

**PROPOSED CURRICULUM STRUCTURE FOR THE PART - II (2<sup>ND</sup> YEARS) OF THE FULL TIME  
DIPLOMA COURSE IN FOOD PROCESSING TECHNOLOGY**

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

TEACHING & EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME: **FOOD PROCESSING TECHNOLOGY**

SEMESTER: **THIRD**

COURSE CODE: **FPT**

DURATION OF COURSE: **6 SEMESTERS**

SR. NO	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME						
			L	TU	PR	INTERNAL SCHEME			ESE	PR	TW	TOTAL
						TA	CT	TOTAL				
1.	Food Microbiology	4	4	---	----	10	20	30	70	---	---	<b>100</b>
2.	Chemistry of Food – I	4	4	---	----	10	20	30	70	---	---	<b>100</b>
3.	Unit Operation of Chemical Engineering – I	4	4	1	----	10	20	30	70	---	---	<b>100</b>
4.	Process Instrumentation Fundamentals	4	4	---	----	10	20	30	70	---	---	<b>100</b>
5.	Food Microbiology Lab.	3	---	---	5	---	---	---	---	100	---	<b>100</b>
6.	Chemistry of Food –I Lab.	3	---	---	5	---	---	---	---	100	---	<b>100</b>
7.	Unit Operation of Chemical Engineering – I Lab	2	---	---	4	---	---	---	---	50	---	<b>50</b>
8.	Professional Practice-I	1	---	--	2	---	---	---	---	---	50	<b>50</b>
	<b>TOTAL</b>	<b>25</b>	<b>16</b>	<b>01</b>	<b>16</b>	<b>40</b>	<b>80</b>	<b>120</b>	<b>280</b>	<b>250</b>	<b>50</b>	<b>700</b>

STUDENT CONTACT HOURS PER WEEK: 33Hrs.

Theory and Practical Period of 60 Minutes each.

L – Lecturer, TU –Tutorial, PR – Practical, TA – Teachers’ Assessment, CT – Class Test, ESE – End Semester Exam., TW – Term Work.

## WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

## TEACHING &amp; EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME: **FOOD PROCESSING TECHNOLOGY**SEMESTER: **FOURTH**COURSE CODE: **FPT**DURATION OF COURSE: **6 SEMESTERS**

SR. NO	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME						
			L	TU	PR	INTERNAL SCHEME			ESE	PR	TW	TOTAL
						TA	CT	TOTAL				
1.	Chemistry of Food-II	3	3	---	---	10	20	30	70	---	---	<b>100</b>
2.	Unit Operation of Chemical Engineering - II	4	4	---	---	10	20	30	70	---	---	<b>100</b>
3.	Food Preservation Technology	4	4	---	---	10	20	30	70	---	---	<b>100</b>
4.	Microbial Technology	4	4	---	---	10	20	30	70	---	---	<b>100</b>
5.	Chemistry of Food –II Lab	2	---	---	4	---	---	---	---	100	---	<b>100</b>
6.	Technology of Food Preservation Lab.	2	---	---	4	---	---	---	---	100	---	<b>100</b>
7.	Unit Operation of Chemical Engineering - II Lab	2	---	---	3	---	---	---	---	50	---	<b>50</b>
8.	Microbial Technology Lab	2	---	---	3	---	---	---	---	100	---	<b>100</b>
9.	Professional Practice-II	1	---	---	2	---	---	---	---	---	50	<b>50</b>
10.	Development of Life Skill – II	1	---	---	2	---	---	---	---	50	---	<b>50</b>
	<b>TOTAL</b>	<b>25</b>	<b>15</b>	<b>00</b>	<b>18</b>	<b>40</b>	<b>80</b>	<b>120</b>	<b>280</b>	<b>400</b>	<b>50</b>	<b>850</b>

STUDENT CONTACT HOURS PER WEEK: 33Hrs.

Theory and Practical Period of 60 Minutes each.

L – Lecturer, TU –Tutorial, PR – Practical, TA – Teachers' Assessment, CT – Class Test, ESE – End Semester Exam., TW – Term Work.

**PROPOSED CURRICULUM STRUCTURE FOR THE PART – II (2<sup>ND</sup> YEAR) OF THE FULL TIME DIPLOMA COURSE IN FOOD PROCESSING TECHNOLOGY**

WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

TEACHING & EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME : **FOOD PROCESSING TECHNOLOGY**

PART : **II**

COURSE CODE : **FPT**

DURATION OF COURSE: **6 SEMESTERS**

Semester	Sl. No	Subject of Study	Subject Code	Credits	Contact Periods/Week			Evaluation Scheme							
					L	TU	PR	Internal			External		TW	ESE	Total Marks
								TA	CT	PR	PR	PR			
3 <sup>RD</sup>	T H E O R E T I C A L	1.	Food Microbiology	FPT/T301	4	4	----	----	10	20	----	----	----	70	100
		2.	Chemistry of Food - I	FPT/T302	4	4	----	----	10	20	----	----	----	70	100
		3.	Unit Operation of Chemical Engineering - I	FPT/T303	4	4	1	----	10	20	----	----	----	70	100
		4.	Process Instrumentation Fundamentals	FPT/T304	4	4	----	----	10	20	----	----	----	70	100
	P R A C T I C A L	5.	Food Microbiology Lab.	FPT/P305	3	----	----	5	----	----	50	50	----	----	100
		6.	Chemistry of Food –I Lab.	FPT/P306	3	----	----	5	----	----	50	50	----	----	100
		7.	Unit Operation of Chemical Engineering – I Lab	FPT/P307	2	----	----	4	----	----	25	25	----	----	50
		8.	Professional Practice-I (Seminar - I)	FPT/P308	1	----	----	2	----	----	----	----	50	----	50
		<b>TOTAL</b>		<b>25</b>	<b>16</b>	<b>01</b>	<b>16</b>	<b>40</b>	<b>80</b>	<b>125</b>	<b>125</b>	<b>50</b>	<b>280</b>	<b>700</b>	
4 <sup>TH</sup>	T H E O R E T I C A L	1.	Chemistry of Food-II	FPT/T401	3	3	----	----	10	20	----	----	----	70	100
		2.	Unit Operation of Chemical Engineering - II	FPT/T402	4	4	----	----	10	20	----	----	----	70	100
		3.	Food Preservation Technology	FPT/T403	4	4	----	----	10	20	----	----	----	70	100
		4.	Microbial Technology	FPT/T404	4	4	----	----	10	20	----	----	----	70	100
	P R A C T I C A L	5.	Chemistry of Food –II Lab	FPT/P405	2	----	----	4	----	----	50	50	----	----	100
		6.	Technology of Food Preservation Lab.	FPT/P406	2	----	----	4	----	----	50	50	----	----	100
		7.	Unit Operation of Chemical Engineering - II Lab	FPT/P407	2	----	----	3	----	----	25	25	----	----	50
		8.	Microbial Technology Lab	FPT/P408	2	----	----	3	----	----	50	50	----	----	100
		9.	Professional Practice-II (Seminar – II on Proposed Project)	FPT/P409	1	----	----	2	----	----	----	----	50	----	50
		10.	Development of Life Skill - II	FPT/P410	1	----	----	2	----	----	25	25	---	----	50
		<b>TOTAL</b>		<b>25</b>	<b>15</b>	<b>00</b>	<b>18</b>	<b>40</b>	<b>80</b>	<b>200</b>	<b>200</b>	<b>50</b>	<b>280</b>	<b>850</b>	
<b>PART - II</b>	<b>GRAND TOTAL</b>			<b>50</b>	<b>31</b>	<b>01</b>	<b>34</b>	<b>80</b>	<b>160</b>	<b>325</b>	<b>325</b>	<b>100</b>	<b>560</b>	<b>1550</b>	

STUDENT CONTACT HOURS PER WEEK: 33Hrs.

Theory and Practical Period of 60 Minutes each.

L – Lecturer, TU –Tutorial, PR – Practical, TA – Teachers' Assessment, CT – Class Test, ESE – End Semester Exam., TW – Term Work.

**Name of the Subject: Food Microbiology**

Course Code: <b>FPT</b>	Semester: <b>Third</b>	Credits: <b>4C</b>
Duration: <b>6 Semesters</b>	Maximum Marks: <b>100</b>	Subject Code: <b>FPT/T301</b>

**Objective:**

For proper preservation & processing of food, it is essential to acquire the knowledge of bacteria & their property, genetics and also the concepts of preventing the growth of bacteria by means of sterilization & pasteurisation. The subject will primarily introduce the students to the essential concepts of understanding microbes, morphology, preparation of culture, genetics, nutrition, methods of prevention from contamination of food.

Teaching Scheme			Examination Scheme										
Theory	4 Hrs/Week		Internal Scheme	End Semester Examination									
Tutorial	Nil			Group	Unit	Objective Questions (Only MCQ/Fill in the Blanks/ True or False)				Subjective Questions			
Total Contact Periods	17 Weeks or <b>68 Hrs</b>		<b>30</b>	A		To Be Set	To be Answered	Marks Per Question	Total Marks	To Be Set	To be Answered	Marks Per Question	Total Marks
	Class Test	Contact Periods			1	3	Any 20	One	1 x 20 = <b>20</b>	2	Any 5 at least 2 from each group	Ten	10 x 5 = <b>50</b>
	<b>3</b>	<b>65</b>		B	2	6				2			
					3	6				2			
				4	6	2							
			5	4	2								

Detail Contents		Total Periods
<b>Unit – 1</b>	<p><b>Study of Microscope</b> Classification (optical and electron microscope), working principle of light-field, dark-field, comparative study of optical and electron microscopes, function of different part of light microscope, importance of numerical aperture, resolving power, immersion objective, depth of focus, compensating eyepiece, condensers of microscope.</p> <p><b>Staining Technique</b> Basic principle of simple and gram staining, simple and gram staining process, mordant and its action, definition of dye, acidic and basic dyes, mode of action of dyes, importance of chromospheres.</p>	<b>12</b>
<b>Unit – 2</b>	<p><b>Bacterial Kingdom</b> Classification with examples, morphology study (size, shape, arrangement, flagella, capsule, cell wall, cell membrane, nucleus), bacterial growth &amp; nutrition, sporulation process, bacteriophage.</p> <p><b>Morphology of other Microbes</b> Classification of fungi, morphology of yeast, moulds, algae, budding of yeast, Structure of hyphae, industrial importance of yeast, moulds and algae</p>	<b>15</b>
<b>Unit – 3</b>	<p><b>Culture Media</b> Classification &amp; preparation of bacteria, yeast, mould growth medium, serial dilution technique, pure culture, mixed culture, slant culture, liquid broth culture, bacterial count by direct and indirect method, pour plate and streak-plate method of isolation, nitrogen fixation. Pasteurisation, sterilization, arnoldization, effect of temperature, Thermal inactivation of microbes; Concept, determination &amp; importance of TDT, lethal rate, F, Z &amp; D values.</p>	<b>15</b>

<b>Unit – 4</b>	<b>Disinfection &amp; disinfectants</b> Inhibition by chemical method using phenol, minerals, alcohol, halogen and dyes, inhibition of bacteria by using UV light desiccation, osmotic pressure, gaseous agent, fumigation and sanitization.	<b>08</b>
<b>Unit - 5</b>	<b>Microbiology of Food and hygiene concepts</b> Food borne diseases and its control, microbial group associated with different food (fish, meat, poultry & egg and their product, fruits & vegetable and products like jam, jelly, sauce, juice; cereal & cereal products like bread, biscuits, confectionary, milk and milk products).	<b>15</b>
	<b>Reference Books</b> <ol style="list-style-type: none"> <li>1. Microbiology / Pelczar &amp; Chang</li> <li>2. Food Microbiology / Fraizer &amp; Foster / Burgess Publisher</li> <li>3. Industrial Microbiology / Prescott &amp; Dunn</li> <li>4. Food Microbiology / M.R. Adams &amp; M.O. Moss / New age International</li> <li>5. Laboratory Manual of Food Microbiology / Fraizer &amp; Foster</li> <li>6. Microbiology / S.K. Purohit</li> <li>7. Bacteriology / S. J. Salle</li> <li>8. Practical Food Microbiology &amp; Technology / H. H. Weoser &amp; W. J. Mountney / AVI</li> </ol>	

Name of the Subject: <b>Chemistry of Food - I</b>															
Course Code: <b>FPT</b>		Semester: <b>Third</b>					Credits: <b>4C</b>								
Duration: <b>6 Semesters</b>		Maximum Marks: <b>100</b>					Subject Code: <b>FPT/T302</b>								
<b>Objective:</b>															
For a professional in the field of food processing, the fundamental knowledge of biochemistry comprising bio-molecules, bio-energetic, metabolism etc., as also of human nutrition, are required. Moreover a food technologist should have the knowledge of basic components of food, their characteristics and role in human nutrition. After successful completion of this subject the student will be able to understand the definition, nomenclature, classification, structure, properties and physiological functions of water, carbohydrates, proteins, lipids, vitamins and minerals.															
<b>Teaching Scheme</b>			<b>Examination Scheme</b>												
Theory	4 Hrs/Week		<b>End Semester Examination</b>												
Tutorial	Nil		<b>Internal Scheme</b>	<b>Group</b>	<b>Unit</b>	<b>Objective Questions</b> (Only MCQ/Fill in the Blanks/ True or False)				<b>Subjective Questions</b>					
<b>Total Contact Periods</b>	17 Weeks or <b>68 Hrs</b>					<b>30</b>	<b>A</b>	To Be Set	To be Answered	Marks Per Question	Total Marks	To Be Set	To be Answered	Marks Per Question	Total Marks
Class Test	Contact Periods	<b>3</b>	<b>65</b>	1	3			Any 20	One	1 x 20 = <b>20</b>	2	Any 5 at least 2 from each group	Ten	10 x 5 = <b>50</b>	
							2				6				2
							3				6				2
				<b>B</b>	4		6				2				
					5	4	2								
<b>Detail Contents</b>											<b>Total Periods</b>				
<b>Unit - 1</b>	<b>Water</b> Bound water, free water, colloid, gels, emulsions and foams. Water activity (Concepts, Methods for measuring). Distribution of water in various foods and moisture determination.										<b>04</b>				
<b>Unit - 2</b>	<b>Carbohydrates</b> Classification and structure of Carbohydrates: Sources of carbohydrates; Physico-chemical and functional properties; (reaction with phenyl hydrazine, NH <sub>2</sub> OH, oxidation, reduction, ring formation); Basic concepts of Starch, cellulose, Glycogen, Pectin, Agar-agar, Gum-Arabic; Reducing and non-reducing sugar: concept and their estimation. Basic idea about Gelatinization, Gel formation, Retrogradation, Crystallization, Caramelization, Maillard reaction.										<b>18</b>				
<b>Unit - 3</b>	<b>Proteins</b> Classification of amino acid, Sources and physico-chemical and functional properties of proteins; structure of protein; protein denaturation; Common food proteins. protein determination methods, Separation of amino acid by chromatographic method.										<b>18</b>				

<p><b>Unit - 4</b></p>	<p><b>Fats</b> Fatty acids- concepts, classification; essential fatty acids, cis and trans fats; physico chemical and functional properties; Defects (rancidity)and their prevention; Chemical constants of fats (acid value, per-oxide value, Saponification number, Iodine value, Reichert-Meissl number); Basic idea about plasticity, hydrogenation, winterization; fats estimation by solvent extraction method</p>	<p><b>15</b></p>
<p><b>Unit - 5</b></p>	<p><b>Vitamins &amp; Minerals</b> Minerals and Vitamins: Sources and physiological functions of minerals &amp; vitamins; deficiency disorder; Effect of processing and storage of vitamins, Pro vitamins A &amp; D; Vitamins as antioxidants.</p>	<p><b>10</b></p>
	<p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>1. Principles of Biochemistry / Albert L. Leninger / CBS Publishers &amp; Distributors, New Delhi</li> <li>2. Biochemistry Laboratory Techniques / Sterling Chaykin / Wiley Eastern Pvt. Ltd.</li> <li>3. Foods Facts &amp; Principles / N. Shakuntala Manay &amp; M. Shadaksharaswamy / New Age International</li> <li>4. Food Science / N.N. Potter</li> <li>5. Food Chemistry / L. H. Meyer</li> <li>6. Food Analysis &amp; Practice / Y. Pamaranz / AVI</li> <li>7. Text Book of Biochemistry / Webb, Todd, Mason</li> <li>8. Food Analysis / Pearson</li> <li>9. Food Science / B. Srilaxmi / New Age international</li> <li>10. Principles of Food Science / Karek &amp; L.M. Delker</li> <li>11. Food Analysis / Rangana</li> <li>12. Food Analysis / R. Lees / C.R.C Press Ltd.</li> <li>13. Food Science laboratory Manual, B, Srilakshmi/ Scitech</li> </ol>	

**Name of the Subject: Unit Operation of Chemical Engineering- I**

Course Code: <b>FPT</b>	Semester: <b>Third</b>	Credits: <b>4C</b>
Duration: <b>6 Semesters</b>	Maximum Marks: <b>100</b>	Subject Code: <b>FPT/T303</b>

**Objective:**

- To understand and effectively implement the scientific approach of food process parameters & their calculations.
- This course will provide the students the knowledge of the principles & equipment of the various mechanical operations, which include fluid and solid handling and their transportation and physical separation techniques. The knowledge of this subject will have great significance in chemical industries in regards to controlling the operation of the equipment and regulating the production of the plant.

Teaching Scheme			Examination Scheme										
Theory	4 Hrs/Week		Internal Scheme	End Semester Examination									
Tutorial	1 Hrs/ Week			Group	Unit	Objective Questions (Only MCQ/Fill in the Blanks/ True or False)				Subjective Questions			
<b>Total Contact Periods</b>	17 Weeks or <b>68 Hrs</b>					A	To Be Set	To be Answered	Marks Per Question	Total Marks	To Be Set	To be Answered	Marks Per Question
Class Test	Contact Periods	30	1	7	Any 20		One	1 x 20 = <b>20</b>	3	Any 5 at least 2 from each group	Ten	10 x 5 = <b>50</b>	
3	65		B	2					6				2
				3					6				2
				4		6			2				

Detail Contents		Total Periods
<b>Unit - 1</b>	<p><b>1.1 Property of Gas :</b> State variable, Boyle's Law, Charles's Law, Ideal Gas Equation, Universal Gas Constant (Dimensions and numerical value in different units), Dalton's law of Partial Pressure, Relation between partial pressure and mole fraction.</p> <p><b>1.2 Chemical Equilibrium:</b> Concepts, Reversible and Irreversible reaction with examples, Types, Characteristics, Rate of a reaction, Active mass, Law of mass action, Equilibrium Constants – Interrelationship (K<sub>p</sub>, K<sub>c</sub>, K<sub>x</sub>), Characteristics and Importance (No mathematical problems only mathematical expressions)</p> <p><b>1.3 Chemical kinetics</b> – reaction velocity, rate constant, molecularity, order of reaction, first order kinetics, example of second and third order reactions. (No problems)</p>	<b>17</b>
<b>Unit - 2</b>	<p><b>2.1 Thermodynamic Principles:</b> Thermodynamic system, Heat, Work, Energy, Internal Energy, 1<sup>st</sup> Law of Thermodynamics - Enthalpy or Heat Content, Heat Capacity, 2<sup>nd</sup> Law of Thermodynamics - Mathematical form of Carnot Cycle, Entropy, Free Energy Functions, Refrigeration – Concepts, Units, Coefficient of Performance, Common refrigerant used in practice. (No mathematical problems only mathematical expressions)</p> <p><b>2.2 Graphical Solution &amp; Psychrometry:</b> Use of log-log, semi log, Triangular Diagram, Psychrometric - Introduction, Terms, Relations, Chart, Processes</p> <p><b>2.3 Dimensional Analysis:</b> Concepts, Aims, Dimensional Homogeneity – Concepts, Applications,</p>	<b>16</b>



	Dimensionless numbers and their physical significance	
<b>Unit - 3</b>	<p><b>3.1 Size Reduction:</b> Reasons/Benefits of size reduction, forces used in size reduction, criteria of size reduction, equipment selection, mode of operation of size reduction (close circuit, open circuit grinding), Theory of comminution, Rittinger's law, Kick's law, Bond's law and their applications in calculation of energy required in grinding (No mathematical problems only mathematical expressions)</p> <p><b>3.2 Sieving:</b> Separation based on size, Effectiveness of screens, Types of screens, Factors affecting the sieving process.</p> <p><b>3.3 Material Handling:</b> Theory, classification of various material handling equipments-conveyors, elevators, trucks, cranes and hoists. Pneumatic conveying, conveyor belts, conveyance of food grain and powder in screw and vibratory conveyors..</p>	<b>16</b>
<b>Unit - 4</b>	<p><b>4.1 Mixing:</b> Mixing terminology (agitating, kneading, blending, and homogenizing). Mixing equipments - mixers for liquids of low or moderate viscosity (Paddle agitators, turbine agitators and propeller agitators), mixers for high viscosity pastes (Pan mixer, horizontal mixer, dough mixer, sigma mixer), mixers for dry solids (tumbler mixer and vertical screw mixer), (No mathematical problems only mathematical expressions)</p> <p><b>4.2 Filtration:</b> Filtration terminology (feed slurry, filtrate, filter medium, filter aids, filter cake and filter), filtration methods/equipments - pressure filtration, vacuum filtration, and centrifugal filtration. (No mathematical problems only mathematical expressions)</p> <p><b>4.3 Centrifugation:</b> sedimentation and sedimentation theory; solid-liquid separation, different types of centrifuges. (No mathematical problems only mathematical expressions)</p>	<b>16</b>
	<p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>1. Unit operations of Chemical Engineering, 4<sup>th</sup> ed. / McCabe and Smith / McGraw-Hill Book Co. Ltd., New York and Kogakusha Co. Ltd., Tokyo</li> <li>2. Introduction to Chemical Engineering / Badger &amp; Banchoff / McGraw-Hill Book Co. Ltd., New York and Kogakusha Co. Ltd., Tokyo</li> <li>3. Introduction to Chemical Engineering / Ghosal, Sanyal and Dutta / Tata McGraw Hill, New Delhi</li> <li>4. Chemical Engineering, Vol. 2 &amp; 5 / Coulson &amp; Richardson / Pergamon Press, Oxford</li> <li>5. Principles of Unit Operations, 2<sup>nd</sup> ed. / Foust &amp; others / John Wiley &amp; Sons Inc., London</li> <li>6. Physical Chemistry / P.C. Rakshit / Sarat Book House</li> </ol>	

**Name of the Subject: Process Instrumentation Fundamentals**

<b>Course Code: FPT</b>	<b>Semester: Third</b>	<b>Credits: 4C</b>
<b>Duration: 6 Semesters</b>	<b>Maximum Marks: 100</b>	<b>Subject Code: FPT/T304</b>

**Objective:**

Numbers of measuring devices are used in food processing to control of number of process variables like temperature, pressure, fluid flow etc. These factors affect the processing and ultimately affect the product quality. It is also necessary to study the principle of operation of process variable measuring devices so that they may be used either online or offline measurement. After taking of this course, the student will be able to know working principles of various process instruments in food processing operation.

Teaching Scheme			Examination Scheme										
Theory	4 Hrs/Week		Internal Scheme	End Semester Examination									
Tutorial	Nil			Group	Unit	Objective Questions (Only MCQ/Fill in the Blanks/ True or False)				Subjective Questions			
<b>Total Contact Periods</b>	17 Weeks or <b>68 Hrs</b>					A	To Be Set	To be Answered	Marks Per Question	Total Marks	To Be Set	To be Answered	Marks Per Question
	Class Test	Contact Periods	B	1	8		Any 20	One	1 x 20 = <b>20</b>	3	Any 5 at least 2 from each group	Ten	10 x 5 = <b>50</b>
	<b>3</b>	<b>65</b>		2	6	2				3			
				3	6	3				2			
				4	5	2							

Detail Contents		Total Periods
<b>Unit – 1</b>	<p><b>Pressure Measurement</b></p> <p>Functional Elements of an Instrument. Static characteristics of an Instrument: Calibration, Accuracy, Precision, Repeatability, Reproducibility, Sensitivity. Different Types of Pressure: Gauge Pressure, Absolute Pressure, Differential Pressure. Mechanical Transducer: C-type Bourdon Gauge for measurement of Pressure, Diaphragm, Bellows, Capsule. Electric Transducer for measurement of Pressure: LVDT, Capacitive Type Pressure Transducer, Piesoelectric Type Pressure Transducer. Low Pressure Measurement by Mcleod &amp; Pirini Gauge.</p>	<b>20</b>
<b>Unit – 2</b>	<p><b>Temperature Measurement</b></p> <p>Temperature Scale, IPTS-20, Temperature Resistance relation with deduction, measurement by Bi-metal thermometers, resistance thermometer, thermistor, thermocouples, thermopile, radiation &amp; optical pyrometer.</p>	<b>15</b>
<b>Unit – 3</b>	<p><b>Flow Measurement</b></p> <p>Measurement by hot wire ammeter flow measurement &amp; level under different parameters. &amp; magnetic flow meter, Visualization by shadow graph, Interferometer, level control.</p>	<b>15</b>

<p><b>Unit - 4</b></p>	<p><b>Thermal Conductivity Measurement</b>  Definition, Measurement of thermal conductivity of solid, liquid and gas, Definition under Different conditions of diffusivity, diffusivity of gas measurement.</p>	<p><b>15</b></p>
	<p><b>Reference Books</b></p> <ol style="list-style-type: none"> <li>1. Process Instrumentation &amp; Control, A.P. Kulkarni, Nirali Publication</li> <li>2. Industrial Instrumentation, K. Krishnamurthy, S Vijayachitra, KrishnaswamyNew Age International, 01-Jan-2005</li> <li>3. Fundamentals Of Industrial Instrumentation And Process Control, By Dunn,Tata McGraw-Hill Education</li> <li>4. Chemical Instrumentation and Process Control, By Mrs.P.D.Kulkarni, D.B.Dhone, Nirali Publications.</li> <li>5. Industrial Instrumentation &amp; Control by D-Patranaleis .</li> <li>6. Text book of industrial Instrumentation by S.K. Singh.</li> <li>7. Electronic Instrumentation by Kalsi.</li> <li>8. Text Book of Process Control by Nagrath Gopal.</li> </ol>	

**Name of the Subject: Food Microbiology Laboratory**

<b>Course Code: FPT</b>	<b>Semester: Third</b>	<b>Credits: 3C</b>
<b>Duration: 6 Semesters</b>	<b>Maximum Marks: 100</b>	<b>Subject Code: FPT/P305</b>

**Objective:**

- Food microbiology is the study of microorganisms that play major roles in food processing and preservation, general food quality, and may even occur naturally within certain food types. It is important to understand these microorganisms and their relation to the food industry in terms of food spoilage, food-borne illness, or food-related intoxication.
- Identify factors essential for the growth of microorganisms
- Relate the requirements for bacterial growth to the definition of “Potentially hazardous food”

<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Practical	5 Hrs/Week	<b>Internal Scheme</b>	<b>External Scheme</b>
Tutorial	Nil	Continuous Internal Assessment of <b>50 marks</b> is to be carried out by the teachers throughout the Second Year First Semester. Distribution of marks: Performance of Job – 35, Notebook – 15.	External Assessment of <b>50 marks</b> shall be held at the end of the Second Year First Semester on the entire syllabus. One job per student from any one of the jobs done is to be performed. Job is to be set by lottery system. Distribution of marks: On Spot Job – 25, Viva-voce – 25.
<b>Total Periods</b>	13 Weeks or <b>65 Hrs</b>		

<b>Sl.No.</b>	<b>Detail Contents</b>
<b>1.</b>	Study of microscope.
<b>2.</b>	Staining (simple and gram) of bacteria and morphological study.
<b>3.</b>	Spore staining of bacteria.
<b>4.</b>	Staining of molds & yeast and morphological study
<b>5.</b>	To prepare nutrient broth and media with agar,.
<b>6.</b>	Culture media preparation for molds & yeast.
<b>7.</b>	Dilution and Plating by spread –plate and pour –plate techniques.
<b>8.</b>	Bacterial count with the help of Haemocytometer

Name of the Subject: <b>Chemistry of Food – I Laboratory</b>			
<b>Course Code: FPT</b>		<b>Semester: Third</b>	
<b>Duration: 6 Semesters</b>		<b>Maximum Marks: 100</b>	
		<b>Credits: 3C</b>	
		<b>Subject Code: FPT/P306</b>	
<b>Objective:</b>			
<ul style="list-style-type: none"> <li>➤ To know the amount of moisture present in food sample that is important for microbial growth.</li> <li>➤ To know the food value of food materials.</li> <li>➤ To know the types of defect occurred in edible oils.</li> <li>➤ To know which type of microorganisms can grow in food materials.</li> </ul>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Practical	5 Hrs/Week	<b>Internal Scheme</b>	<b>External Scheme</b>
Tutorial	Nil	Continuous Internal Assessment of <b>50 marks</b> is to be carried out by the teachers throughout the Second Year First Semester. Distribution of marks: Performance of Job – 35, Notebook – 15.	External Assessment of <b>50 marks</b> shall be held at the end of the Second Year First Semester on the entire syllabus. One job per student from any one of the jobs done is to be performed. Job is to be set by lottery system. Distribution of marks: On Spot Job – 25, Viva-voce – 25.
<b>Total Contact Periods</b>	13 Weeks or <b>65 Hrs</b>		
<b>Sl.No.</b>	<b>Detail Contents</b>		
<b>1</b>	Determination of Moisture in food sample.		
<b>2</b>	Determination of Protein in food sample		
<b>3</b>	Determination of Acidity and pH in food sample		
<b>4</b>	Determination of non-reducing and reducing sugars		
<b>5</b>	Estimation of crude fat in a food sample		
<b>6</b>	Determination of acid value in fats or oils sample.		
<b>7</b>	Determination of per-oxide value in fats or oils sample.		
<b>8</b>	Determination of iodine value value in fats or oils sample.		
<b>9</b>	Determination of saponification value in fats or oils sample.		
<b>10</b>	Determination of Ash (acid soluble and insoluble fraction) content in food sample		

Name of the Subject: <b>Unit Operation of Chemical Engineering - I Laboratory</b>			
Course Code: <b>FPT</b>		Semester: <b>Third</b>	
Credits: <b>2 C</b>		Duration: <b>6 Semesters</b>	
Maximum Marks: <b>50</b>		Subject Code: <b>FPT/P307</b>	
<b>Objective:</b>			
To know the application, principle and handling of machinery in food processing industries.			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Practical	3 Hrs/Week	<b>Internal Scheme</b>	<b>External Scheme</b>
Tutorial	Nil	Continuous Internal Assessment of <b>25 marks</b> is to be carried out by the teachers throughout the Second Year First Semester. Distribution of marks: Performance of Job – 15, Notebook – 10.	External Assessment of <b>25 marks</b> shall be held at the end of the Second Year First Semester on the entire syllabus. One job per student from any one of the jobs done is to be performed. Job is to be set by lottery system. Distribution of marks: On Spot Job – 15, Viva-voce – 10.
<b>Total Periods</b>	13 Weeks or <b>39 Hrs</b>		
<b>Sl.No.</b>	<b>Detail Contents</b>		
<b>1.</b>	To determine crushing efficiency of Jaw crusher		
<b>2.</b>	To study the screen analysis and determine average particle size of solid particles in a ROTAP type sieve shaker.		
<b>3.</b>	To study the grinding characteristics of a Ball Mill and determine its critical speed.		
<b>4.</b>	To study the solid-liquid mixing characteristics in sigma mixer		
<b>5.</b>	To determine the screen characteristics in a vibratory screen		
<b>6.</b>	To study the filtration characteristics in a vacuum filtration apparatus		
<b>7.</b>	To study the filtration characteristics of a slurry in a filter press		
<b>8.</b>	To study the solid-liquid separation characteristics in a centrifuge		

Name of the Subject: <b>Professional Practice - I</b>		
Course Code: <b>FPT</b>	Semester: <b>Third</b>	Credits: <b>1C</b>
Duration: <b>6 Semesters</b>	Maximum Marks: <b>50</b>	Subject Code: <b>FPT/P308</b>
<b>Objective:</b>		
<ul style="list-style-type: none"> <li>➤ To develop an emerging field at the intersection of multi-disciplinary understandings of culture and education.</li> <li>➤ To encourage and financially support the participation of diploma students</li> <li>➤ To actively involve practitioners and users from each venue</li> <li>➤ To use the seminars to develop links between academics and stakeholders in the arts, library, media, community and educational sectors</li> </ul>		
<b>Teaching Scheme</b>		<b>Examination Scheme</b>
Term Work	2 Hrs/Week	<b>Term Work (Internal Scheme)</b>
Tutorial	Nil	
<b>Total Contact Periods</b>	15 Weeks or <b>30 Hrs</b>	
Continuous Internal Assessment of <b>50 marks</b> is to be carried out by the teachers throughout the Second Year First Semester. Distribution of marks: Performance of Job – 35, Assignments – 15.		
<b>Sl.No.</b>	<b>Detail Contents</b>	
<b>1.</b>	To provide opportunity for students to present the seminar on general topic related to course content in front of a technical gathering with the help of different oral, aural and visual communication aids which they learnt through different courses in the Parts – I of the diploma course. In the Seminar, students are not only expected to present their seminar on general topic, but also to defend the same while answering questions arising out of their presentation.	