

Name of the Subject: Chemistry of Food - II													
Course Code: FPT			Semester: Fourth					Credits: 3C					
Duration: 6 Semesters			Maximum Marks: 100					Subject Code: FPT/T401					
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	3Hrs/Week		End Semester Examination										
Tutorial	Nil		Internal Scheme	Group	Unit	Objective Questions (Only MCQ/Fill in the Blanks/ True or False)				Subjective Questions			
Total Contact Periods	17 Weeks or 51 Hrs					30	A	To Be Set	To be Answered	Marks Per Question	Total Marks	To Be Set	To be Answered
Class Test	Contact Periods	3	48	1	3			Any 20	One	1 x 20 = 20	2	Any 5 at least 2 from each group	Ten
				2	6				2				
				3	6				2				
				4	6				2				
				5	4			2					
Detail Contents											Total Periods		
Unit – 1	Enzymes Concepts, Classification, Physico-chemical nature, Mechanism of enzyme action, Enzyme kinetics (MME and their transformations), Factors affecting enzyme activity, Enzyme inhibition, Enzyme specificity, Co-factors, Basic concepts on lysozymes & Isozymes , Enzyme unit, Turn over number, Allosteric enzyme.										12		
Unit – 2	Carbohydrates metabolism Metabolic pathways for breakdown of carbohydrates: Glycolytic pathway, Pentose phosphate pathway, Citric acid cycle, Electron transport chain, ATP balance, Gluconeogenesis;										10		
Unit – 3	Lipids metabolism Utilization of fats, biosynthesis of fatty acids and fats; Digestion & absorption of lipids; Ketone bodies										8		
Unit - 4	Proteins metabolism Metabolism of proteins (digestion and absorption); Nitrogen balance and nitrogen pool; Evaluation of quality of proteins , Urea cycle										10		

<p>Unit - 5</p>	<p>Food Additives</p> <p>Basic concepts, general principles for the application. Examples & role play in food processing – Preservatives, Antioxidants, Emulsifiers, Stabilizers (Thickeners), Sequestering and buffering agents, Bleaching and maturing agents, Food colours, Nutrient supplements, Non-nutritive and special dietary sweeteners, Anti-caking agents, Foaming and anti-foaming agents, Leavening agents, Firming agents, Humectants and texturisers, Clarifying agents. Food Pigments & Flavouring Agents: Importance, types and sources of pigments - their changes during processing and storages.</p>	<p>8</p>
	<p>Reference Books</p> <ol style="list-style-type: none"> 1. Principles of Biochemistry / Albert L. Leninger / CBS Publishers & Distributors, New Delhi 2. Biochemistry Laboratory Techniques / Sterling Chaykin / Wiley Eastern Pvt. Ltd. 3. Foods Facts & Principles / N. Shakuntala Manay & M. Shadaksharaswamy / New Age International 4. Food Science / N.N. Potter 5. Food Chemistry / L. H. Meyer 6. Food Analysis & Practice / Y. Pamaranz / AVI 7. Text Book of Biochemistry / Webb, Todd, Mason 8. Food Analysis / Pearson 9. Food Science / B. Srilaxmi / New Age international 10. Principles of Food Science / Karek & L.M. Delker 11. Food Analysis / Rangana Food Analysis / R. Lees / C.R.C Press Ltd. 	

Name of the Subject: Unit Operation of Chemical Engineering - II

Course Code: FPT	Semester: Fourth	Credits: 4C
Duration: 6 Semesters	Maximum Marks: 100	Subject Code: FPT/T402

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			
Total Contact Periods	17 Weeks or 68 Hrs					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	Any 20		One	1 x 20 = 20	3	Any 5 at least 2 from each group	Ten	10 x 5 = 50	
	3	65		2		6			3				
			3	6		2							
			4	6		2							

Detail Contents		Total Periods
Unit – 1	<p>Heat Transfer</p> <p>Mode of heat transfer process, Conduction – Fourier’s Law (Features & Assumptions), Basic concepts of Thermal Conductivity, Thermal Resistance and Thermal Conductance, Convection – Concept of free convection and forced convection, Newton’s Law of Cooling, Heat Exchangers – Basic concept and different heat exchanger equipment (Classification, Flow arrangement, Mode of operations) Concept of LMTD, Defects and their control, Radiation – Concepts of Total Emissive Power, Emissivity, Absorptivity, Reflectivity, Transmissivity, Black Body, Opaque Body, White Body and Gray Body, Stefan-Boltzmann Law. (No mathematical problems required only mathematical derivation.)</p>	18
Unit – 2	<p>Mass Transfer</p> <p>Introduction, Basic concepts of Concentrations, Velocities and Fluxes, Mode of Mass Transfer – By Diffusion, By Convection, By Change of Phase, Molecular Diffusion – Fick’s Law, Solids, Liquids and Gases, Diffusion coefficients for Solids, Liquids and Gases, Concept of convective mass transfer coefficient. (No mathematical problems required only mathematical derivation.)</p> <p>Distillation –Introduction to distillation tower, boiling point diagram, concept of flux ratio, azeotrope, flash distillation (no problem required)</p> <p>Theory of absorption – elementary principles of absorption, equipment, packed column, packing material. (no problem required)</p> <p>Fundamental theory of solid –liquid – liquid extraction, types of equipments. Principles of crystallization, equipment (no problem required)</p>	18

<p>Unit – 3</p>	<p>Energy Balance & Material Balance</p> <p>Energy Balance - Concept, Steps involved in calculation of energy balance, energy associated with flow and non-flow process, Heat of Reaction at constant pressure and constant volume, Thermochemistry – Heat of reaction, formation, and combustion (simple problems)</p> <p>Material Balance - Concept, Steps involved in calculation of material balance with or without chemical reaction. (Only simple problem)</p>	<p>11</p>
<p>Unit - 4</p>	<p>Pump: Concepts Classification, Head Developed by the Pump, NPSH, Defects and their preventions, Industrial applications (No mathematical problems only mathematical expressions)</p> <p>Fluid Mechanics</p> <p>Fluids: Basic concepts, Classification, Properties [Density (mass density, weight density, specific volume), Specific Gravity, Viscosity (dynamic & kinematic), Vapour Pressure(Roult law), Surface Tension (cohesion & adhesion), Types of Fluid Flow, Continuity Equation (path line, stream line, stream tube and streak line), Laminar Flow – Concepts, Examples, Characteristics, Concept of Hagen-Poiseuilli Equation (No derivation), Turbulent Flow – Concepts, Examples, Characteristics, Concept of Fanning’s Equation(No derivation), Fluid Dynamics – Basic concepts, Derivation Bernoulli’s Equation and its assumptions. (No mathematical problems required only mathematical derivation.)</p>	<p>18</p>
	<p>Reference Books</p> <ol style="list-style-type: none"> 1. Unit operations of Chemical Engineering, 4th ed. / McCabe and Smith / McGraw-Hill Book Co. Ltd., New York and Kogakusha Co. Ltd., Tokyo 2. Introduction to Chemical Engineering / Badger & Banchero / McGraw-Hill Book Co. Ltd., New York and Kogakusha Co. Ltd., Tokyo 3. Introduction to Chemical Engineering / Ghosal, Sanyal and Dutta / Tata McGraw Hill, New Delhi 4. Chemical Engineering, Vol. 2 & 5 / Coulson & Richardson / Pergamon Press, Oxford 5. Principles of Unit Operations, 2nd ed. / Foust & others / John Wiley & Sons Inc., London 	

Name of the Subject: Food Preservation Technology

Course Code: FPT	Semester: Fourth	Credits: 4C
Duration: 6 Semesters	Maximum Marks: 100	Subject Code: FPT/T403

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			
Total Contact Periods	17 Weeks or 68 Hrs					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		1	3		Any 20	One	1 x 20 = 20	2	Any 5 at least 2 from each group	Ten	10 x 5 = 50
3	65	30		2	6	2							
				3	6	2							
			B	4	6	2							
				5	4	2							

Detail Contents		Total Periods
Unit – 1	<p>Canning</p> <p>General Canning technique</p> <p>Can lacquer, can filling solution, Can construction, mechanical defects</p> <p>Effect of temperature, pH, altitude on canning of various food</p> <p>Evaluation of process time by graphical (Bigelow method) and formula method</p> <p>Can defects, aseptic canning</p>	18
Unit – 2	<p>Drying</p> <p>Concept of drying, drying kinetics (no problem required)</p> <p>Different type of driers – solar, tray, spray, fluidised bed drying, tunnel drier, drum drier (working principles with schematic diagram only)</p> <p>Concept of critical moisture, equilibrium moisture content</p> <p>Concept of evaporation and evaporation equipments</p> <p>Concept osmotic dehydration, IMF food.</p>	14
Unit – 3	<p>Refrigeration and Freeze Drying</p> <p>Different phases of freeze drying, Time-temperature relation</p> <p>Quality aspect of freeze dried food product,</p> <p>Types of refrigerant & use</p> <p>Types of freezer – plate, blast, vacuum, immersion, cryogenic freezing (principles, schematic diagram & use only)</p> <p>Working principles of refrigerated van, wagon and cold storage and their use</p>	14

<p>Unit - 4</p>	<p>Preservation by Fermentation Introduction to fermentation (general view) Different fermented food (name, source & use) Factors effecting fermentation Curing and pickling; Hurdle technology.</p>	<p>10</p>
<p>Unit - 5</p>	<p>Irradiation Principles, measurement unit, Effect of irradiation on food product Different food product Use of preservative in foods Chemical preservative, bio-preservative CA Storage and MAP Basic principle of CA MA storage of fruits and vegetables</p>	<p>09</p>
	<p>Reference Books</p> <ol style="list-style-type: none"> 1. Food Process Engineering / D.R. Heldman & R.P. Singh / AVI 2. Food Processing and Preservation / G. Subbulakshmi & S.A. Uddipi / New Age International 3. Elements of Food Engineering / J.C. Harper / AVI 4. The Technology of Food preservation / N.W Desrosier / AVI 5. Laboratory manual for Food Canners & Processors 2 vols. / NCA / AVI 6. Principles of Food Science Vol 2 / Karek & Luno Marcel Delker 7. Food Science & Technology / Magnus Pyke / John Murray, London 8. Food Science / B. Srilaxmi / New Age International 9. Foods Facts and Principles / N. Shakuntala Manay & M. Shadaksharaswamy / New age International 10. Fundamentals of Food Engineering / S.E Charm / AVI 11. Processing of Fruits & Vegetables / Giridharilal & Siddappa / ICAR 12. Fundamentals of Food Processing Operations / J.L. Heid & M.A Joslyn / AVI 	

Name of the Subject: Microbial Technology													
Course Code: FPT			Semester: Fourth					Credits: 4C					
Duration: 6 Semesters			Maximum Marks: 100					Subject Code: FPT/T404					
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		End Semester Examination										
Tutorial	Nil		Internal Scheme	Group	Unit	Objective Questions (Only MCQ/Fill in the Blanks/ True or False)				Subjective Questions			
Total Contact Periods	17 Weeks or 68 Hrs					30	A	To Be Set	To be Answered	Marks Per Question	Total Marks	To Be Set	To be Answered
Class Test	Contact Periods	3	65	1	3			Any 20	One	1 x 20 = 20	2	Any 5 at least 2 from each group	Ten
3	65			2	6		2						
				3	6		2						
		4	6	3									
		5	4	1									
Detail Contents											Total Periods		
Unit – 1	Fermentative production , purification & storage of biomass Different micro organisms and their uses in food fermentation, propagation of micro organisms in food (different propagation processes), Baker’s yeast production, Mushroom Cultivation										10		
Unit – 2	Fermentative production & purification of alcoholic beverages Technology of production and purification of ethyl alcohol, non-distilled beverage (beer, wine), distilled beverage (whisky, rum, champagne)										12		
Unit – 3	Fermentative production & purification of organic acids Biochemical properties of lactic acid bacteria, bacterial activities (only brief discussion), industrial production of lactic acid (process flow and implied conditions). Production and purification of acetic acid and Vinegar (only process flow and implied conditions), production and isolation of citric acid.										14		
Unit - 4	Fermentative production of saccharifying agents, vitamins & antibiotics Saccharifying Agents- Production, isolation & use of different saccharifying agents (amylase, pectinase, etc.), principles behind enzyme immobilization and its application. Vitamins- Production of vitamin B ₂ & B ₁₂ (brief discussion). Antibiotics- Production, isolation & use of penicillin, streptomycin, neomycin use & activities of antifungal antibiotics (brief discussion)										19		
Unit - 5	Solid state fermentation Technique Basic principle of solid state fermentation process, Production and isolation of amyloglucosidase by solid state fermentation process.(brief discussion).										10		

Reference Books

1. Microbiology / Pelczar & Chang
2. Industrial Microbiology / Prescott & Dunn
3. Fundamentals of biotechnology / P. Prave, W. Sitting, D.A. Sukatsch / VCH Pub
4. Food Biotechnology / Roger Arnold, Gordon Beech, John Taggart / Cambridge Univ. Press
5. Fermentation Biotechnology / Owen P. Ward / Open Univ. Press
6. Biotechnology - Food Fermentation (Vol. I & II), By V.K. Joshi and Ashok Pandey, Educational Publishers & Distributors, 1999
7. Fermentation and Food Safety, Martin Adams, M.J.R. Nout, Springer, 28-Feb-2001
8. Microbial Technology: Fermentation technology, Henry J. Peppler, Academic Press, 1979

Name of the Subject: Chemistry of Food – II Laboratory

Course Code: FPT	Semester: Fourth	Credits: 2C
Duration: 6 Semesters	Maximum Marks: 100	Subject Code: FPT/P405

Objective:

- To know the minerals and vitamins content in food materials.
- To know the amount of colouring agents present in food materials.
- To know the enzyme activity with respect to the different factors.

Teaching Scheme		Examination Scheme	
Practical	4 Hrs/Week	Internal Scheme	External Scheme
Tutorial	Nil	Continuous Internal Assessment of 50 marks 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 50 marks 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.
Total Contact Periods	15 Weeks or 60 Hrs		

Sl.No.	Detail Contents
1	Separation of amino acids by Chromatographic method (paper, thin layer, liquid column chromatography)
2	Determination of ascorbic acid, thiamine, riboflavin in food sample
3	Estimation of sodium, calcium, iron in food products
4	Estimation of Zinc, copper, lead, mercury, arsenic in food sample
5	Assay of Phosphatase and potato amylase activity
6	Determination of carotenoids and chlorophyll content in food sample

Name of the Subject: Food Preservation Technology Laboratory

Course Code: FPT	Semester: Fourth	Credits: 2C
Duration: 6 Semesters	Maximum Marks: 100	Subject Code: FPT/P406

Objective:

It provides an extensive introduction into the needs and mechanisms of preservation. This work provides the effects of physical and chemical changes, enzymatic activity on preservation, (integrated) preservation methods and hurdle technology, input of microbiological parameters and the organisms' distribution and state, preservation process, heat treatment and inactivation parameters, sterilization and pasteurization. Non-thermal inactivation process, the effects of product environment and development, and consumer behaviour and expectations are also elaborated upon, apply preservation principles in product design, calculate the efficacy of a heat process and interpret its key parameters (i.e. D-, z- , and F0 - values), enhance the effectiveness of preservation methods and the efficiency of production.

Teaching Scheme		Examination Scheme	
Practical	4 Hrs/Week	Internal Scheme	External Scheme
Tutorial	Nil	Continuous Internal Assessment of 50 marks 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 50 marks 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.
Total Contact Periods	15 Weeks or 60 Hrs		

Sl.No.	Detail Contents
1.	Development and study of frozen food.
2.	Development and study canned food.
3.	Development and study fermented food.
4.	Preparation of drying curve and study of dried food product.
5.	Study of freeze drying and preparation of freeze dried product.
6.	Study of spray drying process

Name of the Subject: Unit Operation of Chemical Engineering - II Laboratory			
Course Code: FPT		Semester: Fourth	
Credits: 2 C		Duration: 6 Semesters	
Maximum Marks: 50		Subject Code: FPT/P407	
Objective:			
To know the application, principle and handling of machinery in food processing industries.			
Teaching Scheme		Examination Scheme	
Practical	3 Hrs/Week	Internal Scheme	External Scheme
Tutorial	Nil	Continuous Internal Assessment of 25 marks 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 25 marks 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.
Total Periods	15 Weeks or 45 Hrs		
Sl.No.	Detail Contents		
1.	To calibrate orifice meter and to find out the orifice coefficient.		
2.	To calibrate rotameter and to determine flow of fluid through rotameter.		
3.	To determine the flow of fluid through venturimeter.		
4.	To determine the efficiency of centrifugal pump		
5.	Experiments on Reynolds's Apparatus –Determination of flow regime and construction of friction factor against NR_E .		
6.	To Determine the Overall heat transfer coefficient of a shell and tube heat exchanger		
7.	To determine friction loss due to pipe fittings.		

Name of the Subject: Microbial Technology Laboratory

Course Code: FPT	Semester: Fourth	Credits: 2C
Duration: 6 Semesters	Maximum Marks: 100	Subject Code: FPT/P408

Objective:

- Identity, characteristics, and sources of microorganisms in food fermentations.
- Metabolic activities of microorganisms and their influence on product attributes.
- Interactions between microorganisms.
- Processing of fermented foods.
- Growth, maintenance, and preservation of microbial starter cultures

Teaching Scheme		Examination Scheme	
Practical	3Hrs/Week	Internal Scheme	External Scheme
Tutorial	Nil	Continuous Internal Assessment of 50 marks 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 50 marks 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.
Total Contact Periods	15 Weeks or 45 Hrs		

Sl.No.	Detail Contents
1.	Fermentative production of alcohol.
2.	Preparation of Baker's Yeast.
3.	Fermentative production of Citric acid.
4.	Production of fungal amylase.
5.	Production of amyloglucosidase by solid state fermentation
6.	Production and assay of antibiotics

Name of the Subject: Professional Practice - II		
Course Code: FPT	Semester: Fourth	Credits: 1C
Duration: 6 Semesters	Maximum Marks: 50	Subject Code: FPT/P409
<p>Objective:</p> <ul style="list-style-type: none"> ➤ Synthesize knowledge from various areas of learning. ➤ Critically and creatively apply knowledge to real life situations ➤ Enhance students' knowledge ➤ Enable students to acquire skills of collaboration, communication & independent learning ➤ Prepare students for lifelong learning and challenges in the future 		
Teaching Scheme		Examination Scheme
Term Work	2 Hrs/Week	<p align="center">Term Work (Internal Scheme)</p> <p>Continuous Internal Assessment of 50 marks is to be carried out by the teachers throughout the Second Year First Semester. Distribution of marks: Performance of Job – 35, Assignments – 15.</p>
Tutorial	Nil	
Total Contact Periods	15 Weeks or 30 Hrs	
Sl.No.	Detail Contents	
1.	<p>To provide opportunity for students to present the proposed Project Work 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 proposed Project Work, but also to defend the same while answering questions arising out of their presentation.</p>	

Name of the Subject: Development of Life Skill - II

Course Code: FPT	Semester: Fourth	Credits: 1 C
Duration: 6 Semesters	Maximum Marks: 50	Subject Code: FPT/P410

Objective:

- Develop Positive Attitudes
- Develop Effective Communication Skills
- How to Relate to Your Instructors
- Learn How to Think and Make Correct Decisions
- Develop Organizational Skills
- Develop Goal Setting/Time Management Skills
- Learn How to Improvise in Pressed Situations
- Complete Applications, etc.
- Develop Positive Work Ethics
- Learn How To Be Motivated To Reach Their Goals
- Be a Positive Influence in Their Community Good Citizens and Leaders, and more..

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/Week	Internal Scheme	External Scheme
Tutorial	Nil	Continuous Internal Assessment of 25 marks 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 25 marks 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.
Total Periods	15 Weeks or 30 Hrs		

Sl.No.	Detail Contents
1.	Identifying Sources — Skimming Newspapers for Information
2.	Preparing for an interview
3.	Responding Appropriately
4.	Group Discussions
5.	Language Interaction
6.	Mock interviews are to be arranged and to be conducted by any suitable person.
7.	Communicating using the electronic devices