Diploma

in

Food Processing Technology (FPT)

Curriculum Structure

(III to VI Semester)

Semester III

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-1	FPPC-301	Food Microbiology	3	0	0	3	3
2	Programme core course-2	FPPC-302	Food Biochemistry	3	0	0	3	3
3	Programme core course-3	FPPC-303	Mechanical Operation	3	0	0	3	3
4	Programme core course-4	FPPC-304	Process Instrumentation and Control	2	0	0	2	2
5	Programme core course-5	FPPC-305	Food Engineering Drawing	0	0	3	3	1.5
6	Programme core course-6	FPPC-306	Food Microbiology Lab	0	0	3	3	1.5
7	Programme core course-7	FPPC-307	Food Biochemistry Lab	0	0	3	3	1.5
8	Programme core course-8	FPPC-308	Mechanical Operation Lab	0	0	3	3	1.5
9	Programme core course-9	FPPC-309	Process Instrumentation and Control Lab	0	0	2	2	1
10	Summer Internship-I (4 weeks) after Semester-II	FPSI-310	Summer Internship-I	0	0	0	0	2
Total				**11**	**0**	**14**	**25**	**20**

Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/ Week	Credit
				L	T	P		
1	Programme core course-10	FPPC-401	Microbial Technology	2	0	0	2	2
2	Programme core course-11	FPPC-402	Chemical Engineering Operation	3	0	0	3	3
3	Programme core course-12	FPPC-403	Food Preservation Technology	3	0	0	3	3
4	Programme core course-13	FPPC-404	Microbial Technology Lab	0	0	2	2	1
5	Programme core course-14	FPPC-405	Chemical Engineering Operation Lab	0	0	3	3	1.5
6	Programme core course-15	FPPC-406	Food Preservation Technology Lab	0	0	3	3	1.5
7	Programme elective course-1 (**Any one to be opted**)	FPPE-407/A	Bakery and Confectionary Technology	2	1	0	3	3
		FPPE-407/B	Fruit and Vegetable Processing Technology					
		FPPE-407/C	Food Toxicology and Allergy					
8	Humanities & Social Science-4	HS-408	Professional Skill Development	2	1	0	3	3
9	Minor Project	FPPR-409	Minor Project	0	0	4	4	2
10	Mandatory Course-1	AU-410	Essence of Indian Knowledge and Tradition	2	0	0	2	0
Total				**14**	**2**	**12**	**28**	**20**

Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/ Week	Credit
				L	T	P		
1	Programme core course-16	FPPC-501	Technology of Food-I	3	0	0	3	3
2	Programme core course-17	FPPC-502	Technology of Food-II	3	0	0	3	3
3	Programme core course-18	FPPC-503	Applied Nutrition	2	0	0	2	2
4	Programme core course-19	FPPC-504	Food Processing Lab	0	0	3	3	1.5
5	Programme core course-20	FPPC-505	Food Analysis Lab	0	0	3	3	1.5
6	Programme elective course-2 (**Any one to be opted**)	FPPE-506/A	Food Industries Waste Management	2	0	0	2	2
		FPPE-506/B	Food Safety Management Systems					
7	Programme elective course-3 (**Any one to be opted**)	FPPE-507/A	Food Process Equipment Design	2	0	0	2	2
		FPPE-507/B	Emerging Technologies in Food Processing					
8	Open elective course-1	(**Any one to be opted from Annexure-I**)		3	0	0	3	3
9	Summer Internship-II (6 weeks) after Semester IV	FPSI-509	Summer Internship-II	0	0	0	0	2
10	Major Project	FPPR-510	Major Project	0	0	4	4	2
Total				**15**	**0**	**10**	**25**	**22**

Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/ Week	Credit
				L	T	P		
1	Programme core course-21	FPPC-601	Food Packaging Technology	2	1	0	3	3
2	Programme core course-22	FPPC-602	Food Safety and Quality Control	3	0	0	3	3
3	Programme elective course-4	FPPE-603/A	Fermentation Technology	2	0	0	2	2
		FPPE-603/B	Food Extrusion Technology					
		FPPE-603/C	Food additives and Preservatives					
4	Humanities and Social Science course	HS-604	Entrepreneurship and Start-up's	3	1	0	4	4
5	Open elective course-2	(**Any one to be opted from Annexure-II**)		4	0	0	4	4
6	Mandatory Course-2	AU-606	Indian Constitution	2	0	0	2	0
7	Major Project	FPPR-607	Major Project	0	0	6	6	3
8	Seminar	FPSE-608	Seminar	2	0	0	2	1
Total				**18**	**2**	**6**	**26**	**20**

Food Processing Technology (FPT) Syllabus

Semester III

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/ Week	Credit
				L	T	P		
1	Programme core course-1	FPPC-301	Food Microbiology	3	0	0	3	3
2	Programme core course-2	FPPC-302	Food Biochemistry	3	0	0	3	3
3	Programme core course-3	FPPC-303	Mechanical Operation	3	0	0	3	3
4	Programme core course-4	FPPC-304	Process Instrumentation and Control	2	0	0	2	2
5	Programme core course-5	FPPC-305	Food Engineering Drawing	0	0	3	3	1.5
6	Programme core course-6	FPPC-306	Food Microbiology Lab	0	0	3	3	1.5
7	Programme core course-7	FPPC-307	Food Biochemistry Lab	0	0	3	3	1.5
8	Programme core course-8	FPPC-308	Mechanical Operation Lab	0	0	3	3	1.5
9	Programme core course-9	FPPC-309	Process Instrumentation and Control Lab	0	0	2	2	1
10	Summer Internship-I (4 weeks) after IInd Semester	FPSI-310	Summer Internship-I	0	0	0	0	2
Total				**11**	**0**	**14**	**25**	**20**

FOOD MICROBIOLOGY

Course Code	FPPC-301
Course Title	Food Microbiology
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	High School level Biology
Course Category	PC

Course Outcomes:-

1. Discuss the fundamentals of Microscope and staining. (K2)
2. Illustrate the fundamentals of Bacterial kingdom and morphology of other microbes. (K3)
3. Illustrate the details of culture media. (K3)
4. Describe / Explain the methods of disinfection and details of disinfectants (K2).
5. Understand / Discuss / describe the Microbiology of food and hygiene concepts (K2).

Course Content:-

Module - 1:

Number of class hours: 8

Suggestive Learning Outcomes:

1. Students will be able to describe microscope.
2. Students will be able to discuss about staining technique.

Detailed content of the unit:

Study of Microscope
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. Staining Technique 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.

Module - 2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to illustrate the fundamentals of bacterial kingdom.
2. Students will know about morphology of other microbes.

Detailed content of the unit:

Bacterial Kingdom
Classification with examples, morphology study (size, shape, arrangement, flagella, capsule, cell wall, cell membrane, nucleus), bacterial growth & nutrition, sporulation process, bacteriophage.

Morphology of other Microbes
Classification of fungi, morphology of yeast, moulds, algae, budding of yeast, Structure of hyphae, industrial importance of yeast, moulds and algae

Module - 3:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to classify micro organisms.
2. Students will be able to illustrate the various culture techniques.

Detailed content of the unit:

Culture Media
Classification & 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.

Module - 4:

Number of class hours: 6

Suggestive Learning Outcomes:

1. Students will be able to describe the methods of disinfection.
2. Students will be able to discuss about various disinfectants.

Detailed content of the unit:

Disinfection & disinfectants
Pasteurisation, sterilization, arnoldization, effect of temperature, Thermal inactivation of microbes; Concept, determination & importance of TDT, lethal rate, F, Z & D values.
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.

Module - 5:

Number of class hours: 8

Suggestive Learning Outcomes:

1. Students will know about food born diseases and its control.
2. Students will know about microbial groups associated with different food products.

Detailed content of the unit:

Microbiology of Food and hygiene concepts

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).

References: -

1. Microbiology / Pelczar& Chang
2. Food Microbiology / Fraizer& Foster / Burgess Publisher
3. Industrial Microbiology / Prescott & Dunn
4. Food Microbiology / M.R. Adams & M.O. Moss / New age International
5. Laboratory Manual of Food Microbiology / Fraizer& Foster
6. Microbiology / S.K. Purohit
7. Bacteriology / S. J. Salle
8. Practical Food Microbiology & Technology / H. H. Weoser& W. J. Mountney / AVI

FOOD BIOCHEMISTRY

Course Code	FPPC-302
Course Title	Food Biochemistry
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	High school level Chemistry
Course Category	PC

Course Outcomes:-

1. Understand the role of water in biological system. (K2)
2. Illustrate the fundamentals of carbohydrates. (K3)
3. Acquire the details of protein. (K3)
4. Discuss the fundamentals of fats. (K2)
5. Describe the basics of vitamins and minerals. (K2)

Course Content:

Module - 1:

Number of class hours: 04

Suggestive Learning Outcomes:

1. Students will know about types of water.
2. Students will be able to describe about distribution of water in different foods.

Detailed content of the unit:

Water

Bound water, free water, colloid, gels, emulsions and foams. Water activity (Concepts, Methods for measuring). Distribution of water in various foods and moisture determination.

Module - 2:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will know about classification and structure of carbohydrate.
2. Students will be able to discuss the properties of carbohydrate.

Detailed content of the unit:

Carbohydrates

Classification and structure of Carbohydrates, Sources of carbohydrates, Physico-chemical and functional properties, (reaction with phenyl hydrazine, NH2OH, oxidation, reduction, ring formation); Basic concepts of Starch, cellulose, Glycogen, Pectin, Agar-agar, Gum-Arabic; Reducing and nonreducing sugar: concept and their estimation. Basic idea about Gelatinization, Gel formation, Retrogradation, Crystallization, Caramelization, Maillard reaction.

Module - 3:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will be able to describe the sources and properties of protein.
2. Students will be able to illustrate the protein determination methods.

Detailed content of the unit:

Proteins

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

Module - 4:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will know the types of fat and fatty acids.
2. Students will be able discuss the properties of fats.

Detailed content of the unit:

Fats/ Lipids

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

Module - 5:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to discuss the functions of minerals and vitamins.
2. Students will know the effect of processing and storage of vitamins.

Detailed content of the unit:

Minerals and Vitamins

Sources and physiological functions of minerals & vitamins; deficiency disorder; Effect of processing and storage of vitamins, Pro vitamins A & D; Vitamins as antioxidants.

References: -

1. Principles of Biochemistry / Albert L. Leninger / CBS Publishers & Distributors, New Delhi.
2. Foods Facts & Principles / N. ShakuntalaManay& M. Shadaksharaswamy /New Age International
3. Food Science / N.N. Potter
4. Food Chemistry / L. H. Meyer
5. Food Analysis & Practice / Y. Pamaranz / AVI
6. Text Book of Biochemistry / Webb, Todd, Mason
7. Food Science / B. Srilaxmi / New Age international
8. Principles of Food Science / Karek& L.M. Delker

MECHANICAL OPERATION

Course Code	FPPC-303
Course Title	Mechanical Operation
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	First year level Physics
Course Category	PC

Course Outcomes: -

1) Discuss the fundamentals of pump. (K2)
2) Illustrate the techniques of size reduction operation. (K3).
3) Illustrate the details of sieving and material handling operations. (K3)
4) Describe the methods of mixing. (K2)
5) Acquire the knowledge of filtration and centrifugation. (K3)

Course Content:

Module - 1:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to illustrate transportation of fluid.
2. Students will be able to discuss the types of pumps.

Detailed content of the unit:

Pump

Flow through pipes and open channels, Transportation of fluids, Pipe Fittings and valves, concepts of pump, Pumps – classification, centrifugal and positive displacement type – peristaltic., Head developed by the Pump, NPSH, Defects and their preventions, Industrial applications (No mathematical problems only mathematical expressions), Blowers and compressors.

Module - 2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to illustrate the size reduction techniques.
2. Students will be able to calculate the energy required for size reduction.

Detailed content of the unit:

Size Reduction

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 communition, Ritinger's law, Kick's law, Bond's law and their applications in calculation of energy required in grinding (No mathematical problems only mathematical expressions)

Module - 3:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to discuss sieving operations.
2. Students will be able to describe material handling equipments.

Detailed content of the unit:

Sieving

Separation based on size, Effectiveness of screens, Types of screens, Factors affecting the sieving process.

Material Handling

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.

Module - 4:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to discuss mixing operations.
2. Students will be able to illustrate different types of mixing equipments.

Detailed content of the unit:

Mixing

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)

Module - 5:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to illustrate various types of mixing.
2. Students will be able to discuss about centrifugation operation.

Detailed content of the unit:

Filtration

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)

Centrifugation

Sedimentation and sedimentation theory; solid-liquid separation, different types of centrifuges. (No mathematical problems only mathematical expressions)

References: -

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
6. Physical Chemistry / P.C. Rakshit / Sarat Book House.

PROCESS INSTRUMENTATION AND CONTROL

Course Code	FPPC-304
Course Title	Process Instrumentation and Control
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	First year level Physics
Course Category	PC

Course Outcomes: -

1. Describe the process of pressure measurement. (K2)
2. Discuss the process of temperature measurement. (K2)
3. Illustrate flow measurement instruments. (K3)
4. Describe thermal conductivity measurement.(K2)
5. Discuss the details of liquid level measurement.(K2)

Course Content :

Module - 1:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will know about elements of an instrument.
2. Students will be able to discuss about pressure measurement gauges.

Detailed content of the unit:

Pressure Measurement

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 & Pirini Gauge.

Module - 2:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will know about temperature measurement processes.
2. Students will be able to illustrate temperature measurement instruments.

Detailed content of the unit:

Temperature Measurement
Temperature Scale, IPTS-20, Temperature Resistance relation with deduction, measurement by Bi-metal thermometers, resistance thermometer, thermistor, thermocouples, thermopile, radiation & optical pyrometer.

Module - 3:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to discuss about flow measurement.
2. Students will be able to illustrate flow measurement instruments.

Detailed content of the unit:

Flow Measurement
Measurement by hot wire ammometer flow measurement & level under different parameters. & magnetic flow meter, Visualization by shado graph, Interferometer, level control.

Module - 4:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will know about thermal conductivity.
2. Students will be able to illustrate diffusivity measurement.

Detailed content of the unit:

Thermal Conductivity Measurement
Definition, Measurement of thermal conductivity of solid, liquid and gas, Different conditions of diffusivity, diffusivity measurement of gas.

Module - 5:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will know about liquid level measurement techniques.
2. Students will able to discuss about measurement of liquid level parameters.

Detailed content of the unit:

Measurement of liquid
Liquid level measurement, direct and differential method, measurement in open and pressure vessels. measurement of viscosity, conductivity, humidity and pH.

References: -

1. Process Instrumentation & Control, A.P. Kulkarni, Nirali Publication
2. Industrial Instrumentation, K. Krishnamurthy, S Vijayachitra, KrishnaswamyNew Age International, 01-Jan-2005
3. Fundamentals Of Industrial Instrumentation And Process Control, By Dunn,Tata McGraw-Hill Education
4. Industrial Instrumentation & Control by D-Patranaleis . 5
5. Text book of industrial Instrumentation by S.K. Singh.
6. Text Book of Process Control by Nagrath Gopal.

FOOD ENGINEERING DRAWING

Course Code	FPPC-305
Course Title	Food Engineering Drawing
Number of Credits	1.5 (L:0, T:0, P:3)
Prerequisites	First Year level Engineering drawing/ graphics.
Course Category	PC

Course Outcomes: -

1. Develop true length, surface of simple objects. (K1)
2. Draw bolts, nut, rivets, riveted joints, pipe joints and couplings. (K3)
3. Sketch and draw machine parts. (K3)
4. Draw isometric project of vessels. (K3)
5. Sketch heat exchanger, evaporator, drier, humidifier. (K3)

Period: 03 hours per week

Course Content:-

1. True length, development of surface of simple objects.
2. Drawing of IS standard hexagonal and square bolts, nut.
3. Drawing of rivets, riveted joints (sectional view).
4. Pipe, flange joints, rectangular tee joints, bend joint.
5. Shift coupling, knuckle joint, cotter joint, flange coupling.
6. Sketching and drawing of simple machine parts – split pulley, stop pulley, stop valve piston, stuffing box.
7. Isometric projection of storage vessels, pressure vessels,
8. Sketches of heat exchanger, evaporator, dryer, humidifier.

FOOD MICROBIOLOGY LAB

Course Code	FPPC-306
Course Title	Food Microbiology Lab
Number of Credits	1.5 (L:0, T:0, P:3)
Prerequisites	Microbiology theory
Course Category	PC

Course Outcomes: -

1. Study Microscope, bacteria, mold, yeast. (K1)
2. Apply staining technique to bacteria (Simple and gram), mold and yeast. (K3)
3. Prepare nutrient broth with agar and culture media for mold and yeast. (K3)
4. Perform dilution and plating technique. (K3)
5. Count bacteria. (K3)

Period: 03 hours per week

Perform any six experiments:-

1. Study of microscope.
2. Staining (simple and gram) of bacteria and morphological study.
3. Spore staining of bacteria.
4. Staining of molds & yeast and morphological study.
5. To prepare nutrient broth and media with agar.
6. Culture media preparation for molds & yeast.
7. Dilution and Plating by spread –plate and pour –plate techniques.
8. Bacterial count with the help of Haemacytometer.

FOOD BIOCHEMISTRY LAB

Course Code	FPPC-307
Course Title	Food Biochemistry Lab
Number of Credits	1.5 (L:0, T:0, P:3)
Prerequisites	Food Biochemistry theory
Course Category	PC

Course Outcomes: -

1. Determine the moisture, protein, acidity, pH and ash content in food samples. (K3)
2. Determine reducing and non reducing sugar. (K3)
3. Estimate crude fat in food sample. (K5)
4. Determine acid value, Iodine value, Saponification value in fats and oil samples. (K3)

Period: 03 hours per week

Perform any six experiments:-

1. Determination of Moisture in food sample.
2. Determination of Protein in food sample.
3. Determination of Acidity and pH in food sample.
4. Determination of non-reducing and reducing sugars.
5. Estimation of crude fat in a food sample.
6. Determination of acid value and iodine value in fats or oils sample.
7. Determination of per-oxide value and saponification value in fats or oils sample.
8. Determination of Ash (acid soluble and insoluble fraction) content in food sample.

MECHANICAL OPERATION LAB

Course Code	FPPC-308
Course Title	Mechanical Operation Lab
Number of Credits	1.5 (L:0, T:0, P:3)
Prerequisites	Mechanical Operation theory
Course Category	PC

Course Outcomes: -

1. Determine crushing efficiency of a crusher. (K3)
2. Perform screen analysis for average particle size. (K3)
3. Determine critical speed of Ball mill. (K3)
4. Study the characteristics of sigma mixture and vibratory screen. (K1)
5. Study filtration characteristics of vacuum filtration apparatus and filter press. (K1)
6. Study solid liquid separation in a centrifuge. (K1)

Period: 03 hours per week

Perform any six experiments:-

1. To determine crushing efficiency of Roll crusher and Jaw crusher.
2. To study the screen analysis and determine average particle size of solid particles in asieve shaker.
3. To study the grinding characteristics of a Ball Mill and determine its critical speed.
4. To study the solid-liquid mixing characteristics in sigma mixer
5. To determine the screen characteristics in a vibratory screen.
6. To study the filtration characteristics in a vacuum filtration apparatus.
7. To study the filtration characteristics of a slurry in a filter press.
8. To study the solid-liquid separation characteristics in a centrifuge

PROCESS INSTRUMENTATION AND CONTROL LAB

Course Code	FPPC-309
Course Title	Process Instrumentation and control Lab
Number of Credits	01 (L:0, T:0, P:2)
Prerequisites	Process Instrumentation and control theory
Course Category	PC

Course Outcomes:

1. Identify mechanical and electrical transducers. (K1)
2. Calibrate Mcleod gauge an Pirani gauge (K3)
3. Measure low pressure by Mcleodanf Pirani gauge. (K5)
4. Measure temperature by thermistor and thermocouple. (K5)
5. Measure flow by Ammometer and Rotameter. (K5)
6. Measure viscosity by viscometer. (K5)

Period: 02 hours per week

Perform any six experiments:-

1. Identification and sketching of mechanical and electrical transducers.
2. Calibration of Mcleod gauge & Pirani Gauge.
3. Low-pressure measurement by Mcleod gauge & Pirani gauge
4. Temperature measurement using thermistor
5. Temperature measurement by thermocouple.
6. Flow measurement using Ammnometer.
7. Flow measurement using Rotameter.
8. Viscosity measurement by viscometer.

SUMMER INTERNSHIP-I

Course Code	FPSI-310
Course Title	Summer Internship-I
Number of Credits	02 (L: 0, T: 0, P: 0)
Prerequisites	Nil
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Activities **	2	80 Hours

(** Students are required to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective Institutions; contribution at incubation/ innovation /entrepreneurship cell of the Institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working for consultancy/ research project within the Institutes and Participation in all the activities of Institute's Innovation Council for e.g.: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.)

Benefits to Students:

1. An opportunity to get hired by the Industry/ organization.
2. Practical experience in an organizational setting.
3. Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
4. Helps them decide if the industry and the profession is the best career option to pursue.
5. Opportunity to learn new skills and supplement knowledge.
6. Opportunity to practice communication and teamwork skills.

7. Opportunity to learn strategies like time management, multi-tasking etc. in an industrial setup.
8. Opportunity to meet new people and learn networking skills.
9. Makes a valuable addition to their resume.
10. Enhances their candidacy for higher education.
11. Creating network and social circle and developing relationships with industry people.
12. Provides opportunity to evaluate the organization before committing to a full-time position.

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Explain the real life organizational and industrial environment situations (K2).

C.O.2: Develop organizational dynamics in terms of organizational behaviour, culture and professional ethics (K1).

C.O.3: Understand the importance of Team work (K2).

C.O.4: Explain invaluable knowledge and networking experience (K2).

C.O.5: Develop skill to build a relationship with a prospective employer (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-I is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.

4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head
Inter/ Intra Institutional Activities	2	Summer Vacation after 2nd Semester	3-4 Weeks	Inter/ Intra Institutional Workshop/ Training
				Working for consultancy/ research project
				Festival (Technical / Business / Others)
				Events
				Contribution in Incubation/ Innovation/ Entrepreneurship Cell/

				Institutional Innovation Council	
				Learning at Departmental Lab/Tinkering Lab/ Institutional workshop	

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

Food Processing Technology (FPT) Syllabus

Semester IV

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/ Week	Credit
				L	T	P		
1	Programme core course-10	FPPC-401	Microbial Technology	2	0	0	2	2
2	Programme core course-11	FPPC-402	Chemical Engineering Operation	3	0	0	3	3
3	Programme core course-12	FPPC-403	Food Preservation Technology	3	0	0	3	3
4	Programme core course-13	FPPC-404	Microbial Technology Lab	0	0	2	2	1
5	Programme core course-14	FPPC-405	Chemical Engineering Operation Lab	0	0	3	3	1.5
6	Programme core course-15	FPPC-406	Food Preservation Technology Lab	0	0	3	3	1.5
7	Programme elective course-1 (**Any one to be opted**)	FPPE-407/A	Bakery and Confectionary Technology	2	1	0	3	3
		FPPE-407/B	Fruit and Vegetable Processing Technology					
		FPPE-407/C	Food Toxicology and Allergy					
8	Humanities & Social Science-4	HS-408	Professional Skill Development	2	1	0	3	3
9	Minor Project	FPPR-409	Minor Project	0	0	4	4	2
10	Mandatory Course-1	AU-410	Essence of Indian Knowledge and Tradition	2	0	0	2	0
Total				**14**	**2**	**12**	**28**	**20**

MICROBIAL TECHNOLOGY

Course Code	FPPC-401
Course Title	Microbial Technology
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	Microbiology theory
Course Category	PC

Course Outcomes:

1. Discuss the fermentative production of biomass. (K2)
2. Describe the fermentative production of alcoholic beverages. (K2)
3. Illustrate the fermentative production of organic acids. (K3)
4. Explain the fermentative production of scarifying agents, vitamins and antibiotics. (K2)
5. Illustrate the solid state fermentation technique. (K3)

Course Content:-

Module - 1:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will be able to know about types of micro organisms .
2. Students will be able to describe yeast production.

Detailed content of the unit:

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.

Module - 2:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to illustrate production of ethyl alcohol.
2. Students will be able to describe production of beverages.

Detailed content of the unit:

Fermentative production & purification of alcoholic beverages
Technology of production and purification of ethyl alcohol, non-distilled beverage (beer, wine), distilled beverage (whisky, rum, champagne).

Module - 3:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to illustrate production of lactic acid.
2. Students will be able to discuss production of acidic acid.

Detailed content of the unit:

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

Module - 4:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will be able to discuss production and isolation of saccaharifying agents.
2. Students will be able to analyze production of vitamins and antibiotics.

Detailed content of the unit:

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 B2 & B12 (brief discussion).

Antibiotics- Production, isolation & use of penicillin, streptomycin, neomycin use & activities of antifungal antibiotics (brief discussion).

Module - 5:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will be able to know solid state fermentation techniques.
2. Students will be able to discuss production of amyloglucosidase.

Detailed content of the unit:

Solid state fermentation Technique

Basic principle of solid-state fermentation process, Production and isolation of amyloglucosidase by solid state fermentation process. (brief discussion).

References: -

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

CHEMICAL ENGINEERING OPERATION

Course Code	FPPC-402
Course Title	Chemical Engineering Operation
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	First year level Chemistry and Physics
Course Category	PC

Course Outcomes: -

1. Illustrate the fundamentals of chemistry. (K3)
2. Illustrate the details of heat transfer. (K3)
3. Explain the concepts of mass transfer. (K2)
4. Discuss the basics of energy balance and .material balance. (K2)
5. Describe the basics of fluid mechanics. (K2)

Module - 1:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to discuss Chemical equilibrium and chemical analysis.
2. Students will be able to illustrate graphical solution and graphical analysis.

Detailed content of the unit:

Introduction:

Chemical Equilibrium- Concepts,mole, mole fraction, Reversible and Irreversible reaction, Rate of a reaction, Active mass, Law of mass action, Equilibrium Constants.

Chemical kinetics – Reaction velocity, rate constant, molecularity, order of reaction, first order kinetics, second and third order reactions. (No problems)

Graphical Solution &Psychrometry- Use of log-log, semi log,Triangular Diagram, Psychrometric - Introduction, Terms, Relations, Chart, Processes .

Dimensional Analysis- Concepts, Aims, Dimensional Homogeneity – Concepts, Applications.Dimensionless groups, Conversion of equations.

Module - 2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to discuss the types of heat transfer processes.
2. Students will be able to describe the details of heat exchangers.

Detailed content of the unit:

Heat Transfer

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.)

Module - 3:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to illustrate diffusion and distillation.
2. Students will be able to discuss about absorption and extraction.

Detailed content of the unit:

Mass Transfer

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.)

Distillation –Introduction to distillation tower, boiling point diagram, concept of flux ratio, azeotrope, flash distillation (no problem required)

Absorption – elementary principles of absorption, equipment, packed column, packing material. (no problem required)

Extraction- Fundamental theory of solid–liquid , liquid-liquid extraction, types of equipments. Principles of crystallization, equipment (no problem required).

Module - 4:
Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to know the details of thermodynamic principles and thermochemistry.
2. Students will be able to illustrate energy balance and material balance.

Detailed content of the unit: -
Energy Balance & Material Balance

Thermodynamic Principles: Thermodynamic system, Heat, Work, Energy, Internal Energy, 1st Law of Thermodynamics - Enthalpy or Heat Content, Heat Capacity, 2nd Law of Thermodynamics , Entropy, Free Energy Functions.

Thermochemistry – Heat of reaction, Heat of formation, and Heat of combustion (simple problems)

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,.

Material Balance - Concept, Steps involved in calculation of material balance with or without chemical reaction. (Only simple problem)

Module - 5:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to know about types of fluids.
2. Students will be able to discuss about fluid dynamics.

Detailed content of the unit:

Fluid Mechanics

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.

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.)

References: -

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.

FOOD PRESERVATION TECHNOLOGY

Course Code	FPPC-403
Course Title	Food Preservation Technology
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	First year level Physics
Course Category	PC

Course Outcomes:

1. Discuss the fundamentals of canning technique. (K2)
2. Illustrate the details of drying technique. (K3)
3. Describe the details of refrigeration and freeze drying. (K2)
4. Illustrate the process of preservation by fermentation. (K3)
5. Explain the preservation process of preservatives and CA, MA storage. (K2)

Course Content:-

Module - 1:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will be able to illustrate canning technique.
2. Students will be able to discuss about process parameters of canning.

Detailed content of the unit:

Canning

General Canning technique Can lacquer, can filling solution, Can construction, mechanical defects Effect of temperature, pH, altitude on canning of various food Evaluation of process time by graphical (Bigelow method) and formula method Can defects, aseptic canning.

Module - 2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to know about drying techniques.
2. Students will be able to discuss about evaporation.

Detailed content of the unit:

Drying

Concept of drying, drying kinetics (no problem required) Different type of driers – solar, tray, spray, fluidized bed drying, tunnel drier, drum drier (working principles with schematic

diagram only) Concept of critical moisture, equilibrium moisture content Concept of evaporation and evaporation equipments Concept osmotic dehydration, IMF food.

Module -3:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to illustrate refrigeration.
2. Students will be able to discuss about freeze drying.

Detailed content of the unit:

Refrigeration and Freeze Drying
Types of refrigerant & use Types of freezer – plate, blast, vacuum, immersion, cryogenic freezing (principles, schematic diagram & use only) Working principles of refrigerated van, wagon and cold storage and their use, Different phases of freeze drying, Time-temperature relation Quality aspect of freeze dried food product,

Module - 4:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will be able to know about fermentation.
2. Students will be able to discuss the factors affecting fermentation.
3.

Detailed content of the unit:

Preservation by Fermentation
Introduction to fermentation (general view) Different fermented food (name, source & use) Factors affecting fermentation, Curing and pickling, Hurdle technology.

Module - 5:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will be able to discuss irradiation techniques and uses of preservatives in food.
2. 2. Students will be able to illustrate CA storage and MA storage.

Detailed content of the unit:

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

References: -

1. Food Process Engineering / D.R. Heldman & R.P. Singh / AVI.
2. Food Processing and Preservation / G. Subbulakhsmi& 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. 5.Food Science & Technology / Magnus Pyke / John Murray, London.
6. Food Science / B. Srilaxmi / New Age International.
7. Foods Facts and Principles / N. ShakuntalaManay& M. Shadaksharaswamy / New age International.
8. Fundamentals of Food Processing Operations / J.L. Heid& M.A Joslyn / AVI.

MICROBIAL TECHNOLOGY LAB

Course Code	FPPC-404
Course Title	Microbial Technology Lab
Number of Credits	01 (L:0, T:0, P:2)
Prerequisites	Microbial Technology theory
Course Category	PC

Course Outcomes: -

1. Demonstrate the fermentative production of ethyl alcohol and citric acid. (K3)
2. Illustrate the preparation of Baker's Yeast. (K3)
3. Analyze the produce fungal amylase and L- glutamic acid. . (K4)
4. Demonstrate the production of amyloglucosidase by solid state fermentation. (K3)
5. Prepare the assay of antibiotics. (K3)
6. Prepare fermented dairy products. (K3)

Period: 02 hours per week

Perform any eight experiments -

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.
7. Production of fermented dairy products.
8. Production of L-Glutamic acid.

CHEMICAL ENGINEERING OPERATION LAB

Course Code	FPPC-405
Course Title	Chemical Engineering Operation Lab
Number of Credits	1.5 (L:0, T:0, P:3)
Prerequisites	Chemical engineering Operation theory
Course Category	PC

Course Outcomes:

1. Study different types of gauges. (K1)
2. Perform calibration of Orificemeter and Rotameter (K3)
3. Determine the flow of fluid through venturimeter. (K5)
4. Determine the efficiency of centrifugal pump.(K5)
5. Determine heat transfer coefficient of a heat exchanger. (K5)
6. Demonstrate the screen analysis of crushed products .(K3)
7. Determine the rate of filtration. (K5)

Period: 03 hours per week

Perform any six experiments :-

1. 1.To study different types of pressure gauges, manometer and valves.
2. To calibrate orifice meter and to find out the orifice coefficient.
3. To calibrate rotameter and to determine flow of fluid through rotameter.
4. To determine the flow of fluid through venturimeter.
5. To determine the efficiency of centrifugal pump
6. To Determine the Overall heat transfer coefficient of a shell and tube heat exchanger.
7. To undertake screen analysis of crushed products.
8. To determine the rate of filtration under different pressure.

FOOD PRESERVATION TECHNOLOGY LAB

Course Code	FPPC-406
Course Title	Food Preservation Technology Lab
Number of Credits	1.5 (L:0, T:0, P:3)
Prerequisites	Food preservation Technology theory
Course Category	PC

Course Outcomes: -

1. Prepare a frozen food and canned food.(K3)
2. Prepare fermented food and dried food product.(K3)
3. Analyze freeze drying and spray drying process.(K4)
4. Perform pasteurization and homogenization of milk. (K3)
5. Apply drying technique to protein foods. (K3)

Period: 03 hours per week

Perform any six Experiments:-

1. To prepare and study of frozen food.
2. To prepare and study canned food.
3. Preparation of fermented food product.
4. 4.Preparation of dried food product and drying curve.
5. Study of freeze drying and preparation of freeze dried product.
6. Study of spray drying process.
7. To undertake pasteurization and homogenization of milk.
8. To dry protein foods (fish, meat).

BAKERY AND CONFECTIONARY TECHNOLOGY

Course Code	FPPE-407/A
Course Title	Bakery and confectionary Technology
Number of Credits	03 (L:2, T:1, P:0)
Prerequisites	Food preservation Technology theory
Course Category	PE

Course Outcomes: -

1. Study the ingredients of baking. (K1)
2. Discuss the details of baking techniques. (K2)
3. Describe the basics of baking equipments. (K2)
4. Illustrate the products of baking. (K3)
5. Explain the basics of confectionary technology. (K2)

Course Content:

Module - 1:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to know the details of major and minor ingredients of baking.
2. Students will be able to discuss the limits for additives.

Detailed content of the unit: -

Ingredients for Baking

Proximate composition of wheat, types of wheat, types and grades of flours, flour process, chemistry of flour, testing of wheat and flour for baking quality, Type & Mechanism of Gluten development. Major & minor ingredients used in baking (product wise) and their role in baking, Different baking ingredients and their role in baking - leavening agents (D.R.C, diastatic activity) , Shortening agents, emulsifiers ,antioxidants ,improver ,dough conditioner Quality of water used and its function in baking, impurities of water and their effect in quality of baked products. FSSAI/PFA limit for additives in bakery product.

Module - 2:

Number of class hours: 06

Suggestive Learning Outcomes:

1. Students will be able to know about process parameters.
2. Students will be able to illustrate the mechanism of baking.

Detailed content of the unit:

Baking Techniques

Bulk handling of ingredients, Process parameters, Various dough and their use, Fermentation and proofing, Mechanism of Heat transfer in baking, time, temperature humidity effect in baking, cooling and packaging of baked products.

Module - 3:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to know the types of dough.
2. Students will be able to illustrate the machines and equipments for processing of bakery products.

Detailed content of the unit:

Baking equipments
Types, working principle &, application of -Dough mixer, dough moulding, dough divider, proofer, baking oven, cooler**.**

Machines & equipment for batch and continuous processing of bakery products.

Module - 4:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will be able to know the procedure of making various types of baked products.
2. Students will be able to illustrate the preservation techniques used for bakery products.

Detailed content of the unit:

Product of Baking
Production of bread, biscuits, cake, Pastry ,cookies, crackers , pasta, noodles, pizza and their quality aspects, defects of baked products and preventive measures. Snack food product Packaging of bakery products. Canned bakery products. Freezing of bakery product.

Module - 5:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to know about confectionary.
2. Students will be able to discuss about manufacturing processes of confectionary products.

Detailed content of the unit:

Confectionary Technology
Definition of Confectionary, Icing Technology, wafer manufacture, Fondant and Fudge, Manufacture of chocolate, production of chocolate mass, chocolate candy, chocolate based confectionary product, Milk based confectionary products, Different Sugar boiled stage, Sugar confectionaries, Sweet candy.

Reference Books

1. Bakery & Confectionary Technology –By S.A.Matz.
2. Chocolate, Cocoa, Confectionary – By Minifie B.W.
3. Bakery Technology and Engineering –By S.A.Matz.

4. Equipments for Bakers –By S.A.Matz.
5. Cookies & Cracker Technology–By S.A.Matz.
6. Basic Baking- By S.C Dubey.
7. Textbook of Bakery and Confectionary – By Yogambal, PHI

FRUIT AND VEGETABLE PROCESSING TECHNOLOGY

Course Code	FPPE-407/B
Course Title	Fruit and Vegetable Processing Technology
Number of Credits	03 (L:2, T:1, P:0)
Prerequisites	Food preservation Technology theory
Course Category	PE

Course Outcomes:

1. Study the agricultural aspects of vegetables and fruits. (K1)
2. Illustrate the physiological characteristics of fresh fruits and vegetables.(K3)
3. Explain the freezing and dehydration techniques of fruits and vegetables.(K2)
4. Describe the general canning techniques to process purees and juices.(K2)
5. Discuss the preparation procedures of fruits and vegetables products. (K2)

Course Content:

Module - 1:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to identify commercially important fruits and vegetables.
2. Students will be able to discuss scope of fruit and vegetable preservation industries.

Detailed content of the unit:

Basic agricultural aspects of vegetables and fruits
Ability to identify all commercially important fruits and vegetables with their names season, Morphology, structure and composition of fruit andvegetable. Production and processing scenario of fruits and vegetable. Scope ofFruit and Vegetable Preservation Industry. Present status, constraints and prospectus.

Module - 2:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will know about maturity standard of fruits and vegetables.
2. Students will be able to describe storage practices of fruits and vegetables.

Detailed content of the unit:

Fresh fruits and vegetables

Physical, Textural characteristics, structure and composition. Maturity standards; Importance, methods of maturity determinations maturity indices for selected fruits and vegetables. Harvesting of important fruits and vegetables. Fruit ripening- chemical changes, regulations, methods.

Storage practices: Control atmospheric, Bead atmosphere, hypotactic storage, cool store, Zeroemerge cool chamber, stores striation. Commodity pre-treatment's - chemicals, wax coating, pre-packaging, phytonutrients in fruits and vegetables grading, cleaning, Physiological postharvest diseases chilling injury and disease. Handling and packaging of fruits and vegetables

Module -3:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to discuss pre-processing of fruits and vegetables.
2. Students will be able to illustrate the methods of drying techniques.

Detailed content of the unit:

Freezing and dehydration of fruits and vegetables

General pre processing, different freezing methods and equipments, problems associated with specific fruits and vegetables; Dehydration – General pre processing, different methods of drying including sun, tray, spray drying and low temperature, osmotic dehydration and other modern methods;

Module - 4:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will be able to discuss about canning techniques.
2. Students will be able to illustrate the processing of fruit juice prodcts.

Detailed content of the unit:

Canning, purees and juices

Canning- General pre processing, specific or salient points in fruits and vegetables like – Blanching, exhausting, processing conditions; Indian Food Regulation and Quality assurance Fruit Juice / pulp/ Nectar/Drinks, concentrates – General and specific processing, different packing including aseptic. Vegetable Purees/ pastes -General and specific processing, different packing including aseptic.

Module - 5:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will know about fruit and vegetable products.
2. Students will be able to discuss about general and specific processing of fruits and vegetables.

Detailed content of the unit:

Fruit and vegetable products

Ready to eat fruit and vegetable products, Jams/Marmalades, Squashes/cordials, Ketchup/sauces, Chutneys, Fruit Bar, Soup powders, Candied Fruits, Natural colors, Fruit and Vegetable Fibres- General and specific processing, different packing including aseptic, Potato: Wafer; starch, Papad, Carrot: Preserve, candy, Pickle, Jam. Cauliflower and cabbage: Dried cauliflower and cabbage, Sauerkraut.

References:-

1. Fellows, P.J. "Food Processing Technology: Principles and Practice", 2nd Edition, CRC/Woodhead, 1997.
2. Sivasankar, B. "Food Processing &Preservation", Prentice Hall of India, 2002.

FOOD TOXICOLOGY AND ALLERGY

Course Code	FPPE-407/C
Course Title	Food Toxicology and Allergy
Number of Credits	03 (L:2, T:1, P:0)
Prerequisites	High school level Biology and Chemistry
Course Category	PE

Course Outcomes:

1. Study the basics of food toxicology. (K1)
2. Discuss about food allergy and sensitivity. (K2)
3. Explain the principles of toxicology. (K2)
4. Describe the toxicant in food samples. (K3)
5. Illustrate the toxicants formation during food processing. (K3)

Course Content:

Module - 1:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to define food toxicology.
2. Students will be able to discuss basics of immune resources.

Detailed content of the unit:

Introduction:

Definition and need for understanding food toxicology; Hazards - Microbiological, nutritional and environmental. Basics of immune resources - humoral and cell media resources. Allergen and mechanism of allergic resources.

Module - 2:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to illustrate chemistry of food allergens.
2. Students will be able to describe various diseases caused by food allergens.

Detailed content of the unit:

Food allergy and sensitivity
Chemistry of food allergens, celiac disease, food disorders associated with metabolism, lactose intolerance, and asthma.

Module - 3:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to illustrate natural food toxicants.
2. Students will be able to discuss the factors influencing toxicity.

Detailed content of the unit:

Principles of toxicology
Natural food toxicants - toxicity of mushroom alkaloids, seafood, vegetables, fruits, pulses, and antinutritional compounds.

Biological factors that influence toxicity, toxin absorption in the G.I. track, Industrial microflora, blood, brain barrier, storage and excretion of toxins

Module - 4:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to analyse toxicants in foods.
2. Students will be able to assess food safety.

Detailed content of the unit:

Determination of toxicants in food sampling
Quantitative and qualitative analysis of toxicants in foods; Biological determination of toxicants.

Assessment of food safety – Risk assessment and risk benefit indices of human exposure, acutetoxicity, mutagen city and carcinogenicity, reproductive and developmental toxicity, neurotoxicity and behavioral effect, immunotoxicity.

Module - 5:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to illustrate intentional additives.
2. Students will be able to discuss toxicity of foods.

Detailed content of the unit:

Toxicants formed during food processing

Intentional direct additives, preservatives, nitrate, nitrite, and N-nitroso compound flavor enhancers, food colours, indirect additives, residues and contaminants, heavy metals, other organic residues and packaging materials.

Toxicity of heated and processed foods, food carcinogens and mutagens - Polycyclic aromatic hydrocarbons, N - nitrosamines, Acrylamide and their mode of action

References: -

1. Helferich, William and Carl K.Winter "Food Toxicology", CRC Press, 2001.
2. Alluwalia, Vikas "Food Hygiene and Toxicology" Paragon International Publishers, 2007
3. Shibamoto, Taka yuki and Leonard F.Bjeldanzes "Introduction to Food Toxicology" IIEdition.Academic Press, 2009.
4. Maleki, Soheila J. A.Wesley Burks, and RickiM.Helm "Food Allergy" ASM Press, 2006.
5. Labbe, Ronald G. and Santos Garcia "Guide to Food Borne Pathogens" John Wiley &Sons, 2001.

PROFESSIONAL SKILL DEVELOPMENT

Course Code	:	HS-408
Course Title	:	Professional Skill Development
Number of Credits	:	03 (L: 2, T: 1, P:0)
Prerequisites	:	NIL
Course Category	:	HS

Course Outcomes:-

After successful completion of this course, students would be able to:

CO1: Understand the importance of soft skills and personality in a person's career growth. K2
CO2: Communicate uprightly while looking for a job. K3
CO3: Learn and utilize the key skills while facing job interview. K2 & K3
CO4: Demonstrate effective writing skills for professional excellence. K2
CO5: Explore ways to make oral communications interesting and captivating. K3

Unit – 1: Soft Skills & Personality Development

Number of Class Hours: 06 **Marks: 08**

Learning Outcomes:

1) Get acquainted with the details of soft skills and the importance of personality K1
2) Understand the importance of communication skills in developing one's personality. K2
3) Understand the importance of soft skills and personality in a person's career growth K2

Detailed Content:

1. **Soft skills - Demand of Every Employer:** How soft skills complement hard skills, Soft skills as competitive weapon, Classification of soft skills into personal and interpersonal traits, Soft skills needed for career growth- Time management, Leadership traits, Communication and networking skills, Teamwork and Interpersonal skills, Empathy and Listening skills, Responsibility, Attitude, Ethics, Integrity, Values and Trust.

2. **Personality Development – A must for career Growth:** Grooming one's personality as a signal that others read, mapping different personality types –

Perfectionists, Helpers, Achievers, Romantics, Observers, Questioners, Enthusiasts or adventurers, Bosses or asserters, Mediators or peacemakers.

Unit – 2: Looking for a Job

Number of Class Hours: 05 **Marks: 08**

Learning Outcomes:

1) Learn to write Job Applications, Cover Letter, Resume, Curriculum Vitae, bio data K2
2) Develop interpersonal skills/ soft skills through Group Discussion. K3

Detailed Content

1. Job Application : Job Application Letters in response to advertisements, Self-application letters for Jobs
2. Curriculum Vitae/Resume: Formats of Resume and CV for a fresher and for someone with experience, Differences between Resume, CV, Bio-data, and choice of referees.
3. Group Discussion : A test of soft skills

Unit – 3: Job Interviews

Number of Class Hours: 05 **Marks: 08**

Learning Outcomes:

1) Understand the importance of Job interviews in the selection procedure K2
2) Comprehend and Adapt to various types, stages and processes of job interviews K1&K3
3) Demonstrate appropriate body language in interviews K3

Detailed Content

1. Job Interviews: Definition, processes of Interviews, Types of Interviews
2. Stages in Job interviews: Before interview stage, On D' Day, After interview stage.
3. Importance of Body language in Interviews: : Facing an interview, Using proper verbal and non- verbal cues, the perfect handshake ,Exhibiting confidence, the business etiquettes to maintain, body language ,and dress code - what to speak, how to speak in an interview and answer interview questions, negative body language, handling an awkward situation in an interview.
4. Probable interview questions and answers.
5. Mock interviews to be conducted by mock interview boards.

Unit – 4: Enhancing Writing skills

Number of Class Hours: 12 **Marks: 08**

Learning Outcomes:

1) Write dialogues on given topics / situations K3
2) Express facts & ideas effectively in written form K3
3) Learn to write formal and informal letters & emails. K2

Detailed Content

1) **Art of Condensation**: Principles to increase clarity of written communication.
2) **Dialogue Writing:** Meeting and Parting, Introducing and Influencing, Requests, Agreeing and Disagreeing, Inquiries and Information.
3) **Letter Writing:** Placing an order, Letter to Inquiry, Letter of Complaint, Letter seeking permission.
4) **E- mail writing**: writing the perfect e-mail, steps to the perfect e-mail, formal and informal greetings, requests through an e-mail, writing an apology, complaint and seeking help and information in an e-mail, informing about a file attached in an email, writing the formal ending of an e-mail.

Unit – 5: Conversations, Panel Discussion and Public Speaking

Number of Class Hours: 12 **Marks: 08**

Learning Outcomes:

1. Speak persuasively on a given topic fluently and clearly. K3
2. Participate in formal and informal conversations. K3
3. Express ideas and views on given topics. K3

Detailed Content

1) **Conversation & Dialogue Practice:**
   a) Introducing oneself
   b) Introduction about family
   c) Discussion about the weather
   d) Seeking Permission to do something
   e) Seeking Information at Railway Station/ Airport
   f) Taking Appointments from superiors and industry personnel
   g) Conversation with the Cashier- College/ bank
   h) Discussing holiday plans
   i) Asking about products in a shopping mall
   j) Talking over the Telephone

2) **Panel Discussion:** Act of a moderator - ways to respond to audience questions.
Suggested topics: Current Affairs

3) **Public Speaking**: Art of Persuasion, Making speeches interesting, Delivering different types of speeches: Ceremonial, Demonstrative, Informative, Persuasive.

List of Software/Learning Websites

1. http://www.free-english-study.com/
2. http://www.english-online.org.uk/course.htm
3. http://www.english-online.org.uk/
4. http://www.talkenglish.com/
5. http://www.learnenglish.de/

Reference Books:
(Name of Authors/ Title of the Book /Edition /Name of the Publisher)

1. Sanjay Kumar &PushpLata Communications Skills , 2nd Edition,Oxford University Press
2. Meenakshi Raman & Sangeeta Sharma Technical Communication: Principles & Practice Oxford University Press
3. M. Raman & S. Sharma Technical Communication Oxford University Press
4. Barun Kumar Mitra, Personality Development and Soft Skills Oxford University Press

MINOR PROJECT

Course Code	FPPR-409
Course Title	Minor Project
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Demonstrate a through and systematic understanding of project contents (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O. 3: Illustrate the key stages in development of the project (K2).

C.O. 4: Develop the skill of working in a Team (K3).

C.O. 5: Apply the idea of mini project for developing systematic work plan in major project (K3).

Course Content:-

The minor project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Perform detailed study about various components of a project.
2) Study about methodologies and professional way of documentation and communication related to project work.
3) Develop idea about problem formulation.
4) Knowledge of how to organize, scope, plan, do and act within a project thesis.
5) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
6) Demonstrate the implementation of a minor project work.

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

Course Code	AU-410
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0 (L:2, T:0, P:0)
Prerequisites	Nil
Course Category	AU

Course Outcomes: -

After completion of the course the students will be able to-

CO 1: Understand the essence of Indian tradition and the importance of carrying them forward. ($\mathbf{K_2}$)
CO 2: Understand the Vedic literature and important ideas discussed in the Vedas. ($\mathbf{K_2}$)
CO 3: Describe scientific heritage of ancient India along with comprehending its relevance and application in various modern scientific disciplines. ($\mathbf{K_1}$)
CO 4: Relate the theoretical and practical sides of the science of Yoga and Aurveda with modern knowledge systems. ($\mathbf{K_1}$)
CO 5: Explain the worth of Indian intellectual heritage, traditional practices and Indian lifestyle from scientific lenses. ($\mathbf{K_4}$)

Module - 1

Name of the Module: Introduction to Vedic Literature

Number of class hours: 05

Content:

- General structure of Vedic Literature,
- Different theories on the age of the Vedas,
- Educational system in the Vedic times
- subject-matter of Ṛgveda-samhitā, *Sāmaveda -Saṁhitā, Yajurveda-Saṁhitā, Atharvaveda-Saṁhitā, Brāhmaṇa* and *Āraṇyaka* literature, Upaveda

Learning outcomes of the Module

1	Describe the Vedic literature (K1)
2	Outline the heritage of ancient India specially the scientific knowledge that is embedded in the Vedas will be shown through this module (K2)

Module - 2

Name of the Module: Fundamental doctrines of the *Upaniṣad*s

Number of class hours: 05

Content:

- General introduction of Upaniṣadic literature
- Philosophical ideas and ethics in Upaniṣadas

Learning outcomes of the Module

1.	Understand Upaniṣads and its significance as the perennial source Indian philosophy (K2)
2.	Explain the scientific temperament, knowledge and methods of scientific enquiry that is embedded in the Upaniṣadas (K2)

Module - 3

Name of the Module: *Vedāṅga*s, Purāṇas and Dharmaśāstra Literature

Number of class hours: 05

Content:

- Introduction to Vedāṅga Literature
- History of Sanskrit Grammar
- An Overview of Purāṇic literature
- History of Dharmaśāstra

Learning outcomes of the Module

1.	Describe various scientific and academic disciplines of ancient India along with scientific knowledge that is rooted in the Puranic literature (K1)
2.	Remember ancient system of Law and Governance in a nutshell especially the principles and philosophy behind the ancient constitutions (K1)

Module - 4

Name of the Module: Introduction to Indian Philosophical Systems, Scientific aspects of Indian knowledge systems

Number of class hours: 05

Content:

- General introduction to Indian Philosophical systems, i.e. Orthodox and Heterodox
- Glimpse of ancient Indian Science and technology.

Learning outcomes of the Module

1.	Describe the Indian Philosophical systems and their relevance and application in modern scientific enquiry (K1)
2.	Remember the various scientific methods, means and validity of knowledge as discussed in these systems, methods of discussion, debate and systemic learning as structured in ancient Indian knowledge literature (K1)

Module - 5

Name of the Unit: Introduction to Yoga & Āyurveda

Number of class hours: 05

Content:

- General ideas about Yoga,
- Origin and Development of Pātañjala Yoga,
- Origin and Development of Āyurveda and its relevance

Learning outcomes of the Module

1.	Understand about principles and philosophy of Yogic sciences and Āyurveda. (K2)
2.	Identify various ancient texts, practices of Yoga and Āyurveda along with gaining basic practical and theoretical knowledge which they will be able to relate with modern healthcare systems (K4)

References: -

1. Capra, Fritjof. *The Tao of Phisics*. New York: Harpercollins, 2007.
2. Capra, Fritjof. *The Web of Life*. London: Harpar Collins Publishers, 1996.
3. Dasgupta, Surendranath & De, Sushil Kumar. *A History of Sanskrit Literature.* Delhi: Motilal Banarsidass, 2017.

4. Dasgupta, Surendranath. *A History of Indian Philosophy*. Delhi: Motilal Banarsidass, 1991.
5. Gonda, Jan. *A History of Vedic Literature*. Delhi: Monohar Publishers and Distributors, 2020.
6. Jha, R.N. *Science and Consciousness Psychotherapy and Yoga Practices*. Delhi: Vidyanidhi Prakashan, 2016.
7. Kane. P.V. *History of Dharmasastra*, Poona: Bhandarkar Oriental Research Institute, 1930.
8. Max Muller. *Ancient Sanskrit Literature*, London: Spottiswoode and Co., 1859.
9. *Pride of India*, New Delhi: Samskrita Bharati, 2006.
10. Shastri, Gourinath. *A History of Vedic Literature*, Kolkata: Sanskrit Pustak Bhandar, 2006.
11. Sinha, Jadunath. *Indian Philosophy*. Delhi: Motilal Banarsidass,1938.
12. Wujastiyk, Dominik. *The Roots of Ayurveda*. India: Penguin India, 2000.

Food Processing Technology (FPT) Syllabus

Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/ Week	Credit
				L	T	P		
1	Programme core course-16	FPPC-501	Technology of Food-I	3	0	0	3	3
2	Programme core course-17	FPPC-502	Technology of Food-II	3	0	0	3	3
3	Programme core course-18	FPPC-503	Applied Nutrition	2	0	0	2	2
4	Programme core course-19	FPPC-504	Food Processing Lab	0	0	3	3	1.5
5	Programme core course-20	FPPC-505	Food Analysis Lab	0	0	3	3	1.5
6	Programme elective course-2 (**Any one to be opted**)	FPPE-506/A	Food Industries Waste Management	2	0	0	2	2
		FPPE-506/B	Food Safety Management Systems					
7	Programme elective course-3 (**Any one to be opted**)	FPPE-507/A	Food Process Equipment Design	2	0	0	2	2
		FPPE-507/B	Emerging Technologies in Food Processing					
8	Open elective course-1	(**Any one to be opted from Annexure-I**)		3	0	0	3	3
9	Summer Internship-II (6 weeks) after IV Semester	FPSI-509	Summer Internship-II	0	0	0	0	2
10	Major Project	FPPR-510	Major Project	0	0	4	4	2
Total				**15**	**0**	**10**	**25**	**22**

TECHNOLOGY OF FOOD-I

Course Code	FPPC-501
Course Title	Technology of Food-I
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	Food Biochemistry, Food Preservation Technology
Course Category	PC

Course Outcomes: -

1. Study the fundamentals of cereals. (K1)
2. Describe cereal processing and cereal products. (K2)
3. Illustrate the details of pulses and legumes. (K3)
4. Understand the basics of extruded foods. (K2)
5. Discuss fats and oil processing with products. (K2).

Course Content:

Module- 1:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to know the composition of cereals.
2. Students will be able to discuss about the storage of cereals.

Detailed content of the unit:

Introduction to Cereals

Proximate composition of cereals, different types of cereals, general physiochemical structure of cereals, Storage of cereals, infestation control and use of pesticides, Toxic factors in cereals.

Module- 2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to describe cereal processing.
2. Students will know the details of cereal products.

Detailed content of the unit:

Cereals Processing

Drying of cereals – solar, Ultra high temp. drying, Ultra low temp. drying, Milling of paddy and wheat, Parboiling of paddy, Classification of wheat, flour; difference between atta, sujiand flour. Milling of corn and barley.

Cereal Products

Different cereal products, fermented cereal products, break first cereals products, macaroni product.

Module-3:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to discuss about pulses and legumes.
2. Students will be able to illustrate types of pulse products.

Detailed content of the unit:

Pulses and Legumes

Proximate composition of pulses and legumes, classification of pulses , Toxic constituents of pulses, processing and milling of pulses, different types of pulse product, Processed soybean products including fermented soya product.

Module-4:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will know the objectives and importance of extrusion process.
2. Students will be able to describe manufacturing process of extruded products.

Detailed content of the unit:

Extruded Foods

Objectives and importance of extrusion in food product development; Components and functions of an extruder; Classification of extruder; Advantages and disadvantages of different types of extrusion; Pre and post extrusion treatments; Manufacturing process of extruded products; Application of extrusion technologies in food industries. Texturized, vegetable protein product.

Module- 5:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will know about fats and oil processing.
2. Students will be able to describe the preparation of fats and oil based products.

Detailed content of the unit:

Fats and oils processing

Introduction to oilseed, classification of oilseed, Extraction of fats and oil seeds –, rendering, pressing, solvent extraction; Processing of oils – degumming, refining, bleaching, deodorization, fractionation, winterization, hydrogenation, esterification, inter-esterification & emulsification.

Preparation of fats and oils-based products

Natural vegetable fat (margarine; vanaspati) and animal fat (butter, lard):- source, composition, properties and industrial applications; Plastic fat in bakery and confectionary; Preparation of shortenings and salad oil. Preparation of protein concentrate from oil seed, Standard and quality control of fats and fatty foods; By-products of fat/oil processing industries.

References: -

1. Foods Facts & Principles / N. Shakuntala Manay & M. Shadaksharaswamy / New Age International.
2. Cereal Food Technology/NIIR Board, Asia pacific Business press.
3. Food Analysis & Practice / Y. Pamaranz / AVI.
4. Food Science / B. Srilaxmi / New Age international.
5. Principles of Food Science / Karek & L.M. Delker.
6. Advances in Pulse Production Technology, Jeswani and Baldev, ICAR.
7. Fundamentals of food engineering- D.G.Rao, PHI Learning.

TECHNOLOGY OF FOOD-II

Course Code	FPPC-502
Course Title	Technology of Food-II
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	Food Biochemistry, Food Preservation Technology
Course Category	PC

Course Outcomes: -

1. Understand the basics of fish.(K2)
2. Describe the fundamentals of meat. (K2)
3. Acquire the knowledge of poultry and eggs. (K3)
4. Discuss the fundamentals of fruits and vegetables storage. (K2)
5. 5)Illustrate the details of dairy products.(K3)

Course Content:

Module- 1:

Number of class hours: 06

Suggestive Learning Outcomes:

1. Students will know the details of fish.
2. Students will be able to discuss about preservation of fish.

Detailed content of the unit:

Fish

Classification of fresh water fish and marine fish; Fish as raw material for processing and its biochemical composition. Factors affecting the quality of product. Physical, chemical, microbiological and sensory changes during storage, Commercial storage and transport of raw fish, Proximate composition of fish, Different spoilage & quality assessment Preservation of fish by canning, freezing & drying; salting, Smoking & curing of fish, Manufacture of fish protein concentrates, fish oil, fish paste & fish sauce, fish oil, fish meal, IQF prawn, fermented fish product and other important byproducts; Quality control of processed fish.

Module-2:

Number of class hours: 11

Suggestive Learning Outcomes:

1. Students will know the composition of meat.
2. Students will be able to discuss about meat products.

Detailed content of the unit:

Meat

Chemical and nutritional composition of meat ; The quality of meat - color, water holding

capacity (WHC) and juiciness, texture and tenderness, odour and taste, Postmortem changes of meat. Meat processing- comminution, emulsification, curing, smoking, cooking, ageing and tenderization; Meat products - meat emulsion, fermented meats, sausages, ham, bacon and comminuted meat products; Meat analogs; Meat storage and preservation- by temperature control(refrigeration, freezing, thermal processing), by moisture control (dehydration, freeze drying, curing, IMF meat), by microbial inhibition (chemical preservation, ionizing radiation); Packaging of meat products. Meat production, processing and consumption trends; Meat plant sanitation and waste disposal; By-products from meat industries and their utilization.

Module-3:

Number of class hours: 11

Suggestive Learning Outcomes:

1. Students know the details of poultry meat.
2. Students will be able to discuss about egg and egg products.

Detailed content of the unit:

Poultry
Classification of poultry meat; Composition and nutritional value of poultry meat ; Processing and preservation of poultry meat, spoilage and control; By-product utilization.

Egg and egg products
Structure, composition and functions of eggs; Abnormalities in eggs; Functions of eggs in food products; Inspection and grading for egg quality; Preservation and safe handling of eggs; egg quality assessment, Spoilage and control ; Coagulation of eggs, egg foams, egg powder and egg based products.

Module-4:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to illustrate the details of fruits and vegetables.
2. Students will be able discuss about fruit and vegetable products.

Detailed content of the unit:

Fruits and Vegetables
Types of fruits and vegetable, chemical composition, physical & chemical treatment for increasing post harvest shelf life, storage & handling – CA, MA storage, Cold storage, Different microbial groups associated with fruits & vegetables, microbial change during storage, Effects of enzymes on quality of fruit & vegetable storage, methods for reventing microbial attack on fruit & vegetable during harvesting & storage. Preparation of jam, jelly,

machineries used in fruits and vegetables processing, Analysis and quality control of Fruits and Vegetables Products , Analysis and quality control of fruit juice beverage products.

Non alcoholic Beverage

Proximate composition of tea, coffee & cocoa; different grades of tea and coffee; tea & coffee processing, different tea & coffee products, preparation of health drinks. Analysis and quality control of tea, coffee & cocoa products.

Module- 5:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to understand the details of constituent of milk.
2. Students will acquire the knowledge of microbiology of milk.

Detailed content of the unit: -

Dairy Product:

Chemical composition of milk, effect of heat on milk constituents, milk fat detection by Garber test, refractive index of milk, milk adulteration, Pasteurisation & homogenisation of milk, Microbiology of milk- detection of Ecoli in milk, microbes present in milk, inhibitors in milk., Drying of milk – drum, spray drying, Toned, skim, synthetic, dehydrated milk, Production of butter, ghee, cheese and ice cream (only flow process and brief discussion)

.

References: -

1. Foods Facts & Principles / N. Shakuntala Manay & M. Shadaksharaswamy / New Age International
2. Food Science / N.N. Potter
3. Food Science / B. Srilaxmi / New Age international
4. Meat processing and preservation with packaging Technology, NIIR Board, Asia pacific Business press.
5. Processing of fruits & vegetables/Giridharilal & Siddappa
6. Technology of Food Preservation/ Desrosier & Desrosier
7. Principles of Food Science / Karek & L.M. Delker
8. Food Analysis / R. Lees / C.R.C Press Ltd.

APPLIED NUTRITION

Course Code	FPPC-503
Course Title	Applied Nutrition
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	Food Biochemistry
Course Category	PC

Course Outcomes: -

1. Describe the basics of enzymes.(K2)
2. Explain the process of carbohydrate metabolism. (K2)
3. Acquire the knowledge of lipid metabolism. (K3)
4. 4)Discuss the fundamentals of protein metabolism.(K2)
5. 5)Illustrate the details of food additives. (K3)

Course Content:

Module- 1:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will know the details of enzymes.
2. Students will be able to discuss about enzyme activity.

Detailed content of the unit:

Enzymes
Concepts, Classification, Physico-chemical nature, Mechanism of enzyme action, Enzyme kinetics (MME and their transformations), Factors affecting enzyme activity, Enzyme inhibition, Enzymespecificity, Co-factors, Basic concepts on lysozymes & Isozymes, Enzyme unit, Turn over number, Allosteric enzyme.

Module- 2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to describe the metabolic pathways of carbohydrates.
2. Students will be able to illustrate the citric acid cycle.

Detailed content of the unit:

Carbohydrates metabolism

Metabolic pathways for breakdown of carbohydrates: Glycolytic pathway, Pentose phosphate pathway, Citric acid cycle, Electron transport chain, ATP balance, Gluconeogenesis.

Module-3:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will know the utilization of fats and fatty acids.
2. Students will be able to discuss about digestion and absorption of lipids.

Detailed content of the unit:

Lipids metabolism

Utilization of fats, biosynthesis of fatty acids and fats; Digestion & absorption of lipids; Ketone substances.

Module-4:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able discuss the metabolism of proteins.
2. Students will be able to illustrate Nitrogen balance.

Detailed content of the unit: -

Proteins metabolism

Metabolism of proteins (digestion and absorption); Nitrogen balance and nitrogen pool; Evaluation of quality of proteins, Urea cycle

Module- 5:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to discuss the basics of food additives.
2. Students will acquire the knowledge about food pigments & flavouring agents.

Detailed content of the unit:

Food Additives

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.

References: -

1. Principles of Biochemistry / Albert L. Leninger / CBS Publishers & Distributors, New Delhi.
2. Foods Facts & Principles / N. Shakuntala Manay & M. Shadaksharaswamy / New Age International.
3. Food Science / N.N. Potter.
4. Food Chemistry / L. H. Meyer.
5. Food Analysis & Practice / Y. Pamaranz / AVI.
6. Text Book of Biochemistry / Webb, Todd, Mason.
7. Food Science / B. Srilaxmi / New Age international.

FOOD PROCESSING LAB

Course Code	FPPC-504
Course Title	Food Processing Lab
Number of Credits	1.5 (L:0, T:0, P:3)
Prerequisites	Technology of Food-I, Technology of Food-II
Course Category	PC

Course Outcomes: -

1. Prepare fruit squash, nectar, jelly, jam and synthetic jelly, fruit pickle and mixed pickle. (K3)
2. Prepare ice cream and milk product. (K3)
3. Prepare soya products, canned fish and meat. (K3)
4. Prepare fermented fruit and vegetable, cereal and pulse product. (K3)

Course Content :

1. Preparation of fruit squash, nectar, jelly, jam and synthetic jelly.
2. Preparation of fruit pickle and mixed pickle.
3. Preparation of flavoured ice cream.
4. Preparation of milk product (curd, yogurt, paneer, cheese, ghee, butter etc).
5. Preparation of flavoured soya milk and soya milk product.
6. Preparation of canned fish and meat product.
7. Preparation of Fermented fruits and vegetable product.
8. Preparation of Fermented cereal and pulses products.

FOOD ANALYSIS LAB

Course Code	FPPC-505
Course Title	Food Analysis Lab
Number of Credits	1.5 (L:0, T:0, P:3)
Prerequisites	Technology of Food-I, Technology of Food-II
Course Category	PC

Course Outcomes: -

1. Analyze jam, jelly, fruit juice and beverage product. (K4)
2. Analyze raw milk, milk product quality and wheat flour. (K4)
3. Analyze cereals product, pulses product and lysine content in animal /vegetable sources. (K4)
4. Identify Caramel, Cochineal, Turmeric, Annatto dye in fruit/ vegetable and products. (K3)
5. Identify adulteration in food samples qualitatively. (K3)

Course Content:-

1. Analysis of jam, jelly.
2. Analysis of fruit juice and beverage product
3. Analysis of raw milk and milk product quality.
4. Analysis of wheat flour.
5. Analysis of cereals and pulses product.
6. Identification of Caramel, Cochineal, Turmeric, Annatto dye in fruit/ vegetable and products.
7. Analysis of lysine content in animal /vegetable sources.
8. Qualitative identification of adulteration in food samples.

FOOD INDUSTRIES WASTE MANAGEMENT

Course Code	FPPE-506/A
Course Title	Food Industries Waste Management
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	Food Microbiology
Course Category	PE

Course Outcomes: -

1. Study the details of waste treatment of parameters and stream pollution. (K1)
2. Describe the basics of waste treatment. (K2)
3. Illustrate the details of waste treatment units. (K3)
4. Acquire the knowledge of industrial waste treatment. (K3)
5. Discuss the source and characteristics of solid waste treatments. (K2)

Course Content:

Module– 1

Number of class hours: 05

Suggestive Learning Outcomes:

1. Students know the details of waste treatment parameters.
2. Students will describe stream pollution and measurement.

Detailed content of the unit:

Waste Treatment Parameters

Constituents of suspended solids, volatile suspended solids, MLVSS, BOD, COD, Dissolve oxygen, Analytical determination of BOD, COD and DO, Mathematical model for BOD, BOD curve.

Stream Pollution & Measurement

Nature of stream pollution, Oxygen sag curve, Oxygen sag equation and industrial problems based on oxygen sag equation.

Module – 2

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will know the fundamentals of waste treatment.
2. Students will be able to describe the types of waste treatments.

Detailed content of the unit:

Fundamental of physical and chemical treatment

Objective of physical treatments, screening, flow equalization, mixing and flocculation, gravity separation, grit removal, sedimentation, Ideal sedimentation tank concept, high-rate clarification, flotation, aeration system (principle only). Objective of chemical treatments, chemical coagulation, chemical precipitation, chemical oxidation, neutralization and stabilization (Principle only).

Fundamentals of biological treatment

Objective of biological treatment, Types of biological process, Microbial growth kinetics, Substrate utilization kinetics, Aerobic biological oxidation, Biological nitrification and denitrification, Biological phosphorous removal, Anaerobic biological oxidation, Biological removal of toxic, recalcitrant organic compound and heavy metals (No design principle only)

Module – 3:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will be able to describe various types of biological treatment units.
2. Students will be able to discuss biological treatment process.

Detailed content of the unit:

Biological Treatment unit

Activated sludge process and advantage (No design), Rotating biological contractors and its advantage and disadvantage (No design), Aerated lagoon – principle, application, advantage, residence time in aerated lagoon, brief discussion on stabilization pond(no problem) Trickling filter (only principle, application, advantage) Facultative pond, Oxidation ditch, aerobic pond, Biofilters and Bioclarifiers Anaerobic suspended and attached growth biological treatment process- Anaerobic contact process, anaerobic sludge blanket process, attached growth anaerobic process, (principle, application,)

Module – 4

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to classify food industrial wastes.
2. Students will be able to discuss waste disposal methods.

Detailed content of the unit:

Industrial Waste Treatment

Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry; Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment, reuse and recycling. (Only principle, application,)

Module – 5

Number of class hours: 06

Suggestive Learning Outcomes:

1. Students will know the sources of solid wastes.
2. Students will be able to understand solid techniques of solid waste treatment.

Detailed content of the unit:

Solid Waste Treatment

Source and characteristics of solid wastes, Preliminary operation, thickening, stabilization, anaerobic digestion, aerobic digestion, composting, Vermicomposting conditioning, dewatering, heat drying, incineration, disposal and landfilling. (only principle, application,)

Reference:

1. Waste treatment engineering / H.J. Hammer
2. Waste treatment / Eddy & Metcafe .
3. Environmental Science / J. Turk & A. Turk
4. Environmental Pollution / Dix Pollution Control Acts, Rules and Notification / Central Pollution Control Board, New Delhi
5. Wastewater engineering- Jain and Jain

FOOD SAFETY MANAGEMENT SYSTEM

Course Code	FPPE-506/B
Course Title	Food Safety Management Systems
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	Food Microbiology, Food Biochemistry
Course Category	PE

Course Outcomes: -

1. Understand the fundamentals of food safety and security. (K2)
2. Explain the basics of food quality.(K2)
3. Describe the details of critical quality control point. (K2)
4. Acquire the knowledge of food laws and regulations. (K3)
5. Discuss the details of codax alimentarius. (K2)

Course Content:

Module -1:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will know the details of food safety and security.
2. Students will be able to discuss food packaging and labelling.

Detailed content of the unit:

Introduction to food safety and security:
Hygienic design of food plants and equipments, Food Contaminants (Microbial, Chemical, Physical), Food Adulteration (Common adulterants), Food Additives (functional role, safety issues), Food Packaging & labeling. Sanitation in warehousing, storage, shipping, receiving, containers and packaging materials. Controlofrats, rodents, mice, birds, insects and microbes. Cleaning and Disinfection, ISO22000–Importance and Implementation

Module -2:

Number of class hours:10

Suggestive Learning Outcomes:

1. Students will know about quality attributes of food.
2. Students will be able to discuss about sensory evaluation of food.

Detailed content of the unit:

Food quality:
Various Quality attributes of food, Instrumental, chemical and microbial Quality control. Sensory evaluation of food and statistical analysis. Water quality and other utilities.

Module -3:

Number of class hours: 11

Suggestive Learning Outcomes:

1. Students will be able to identify critical control points in food production.
2. Students will be able to discuss about food laws.

Detailed content of the unit:

Critical Quality control point in different stages of production including raw materials and processing materials. Food Quality and Quality control including the HACCP system. Food inspection and Food Law, Risk assessment –microbial risk assessment, dose response and exposure response modeling, risk management, implementation of food surveillance system to monitor food safety, risk communication.

Module -4:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will know the details of food product regulation laws.
2. Students will be able to discuss the details of food product regulation agencies.

Detailed content of the unit:

Indian and global regulations:

FAO in India, Technical Cooperation programmes, Bio-security in Food and Agriculture, World Health Organization (WHO), World Animal Health Organization (OIE), International Plant Protection Convention (IPPC)

Module -5:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will know about Codex Alimentarius Commission.
2. Students will be able to discuss about Codex committee functions.

Detailed content of the unit:

Codex Alimentarius Commission- Codex India –Role of Codex Contact point, National Codex contact point (NCCP), National Codex Committee of India–ToR, Functions, Shadow Committee, etc.

References:

1. Nutritional and safety aspects of food processing by Tannenbaum SR.
2. Microbiological safety of food by Hobbs BC.

FOOD PROCESS EQUIPMENT DESIGN

Course Code	FPPE-507/A
Course Title	Food Process Equipment Design
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	Food Engineering Drawing
Course Category	PE

Course Outcomes:

1. Study the details of material of construction. (K1)
2. Explain the basics of construction requirements.(K2)
3. Understand the design of pipes and pressure vessels.(K2)
4. Describe the design of supports.(K2)
5. Discuss the design of process equipments. (K2)

Course Content :

Module -1 :

Number of class hours: 06

Suggestive Learning Outcomes:

1. Students will know the details of material selection.
2. Students will be able to discuss about the properties of materials.

Detailed content of the unit:

Introduction

Material of construction: Introduction to material selection; Material properties; Environmental effects on material selection; Mechanical properties & strength of materials.

Module -2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will understand the design parameters.
2. Students will be able to discuss about design loadings.

Detailed content of the unit:

Construction Requirements
Design basis: Design code; Design pressure, stress & factor of safety, Corrosion allowance, Weldjoint efficiency factor, Design loadings, Criteria of failure.

Module -3:

Number of class hours: 11

Suggestive Learning Outcomes:

1. Students will be able to describe the design of pipes.
2. Students will be able to illustrate the details of process vessel.

Detailed content of the unit:

Design of Pipes and Pressure Vessels
Design of pipe and pipe fittings. Process vessels under internal and external pressure; Design of attachments and closures;

Module -4 :

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will know about designs of connections.
2. Students will be able to illustrate the design of supports.

Detailed content of the unit:

Design of Supports
Design of flange connections & threaded fasteners; Design of supports; Bracket or Lug support, Skirt Supports.

Module -5 :

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to describe double pipe heat exchangers.
2. Students will be able to discuss the details of agitation vessesls.

Detailed content of the unit:

Design of Process Equipments

Process Design of double pipe heat exchanger, Shell & Tube Heat Exchanger, Design of Evaporator; Agitation Vessels and centrifugal separator, Design of Rotary Dryer.

References:

1. B.C.Bhattacharya.―Introduction to Chemical Equipment Design — Mechanical Aspects, CBS Publishers,Delhi.1991.
2. Anantha krishnan.C.P.and M.N.Sinha.―Technology and Engineering of Dairy Plant Operations, Laxmi Publications, New Delhi,1997.
3. Groff, GaneK. and Muthu, JohnF.,―Operations Management Selected Readings,D.B.TaraporevalaSonsandCo,Bombay,1975.
4. Thuesen,H.G., Febrycky,W.J. and Thuesen,G.J.,―Engineering Economy, Prentice–Hall Inc,NewJersey,1978.

EMERGING TECHNOLOGIES IN FOOD PROCESSING

Course Code	FPPC-507/B
Course Title	Emerging Technologies in Food Processing
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	Food Preservation Technology
Course Category	PE

Course Outcomes:

1. Understand the basics of high pressure processing foods.(K2)
2. Explain pulsed electric field processing. (K2)
3. Describe the fundamentals novel method. (K2)
4. Discuss the basics of hurdle technology.(K2)
5. Illustrate the details of innovation in food refrigeration. (K3)

Course Content:

Module-1:

Number of class hours: 06

Suggestive Learning Outcomes:

1. Students will know about the principles of high pressure processing foods.
2. Students will be able to discuss the effects of high pressure on foods.

Detailed content of the unit:

High pressure processing foods

Introduction, principles, use of high pressure to improve food safety and stability, Effects of high pressure on food quality, Applications of high pressure. HPP of Salads/Ready Meals – effects on microorganisms, enzyme activity, texture and nutrients.

Module-2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to describe the mechanism of pulse electric field processing.
2. Students will be able to discuss about electric field pulses on solid foods.

Detailed content of the unit:

Pulsed electric field processing

Mechanism of action, PEF treatment systems, PEF processing of liquid foods and beverages. High intensity electric field pulses on solid foods. Non thermal methods- its applications - Application of light pulses in sterilization of foods and packaging materials.

Module-3:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to describe the details of non thermal processing of foods.
2. Students will be able to discuss about aseptic processing in foods.

Detailed content of the unit:

Novel Method

Non thermal processing by radio frequency electric fields; Ultrasound as a food preservation tool; Freeze drying - Food irradiation - advantages and applications. – Super critical fluid extraction Aseptic processing in foods - extrusion cooking – equipment

Module-4:

Number of class hours: 11

Suggestive Learning Outcomes:

1. Students will know the basics of hurdle technology.
2. Students will be able to discuss about antimicrobial enzymes.

Detailed content of the unit:

Hurdle Technology

Basics of hurdle technology – Mechanism, Application to foods - Newer Chemical and Biochemical hurdles- organic acids – Plant derived antimicrobials – Antimicrobial enzymes– bacteriocins chitin/chitosan (only one representative example for each group of chemical and biochemical hurdle).

Module-5:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will know about high pressure freezing.
2. Students will be able to Freeze concentration.

Detailed content of the unit:

Innovation in Food Refrigeration

Vacuum cooling of foods, High pressure freezing, Freeze drying (lyophilisation) – Theory , Equipment ,Effect on foods , Freeze concentration – Theory, Equipment

References:

1. Da-Wen Sun,"Emerging Technologies for Food Processing", Academic press/ Elsiever, London, UK,2005.
2. Leistner L. and Gould G. Hurdle Technologies – Combination treatments for food stability.
3. safety and quality, Kluwer Academics / Plenum Publishers, New York (2002).
4. Da –Wen Sun, "Thermal Food Processing: New Technologies and Quality Issues, 2nd Edition, CRC Press/Taylor & Francis, Boca Raton, Florida,USA, 2012.
5. Gustavo V.Barbosa-Canovas, Maria S.Tapia and M.Pilar Cano, " Novel Food Processing Technologies". CRC Press, 2004.

SUMMER INTERNSHIP-II

Course Code	FPSI-509
Course Title	Summer Internship-II
Number of Credits	03 (L: 0, T: 0, P: 0)
Prerequisites	Fundamental and basic practical skills of relevant discipline/programme
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 4th Semester	6 Weeks	Industrial/Govt./NGO/MSME/ Rural Internship/Innovation / Entrepreneurship ##	3	120 Hours

(##During the summer vacation after 4th Semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship /Innovation /Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case a student want to pursue his/her family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)

Course Outcome: -

After completion of the course, students will be able to:

C.O.1: **Describe a better understanding of the engineering / technological workplace**(K2).

C.O.2: **Develop and demonstrate workplace competencies necessary for professional and academic success (K2).**

C.O.3: **Classify career preferences and professional goals (K3).**

C.O.4: Develop preliminary portfolio including work samples from the internship (K2).

C.O.5: **Increase competitiveness for full-time engineering employment / start-up** (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-II is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the

intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	Credit	Schedule	Total Duration	Sub Activity Head	Proposed Document as Evidence	Evaluated by	Performance appraisal/ Maximum points/ activity
Innovation / IPR / Entrepreneurship	3	Summer Vacation after 4th Semester	6 Weeks	Participation in innovation related completions for eg. Hackathons etc.	Certificate	Faculty Mentor	Satisfactory/ Good/ Excellent
				Development of new product/ Business Plan/ registration of start-up	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.	Certificate	President/ Convener of ICC	Satisfactory/ Good/ Excellent
				Work experience at family business	Declaration by Parent	TPO	Satisfactory/ Good/ Excellent
Internship	3	Summer Vacation	6 Weeks	(Internship with Industry/ Govt. /	Evaluating Report	Faculty Mentor/	Satisfactory/ Good/

		after 4th Semester		NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ Online Internship		TPO/ Industry supervisor	Excellent
Rural Internship	3	Summer Vacation after 4th Semester	6 Weeks	Long Term goals under rural Internship	Evaluating Report	Faculty Mentor/ TPO/ NSS/ NCC head	Satisfactory/ Good/ Excellent

Student's Diary/ Daily Log

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

Internship Report

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

MAJOR PROJECT - I

Course Code	FPPR-510
Course Title	Minor Project
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms. (K3)

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

Food Processing Technology (FPT) Syllabus

Semester VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-21	FPPC-601	Food Packaging Technology	2	1	0	3	3
2	Programme core course-22	FPPC-602	Food Safety and Quality Control	3	0	0	3	3
3	Programme elective course-4	FPPE-603/A	Fermentation Technology	2	0	0	2	2
		FPPE-603/B	Food Extrusion Technology					
		FPPE-603/C	Food additives and Preservatives					
4	Humanities and Social Science course	HS-604	Entrepreneurship and Start-up's	3	1	0	4	4
5	Open elective-3	(**Any one to be opted from Annexure-II**)		4	0	0	4	4
6	Mandatory Course-2	AU-606	Indian Constitution	2	0	0	2	0
7	Major Project	FPPR-607	Major Project	0	0	6	6	3
8	Seminar	FPSE-608	Seminar	2	0	0	2	1
Total				**18**	**2**	**6**	**26**	**20**

FOOD PACKAGING TECHNOLOGY

Course Code	FPPC-601
Course Title	Food Packaging Technology
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	Food Preservation of Technology
Course Category	PC

Course Outcomes:

1. Study the fundamentals of food packaging. (K1)
2. Describe the basics of packaging materials and properties.(K2)
3. Acquire the knowledge of packaging materials and properties. (K3)
4. Illustrate the details of packaging machineries and evaluation. (K3)
5. Explain packaging systems and regulations. (K2)

Course Content:

Module- 1:

Number of class hours: 06

Suggestive Learning Outcomes:

1. Students will know about food packaging.
2. Students will be able to illustrate the important functions of packaging.

Detailed content of the unit:

Introduction

Introduction to Food Packaging: Definitions, types of packaging materials, manufacturing processes, Importance and scope functions of packaging, Factors responsible for the selection of Packaging materials for fresh and processed food products.

Module- 2:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to describe the types of packaging materials.
2. Students will be able to explain the properties packaging materials.

Detailed content of the unit:

Packaging Materials and Properties

Types, properties, advantages and disadvantages –Primary Packaging Materials (Paper and paper based packaging materials, Plastic as packaging materials). Secondary Packaging Material (Folding carton) Transport packaging materials Ancillary Packaging Materials

(Printing inks, varnishes, lacquers and adhesives), Glass packaging materials, Composition, structure, properties, Aluminium foil, Metal packaging materials.

Module-3:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to understand the packaging requirements of various types of foods.
2. Students will be able to discuss about instant foods.

Detailed content of the unit: -

Packaging Requirements

Packaging requirements of different types of foods: fruits and vegetables, meat, fish, poultry, dairy products, edible oils and spice products, bakery products, confectioneries, Instant foods, extruded foods, snack foods, alcoholic and non-alcoholic, carbonated beverages.

Module-4:

Number of class hours: 12

Suggestive Learning Outcomes:

1. Students will be able to illustrate packaging machineries.
2. Students will be able to analyze package evaluation.

Detailed content of the unit:

Machineries & Evaluation

Packaging Machineries**:** Bottling, canning, capping, labeling, form- fill sealing, strapping, cartooning machineries. Package Evaluation: evaluation of mechanical, optical and barrier properties like WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test.

Module- 5:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will acquire knowledge of packaging systems.
2. Students will be able to explain packaging standards and regulations.

Detailed content of the unit:

Packaging Systems and Regulations

Packaging Systems- Vacuum and gas packaging, aseptic packaging, retort packaging, CAP and MAP, intelligent packaging, active packaging, shrink packaging, lined cartooning

system, PET, TTI, Preform, tetra pack processes. Bio-composite and alternative packaging.

Packaging standards and regulations- laws, specifications and quality control, collection, separation, disposal and recycling of packaging materials

References: -

1. Food Packaging Materials, N.T.Crosby, published by Applied Science.
2. Plastic Films for Packaging Technology, Calvin J. Bening, published by Technomic.
3. Packaging of Food Beverages- F.T.Day.
4. Food Packaging- Sacharow & Griffin.
5. Flexible Packaging of Foods- A.L. Brody

FOOD SAFETY AND QUALITY CONTROL

Course Code	FPPC-602
Course Title	Food Safety and Quality Control
Number of Credits	03 (L:3, T:0, P:0)
Prerequisites	Food Analysis Lab
Course Category	PC

Course Outcomes: -

1. Study the basics of food safety. (K1)
2. Describe foods analysis and quality evaluation. (K2)
3. Acquire the knowledge statistical of quality control. (K3)
4. Discuss the fundamentals of food legislation and standard. (K2)
5. Illustrate the details of quality standards. (K3)

Module- 1:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will know the basics of food safety.
2. Students will acquire the knowledge of food hazards.

Detailed content of the unit:

Introduction to Food Safety

Definition, food safety issues and strategies [concept of food safety and standards (FSSAI)], factors affecting food safety, importance of safe foods, factors affecting shelf life and

methods to check the shelf life. Food hazards and contaminations - biological (bacteria, fungus and parasites), chemical (toxic constituents / hazardous materials) pesticides residues / environmental pollution / chemicals) and physical factors. Prevention and control of microbiological and chemical hazards. Recent concerns on food safety: Genetically Modified Foods.

Module- 2:

Number of class hours: 11

Suggestive Learning Outcomes:

1. Students will be able to discuss the objectives of food analysis.
2. Students will be able to illustrate the types of food quality evaluation technics.

Detailed content of the unit:

Food Analysis &**Quality Evaluation**

Food Analysis: Objective and purpose of food analysis; food adulteration; Simple and quick method of adulteration detection. Sensory Evaluation: Definition, objectives, panel selection, sensory techniques, pros & cons, Sensory evaluation of food by subjective method- Difference tests, Sensitivity test, Rating test, Objective method- colour (Theory of spectrophotometer & colorimeter, selection of filter, Colour measurement , Colour specification), Brooke field Viscometer (Principle), Rheological properties of fruitjuice and concentrate, Different textural attributes of food, Texture measurement instruments and unit of measurement, Instron testing machine), Chromatographic principle (HPLC), Atomic absorption spectrophotometer principle for measurement of heavy metals

Module-3:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to explain the basic concepts of quality control.
2. Students will be able to discuss on sampling and hypothesis testing.

Detailed content of the unit:

Statistical Quality Control

Basic concepts, uses, limitations, applications of statistics in food quality control. Types of data, data collection methods. Data presentation, Graphical presentation of data(histogram, bar diagrams, line diagram, frequency polygon), Measures of central tendency (Mean, Median, Mode.), Measures of dispersion (range, quartile deviation, mean absolute deviation, standard deviation, coefficient of variation), Measures of skewness &Kurtosis. Control

Charts. Sampling (Definition of sampling, purpose, sampling techniques, requirements and sampling procedures). Hypothesis testing. Applications of t-test, z-test, F-test, Chi square test.

Module-4:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will know the details of national food legislations.
2. Students will be able to illustrate international food legislations.

Detailed content of the unit: -

Food Legislations & Standards
National Food Legislations: PFA, FPO, MPO, BIS, AGMARK, ISI, Misbranding, Enforcement, Essential Commodities Act, 1954; Consumer Protection Act, 1986. International Food Legislations: FAO, WHO Codex Alimentarius, Codex India, JECFA (Joint FAO/WHO Expert Committee on Food Additives), WTO, SPS (Sanitary and Phytosanitary Measures),TBT (Technical Barriers to Trade), ISO (International Organization for standard)

Module- 5

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will know about food quality standards.
2. Students will acquire knowledge of various quality standards rules.

Detailed content of the unit:

Quality Standards
GMP, GHP, HACCP, GAP, ISO Series (9000, 22000, 14000 & 17025.)

References:

1. Food Quality Assurance: Principles and Practices, Inteaz Alli, CRC Press, 2003
2. Quality Assurance for the Food Industry: A Practical Approach , J. Andres Vasconcellos, CRC Press,29-Dec 2003

FERMENTATION TECHNOLOGY

Course Code	FPPE-603/A
Course Title	Fermentation Technology
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	Microbial Technology
Course Category	PE

Course Outcomes:

1. Study the basic concepts of fermentation technology. (K1)
2. Understand the fundamentals of fermenter design(K2)
3. Describe the details of fermentation process. (K2)
4. Illustrate fermentative production of food products. (K3)
5. Discuss the fundamentals of down steam processing. (K2)

Course Content:

Module- 1:

Number of class hours: 11

Suggestive Learning Outcomes:

1. Students will know about fermentation.
2. Students will be able to describe the criteria for the selection of micro organism.

Detailed content of the unit:

Introduction to Fermentation Technology

Concepts about fermentation, Culture preservation, Criteria used for the selection of microorganisms for fermentation; Methods of culture maintenance, Cultures maintenance by storage with limited metabolic activity.

Module- 2:

Number of class hours: 10

Suggestive Learning Outcomes:

1. Students will be able to discuss the basic functions of fermenters.
2. Students will be able to illustrate the types of fermenters.

Detailed content of the unit:

Fermenter Design

Basic functions of Fermenters, Types of Fermenters (or Bioreactor) – Fluidized Bed Bioreactor, Loop or Air Lift Bioreactor, Membrane Bioreactor, Pulsed Column Bioreactor,

Bubble Column Bioreactor, Photo Bioreactor, Packed Tower Bioreactor; Construction of Fermenters, Design and Operation of Fermenters.

Module-3:

Number of class hours: 09

Suggestive Learning Outcomes:

1. Students will be able to explain fermentation process kinetics.
2. Students will be able to discuss the role of fermentation in food industries.

Detailed content of the unit:

Fermentation Process

Types, Model of Batch (Stoichiometry of cell growth. Monod's Growth kinetics, Specific growth rate, growth yield, production yield, Saturation constant, maintenance energy, Transient growth); Model of Fed-Batch and Model of Continuous (chemostat, chemostat with recycle, turbidostat), Scale-up of Fermentations. Overview of aerobic and anaerobic fermentation processes and their application in food processing industry, Solid substrate and submerged fermentation and its application.

Module-4:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will know the fermentative production of food.
2. Students will acquire the knowledge of fermentation metabolites.

Detailed content of the unit: -

Fermentative Production of Different Products

Fruits & Vegetable products, Cereal Based Products, Primary & Secondary Metabolites, Alcoholic Beverages

Module- 5:

Number of class hours: 08

Suggestive Learning Outcomes:

1. Students will be able to describe pre-treatment of down steam processing.
2. 2. Students will be able to discuss about purification processes.

Detailed content of the unit: -

Down stream processing

Pretreatment (cell disruption and flocculation); Solid liquid separation (filtration, sedimentation and centrifugation); Concentration (membranes, salt and solvent precipitation, evaporation, liquid – liquidextraction, distillation); Purification (precipitation, chromatography, adsorption and elution); Formulation (drying, extrusion, granulating and tableting.)

References:

1. Principles of Fermentation Technology, P F Stanbury Dr. A Whitaker
2. Fermentation Technology, M. L. Srivastava, Alpha Science Intl Ltd

FOOD EXTRUSION TECHNOLOGY

Course Code	FPPE-603/B
Course Title	Food Extrusion Technology
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	Technology of Food Preservation
Course Category	PE

Course Outcomes: -

1) Understand the basics of extrusion process. (K2)
2) Describe the types of screw extruder. (K2)
3) Illustrate the processing of breakfast cereal and speghatti. (K3)
4) Discuss the details of texurized vegetable protein. (K2)
5) Explain the fundamentals of extruded foods.(K2)

Course Content:

Module-1:

Number of class hours: 06

Suggestive Learning Outcomes:

1. Students will be able to define extrusion.
2. Students will be able to explain the principles and types of extrusion.

Detailed content of the unit: -

Extrusion:
Definition, introduction to extruders, principles and types, Uses of extruders in the food industry, Single screw extruder: principle of working, net flow, factors affecting extrusion process.

Module-2:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will be able to describe the types of screw extruder.
2. Students will be able to discuss the process characteristics of screw extruder.

Detailed content of the unit: -

Twin screw extruder:

Counter rotating and co-rotating twin screw extruder, Process characteristics of the twin screw extruder Pre-conditioning of raw materials used in extrusion process Use of dry extruders in extrusion Chemical and nutritional changes in food during extrusion.

Module-3:

Number of class hours: 06

Suggestive Learning Outcomes:

1. Students will be able to classify breakfast cereals.
2. Students will be able to illustrate the processing technique of spaghetti.

Detailed content of the unit:

Classification of Breakfast cereals: Raw materials, Preparation of noodles/ vermicelliprocess and quality testing of vermicelli,
Spaghetti: Raw materials, process and quality testing of pasta and macaroni products.

Module-4:

Number of class hours:05

Suggestive Learning Outcomes:

1. Students will be able to define texturized vegetable protein.
2. Students will be able to illustrate processing techniques of texturized vegetable protein.

Detailed content of the unit: -

Texturized vegetable protein:

Definition, processing techniques, and foods Ready to eat breakfast cereals by extrusion cooking. Cooking quality of TVP

Module-5:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will be able to describe properties of extruded foods.
2. Students will be able to analyze extruded products.

Detailed content of the unit: -

Extruded Foods:

Physical properties of extruded foods (expansion, density, water absorption index, etc), Preparation of weaning foods , Determination of oil absorption capacity of extruded products ,Determination of water absorption capacity of noodles, Studies on Textural Profile Analysis of extruded products, Effect of extrusion cooking on antinutritional factor .

References:

1. Extruders in Food Application, Riaz M.N. CRC Press, 2000
2. Advances in Food Extrution Technology, Maskan and Altan, CRC press 2000
3. Extrutions of Foods, Harper JM ,CRC Press, 1981
4. Food process Engineering and Technology, Berk Z ,Academic Press, 2013

FOOD ADDITIVES AND PRESERVATIVES

Course Code	FPPE-603/C
Course Title	Food additives and Preservatives
Number of Credits	02 (L:2, T:0, P:0)
Prerequisites	Applied Nutrition
Course Category	PE

Course Outcomes:

1) Study the details of food additives.(K1)
2) Understand the role of food acidulants and pigments.(K2)
3) Illustrate the basics of food preservatives and antioxidants. (K3)
4) Acquire the knowledge of stabilizer and sweeteners. (K3)
5) Explain the fundamentals of flavoring agents and starch modifiers. (K2)

Module-1:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will know the effects of food additives.
2. Students will be able to explain the risk of food additives.

Detailed content of the unit: -

Toxicology and Safety Evaluation of Food Additives, Effects of Food Additives, Food Additives generally recognized as safe (GRAS), Tolerance levels & Toxic levels in Foods, Legal safeguard, Risks of food additives.

Module-2:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will know about food acidulants.
2. Students will be able to discuss on food colorants and pigments.

Detailed content of the unit: -

Naturally occurring food additives: Classification, Health Implications, and Role in Foods.

Acidulants: Introduction, Different acidulants, Role in food processing.

Food colorants: Introduction, Natural & Synthetic food colorants, Classification of Food colorants, Chemical nature, Impact on health.

Pigments: Importance, Classification, Utilization as food colour.

Module-3:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will know the details of food preservatives.
2. Students will be able to discuss on antioxidants and chelating agents.

Detailed content of the unit: -

Food Preservatives: Introduction; Classification- Natural & chemical preservatives; Mode of action; Role in Food processing.

Antioxidants &chelating agents: Introduction, Role in foods, Types of antioxidants -natural & synthetic, Mode of action of antioxidants in foods; Chelating agents- Naturally & synthetic; Mode of action of chelating agents; Applications of antioxidants and chelating agents.

Module-4:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will be able to define stabilizers.
2. Students will be able to know the details sweeteners.

Detailed content of the unit: -

Stabilizers, thickeners and Emulsifiers: Introduction, Types, Applications in food processing; Sweeteners: Introduction; Classification- Artificial sweeteners & Non-nutritive sweeteners, Health implications, Role in food processing.

Module-5:

Number of class hours: 07

Suggestive Learning Outcomes:

1. Students will be able to define taste and flavouring agents.
2. Students will be able to explain starch modifiers.

Detailed content of the unit: -

Taste and Flavoring agents: Introduction, Classification of flavors- natural & synthetic, Flavor enhancer/ Potentatior, Importance of taste and flavours, Role of flavoring agents in food processing.

Anti-caking agents and Humectants: Introduction, Different Anti-caking agents and Humectants, Role in food processing

Starch modifiers: Introduction, Chemical nature, Role in food processing, Antimicrobial agents, Clarifying agents, antifoaming agents,

Fat mimetics and replacers: Introductions; Role in food processing;

References:

1. Food Additives: A Larry Branen, P Michael Davidson and Seppo Salminen, CRC Book Press. USA.
2. Food Additives: S.N. Mahindru, APH Publishing Corporation, Drya Ganj, New Delhi.
3. Food chemistry:,Owen R Fennema, Marcel Dekker, Inc. New York. 1996
4. Food chemistry: Lillian Hogland Meyer, Avi Pub Co .1974

ENTREPRENEURSHIP AND START-UPS

Course Code	:	HS-604
Course Title	:	Entrepreneurship and Start-ups
Number of Credits	:	04 (L:3, T:1, P:0)
Prerequisites (Course code)	:	Nil
Course Category	:	HS

CO1 Understand the basic concepts of Entrepreneurship and Startups.

CO2 Illustrate skills of discovering business ideas, visualizing and planning a business.

CO3 Analyze market and business risk for strategy development.

CO4 Demonstrate skills of organizational management.

CO5 Exhibit knowledge of financing methods, institutions and skills for communication of ideas.

Course Content:

Unit1-Introduction and Basics of Entrepreneurship and Start–Ups

Suggestive Learning Outcomes:

(1) Describe the Basic Elements of Entrepreneur and Entrepreneurship

(2) Distinguish between Entrepreneur, Manager and Intrapreneur

Content:

- Definitions, Traits of an entrepreneur, Factors influencing entrepreneurship, Types and Functions of Entrepreneurs, Need for promotion of entrepreneurship, Intrapreneur, Motivation
- Role of Entrepreneurs in Economic Development
- Similarities/differences between - Entrepreneur and Manager, Entrepreneur and Intrapreneur.

Unit2–Business Ideas and their implementation

Suggestive Learning Outcomes:

(1) Illustrate different Types of Business Planning and Business Structure
(2) Select specific Institutions Assisting Entrepreneur
Content:

- Discovering ideas
- Visualizing the business
- Business Plan, - Types of planning, Importance of planning, Steps in planning
- Types of Business Structures
- Institutions assisting entrepreneur

Unit3–**Idea to Start-up**

Suggestive Learning Outcomes:

(1) Identify Steps for Starting a SSI
(2) Predict the Target Market and Associated Risk
Content:

- Market analysis – Identifying the target market
- Competition evaluation and Strategy Development
- Steps for starting a small enterprise
- Risk analysis

Unit4–Management of Enterprise

Suggestive Learning Outcomes:

(1) Apply the Basic Accounting Concepts in Business
(2) Demonstrate Knowledge of Pricing, Positioning and Advertising of Products

Content:

- Recruitment and management of talent.
- Determinants of Price, Pricing methods in practice.
- Market Positioning, Advertising and Sales Promotion
- Accounting - Understanding basics of Transaction, Journal, Ledger, Cashbook, Trial Balance, Cost Sheet and Final Accounts through simple problems

Unit5-Financing and Communication of Ideas

Suggestive Learning Outcomes:

(1) Exhibit Knowledge of various Financial Institutions and Financing Methods
(2) Illustrate Business Ideas through Communication Skills

Content:

- Financial Institutions
- Financing methods available for start-ups in India
- Communication of Ideas to potential investors–Investor Pitch

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN–978-0984999392
2.	The Lean Startup: How Today's Entre-preneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN–978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN–978-0755388974

4.	Entrepreneurship	Alpana Trehan	Dreamtech PressISBN: 978-93-5004-026-3
5	Marketing and Sales Management	D C Kapoor	S Chand and Company Ltd. ISBN: 81-219-2430-8
S.No.	**Title of Book**	**Author**	**Publication**
6	Business Economics	H L Ahuja	S Chand and Company Ltd. ISBN: 81-219-1791-3
7	Financial Accounting (Principles and Practice)	Jawahar Lal & Seema Srivastava	S Chand Publishing
8	Accounting for Management	N.P. Srinivasan & Sakthivel Murugan	S Chand Publishing
9	Marketing	Harsh V Verma and Ekta Duggal	Oxford University Press ISBN: 0-19-945910-X
10	Marketing (Asian Edition)	Paul Baines, Chris Fill, Kelly Page and Piyush K. Sinha	Oxford University Press
11	Entrepreneurship	Rajeev Roy	Oxford University Press ISBN: 0-19-807263-5
12	Entrepreneurship Development	Kumar S Anil	New Age Publishers
13	Human Resource Management	Uday Kumar Haldar and Juthika Sarkar	Oxford University Press
14	Fundamentals of Entrepreneurship	S K Mohanty	Prentice Hall of India Private Limited ISBN: 81-203-2867-1
15	Entrepreneurship Development	S S khanka	S Chand and Company Ltd. ISBN: 81-219-1801-4

SUGGESTED SOFTWARE/LEARNINGWEBSITES:

a. https://www.fundable.com/learn/resources/guides/startup
b. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/
c. https://www.finder.com/small-business-finance-tips
d. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

INDIAN CONSTITUTION

Course Code	:	AU-606
Course Title	:	Indian Constitution
Number of Credits	:	0 (L: 2, T:0; P:0)
Prerequisites (Course code)	:	None
Course Category	:	AU

Course Outcomes:

1. Illustrate Preamble, Basic Structure, Fundamental Rights and Duties of Indian Constitution(K3).
2. Discuss the Structure of The Indian Union Government (K2).
3. Memorize the Role and Power of Governor, Chief Minister and Council of Ministers and explain the role of State Secretariat (K2).
4. Describe the role of Local Administration (K2).
5. Explain the Role and Functioning of Election Commission (K2).

Detailed Course Content:

Unit 1 – The Constitution – Introduction

Number of Class hours:06

Learning Outcomes:

1. Describe the History of the Making of the Indian Constitution (K2)
2. Illustrate Preamble and the Basic Structure of Indian Constitution (K3)
3. Illustrate the Fundamental Rights and Duties set by Indian Constitution(K3)

Detailed content of the unit:

1. The History of the Making of the Indian Constitution

2. Preamble and the Basic Structure, and its interpretation
3. Fundamental Rights and Duties and their interpretation
4. State Policy Principles

Unit 2 – Union Government

Number of Class hours:06

Learning Outcomes:

1. Discuss the Structure of the Indian Union Government (K2).
2. Memorize the Role and Power of President, Prime Minister and Council of Ministers of India (K1)
3. Explain the role of Lok Sabha and RajyaSabha (K2)

Detailed content of the unit:

1. Structure of the Indian Union
2. President – Role and Power
3. Prime Minister and Council of Ministers
4. Lok Sabha and Rajya Sabha

Unit 3 – State Government

Number of Class hours:06

Learning Outcomes:

1. Memorize the Role and Power of Governor, Chief Minister and Council of Ministers of a state(K1)
2. Explain the role of State Secretariat (K2)

Detailed content of the unit:

1. Governor – Role and Power
2. Chief Minister and Council of Ministers
3. State Secretariat

Unit 4 – Local Administration

Number of Class hours:06

Learning Outcomes:

1. Describe the role of District Administration (K2)
2. Explain the role of Municipal Corporation (K2)
3. Discuss the role of Zila Panchayat (K2)

Detailed content of the unit:

1. District Administration
2. Municipal Corporation
3. Zila Panchayat

Unit 5 – Election Commission

Number of Class hours: 06

Learning Outcomes:

1. Explain the Role and Functioning of Election Commission (K2)
2. Classify the role and functioning of Chief Election Commissioner and State Election Commissioner (K2).

Detailed content of the unit:

1. Role and Functioning of Election commission
2. Chief Election Commissioner
3. State Election Commission

Suggested Learning Resources:

S. No.	Title of Book	Author	Publication
1.	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2.	The Constitution of India	B.L. Fadia	Sahitya Bhawan; New edition (2017)
3.	Introduction to the Constitution of India	DD Basu	Lexis Nexis; Twenty-Third 2018 edition

Suggested Software/Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution
d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

MAJOR PROJECT - II

Course Code	FPPR-607
Course Title	Major Project
Number of Credits	3 (L: 0, T: 0, P: 6)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms (K3).

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should provide the scope to develop the following by the students-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

SEMINAR

Course Code	FPSE-608
Course Title	Seminar
Number of Credits	1 (L: 0, T: 0, P: 1)
Prerequisites	Nil
Course Category	Seminar presentation

Course Outcome:-

After completion of the course, students will be able to:

C.O.1: Demonstrate a thorough and systematic understanding of a seminar topic (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O.3: Demonstrate the ability to construct a report consistent with expectations of the topic, including an appropriate organization, style, voice, and tone (K3).

C.O.4: Develop the ability to follow discussions, oral arguments, and presentations, noting main points or evidence and tracking through different comments given by the audience (K3).

C.O.5: Developthe communication skill as a speaker (K3).

Course Content:-

The seminar topics may be any aspect of the science and technology, entrepreneurship or any contemporary social issues to be solved by specific branch of engineering and technology (For example, Water logging problems in a particular city may be a seminar topic for Civil Engineering Students) must be approved by the instructor in advance.

The course should have the following-

7) Practice speaking in front of a scientific audience.
8) Explore topics in detail.
9) Research topics and organize presentations.
10) To improve as speakers, each student will receive feedback from the fellow students and the instructor.
11) PowerPoint, Key Note or overheads are acceptable media for Visual aids. Visual aids should look professional and be readable in the entire room; use spell check and proofread for typographical errors.
12) Students have to submit a hard copy contains detailed outline (4-5 pages) of their presentation and also a brief abstract (one or two paragraphs; **250 words max.**) describing their presentation.
13) Each student will give 20-minute presentations followed by 3 minutes of question-answer session.

Proposal Seminar Format for Students:

- Introduce yourself.
- Give an introduction and background information on your topic. What relevant research has been performed previously?
- State the problem(s) that remain unanswered.
- Clearly state your objectives and give the specific hypotheses you wish to test.

- Describe the methodology you will use to test your hypotheses. Be sure you fully understand your chosen methods. Give reasons why you chose these methods over other approaches.
- Present any data you have collected thus far.
- Describe what remains to be done, and what you expect to find.
- Explain the significance of your findings (or potential future findings).

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