department

Discuss the relationship of quality control department with other

departments of organization.

Describe the statistical methods of quality control

Explain the benefits of statistical methods in quality control.

**6. UNDERSTAND THE CONCEPTS OF QUALITY ASSURANCE STANDARD**

Describe the concept of total quality management

Explain ISO-9000 standards and their application

Describe the effects of total quality of foods

Explain how ISO-9000 can help to increase the export of food products

Discuss new approaches to quality assurance

## **FPPT382 QUALITYCONTROL**

### **LISTOFPRACTICALS**

**96 Hrs.**

1. Determination of suspended and settleable wastes
2. Determination of BOD
3. Calculation of COD
4. Visit to a biogas plant
5. Visit to a food plant to see waste treatment plant
6. Visit to local municipal wastewater facilities
7. Utilization of wastes for preparation of animal feed
8. Utilization of wastes for the preparation of fertilizer

## FPPT 392 WASTE MANAGEMENT

### Total Contact Hours

<b>Theory</b>	<b>32</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Practical</b>	<b>96</b>	<b>1</b>	<b>3</b>	<b>2</b>

**AIM:** The student will be able to understand food industry waste and methods employed in its treatment, utilization and disposal.

- 1. INDUSTRIAL WASTES 2 hours**  
 1.1 Definitions of wastes and by-products  
 1.2 Nature and classification of wastes
- 2. SOLID WASTE MANAGEMENT 6 hours**  
 2.1 Characteristics  
 2.2 Separation  
 2.3 Recycling  
 2.4 Utilization
- 3. LIQUID WASTE MANAGEMENT 4 hours**  
 3.1 Characteristics  
 BOD, COD  
 Toxic chemicals in effluents
- 4. METHODS OF LIQUID WASTE TREATMENT 12 hours**  
 Physical Methods  
 Chemical Methods  
 Biological Methods
- 5. ENVIRONMENTAL POLLUTION 8 hours**  
 5.1 Definition  
 Air and noise pollution  
 Land pollution  
 Water pollution  
 Role of Environmental Protection Agency

## FPPT 392 WASTE MANAGEMENT

### INSTRUCTIONAL OBJECTIVES

On completion of this course, the students will be able to

1. **KNOW VARIOUS WASTES FROM FOOD INDUSTRY**
  - Define waste and by-products
  - Enlist types of wastes
  - Classify wastes into solid and liquid
  
2. **UNDERSTAND SOLID WASTE MANAGEMENT**
  - Describe characteristics of solid wastes
  - Discuss separation of solid wastes
  - Discuss utilization of wastes as food and feed through the production of biomass or single cell protein
  - Discuss uses of wastes as fuel through the production of biogas
  - Discuss uses of wastes as fertilizer
  - Discuss uses of wastes for other purposes
  
3. **UNDERSTAND THE MANAGEMENT OF LIQUID WASTE**
  - List different types of insoluble wastes
  - Discuss the effect of insoluble wastes on eco-system
  - Discuss the methods of liquid waste disposal
  - Estimate total organic matter in wastewater.
  - Calculate B.O.D. and C.O.D.
  - List possible chemical and biochemical toxic substances in effluents from food processing plants
  
4. **UNDERSTAND THE METHODS OF LIQUID WASTE TREATMENT**
  - State the physical treatment by sedimentation, centrifugation, concentration, flotation, adsorption and ultra filtration
  - Explain the physical treatment by each of the above methods.
  - State the principle used in chemical treatment by coagulation, emulsion breaking, neutralization, precipitation and oxidation
  - Explain the biological treatment by each of the above processes
  - Explain the biological treatment by activated sludge process,

Explain the biological treatment by trickling filter.  
Explain the biological treatment by aerated lagoons  
Explain the biological treatment by stabilization ponds  
Explain the biological treatment by an anaerobic process.

**5. UNDERSTAND ENVIRONMENTAL POLLUTION**

Define and identify sources of environmental pollution  
Enlist different types of pollutants  
Discuss possible chemical and biological toxic substances in air  
Describe methods of air pollution prevention  
Enlist sources of noise pollution  
Discuss effect of noise pollution on personnel  
Describe control method for noise pollution  
Discuss the sources of land pollution  
Discuss the effect of pollution on eco-system  
List water pollutants  
Discuss effect of water pollution on aquatic life  
Explain the role of EPA in controlling the environmental pollution



**FPPT392            WASTEMANAGEMENT**

**LIST OF PRACTICALS**

**96 hours**

1. Setup of a quality control lab
2. Performance of sensory evaluation
3. Practice using different sensory evaluation methods
4. Physical examination of selected foods
5. Examination of selected foods by chemical analysis
6. Microbiological analysis of water
7. Microbiological examination of selected foods
8. Practice of applying statistical methods in quality control parameters in any food processing industry
9. Visit to a food industry quality control lab
10. Quality control analysis of milk

**FPPT 353 FOOD ENGINEERING****Total Contact Hours**

<b>Theory</b>	<b>64</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Practical</b>	<b>96</b>	<b>2</b>	<b>3</b>	<b>3</b>

**AIM:** The course is aimed at enabling the students to develop proficiency in basic engineering involved in food processing and preservation industries.

**COURSE CONTENTS****1. UNIT OPERATIONS 14 hours**

Introduction to unit operations in food industry  
 Concept of each unit operations in food industry i.e. cleaning, sorting, separation, grading, centrifugation, filtration, crystallization, extraction, pressing, sterilization, evaporation, heat transfer, freezing, irradiation, mixing, etc.  
 Basic laws of energy and material balance  
 Generalized flow diagram of a food processing operation

**2. FLUIDS 8 hours**

Definition and types  
 Mechanism of fluid flow  
 Fluid statics, fluid dynamics  
 Reynolds number  
 Viscosity  
 Bernoulli's theorem  
 Fluid heads, friction losses  
 Friction in pipes, enlargement and contraction losses

**3. MEASUREMENT OF FLUIDS 6 hours**

Types of manometers  
 Venturi-meter, orifice meter  
 Rotameters, pitot tubes and wiers  
 Displacement meters

**4. PUMPS 10 hours**

Terminology of pumps  
 Types of pumps  
 Theory of compression, compressor selection  
 Construction and working of compressors

**5. HEAT TRANSFER 10 hours**

Modes of heat transfer, Fourier law

Thermal conductivity, pipe insulation  
 Film coefficient  
 Heat transfer coefficient  
 Factors affecting heat transfer coefficients  
 Classification of heat transfer equipment  
 Heat exchangers

**6. EVAPORATORS 8 hours**

Basic principles of evaporation  
 Types of evaporators  
 Construction and working of evaporators  
 Methods of feeding  
 Evaporator accessories  
 Economy and capacity

**7. EVAPORATOR PROBLEMS 4 hours**

Scale formation and its removal  
 Steam tables and their use, choice of steam pressure  
 Trouble shooting

**8. PROPERTIES OF MATERIALS USED IN FOOD ENGINEERING 4 hours**

Metals/ Alloys (stainless steel, copper, aluminum)  
 Glass  
 Plastics  
 Polymers  
 Corrosions of metals and their protection

**RECOMMENDED BOOKS**

1. W.L. Bedger and J.T. Bencharo, Introduction to Chemical Engineering.
2. R.T. Toledo, Fundamentals of Food Process Engineering, AVI, Westport.
3. K.L. Earle, Unit Operations in Food Processing, Pergamon Press, Oxford.
4. P. Fellows, Food Processing Technology, Ellis Horwood, Chichester.
5. Stanly Charm, Fundamentals of Food Engineering, AVI Publishing Westport
6. S. Herkal, Basic Engineering Principles, AVI Publishing Westport
7. M. Lemoguer & P. Jelen, Food Engineering & Process Applications, Elsevier Publishing Co.
8. D.R. Heldman, Food Process Engineering, AVI Publishing Westport

**INSTRUCTIONAL OBJECTIVES**

On completion of this course, the students will be able to:

**1. UNDERSTAND UNIT OPERATIONS IN FOOD ENGINEERING**

- Define food engineering
- Explain unit operations with examples
- Explain examples of unit processes using flow diagrams
- Identify the principle unit operations relative to handling and preparation of food raw materials
- List and discuss the principles involved in preservation operation
- Describe dry and wet cleaning operations in food industry
- Discuss the principle of sorting machine
- Describe the principles working of various machines used in separation and grading operations in food industry
- Briefly discuss centrifugation
- Discuss principles and application of various types of filters in food industry
- Introduce the theory and function of crystallization in food industry
- Discuss the theory and functions of various extractors used in food industry
- Discuss theory, equipment and application of sterilization, evaporation, dehydration, freezing, lyophilization operation for preservation of foods
- Explain different types of mixing techniques
- Give a brief introduction to mixing equipments commonly used in food industry
- Explain Laws of material and energy balance

**2. UNDERSTAND FLUIDS**

- Define and state types of fluids
- Differentiate between Newtonian and Non-Newtonian fluids
- Define fluid statics
- Derive relationship to calculate the pressure exerted by liquid column

- Define fluid dynamics
- Define viscosity and its units
- Explain the mechanism of fluid flow by Reynolds experiment
- Differentiate between laminar flow and turbulent flow
- Explain critical velocity of flowing fluids
- Differentiate between point velocity, maximum velocity and mean velocity of flowing fluids
- Explain Bernoulli's Theorem
- Develop mathematical equation for Bernoulli's Theorem
- Explain fluid heads
- Enlist friction losses and calculate the head loss due to friction, enlargement and contraction

**3. UNDERSTAND THE MEASUREMENT OF FLUIDS**

- Define measurement of fluids and enlist equipment
- Differentiate between various types of manometers
- Describe working of U-tube, differential and inclined manometers
- Calculate pressure drop from manometer readings
- Describe working installation method of Orifice meter, Venturimeter, pitot tube, Rotameter and Weirs.

**4. UNDERSTAND THE WORKING OF PUMPS**

- Define pumps
- Explain the terminology used in pumps
- Explain suction and discharge heads
  - Enlist types of pumps
- Describe the working of centrifugal, positive displacement, reciprocating, plunger, diaphragm, gear, cycloidal and turbine pumps
  - Enlist factors considered in the selection of a pump
  - Enlist pump losses
  - Define blowers
  - List types of blowers
- Explain working of cycloidal, Nash Hytor and centrifugal blowers
  - Define compressors
- Explain working principle of reciprocating and centrifugal compressors
- Enlist factors considered for the selection of a compressor

**5. UNDERSTAND THE TRANSFER OF HEAT**

- Define heat and enlist modes of heat transfer
- Explain conduction, convection and radiation

State Fourier's Law and give its mathematical form Give units of thermal conductivity  
 Describe the effect of temperature on thermal conductivity  
 State Newton's Law of heat convection  
 Explain film coefficients  
 Enlist factors affecting overall heat transfer coefficient  
 Understand temperature drop in flowing fluids Differentiate between co-current flow  
 Make calculations related to conduction, convection and radiation  
 State Stefan Boltzmann Law of heat radiation Explain black body and grey body  
 Define and classify heat exchangers  
 Explain the construction and working of double pipe and plate heat exchangers

**6. UNDERSTAND DIFFERENT TYPES OF EVAPORATORS**

Define evaporation and enlist types of evaporators  
 Explain working of horizontal tube, climbing film, falling film and multiple effect evaporators  
 Describe evaporator accessories  
 Enlist types of condensers and explain the working of contact condenser  
 Explain the working of a steam ejector and entrainment separator  
 Explain economy and capacity of a multiple effect evaporator  
 Make calculations related to evaporator  
 Explain the use of steam table and calculate the amount of steam required for evaporating a given sample

**7. UNDERSTAND EVAPORATOR PROBLEMS**

List the problems of evaporators  
 Explain the effect of non-condensed gases and their removal  
 Explain scale formation, its effects and removal  
 Explain troubleshooting in the operation of evaporator and their remedies

**8. UNDERSTAND FOOD ENGINEERING MATERIALS**

Identify various metals used in food processing equipment  
 Define and differentiate between metal and alloy  
 Describe types of steel  
 Explain corrosion and its protection  
 Explain the properties of glass to be used for food  
 Explain the properties of plastics and polymers useful for food

**LIST OF PRACTICALS**

- 1 Draw flow diagrams of some food processing operations
- 2 Solving juice industry material balance problems
- 3 Solving dairy industry material balance problems
- 4 Solving sugar industry material balance problems
- 5 Solving cereals industry material balance problems
- 6 Solving fruits industry material balance problems
- 7 Solving vegetable industry material balance problems
- 8 Solution of energy balance and enthalpy problems
- 9 Operation of spray drier for fruit juice
- 10 Operation of spray drier for milk
- 11 Operation of spray drier for juice
- 12 Operation of spray drier for egg
- 13 Study the operating characteristics and performance of different pumps
- 14 Operation of drum drier for milk
- 15 Operation of drum drier for cereals
- 16 Visit to various food industries to observe the working of different unit operations involved in food processing and preservation

**FPPT 362**

**SPECIAL PROJECT**

**Total Contact Hours**

<b>Theory</b>	<b>0</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Practical</b>	<b>192</b>	<b>0</b>	<b>6</b>	<b>2</b>

**Pre-requisite**                      **Qualified firstyear of study**

**AIM:** The students will grasp the techniques for undertaking a study in the discipline and preparing a final written report.

**COURSE CONTENTS**

Each student will be assigned a special topic for research in the library, industry, laboratory or the field. He will be assigned to a supervisor. At the end of the project, the student will submit a written report and deliver an oral presentation



**INSTRUCTIONAL OBJECTIVES**

At the end of this course the student will be able to:

**1 APPLY KNOWLEDGE**

Apply the knowledge from the study of the discipline into his practical life

**2 UNDERTAKE ASSIGNMENTS**

Acquire the techniques to undertake assignments in his discipline.

**3 PRESENT REPORT**

Present results of assignments in written as well as oral form

**Total Contact Hours**

<b>Theory</b>	<b>32</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Practical</b>	<b>96</b>	<b>1</b>	<b>3</b>	<b>2</b>

**AIM:** At the end of the course the students will be able to understand layout and hygiene of food processing plant and their environment.

**COURSE CONTENTS**

**1. INTRODUCTION 10 hours**

- Significance.
- Selection of site
- Design and construction of building
- Layout of equipment
- Good Manufacturing Practices (GMP)
- Microbiology in food plant sanitation

**2. PLANT CLEANING 12 hours 2.1**

- Need for cleaning
- Dismantling cleaning
- Requirements of aseptic packaging
- Factors affecting degree of cleaning
- Disinfectants and detergents

**3. SANITARY FACILITIES 10 hours**

- Required facilities
- Field sanitation
- Food grade steam and water

**RECOMMENDED BOOKS**

1. M.A. Joslyn and J.L. Heid, Food Processing Operations, AVI, Westport

2. W.C. Frazier & D.C. Westhoff, Food Microbiology, McGraw Hill Book Co., New York

3. J.G. Brennan, J.R. Butters, N.D. Cowell and A.E.V. Lilly. Food Engineering Operations. Elsevier Publishing Co. Limited, Amsterdam.

**INSTRUCTIONAL OBJECTIVES**

On completion of this course, the students will be able to:-

**1. UNDERSTAND THE IMPORTANCE OF PLANT LAYOUT**

- State the importance of food plant layout and hygiene
- Explain the factors considered for site selection
- Discuss the demerits of unsuitable site
- Enlist the requirements for the building design
- Illustrate the requirements for building construction
- Explain the layout of equipment
- Discuss drawbacks of improper equipment layout
- Explain good manufacturing practices and discuss their

application

- Identify microorganisms that can cause hazards
- Explain the importance of microbiology in food plant sanitation
- Discuss applications for maintaining good hygiene

**2. UNDERSTAND THE PLANT CLEANING**

- State need for cleaning
- State cleaning demands of batch and continuous operations
- Explain dismantling cleaning
- Describe the procedure of cleaning-in-place (CIP)
- Explain the requirements of aseptic packing
- Enlist factors affecting the degree of cleaning
- Explain the mode of action of detergents

**3. UNDERSTAND SANITARY FACILITIES**

- Enlist the facilities required for maintaining good sanitation in a food plant
- State the need for field sanitation
- Explain food grade steam and water

## **FPPT 262 FOOD PLANT LAYOUTS AND HYGIENE**

### **LIST OF PRACTICALS**

**96 hours**

1. Examine lab and commercial equipment for features of hygienic design
2. Examine Departmental building for sanitary design and construction faults
3. Determination of levels of various disinfectants
4. Determination of water hardness
5. Determination of the effect of water hardness and organic matter on cleaning efficiency
6. Estimation of microbial load before and after cleaning
7. Visit to a food factory for observing water treatment process
8. Visit to local waste disposal system

## **MINIMUM QUALIFICATION OF TEACHER/INSTRUCTOR**

- **Gazetted Posts**

Qualification:

B.Sc (Hons.) Food Technology/ B.Sc (Hons.) Agri. Food Technology/

B.Sc (Hons.) Dairy Technology.

- **Non-Gazetted Posts**

Qualification: D.A.E. (Food Technology) / D.A.E. (Food Processing &

Preservation Technology).

## **EMPLOYABILITY OF PASSOUTS**

- Dairy Industry: ( Nestle, Haleeb, Engro, Nirala, etc.)
- Beverages: ( Pepsi Cola, Coca Cola, Amrat Cola, Shezan, Benz, Golden Juices, Maza, etc.)
- Fats & Oils: (Habeb, Kashmir, Dalda, Manpasad, Tuloo, etc.)
- Confectionary: ( Mitchell's, Mayfair, Candy-land, Hillal, etc)
- Meat Industry: ( K&Ns Foods, Flourey Meat, Knoor, etc.)
- Bread Industry: ( Vita, Dawn, Bunny, etc.)
- Snack Industry: ( Lays, Golden, Triple EM, etc)

## LIST OF MACHINERY/TOOLS AND EQUIPMENT:

### FOOD PROCESSING AND PRESERVATION TECHNOLOGY (DAE 3 YEARS)

S.NO	EQUIPMENTS/TOOLS/MACHINERY
1.	AUTOCLAVE
2.	AUTOMATIC KJELDAHL DIGESTION & DISTILLATION APPARATUS
3.	AUTOMATIC PIPET TORS WITH DISPENSORS
4.	BOD APPARATUS WITH BOTTLES
5.	BOD INCUBATORS
6.	CENTRIFUGE 100-5000 RPM
7.	COD APPARATUS WITH HEATING DIGESTORS
8.	COD METER
9.	CONDUCTIVITY METER
10.	DIGITAL COLONY COUNTER
11.	DIGITAL ELECTRONIC BALANCE 4 DIGITS
12.	ELECTRONIC TOP LOADING BALANCE (1 kg)
13.	ELECTROPHORESIS
14.	SIX PLATE APPARATUS
15.	FLAME PHOTOMETER (K, Ca, Br, Na filters)
16.	HAND REFRACTOMETER
17.	HEATING MANTLE
18.	HOT PLATE
19.	INCUBATOR HEATING TYPE (115L CAPACITY)
20.	INCUBATOR COOLING TYPE
21.	LABORATORY CENTRIFUGE
22.	LABORATORY DIGITAL REFRACTOMETER
23.	LABORATORY OVEN
24.	LAMINAR FLOW HOOD
25.	MAGNETIC STIRRER
26.	MAGNETIC STIRRER + HOT PLATE
27.	PORTABLE COD TEST KIT
28.	PORTABLE DISSOLVED OXYGEN METER AND OXYGEN ELECTRODE
29.	PORTABLE PH METER
30.	PORTABLE TDS METER

31	REFLUXAPARATUS
32	STEAKING WIRE LOOP
33	DIGITALTHERMOMETER
34	THERMOMETER
35	TLC APPARATUS
36	UV-VISIBLE SPECTROPHOTOMETER
37	VACUUMPUMP
38	MICROSCOPES
39	MOISTUREDETERMINATIONBALANCE
40	MUFFLEFURNACE
41	TURBIDITYMETER
42	PHMETERDIGITAL
43	POLARIMETER
44	PORTABLEAPPARATUSBOD
45	VACUUM STERILIZER
46	WATERBATH
47	VISCOMETER
48	WATERDISTILLATIONUNIT
49	SPRAYDRIER
50	DRUM DRIER
51	EVAPORATOR
52	DEHYDRATOR
53	DOUGHPROOFER
54	HOMOGENIZER
55	ROTARYWASHER
56	ABRASIVE PEELER
57	LYEPEELER
58	MANGOPEELER
59	FINE PULPER
60	ROSE HEAD MACHINE
61	MINCER
62	JUICE EXTRACTOR
63	JUICE EXTRACTORMANUAL
64	CAPPINGMACHINE
65	STEAM BOILER
66	MILKCHILLER
67	SLICERMACHINE
68	JUICE BLENDER
69	DOUGHMIXINGMACHINE
70	SEPERATORMANUAL
71	SIEVING SYSTEM



72	ICE CREAMMACHINE
73	EXHAUST BOX
74	STEAM BLANCHER

75	RICHARDMEISEL RM APPARATUS
76	EXTRUDER
77	AIR COMPRESSOR
78	ASSORTEDRETORTCLAMPS
79	BUNSER BURNER
80	BURETTE CLAMPS
81	CONTAINERS FORCULTURE MEDIUM
82	FIRE FIGHTING EQUIPMENT
83	FIRST AIDKIT
84	FUNNEL STANDSHOLE BORING MACHINE FORRUBBERSTOPPERS
85	MEASURING SPOONS
86	PETRIDISHES
87	REFRIGERATOR
88	RELATIVEHUMIDITYMETERS
89	RETORT CLAMPS
90	RUBBER STOPPER
91	STOPWATCH
92	TEST TUBE HOLDERS
93	TEST TUBE RACKS
94	TONGS
95	TRIPODSTAND
96	TUBING CLAMPS
97	TUBING CONNECTORS
98	HYDROMETER
99	LACTOMETER

## LIST OF CONSUMABLE (GLASSWEAR AND CHEMICALS)

S.NO	GLASSWEAR
1.	AERATION BOTTLES
2	BEAKERS (100 TO 1000 ml) plastic + glass
3	Brown glass bottle
4	Burettes
5	Coverslips
6	Culture dishes
7	Culture flask
8	Depression slides
9	Desiccators
10	Distilled water containers
11	Filtration vacuum flask
12	Flask 1000 ml
13	Glass beads / boiling chips
14	Glass rods
15	Glassware drying racks
16	Measuring cylinders 50-500 ml
17	Microscope slides
18	Microscope slides (Prepared with yeast, bacteria and molds)
19	Pipette racks
20	Pipettes (1-50 ml)
21	Reagent bottles (plain & brown with glass stoppers)
22	Round bottom flask (100-500 ml)
23	Rubber bulbs 100 ml
24	Soxhlet glassware

25	Testtubes(plain&screwtype)
26	Titrationflask
27	Volumetricflasks(50-1000ml)
28	<b>CHEMICALS</b>
29	Aceticacid
30	Acetylene
31	Aluminumhydroxidesuspension
32	Ammoniumchloride
33	Ammoniumhydroxide
34	Asbestos
35	Ascorbicacid
36	Boratebuffersolution
37	Boricacid
38	Bromocresolpurple
39	Bromocresolblue
40	Buffertablets(pH4.01&7.01)
41	Calciumchloride
42	Carbontetrachloride
43	Chloroform
44	Congored
45	Coppersulphate
46	Crystalviolet
47	Diatomaceousearth
48	Diethylether
49	Ethylalcohol
50	Ferricchloride
51	Ferroussulphate
52	goaicol

53	Hydrochloric acid concentrated
54	Hydrogen peroxide
55	Isoamyl alcohol
56	Isopropyl alcohol
57	Lead acetate
58	Mercuric sulphate
59	Methyl alcohol
60	methyl orange
61	Methyl red
62	Methylene blue
63	Ninhydrin
64	Nitric acid
65	Petroleum ether
66	phenolphthalein
67	Phosphate buffer pH 7
68	Potassium sulphate
69	Potassium dichromate
70	Potassium dihydrogen phosphate
71	Potassium hydroxide
72	Potassium oxalate
73	Potassium permanganate
74	Silver sulphate
75	Sodium carbonate
76	Sodium chloride
77	Sodium hydroxide
78	Sodium sulphate
79	Sodium thiosulphate
80	Starch

81	Standard EDTA titrant
82	Sulfuric acid