**BRANCH: FOOD PROCESSING TECHNOLOGY**

STRENGTH OF MATERIALS

Code: BES-401 L – T – P: 3 – 0 – 0

Total Marks: 100 Theory: 28/70 Sessional: 15/30

1. Concept of stress and strain, normal and shearing stresses and strains, stress-strain relationship, generalized Hooke’s Law, plane stress and plane strain, Poisson’s ratio, stress-strain diagrams for uni-axial loading.
2. Deformation of axially loaded members and statically indeterminate problems, torsion of circular shafts; Stress and deflections in closed coiled helical springs subjected to axial forces, members subjected to flexural loads.
3. Reactions for statically determinate beams, relationship between load, shearing force and bending moment, shear force and bending moment diagrams.
4. Theory of simple bending stresses in beams, shearing stresses in beams, members subjected to combined loads, principal stresses and principal planes, principal strains. Mohr’s circle of stresses and strain, principal stresses in 3D, relation between elastic constants.
5. Principal stresses for strain measurements, combined torsion and bending, pressure vessels, biaxial stresses, yield theories, deflection of beams, direct integration method, moment area method.

**References:**

1. Mechanics of Materials - J.M. Gera and S.P. Timoshenko, CBS Publishers & Distributors, New Delhi.
2. Strength of Materials & Mechanics of Structures, Vol. I&II: B.C. Punmia, Standard Publishers & Distributors, New Delhi.
3. Mechanics of Structures, Vol. I&II: S.B. Junnarkar, Charotar Publishing House, Anand.
4. Strength of Materials - F.L. Singer & A Pytel, Harper & Row Publisher, NY.

\*\*\*\*\*\*\*\*\*\*00000\*\*\*\*\*\*\*\*\*\*

INSTRUMENTATION AND PROCESS CONTROL

Code: CAI-403 L – T – P: 3 – 0 – 2

Total marks: 100 Theory: 28/70 Sessional: 15/30

1. Fundamental & Importance of Instrumentation, types of instruments, selection of instruments, performance of instruments, error in measurement, calibration & standard, Calibration of Instruments: Methods & analysis, Introduction to Transducer & types, Process Instrumentation, recording instruments, indicating & recording Instruments.

1. Measurements of temperature, pressure, relative humidity, moisture content & velocity & flow.
2. Miscellaneous measurement: force &torque, level, pH, gas analyzer, emissivity, refractive index, viscosity, surface tension, & color. Spectro-photo-metry, chromatography & NIR Introduction to biosensors.
3. Basic concept of process controls, types of control & their application. Concept of automatic control & its classification, Instrumentation & control of typical food processing units like reactor, evaporator, dryer etc.

**References:**

1. Experimental Methods - J. P. Holman McGraw Hill International, Auckland.
2. Engineering Metrology - R K Jain, Khanna Publishers, Delhi.
3. Mechanical Measurements - Thomos G. Beckwith & Lewis Back N. Adison Wesely Longman, Harlow.
4. Industrial Instrumentation - John Wiley Eastem Ltd, New Delhi.

\*\*\*\*\*\*\*\*\*\*00000\*\*\*\*\*\*\*\*\*\*

COMPUTER PROGRAMMING WITH C/C++

Code: CAI-406 L – T – P: 4 – 0 – 3

Total Marks: 100 Theory: 28/70 Sessional: 15/30

1. Introduction, Salient features of C, C-tokens, data types of variables, declarations, type casting and expression Control flow-branching & looping.
2. Functions-pass by value, Pass by reference and program structure, string manipulation, pointer and array, passing pointers as arguments in function.
3. Structural input and output file and handing, UNIX system interfaces, special features of C.
4. Object oriented programming, data encapsulating, inheritance and overloading.
5. File handing with C++, constructors, destructor, special features of C++

**References:**

1. Programming in ANSI C – E. Balaguruswamy, Tata McGraw Hill, New Delhi.
2. Programming with C - Byron Gottfried, McGraw Hill International, New York.
3. The C Programming Language - Kernighan B W & Ritchie Denison, prentice Hall of India, New Delhi.
4. Object Oriented Programming in TURBO C++: Robert Lafore, Galgotia publications, new Delhi.

**\*\*\*\*\*\*\*\*\*\*00000\*\*\*\*\*\*\*\*\*\***

ELEMENTS OF FOOD ENGINEERING – II

Code: FPT-401 L – T – P: 3 – 0 – 2

Total Marks: 100 Theory: 28/70 Sessional: 15/30

1. Physical Properties of fluids, classification of fluid flow, continuity equations, Bernoulli’s equation & its application, Steady State flow equation, Concept of viscosity, Newtonian & non-Newtonian fluids. Poiseuille’s equation
2. Navier Stoke’s equation, flow through parallel plates & circular pipes, Concept of Reynolds’s number & its application, Concept of fluid transportation, fluid transportation devices & accessories. Pipe & pipe flow, fitting, Pumps, types of pumps & their application and selection. Valves & joints
3. Fick’s Law of diffusion & basic concepts of convective mass transfer, Simultaneous heat & mass transfer, Introduction to mass transfer operations in food processing
4. Psychometrics: properties of air water vapor mixture; psychometric properties, charts & relations, & psychometric calculations. Principles of humidity control for food processing operations. Water relations of foods

**References:**

1. Unit operations in Food Processing - Earle, R. L. Pergamon press, NY.
2. Food Engineering Operations - Brennan, J. G. et. Al. Elsevier Applied Science, Amsterdam.
3. Food Process Engineering - Held man, R. R. & R. P. Singh, CBS Publication.
4. Fundamental of Food Engineering - Toledo, R. T., CBS Publication.

\*\*\*\*\*\*\*\*\*\*00000\*\*\*\*\*\*\*\*\*\*

SERVICING AND MAINTENANCE OF FOOD MACHINERIES

Code: FPT-402 L – T – P: 2 – 0 – 0

Total Marks: 100 Theory: 28/70 Sessional: 15/30

1. Introduction to general repair of hand tools &food machineries, Description of Engineering materials like: Fe & its alloys, Cu, Al & their alloys, Material hardening & electroplating, Surface finish & its importance in food processing
2. Study on general purpose machine components, fasteners plumbing, Elements of rotary motion drive, springs, their fittings. Preventive maintenance, Common defects in service & remedial procedure.
3. Lubrication & Lubricants, Seals & packaging. Common appliance-mechanisms & servicing
4. Introduction to operation & maintenance of general plant accessories like pumps, compressors, etc.

References:

1. Industrial Maintenance - H.P. Garg, S. Chand & Co., New Delhi.
2. Machine Operation & Maintenance Manual - Escorts Tractor Limited, Bangalore.
3. Elements of Workshop Technology, Vol.-I - S. K. Hajra Choudhury, et al.Media Promoters & publishers, Pvt. Ltd., Mumbai.

\*\*\*\*\*\*\*\*\*\*00000\*\*\*\*\*\*\*\*\*\*

BASICS OF FOOD CHEMISTRY

Code: FPT-403 L – T – P: 3 – 0 -2

Total Marks: 100 Theory: 28/70 Sessional: 15/30

1. Introduction, role of food chemistry and chemist in food industries. Importance of different food constituent. Water: structure, properties, types of liquid water and ice, mineral water. Water activity and storage stability of food.
2. Carbohydrate: nomenclature and classification, structure, physical and chemical properties of mono & Polysaccharides (cellulose, starch, fructose, galactans, hemi cellulose, pectic substances) and their functions. Proteins: Classification and properties of amino acids, chemical properties of proteins, structure of amino acids, essential and non-essential amino acid, isolation of amino acids.
3. Lipids: structure, physical and chemical properties, acidity, reversion, introduction to hydrogenation and its importance. Vitamins: types (water and fat soluble), chemistry and functions, source and deficiency disease. Minerals in foods: calcium, phosphorus, iron, copper, lead, tin, zinc and arsenic.
4. Food Enzymes: classifications, nomenclature, activation energy, factors effecting enzymes actions. Food additives: Properties and function. Plant pigments: structure and properties of chlorophyll, anthocyanins and arytenoids, chemical changes during processing. Emulsions and emulsifiers, mechanism of emulsification.

**References:**

1. Food Chemistry - L.H. Meyer, CBS, New Delhi.
2. Food Chemistry - Fennama, CRC.
3. Principles of Biochemistry - Lehnninger, CBS, New Delhi.

\*\*\*\*\*\*\*\*\*\*00000\*\*\*\*\*\*\*\*\*\*