

SYLLABUS

Faculty of Engineering and Technology



FOOD TECHNOLOGY

**MAHATMA GANDHI CHITRAKOOT GRAMODAYA VISHWAVIDYALAYA
CHITRAKOOT, SATNA (M.P.) - 485 331**

**MAHATMA GANDHI CHITRAKOOT GRAMODAYA
VISHWAVIDYALAYA**

ORDINANCE FOR B.TECH.

Programme Offered	: B.Tech. (Information Technology) : B.Tech. (Food Technology) : B.Tech. (Agricultural Engineering)
Intake	: 30 Students in each course, can be increased with permission of AICTE.
System of Education	: Credit System on semester basis.
Eligibility for Admission	: 10+2 With Physics, Chemistry and Mathematics or Equivalent.
Mode of Admission	: Entrance examination conducted by VYAPAM, Bhopal.
Duration of Course	: 8 Semesters
Examination and Evaluation	: Internal (20%) + External (80%)
Grading	: 10-point scale

Evaluation of the programme will be referred to as grading and shall be measured by the quality of performance in that course by assigning course grade as indicated below :

Comulative Grade Point Average	: Description of Performance
8.5 to 10.0	: First Class with distinction
6.5 to 8.4	: First Class
5.0 to 6.4	: Second Class
Below 5.0	: Fail

Student obtaining Grading point of less than 5.0 will be declared as Fail (F). The course with grade point of 5.0 or more will be treated as cleared.

Minimum OGPA required for degree : To qualify for a degree the student shall complete all the prescribed courses with CGPA of not less than 5.0

Grade : It is a measure of quantity of the performance of a student work done in a course at the end of a semester. It is computed by dividing the percentage of marks obtained in a course by ten. It shall be expressed on a 10-point scale upto first decimal place.

Grade-Point : A grade point is product of course credit and grade secured by a student in a course. It shall be expressed upto first decimal place.

Grade-Point Average : It is a measure of Quantity of work done in a semester. It is a quotient of the total grade point secured by a student in various courses registered in a semester divided by the total course credit during that semester. It shall be expressed upto first decimal Place.

Cumulative Overall Grade-Point Average (CGPA) : It is a measure of overall cumulative performance of a student on completion of two or more semesters. It is computed by dividing total member of course grade points earned by a student over the semesters by the total number of credits. It shall be expressed upto first decimal place.

Attendance : Normally the attendance should be 100%. The Minimum required by a student is 80%. The attendance can be condoned by Dean /Director/CSSC upto 10% on justifiable grounds.

Maximum number of semesters permitted to complete the course : 12 semesters

Make-up examination : The students of final year shall be allowed for make-up examination on one or more grounds such as hospitalisation; death of parents; own marriage; attending interview and attending court case (s) etc.

Procedure for awarding sessional marks : For theory subjects one midterm exam of 10 marks will be conducted, 5 marks for assignments and five marks for quizzes are given by the subject teacher .

Procedure for evaluation of practicals/extension etc. : The internal assessment will be based on practicals, extension work, the submitted report, test conducted if any and attendance (attendance valuation not more than 20%). End semester evaluation will normally involve external examiner.

Fee : As prescribed by the VYAPAM/University from time to time.

Matters not provided for in this ordinance shall be governed by the orders of the Chairman Academic Council.

Effective from Batch 2006-2007

Course curriculum of B. Tech. (Food Technology)									
1st Semester					2st Semester				
Sr.	Course Name	Credit	CFA	ESE	Sr.	Course Name	Credit	CFA	ESE
1.	Engg. Physics	4	20	80	1.	Engg. Chemistry	4	20	80
2.	Engg. Physics Lab	2	20	80	2.	Material Sc.	4	20	80
3.	Engg. Maths –I	3	20	80	3.	Engg. Maths –II	4	20	80
4.	Communication Skill	4	20	80	4.	Engg. Mechanics	4	20	80
5.	Engg. Graphics-I	4	20	80	5.	Basic Mechanical Engg.	4	20	80
6.	Workshop Practice	4	20	80	6.	Engg. Mechanics Lab	2	20	80
7.	Computer Programming Lab -I	3	20	80	7.	Computer Programming Lab – II	3	20	80
8.	Fundamental of Computer	2	20	80	8.	Engg. Chemistry Lab	2	20	80
9.	Basic Electrical Engg.	4	20	80	9.	Fundamentals of Computer	2	20	80
10.	Basic Electrical Engg. Lab	2	20	80	10.	Basic Mechanical Engg. Lab	2	20	80
11.	V.S.R.	2	100	-	11.	V.S.R.	2	100	-
3rd Semester					4th Semester				
Sr.	Course Name	Credit	CFA	ESE	Sr.	Course Name	Credit	CFA	ESE
1.	Food Composition & Chemistry	4	20	80	1.	Unit Operation	4	20	80
2.	Food Microbiology	4	20	80	2.	Principles of Food Preservation	4	20	80
3.	Theory Of Machine	4	20	80	3.	Food Bio Chemistry & human Nutrition	4	20	80
4.	Strength of Material	4	20	80	4.	Machine Design	4	20	80
5.	Engg. Math III	4	20	80	5.	Heat & Mass Transfer	4	20	80
6.	Energy, Ecology & Environment Science	4	20	80	6.	Unit Operation Lab	3	20	80
7.	Food Composition & Chemistry Lab	3	20	80	7.	Principles of Food Preservation Lab	3	20	80
8.	Food Microbiology Lab	3	20	80	8.	Food Bio Chemistry & human Nutrition Lab	3	20	80
9.	V.S.R.	2	100	-	9.	V.S.R.	2	100	-
5th Semester					6th Semester				
Sr.	Course Name	Credit	CFA	ESE	Sr.	Course Name	Credit	CFA	ESE
1.	Cereal Technology	4	20	80	1.	Fermented Food Products	4	20	80
2.	Fruits & Vegetable Processing	4	20	80	2.	Storage Engg.	4	20	80
3.	Oil Seed & Pulses Technology	4	20	80	3.	Dairy Technology	4	20	80
4.	Fluid Mechanics	4	20	80	4.	Instrumentation	4	20	80
5.	Principles of mgt. & Managerial economics	4	20	80	5.	Dairy Technology Lab	3	20	80
6.	Cereal Technology Lab	3	20	80	6.	Instrumentation Lab	3	20	80
7.	Fruits & Vegetable Processing Lab	3	20	80	7.	Packaging Technology	4	20	80
8.	Fluid Mechanics Lab	3	20	80	8.	V.S.R.	2	100	-
9.	V.S.R.	2	100	-	8th Semester				
7th Semester					Sr.	Course Name	Credit	CFA	ESE
1.	Food Industry Waste Management	4	20	80	1.	Elective –I	4	20	80
2.	Food Plant Sanitation	4	20	80	2.	Elective –II	4	20	80

3.	Food Quality	4	20	80		3.	Major Project	20	20	80
4.	Process Equipment design	4	20	80						
5.	Refrigeration & Air Conditioning	4	20	80						
6.	Seminar	4	100	-						
7.	Minor Project	8	100	-						
8.	Industrial Training	3	100	-						

Name of Labs ***Clubbed***

To

i.	Food Microbiology Lab	F .T
ii.	Unit operation Lab	F .T
iii.	Food Biochemistry and Human nutrition Lab	F .T
iv.	Principle of Food Preservation Lab	F .T
v.	Cereal Technology Lab	F .T
vi.	Fruit and Vegetable Processing Lab	F .T
vii.	Dairy Technology Lab	F .T
viii.	Food Composition & Engg. Chemistry Lab.	F .T
ix.	Post Harvest Tech. and Processing Lab	F .T

B.Tech. (Food Tech.) I Sem
Sub: Engineering Mathematics I (3+1+0)

UNIT- 1

Maclaurin's and Taylor's theorem. Partial differentiation. Euler's theorem and its application in approximation and error. Maximum and minimum of one and two variables. Tangents and Normal. Curvature, Indeterminate forms.

UNIT- 2

Definite Integral as limit of a sum, Application in summation of series. Beta and Gamma functions. Double of triple integral. Length of the curves, Volumes and surfaces.

UNIT- 3

Ordinary differential equations of first order. Linear higher order differential equation with constant coefficients. Homogeneous linear differential equation. Simultaneous differential equations.

UNIT - 4

Rank, Solution of simultaneous equation by elementary transformation, Consistency of equation. Eigen Value and Eigen Vectors. Cayley-Hamilton theorem. Algebra of Logic, Fuzzy Logic.

UNIT- 5

Boolean Algebra Principle of Duality Basic theorems, Boolean expressions and function. Graph Theory, Graphs Sub graphs, degree and distance, Tree, Cycles and Network

References:

1. Differential Calculus- By Gorakhprasad
2. Higher Engg. Mathematics- By B.S. Grawal.
3. Integral Calculus- By A.R. Vashishta & H.K. Sharma.
4. Statistics- By Ray and Sharma
5. Boolean Algebra – By Thakur & Shrivastava

B.Tech. (Food Tech.) I Sem
Communication Skill (3+0+0)

UNIT-I

LANGUAGE ASSKILL OF COMMUNICATION:

Linguistic Techniques, Modern usage and style – comprehension skills, English Phonetic symbols/signs, Oral Presentation- Audition.

UNIT-II

APPLICATION OF LINGUISTICABILITY:

Writing of definitions of engineering terms, Objects, processes and principles (Listening) Topics of General Interest, Reproduction from business, daily life, travel, health buying & selling, company structure, systems etc.

UNIT -III

LETTERWRITING:

Applications, Enquiry, Calling quotation, Tenders. Order and complaint.

UNIT-IV

Precise Writing, Noting and drafting, Technical Descriptions of simple engineering objects and processes (Writing) Report writing, Précis writing, note writing, slogan writing comment, speech advertising.

UNIT -V

Writing technical reports of the type of observation report, Survey report, Report of trouble, Laboratory Report and Project Report on the subjects of engineering. (Speaking) Vocabulary,

Presentations, Demonstrations, Conversation- Telephone media, socializing, cultural events, debates, speech.

References:

1. Business Correspondence and Report Writing – By Krishna Mohan, Prentice Hall India
2. Living English Structure – By W. Stannard Allen, Longmans.
3. Student's Grammar- By Dev Willys Collins (Harper)
4. Spoken English for India – By R.K. Bansal & IB Garrioson (Orient Longman)
5. New International Business English – By Joans and Alexander (OUP)
6. Testing English as a Second Language – By David P. Harris (McGraw Hill Pub.)

B.Tech. (Food Tech.) I Sem

Basic Electrical Engineering (3+1+2)

UNIT -I

AC CIRCUITS

Review of I-phase as circuits under sinusoidal steady state. Active, reactive and apparent power, power factor. 3- Phase accircmis, star and delta connexions. 3- Phase source and load. Analysis of balanced and unbalanced systems. Power in 3 –phase circuits and their measurements.

UNIT -II

MAGNETIC CIRCUITS

Review of lawa of electromagnetism. Flux, mmf and their relation. Analysis of magnetic and electric circuits. Saturation, B-H curves, fringing and leakage. AC excitation in magnetic circuits. Induced voltage, Hysteresis effect and eddy currents.

UNIT -III

TRANSFORMERS

Single-phase transformer, Basic concepts and construction features. Types of transformers, Voltage, current and impedance transformation Equivalent circuits. Per unit system, voltage regulation, losses and efficiency. Testing of transformers. Auto transformers.

UNIT -IV

ELECTRO MECHANICAL ENERGY CONVERSION

Principles of energy conversion. Production of force and emf. Singly and multiply excited magnetic field system. Torque production and torque balance. General analysis of electromechanical System.

UNIT -V

ROTATING ELECTRIC MACHINES

General construction. Definitions and terminologies, generation of emf in rotating machines. Voltage in dc and ac machines. Air gap mmf in dc and ac machines. Rotating magnetic field. Torque production. Principle of operation and application of dc, 3- phase synchronous and induction machines. I- phase induction motors.

Insulating materials, name plate rating, frame size, duty cycles, cooling, enclosures materials and standards.

Practical:

- Measurement of impedance of RL, RC and RLC circuits. Study of Resonance phenomenon
- Measurement of active and reactive powers in I – phase and 3-phase
- Study of no load current waveform in a single phase transformer using CRO

- Study of transformer name plate rating, determination of ratio and polarity Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and estimation of voltage regulation and efficiency at various loading conditions. Verification by load test
- Study of constructional features of dc machines. Magnetization and load characteristics of dc generator
- Characteristics of dc motors. Study of 3 and 4 point starters for dc shunt motors
- Speed control of d.c motor by armature resistance control and field resistance control and armature voltage control
- Study of constructional features of K3- phase induction motors. No load, blocked rotor and load tests on 3 phase Induction motors
- Starting methods and construction of I –phase Induction motors.

References:

1. Electrical Machinery, A.E. Fitzgerald, C. Kingsley and Umans, Mc Graw Hill, 5th Edition, 1992
2. Principles of Electrical Engineering, Vincent Del Toro, Prentice Hall, 1987
3. Basic Electrical Engineering, A.E. Fitzgerald, Higginbotham and Grabel, Mc Graw Hill
4. Basic Electrical Engineering, I.J. Nagrath, Tata Mc Graw Hill, 1991
5. Electrical Machinery, P.S. Bimbhara
6. Basic Electrical Engineering, V.N. Mittle

B.Tech. (Food Tech.) I Sem Engineering Physics (3+1+2)

UNIT -I

QUANTUM PHYSICS:

Matter waves & its experimental verification. Wave. Group and particle velocity & their relation. Uncertainty principle with elementary proof & application to Microscope & Single slit. Characteristics and continuous X-rays. Duan Hunt limits. Moseley's law. Bragg's equation, Laws of diffraction Bragg's spectrometer. Compton Effect. Electron reflection. Bethe's Law. Electron gun. Working and application of CRT & CRD viz measurement of voltage, frequency and phase etc. Bainbridge mass spectrograph & Electron Microscope.

UNIT-II

RAY & WAVE OPTICS:

Cardinal points of a co-axial lens system Nodal slide experiment. Idea of Spherical & Chromatic aberration, coma, astigmatism and distortion Ramsden & Huygens's eye pieces and their cardinal points, Fresnel's biprism. Newton's rings and Michelson's Interferometer experiments. Diffraction at single slit, double slit and diffraction grating. Rayleigh criterion, resolving power of a telescope, microscope, grating and prism. Concept of polarized light, Brewster's laws, Double reflection, Nicol prism, quarter & half wave plates. Nuclear reactors, its site selection and working Giger-Muller Counter, Mass spectrographs, Idea of cosmic rays.

UNIT -III

NUCLEAR PHYSICS:

Static properties and applications of nuclear model: Gamow, liquid drop and shell models, Linear Particle accelerator, Cyclotron, Synchrotron, Synchrocyclotron, and Betatron, differential cross section, chain reacting, critical size. Nuclear fusion & nuclear reactors, its site selection and working. Giger-Muller Counter, Mass spectrographs, Idea of cosmic rays.

UNIT -IV

DIGITAL ELECTRONICS:

Number system used in digital electronics: decimal, binary, octal, hexadecimal. Conversion of decimal to binary octal & hexadecimal & vice versa. Addition, subtraction, multiplication, division floating point numbers. Signed & unsigned numbers 2, 3 complement Boolean algebra. AND, OR, NOT, NOR, NAND, EX-NOR, EX-OR gates & their representation & truth table, laws of Boolean algebra, De Morgan's theorem & Demorganization conversion of logic circuit from one type to Universal logic gates circuits.

UNIT -V

DIELECTRICS:

Dielectric constant, moment of charge distribution, potential field due to dipole Torque & force on a dipole in an external field. Work done in rotating a dipole. Dielectrics polarization, polar and non-polar dielectrics. Gauss's law, E, P and D vectors, Different type of polarization. Concept of internal fields Clausius-Mossotti relationship. Langevin theory of dipolar orientation. Ideal and loss dielectrics. Loss tangent and index of complex permittivity.

LASER & FIBEROPTICS:

Stimulated and spontaneous emission, active medium, population inversion, pumping Optical resonators, properties of Laser beam. Principles of Ruby, Nd YAG, He-Ne & Carbon dioxide Lasers and their engineering uses & applications.

Practical:

- To determine moment of inertia of a Fly wheel about its own axis of rotation.
- To determine value of modulus of rigidity of the material of a given wire by a dynamical method using Maxwell Needle.
- To determine the restoring force per unit extension of a spiral spring by static and dynamical method.
- To determine the frequency of an electrically maintained tuning fork by Melde's method.
- To determine the value of "g" by Kater's reversible pendulum bar pendulum.
- To determine the moment of inertia by inertia table.
- To determine the value of specific resistance of wire by post office box.

References:

1. A.T.B. of Optics by Brijlal and Subramanyan
2. Feynman Lectures on physics by R.P. Feynman R.B. Leighton, A- W Publications Massachusetts U.S.A.
3. Concepts of modern physics – A. Beiser- Mc Graw Hills, New York
4. Engineering Physics By M.N. Avadhanulu and P.G. Kshirsagar.
5. Engineering Physics By Gaur and Gupta
6. Atomic and Nuclear Physics by Brijlal and Subramanyam
7. Electricity and Electronics by D.C. Tayal
8. Introduction of Atomic and Nuclear Physics- Harvey. E. White-east west press New Delhi
9. Elements of Modern Physics- S.H. Patel – Tata Mc Graw Hill New Delhi

B.Tech. (Food Tech.) I Sem

Engineering Graphics (0+0+3)

UNIT -I

Scales: Representative fraction, plain scales, diagonal scales, scales of chords. Conic sections. Construction of ellipse, parabola and hyperbola by different methods. Normal and Tangent.

Special Curves: Cycloidal, Epi-cycloid, Hypo-cycloid. Involute. Archimedean medium and logarithmic spirals.

UNIT -II

Projection points and lines, True inclinations and true length of straight lines, traces of straight lines. Auxiliary planes.

UNIT -III

Projection of planes and solids: Projection of planes, Projection of polyhedral Pyramids. Cylinder Cone and Spinier.

UNIT -IV

Section of solids: Section of right solids by normal and inclined planes.

Development of Surfaces: Parallel line and radial – line method for right solids. Method of triangulation for oblique pyramids. Cones and transition pieces.

UNIT -V

Intersection of Surfaces: Intersection of prisms. Pyramids, cylinder, cone, line method, cutting plane method.

Isometric Projection: Isometric scale, isometric axes, isometric projections of planes and solids.

References:

- 1Engineering drawing – By N.D. Bhatt
- 2Engineering drawing – By Venugopal
- 3Engineering drawing – By Gufral & Shende
- 4Engineering drawing – By Laxminarain & Vaishwakar

B.Tech. (Food Tech.) I Sem **Fundamental of Computers (2+0+0)**

UNIT -I

History and Organization of computers, Data representation-Binary, Octal and Hexadecimal representation, Conversion do Decimal Binary, Octal and Hexadecimal and viveversa.Binary addition and subtraction by complementary method.

UNIT -II

Introduction to various types of input/output devices of a computer, Computer Memory: Introduction to RAM, ROM, PROM, EPROM, magnetic hard disk, floppy disk and magnetic tape drives.

UNIT -III

Computer languages: Need of a programming language, low level and high level language, introduction to compiler and interpreters.

Operating System: Need of an operating System, Types-Batch O.S., Multiprogramming O.S., Time Sharing O.S., Online and real time O.S.

UNIT -IV

Problems solving on computer, Algorithms and flow charts, Elements of BASIC, Control and Input-Output statement, subscripted variables.

UNIT -V

Functions and subroutines, writing a simple computer programs in BASIC, Introduction to Disk Operating System-Its Internal and External Commands, Application packages-Wordstar, Lotus-123, Introduction to dBase III Plus (Assist mode)

References:

1. Fundamental of Computer by P. K. Sinha
2. Fundamental of computer by V. Rajaraman

Workshop Practice (0+0+3)

UNIT -I

BLACKSMITHY SHOP:

Smithy forges, maintenance and control of fire and fuel used in smithy shop. Use of various smithy tools such as swage block. Anvil, Different types of Hammers, Tongs, Flatters, Cold set, Hot set, Hydraulic swates, fullers, set hammers punches, Drifts and rivet headers (rivet snaps) etc. Use of measuring rule. Callipers (outside and inside), Templates and gauges used in forging.

Introduction to forging and forging methods heating metals for forging.

Forging operations:

Upsetting, Drawing down, Fullering. Swaging, Platening, Cutting down, forge welding Punching and drafting

Three jobs to cover above course such as

Forging of chisel

Forging of C-Ring.

Forging of Pan Hook (S-shaped)

Forging of screw driver

Forging of hexagonal nut etc.

UNIT -II

CARPENTRY SHOP:

Timber:

Type, Qualities of timber, disease, Timber grains, Structure of timber. Timber seasoning. Timber preservation, approximate conversion & Market forms of timber

Wood Working tools:

Timber:

: Wood working machinery, joints & joinery.

Various operations of planning using various carpentry planes swaing and marking of various carpentry joints.

Two jobs to cover above courses such as:

Carpentry joints such as cross halving joint, mortise and tenon joint, Dovetail joint etc.

Develiling plates. Wall bracket.

UNIT -III

FITTING SHOP:

Metal Bench Work

Measuring instruments. Engineer steel rule. Surface gauges calliper. Hermaphrodite calliper (Jenny calliper). Height gauges. feeler gauges. Try square and micrometer. Use. Care and maintenance of hand tools such as hammer. Cold chisel of different type. Center punch Hack-saw. Dot punch. Drift. Different types of files. File cuts. File grades. Use of surface plate. Surface gauges type of drills. Taps and dies for drilling tapping and screw threads.

Fitting operations: Chipping filling. Drilling and tapping

Two joints to cover above course such as:

Preparation of job piece by making use of filling. Sawing and chipping operation.

Job having combined practice for drilling and tapping

Job having combined practice for drilling and reaning

UNIT -IV

FOUNDRY:

Pattern Making: Students are required to prepare four jobs related to pattern making and moulding and know about:

Pattern materials, pattern allowances and types of patterns

Core box and core print. Colour codes

Use and care of tools used for making wooden patterns

Moulding:

Properties of good moulding and core sand. Composition of green sand. Dry sand and loam sand.

Methods used to prepare simple green and bench and pit mould, dry sand bench mould using single piece and split patterns.

Care and use of moulding tools.

UNIT -V

WELDING:

Students are required to make three jobs related to Brazing. Soldering and welding and to know about:

Equipment used for Brazing. Soldering and gas arc welding

Selection of material and flux and pipe for gas welding

Selection of welding machine, Electrodes and current for Arc welding.

Use of tools and equipments. Safety precautions.

UNIT -VI

ADVANCE FITTING:

One composite job related to advance fitting covering knowledge about allowances and limits, Fits and tolerances.

Use and care of important precision tools used in fitting.

References:

1. Manufacturing Processes – Chapman Vol & II
2. Production Technology – P.N. Rao.
3. Workshop Technology – Raghuvanshi Vol & II
4. Workshop Practices – Hazara Choudhary. Vol. I & II
5. Production Technology – R.K. Jain.

B.Tech. (Food Tech.) I Sem

Computer Programming I (0+0+3)

UNIT -I

Principles of object – Oriented Programming

Procedure – Oriented Programming vs. Object-Oriented Programming. Basic concepts of OOps, Advantages of OOps. Object Oriented Languages.

Beginning with C++

What C++, Structure of C++ program, is creating. Compiling, Linking. And Executing a C++ program.

UNIT -II

Token. Expressions and Control Structures.

Tokens. Keywords. Identifiers. Basic Data Types, User- Defined Data Types Derived

Data Types, Symbolic Constants. Type Compatibility. Variable Declaration. Dynamic Initialization of Variables. Reference Variables. Operators in C++ . Scope Resolution Operator.

Memory. Management Operators, Manipulators, Type Cast Operators. Operator Overloading. Operator Precedence. Control Structures.

UNIT -III

Functions in C++

Main function. Function Prototyping. Call by Reference vs. Call by Value. Inline Functions. Default Arguments. Const Arguments. Function Overloading. Friend and Virtual Functions.

UNIT -IV

Classes and Objects

Specifying a Class. Defining Member Functions. Making an Outside Function Inline, Nesting of Member Functions. Private Member Functions. Arrays within a Class. Memory Allocation for Objects, Static Data Members. Static Member Functions. Array of Objects. Objects as Function Arguments. Returning Objects. Pointers to Members.

UNIT -V

Constructors and Destructors

Constructors, Parametric constructors, Multiple Constructors in a Class. Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor.

Dynamic Constructor. Destructors. Operator overloading and type conversion

Definition, Overloading Unary Operators, Binary Operators, Binary Operators using Friends, Rules for Overloading Operators.

UNIT -VI

Pointers, Virtual Functions and Polymorphism

Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT -VII

Managing Console I/O Operations

C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators.

Working with Files

Classes for File Stream Operations, Opening and Closing a File, Detecting EOF, File Pointers, Updating a File, Error Handling During File Operations.

Practical:

C++ programs based on course contents.

(At least two program from each unit.)

References:

1. Object Oriented Programming with C++ By E. Balagurusamy 1995 . Tata Mc Graw-Hill pub.
2. Programming in C++ By Robert Lafore
3. Mastering C++ By Venugopalam, TMH pub

B.Tech. (Food Tech.) II Sem Engineering Mathematics II (3+1+0)

UNIT -I

Fourier series and half range Fourier series. Fourier Integral.

Laplace transforms and their basic properties, Application on solution of ordinary differential equation.

UNIT -II

Second order differential equation with variable Coefficient, Solution by series method with emphasis on Legendre's and Bessel's aquatic. Analytic function and conformal Transformation.

UNIT -III

Linear and Non-Linear Partial differential equation of first and second order with constant coefficients, Separation of variable method. Application in solution of wave and heat conduction equation.

UNIT -IV

Vector calculus, Vector Differentiation Divergence, Gradient and Curl, Vector Integration, Gauss divergence and Stokes's theorem.

UNIT -V

Binomial, Normal and Poisson's distribution, Curve fitting Index number, Reliability or casting and decision theory.

References:

1. Integral transform – By Vashishta & Gupta.
2. Laplace transform – By Spicel (Schaum's Series)
3. Vector Calculus – By A.R. Vashishta
4. Higher Engg. Maths – By B.S. Grawal.

B.Tech. (Food Tech.) II Sem **Material Science and Technology (3+1+0)**

UNIT -I

ALLOYS AND HEAT TREATMENT:

Alloys- Introduction, purpose of making alloys, Types-Ferrous alloys- stainless steel. Nickel steel, Vanadium steel, Non ferrous alloys - Aluminium, Copper, Nickel alloys, Heat treatment Introduction, Heat treatment processes, Annealing, Normalising, Hardening, Tempering, Case hardening, Surface hardening, Heat treatment furnaces, Heat treatment furnace atmosphere control, Pyrometry, Defects in the heat treatment of steel.

UNIT -II

PHASE RULE AND PHASE TRANSFORMATION:

Introduction, definition of terms involved in phase rule, Thermodynamic derivation of phase rule. One component system, water system, General study of Eutectic system. Peritectic system, Ternary equilibrium Diagram, Allotropy of Iron, Iron carbon equilibrium Diagram.

UNIT -III

POWDER METALLURGY AND COMPOSITE MATERIALS:

Powder Metallurgy, Introduction, Application, Advantages and Disadvantages, various steps involved in powder metallurgy. Tungsten wires, cemented carbides and metal bonded ceramics. Composites, materials- Laminates, Reinforced composites floor materials- Linoleum. Tiles and seamless floor finishes.

Applications of Plastics in Engineering and Industry.

UNIT -IV

CORROSION & PROTECTIVE COATINGS:

Corrosion – Introduction. Factors, types of corrosion. Dry and Electrochemical corrosion & its mechanism.

Galvanic corrosion, specific types – Pitting, waterline, Intergranular, stress.

Microbiological corrosion, corrosion Fatigue, Erosion corrosion

Control and prevention of corrosion – Metallic and non – metallic coatings, Paints,

Varnishes and Lacquers, cathode protection.

UNIT -V

ELECTRON THEORY OF METALS, SUPERCONDUCTIVITY:

Metallic Bonding, Drude and Lorentz theory, Sommerfield free electron theory, Electron energies in metal Brillouins. Zone theory, Factors affecting electrical resistance of materials. Outline of BCC Theory. Superconductivity and superfluidity, General features of cuprate superconductors. Electron superconductors, copper-free oxide superconductors preparation of cuprate materials. Applications of superconductors.

Structure of Metals – Bonds in Solids, space lattices, symmetries space points and space groups, crystal systems and crystal structure of metals. Miller indices, Miller Bravais indices, Crystallization of metals, grains and Grain boundaries, Crystal defects.

References:

1. Materials science – Narula & Gupta, Tata McGraw Hill
2. Superconductivity today – Rama Krishnan & CNR Rao, Universities Press
3. Chemistry of Engineering Materials- C. V. Agrawal, Tara Book agency
4. Solid State Physics – Kittel
5. Solid State Physics – Seitz

B.Tech. (Food Tech.) II Sem **Basic Mechanical Engineering (3+1+2)**

UNIT -I

Workshop Technology:

Materials of Construction : Classification of Engineering materials, Composition, Mechanical properties and uses of cast iron, mild steel, high carbon steel and high speed steel.

Foundry Practice: Introduction, Pattern, Pattern materials like wood, metals, plastics etc. Types of pattern like solid, split, match plate, gated and sweep, pattern allowances, Mould materials, Properties of a good molding sand. Composition of green sand, dry sand, loam sand. Types of mould gating system. Core, Core materials, properties of good core materials, core preparation.

UNIT -II

Welding Practice: Gas Welding Method of preparation and accumulation of oxygen and acetylene. Equipment's used in high pressure and low pressure gas welding plant. Function of flux. Types of gas flames

Arc welding various methods of producing arc are Arc welding equipment's comparison between AC and DC welding ARC welding electrodes. Flux coating on welding electrodes.

UNIT -III

Measurement, Measuring Tools and Machine Tools: Construction, care & uses of surface plate, Straight edge, Vernier calliper, Micrometer, Dial gauge, Slip gauge, Sine bar and Combination set.

Description, definition, specification of machine tools, working, classification and specification of Lathe and drilling machine.

UNIT -IV

Heat Engines:

Boilers : Names and functions of principle parts, classification, Boiler mountings and accessories, Draught-natural and artificial, Height of chimney, Equivalent evaporation and boiler performance.

Steam

Sensible heat, latent heat, super heat, internal energy, enthalpy, dryness fraction and its determination, steam processes at constant pressure, constant volume, and constant enthalpy.

UNIT -V

Steam Engines : Description and working, hypothetical and actual indicator diagram, diagram factor, H.P. developed and efficiencies e.g. mechanical efficiency, brake thermal efficiency and indicated Thermal efficiency, governing, cut off and throttles compound engines (Description and working only).

I.C. Engines

Description and working of four stroke petrol engines, two stroke petrol engines, four stroke diesel engines and two stroke diesel engines, relative merits and demerits

Practical:

- To study foundry shop
- To study dial gauge
- To study Combination set
- To study gas welding
- To study lathe machine
- To study drilling machine
- To study boiler and its mountings and accessories
- To study IC engines and its system
- To perform spark test
- To perform sieve analysis

References:

1. Workshop practice Raghuvanshi
2. Workshop practice Hazra & chaudhary
3. Foundry Technology Sinha & Goel (Rastogi Publication)
4. Heat engines P.L. Sallaney
5. Heat engineering Kumar & Vasandani (Metropolitan Book Company)

B.Tech. (Food Tech.) II Sem Engineering Chemistry (3+1+2)

UNIT -I

WATER ANALYSIS & TREATMENT:

Sources, Impurities, Hardness & its units. Industrial water requirement & characteristics, softening of water by various methods (L.S. Zeolite, ion exchange resin) boiler trouble (carry over, scale and sludge, caustic embitterment) Boiler corrosion causes, effect & remedies, internal treatment to boiler feed water, Characteristics of municipal water & its treatment, water analysis (determination of alkalinity, temporary and permanent hardness by complexometry, D.O, B.O.D, C.O.D, Chlorides, Sulphates, dissolved CO₂ & residual chlorine. T.D.S) Numerical problems based on water analysis and water softening processes.

UNIT -II

FUELS & COMBUSTION:

Fossil fuels & classification. Calorific value & its determination by Bomb Calorimeter & its numerical. Proximate and Ultimate analysis of coal and their significance, calorific value Computation based on utilization analysis data. Ranking of solid fuel. Carbonization. Manufacturing of coke & recovery of by products petrochemicals derived from alkenes, alkenes, alkenes, benzene & its homologues. Cracking of higher Hydrocarbons & mechanism of cracking. Knocking, relationship between knocking & structure of hydrocarbon, improvement of anti knocking characteristics of IC engine fuels. Diesel engine fuels. Cetane number, flue gas analysis, combustion and its related numerical problems.

UNIT -III

LUBRICANTS:

Introduction, Mechanism of lubrication, Classification of lubricant, Lubricating oils, grease & semisolid lubricant, solid lubricant, synthetic lubricant, properties and Testing of lubricating oils (Viscosity & Viscosity index, flash and fire points, cloud and pour point, Aniline value, Steam Emulsion Number, Neutralization no, Saponification Value. Iodine. Iodine value, carbon residue) Numerical problems based on Viscosity Index.

UNIT -IV

POLYMER:

(Fibers, Rubbers & Elastomers, Plastics). Introduction. Classification. Types of Polymerization, reaction mechanism. Fibers-Cellulose & synthetic Nylon Decoran, polyvinyl, Polyacrylates their manufacture & flow sheet diagram. Rubber-Natural rubber, Isolation from latex. Vulcanization & its mechanism cis-trans rubbers.

Elastomers: Styrene rubber (GR-S) and Vitreous rubber (GR-A), Neoprene, Butyl rubber, thiocols, Polyurethanes, Plastic- Plastic- Classification. Thermoplastic & Thermosetting plastics, manufacturing of Polythene, PVC, PVA, polyacrylates, Acrylonitrils, phenol formaldehyde resins, urea formaldehyde resin & glyptals, silicone resin & its flow sheet diagrams

UNIT 5:

CEMENT AND REFRACTORIES:

Classification of Cements, 1.5.1. Specifications, Composition & Manufacture of portland Cements. Setting & Hardening of lime mortar, plaster of paris, Magnesium oxy chloride. Decay of Cements. Refractories. Refractories- Definition, classification. Properties & uses of silica bricks, Fire clay, Dolomite, Magnesite, Carborundum, Chromite bricks.

UNIT 6:

INSTRUMENTAL TECHNIQUES IN CHEMICAL ANALYSIS:

Introduction, Infra red. Ultraviolet, Nuclear Magnetic Resonance spectrophotometry, Chromatography – Gas chromatography, Colorimetry, Lambert's and Beer's Law.

Practical:

NOTE: At least 10 of the following experiments be performed during the session.

1. Water Testing

- (i) Determination of Total hardness by Complexometric, titration Method.
- (ii) Determination of mixed alkalinity (a) OH & CO₃ (b) CO₃ & HCO₃
- (iii) Chloride ion estimation by Argentometric method.

2. Fuels & lubricant testing

(i) Flash & fire point's determination by

- (a) Pensky Martin Apparatus (b) Abel's Apparatus
- (c) Cleveland's open cup Apparatus

(ii) Miscosity and Viscosity index Determination by

- (a) Redwood viscometer No. 1
- (b) Redwood viscometer No. 2

(iii) Proximate analysis of coal

- (a) Moisture content
- (b) Volatile matter content
- (c) Ash content
- (d) Carbon residue

(iv) Stem emulsification No & - Aniline point determination

(v) Cloud's and power point determination of lubricating oil

3. Alloy Analysis

- (i) Determination of percentage of Fe in an iron alloy by redox titration using N – Phenyl anthranilic acid as internal indicator.
- (ii) Determination of Cu and or Cr in alloys by iodometric Titration

References:

1. Chemistry in Engineering & Technology – Vol II Kuriacose & Rajaram Tata Mc. Graw.
2. A Text Book of Engineering Chemistry – S.S. Dara.
3. Chemistry for Environmental Engineering – Sawyer, Mc Carty and Parkin- Mc Graw Hill International
4. Engineering Chemistry – Gopalan Venkappayya.
5. Applied Chemistry – N.Krishnamurthy. Jayasubramaniam.
6. Engineering Chemistry – B.K. Sharma
7. Applied Chemistry Theory and Practice, O.P. Viramani. A.D. Narula New

B.Tech. (Food Tech.) II Sem
Sub: Engineering Mechanics (3+1+2)

UNIT-I

STATICS

Concurrent, Non concurrent and parallel forces in a plane, Composition, resolution of forces, Free body diagrams, Moment of a force and Varignon's theorem, Conditions of Equilibrium, Polygon of Forces and Funicular Polygon of Forces, Principle of Virtual work, Equivalent Force System.

TRUSSES

Analysis of forces in the members of a truss. Method of joints, Method of sections. Graphical Method for Perfect Trusses.

UNIT -II

CENTROID & MOMENT OF INERTIA

Location of centroid and Moment of Inertia of plane areas, Perpendicular Axis and Parallel Axis theorems. Product of Inertia, Principal Axes and Principal Moment of solid bodies.

FRICTION

Coulomb's law of friction. Friction on inclined planes. Screw and Nut friction. Ladder and wedge friction, Friction in journal collar bearings. Uniform pressure and uniform wear, Lifting machines.

UNIT -III

TRANSMISSION OF POWER

Transmission of power through Belt, Rope and Gears, Ratio and tension on tight side and slack sides. Centrifugal tension, Spur, Bevel .Worm gearing. Rack and Pinion gear, Gear Trains. Epicyclic Gear Train.

UNIT -IV

KINEMATICS

Kinematics in cartesian and polar coordinates, Particle under uniform and non-uniform acceleration. Tangential and normal acceleration, Radial and Transverse velocity and acceleration, motion under gravity.

UNIT -V

KINETICS

Kinetics of particle, motion under constant force, momentum and energy principle, Impulses and angular momentum, D' Alemberts principle, Motion under constant force. Flywheel, Collision of Elastic Bodies, Shear force, and Bending moment Diagram in Cantilever and Simply Supported beam with concentrated, Distributed load, and couple, Overhanging beams, Point of Contraflexure, Relationship between bending moment and shear force pure bending.

Practical:

- 1 To determine moment of inertia of a flywheel about its own axis of rotation.
2. To study the variation of time period (T) with length (l) for a compound pendulum and then to determine –
 - The value of acceleration due to gravity.
 - The radius of gyration (k) of the bar about an axis passing through C.G. and perpendicular to its length.
 - The position of center of gravity of the bar.
3. To determine value of modulus of rigidity of the material by dynamical method using Maxwell's needle
4. To determine the movement of an irregular body about an axis passing through its center of gravity and perpendicular to its plane by dynamical method of inertia table.

References:

- 1 Engineering Mechanics by R. S. Khurmi S. Chand Publication
- 2 Engineering Mechanics by S. B. Junarkar
- 3 Strength of Material and Engineering Mechanics by S. B. Prasad

B.Tech. (Food Tech.) II Sem

Sub: Computer Programming -II 4 (0+0+4)

UNIT -I

INTRODUCTION:

How Windows Works: MS Windows: Various features, Advantages, How Windows program works, The Structure of Windows Program, Code and Resources, Program Instances, Compiling a Windows Program, Windows Memory Management – Memory options, stacks and heaps.

Setting up Your System: Hardware and Software Requirement. Installation and setup options.

First Programming Experiments:

Hungarian Notation. A Minimal Windows Program Structure, the Windows. H file, Win Main O function, creating a new Windows class, Message Loop.

UNIT -II

MENUS: Operating Menus, Menus Defined as Resource Data, Popup Menu, creating a Menu as program operates, Menu Functions, The System Menu.

Mouse Handling: Mouse Shape. The Caret

UNIT -III

TEXT AND GRAPHICS OUTPUT:

Character Mode versus Graphics Mode, The Device Context, Windows GDI, Text Output, The WM_PAINT Message, Changing the Device Context, Graphics Output, Animated Graphics using Peek Message 0 Loop, Graphics Objects like Pen, Brush. Character Sets, Fonts, and the Keyboard.

The ANSI Character Set, Keyboard Message Processing, System Key Messages and Dead.

Characters, Selecting a Stock Font, Keyboard Accelerators.

UNIT -IV

WINDOWS CONTROLS:

Types of Windows Controls Static, Button, List Boxes, Combo Boxes, Scroll Bars, Edit Controls and their use in windows programs.

UNIT -V

CHILD AND POPUP WINDOWS:

Creating a Child Window, Sending Messages to Child Windows. Fixed Child windows, Popup Windows.

Dialog Boxes:

How Dialog Boxes work, Designing a Dialog Box, Using a Dialog Box, Exchanging Data with a Dialog Box, Modal, Modeless, and System Modal Dialog Boxes.

UNIT -VI

OTHER RESOURCES: String Tables, User-Defined Resources Managing Memory: Local vs. Global Memory. Using Fixed and Discard able Memory Blocks. Global Memory Allocation.

UNIT -VII

PRINTING:

How Windows Support Printers. Printer Device Context Sending Special Commands to a Printer, Scaling the Printer Output. Allowing Interruption of a Print Job, Getting Information. About A Device, Calling functions in the Printer Driver.

Dist File Access: How Windows Access Disk Files, Various Operations like Create, Open, Read, Write, Close etc.

UNIT -VIII

BITMAPS:

How Bitmaps Store Images, Loading and Displaying a Bitmap, BITMAP Data Format, DIB Format. Dynamic Link Librarics: Compiler Runtime Libraries. Dynamic Link Libraries, Writing a DLL, Using DLL, Alternate Ways to Reference DLL Functions

References:

- 1.Windows programming Printer Plus – By Jim Conger 1999, Galgotia Pub.
- 2.Windows API Bible : By James L Conger, Galgotia

B.Tech. (Food Tech.) III Sem

Mathematics III (3+1+0)

UNIT -I

Functions of complex variables: Analytic function, Harmonic conjugate, Cauchy – Riemann Equations, Line integral, Cauchy's theorem, Cauchy's integral formula, singular points, poles and residues, residues theorem, evaluation of real integral, bilinear transformation.

UNIT -II

Numerical Analysis: Different operators, errors and approximations, interpolation, inverse interpolation, method of least squares, numerical differentiation and integration, Newton Raphson method of solving polynomials.

UNIT -III

Solutions of algebraic and transcendental equations. Solutions of simultaneous algebraic equations, solutions of ordinary differential equations and partial differential equations.

UNIT -IV

Linear Algebra: Simultaneous linear equations, matrices, vector space and subspaces, bases and dimension, Linear transformations and their matrix representations, change of basis.

UNIT V:

Eigen values and Eigen vectors, Cayley-Hamilton theorem, diagonalizable operators, Quadratic forms and their diagonalization, bilinear forms. Hermitian forms, definite and semi definite forms.

References

1. Engineering maths part 2 & 3, D.S. Chandrasekharaiah, Prism Publications Pvt. Ltd., 1999.
2. Advanced Engineering mathematics, E. Kveyszig – Wiley Eastern Ltd.
3. Numerical analysis by Ralph J. Stanton.
4. Engineering mathematics by Lazpachary

B.Tech. (Food Tech.) III Sem

Sub: Energy Ecology Environment & Society (3+1+0)

UNIT -I

Introduction of energy scenario, conventional and non-conventional resources of energy, utility and waste management of thermal, hydra energy. General idea of solar, winds, bio-mass, geothermal, tidal and wave energy, sources and waste management of nuclear power energy. Electromagnetic energy, radio frequency and microwaves, its biological effects.

UNIT -II

Global warming, depletion of ozone layer, human activity and meteorology, genetic and plant bio-diversity, EL-Nino phenomenon and its effects. Solid waste, waste disposal methods, recycling of solid waste and its management.

UNIT -III

Atmosphere – introduction, structure of the atmosphere, chemical and photochemical reactions in the atmosphere, primary air pollutants – sources, control and harmful effects of CO, NO_x, SO_x, HC, particulates, sampling techniques, air pollution from automobiles, photochemical smog, acid rain some case studies of

Air pollution.

UNIT -III

Hydrosphere – Aquatic environment, organic and inorganic water pollutants, domestic and industrial waste treatment, aerobic and anaerobic treatment processes, sampling and preservation, some case studies of water pollution.

UNIT -IV

Lithosphere and noise pollution – introduction of land soil pollution, control and disposal, harmful effects.

General introduction of noise pollution and its effects. Sound unwanted form of noise, changes, and traffic noise. Prediction and control.

References:

1. Environmental Engineering –Howard
2. Environmental protection- Emil T. Chanlett.
3. Environmental chemistry – A.K. Dey. Wiley Eastern Ltd.
4. Environmental science – Cumingham, Saigo, Mc.Graw Hill.
5. Ecology concepts and application- Manuel C. Mmoller, Jr. Mc. Graw Hill.
6. Environmental chemistry and pollution control – S.S. Dora,

B.Tech. (Food Tech.) III Sem

Theory of Machine (3+1+0)

UNIT-I

Concept of plane motion of rigid bodies, basic kinematics concept, links, kinematic pairs, degree of freedom and constrained motion, mechanisms, inversion of mechanisms, equivalent linkages. Velocity and acceleration in mechanisms, velocity diagram, instantaneous centre of rotation, Kennedy's theorem of three centres, acceleration diagrams, Coriolis, component acceleration.

UNIT-II

Introduction to friction, Clutch friction, belt drives, stepped pulleys.

UNIT-III

Cams, radial cam nomenclature, type of follower motions-uniform velocity, SHM, generation of cam profile by graphical method.

UNIT-IV

Toothed gearing : Fundamental law of gearing, classification of gears and basic terminology, geometric and kinematic characteristics of involute, interference phenomenon, path of contact.

Gear trains : Gear trains with parallel axis, planetary gear trains.

UNIT-V

Brakes and Dynamometers : Absorption and transmission type of dynamometers

Governors : Watt, Proell, Hartnell.

References :

1. Theory of machine by P.L. Balleney
2. Theory of machine by R.S. Khurmi
3. Theory of machine & mechanism by Amitabh Ghosh

B.Tech. (Food Tech.) III Sem

Strength of Material (3+1+0)

UNIT- I

Elasticity – stress and strain – elastic limit- Hooke's law, Young's modulus, stresses in bar due to its own weight, varying sections and uniformly tapering circular bars, primary and secondary strain, bulk and shear modulus and their relationship, volumetric strain in a body.

UNIT- II

Principal stresses and strains, Mohr's circle, Temperature stresses, Resilience, Shear force and bending moment diagram for simply supported beams and overhanging beams, centroid of different cross sectional laminar.

UNIT- III

Moment of inertia, parallel axis theorem and perpendicular axis theorem, Moment of inertia of different cross sectional laminar, stress in beams, derivation of bending equation Deflection, derivation of double order differential equation, Moment area method.

Unit - IV

Stresses in thin cylinder and spherical shells, derivation of equations for circumferential longitudinal stresses in shells and their applications.

UNIT -V

Combined bending and direct thrust, derivation of torsional equation, shaft coupling and key design, design of helical and laminated spring.

PRACTICAL

Coplaner force system, resultant and equivalent, SFD and BMD for different types of beams, force determination in trusses, Young's modulus of elasticity for steel and timber, angle cubes, tensile strength of sand, crushing stress for cement mortar cubes, tensile strength of cement, determination of particle size using sieve shaker.

References:

- | | |
|--------------------------|------------------------------|
| 1. Strength of Materials | : By R.S. Khurmi |
| 2. Strength of Materials | : By Surendra Singh |
| 3. Strength of Materials | : By Timoshenko & D.H. Young |

B.Tech. (Food Tech.) III Sem

Food Composition and Chemistry (3+1+3)

UNIT-I

Food Chemistry - Introduction, history and approaches to the study of food chemistry

Water and Ice - Water molecule, association of water molecules, structure of water structure of Ice, water activity, Isotherms, and food stability.

UNIT-II

Carbohydrate - Introduction, monosaccharides disaccharides, oligosaccharides, polysaccharides (Starch, cellulose, pectin substances, arabic agar, gums crude fibre). Changes in carbohydrate on cooking (solubility, hydrolysis, gelatinization, Retrogradation, hydrolysis and browning reactions.

UNIT-III

Fats & Lipids- Introduction, crude fat, nomenclature of fatty acids, physical properties (melting, softening point, specific gravity, refractive index, smoke-flash and fire point, flavour changes in fats and oils. Dietary fat and coronary heart diseases. Chemistry of frying (deep fat frying).

UNIT-IV

Proteins - Introduction, Chemical and physical properties, nature and denaturation of protein, gel formation, gelatinization, Kjeldhal method of determination of proteins in foods. Importance & classification of amino acids.

UNIT-V

Flavour and Aroma of foods - Taste, odour, feeling, blends, control of aroma in processed food.

Pigments and their colourants- Chlorophyll, Myoglobin Haemoglobin and Carotenoids. Survey and composition of various food products such as Fruits, Vegetables, milk, meat and cereals.

Practical

1. Determination of proteins starches, crude fat and water content in foods.
2. Determination of ascorbic acid.
3. Determination of crude fibre.
4. Estimation of preservative and antioxidant.

Reference :

1. Food Chemistry - Mayor
2. Principles of Food Science & Tech, Part-II, Fenema, O.W.

B.Tech. (Food Tech.) III Sem

Food Microbiology (3+1+3)

UNIT-I

Microbiology - Definition and its scope, Microscopy types and details of bright field microscopy, Basics of smear preparation, Staining, Gram staining, Types and preparation of nutrient medium. Introduction to classification and nomenclature system for microbes.

UNIT-II

Morphology, Physiology, Growth, Nutrition Reproduction of yeast-mold and bacteria, Isolation of pure cultures and their characteristics & maintenance.

UNIT -III

Enumeration techniques for a microbial culture, Algae : its food application, Virus, Bacteriophage, Physical and chemical controls of microbes, Food borne illness, Poisoning, Infection and Intoxication, Sanitation, HACCP, CIP.

UNIT -IV

Food as a substrate for microbes, General principle underlying spoilage- chemical changes caused by microorganisms, sources of contamination in food.

UNIT -V

Contamination and spoilage of - cereals & cereals products, Vegetable & fruit products, meat & meat products, milk and milk products.

References :

1. Microbiology - Reid & Chann
2. Food Microbiology - Westhoff & Frazer

B.Tech. (Food Tech.) IV Sem Machine Design (3+1+0)

UNIT -I

1. Introduction : Introduction to design procedure, design requirements, properties of materials and their selection, manufacturing considerations in design, concept of interchangeability and types of fit.
2. Stresses in machine parts : Simple stresses : stress and strain (tensile, compressive and shear), modulus of elasticity, modulus of rigidity, bearing stress, thermal stress, stresses in composite bars, linear and lateral strain, poisson ratio, volumetric strain, bulk modulus, resilience.

UNIT -II

1. Torsional & Bending stresses : Torsional shear stress, bending stress in straight beams, principal stress, eccentric loading - direct & bending combined, introduction to theories of failure under static load.
2. Variable stresses : Introduction to cyclic stresses, fatigue, endurance limit, stress concentration and notch Notch sensitivity.

UNIT -III

Design of machine elements : Threaded fasteners : Stresses due to screwing up forces. stresses due to external forces, bolted joints under eccentric loading - acting parallel to the axis of bolt, acting perpendicular to the axis of bolt.

UNIT -IV

Keys and couplings : types of keys and couplings, force acting on sunk key, design of sunk key, sleeve (muff coupling) and flange coupling-empirical design and check for strength.

Unit-V

1. Shafts : Design of shafts for strength - torsional strength, bending strength, introduction to rigidity
2. Flat belt drives : Velocity ratio and power transmission.

B.Tech. (Food Tech.) IV Sem Heat & Mass Transfer (3+1+0)

Unit-I :

Conduction

Importance of heat transfer. Nodes of heat transfer 3 dimensional fourier equation of heat conduction in cartesian coordinates, Derivation of fourier equation into polar & spherical coordinates. One dimensional steady conduction through a composite wall, radial steady conduction through the wall of a tube. Heat flow through slab with heat generation when both surface are at same/different temperatures.

Heat transfer through rectangular fin effectiveness & efficiency of fin. Approximate solution of fin. Effect of fin on heat flow steady state critical thickness of insulation.

UNIT -II :

Convection

Forced convection in Laminar flow past a flat plate, forced convection in fully developed Laminar flow through a tube.

Mechanism of heat flow by natural convection. Heat transfer from vertical wall by free convection. The principle of dynamic similarity applied to free convection, convection with change of phase.

Unit-III :

Radiation

The laws of black body radiation Kirchoff's law & grey body radiation. Radiation exchange between two black surfaces, radiation exchange between two grey surfaces, Radiation from gases and flames.

Unit-IV :

Analysis of heat exchanges

Mean temperature difference, Temp. distribution and heat flow in evaporators & condensers shell & two pass type heat exchanges effectiveness method (NTU method)

Unit-V :

Mass transfer

Ficks law of diffusion, steady state diffusion of gasses and liquids through solids equimolar diffusion. Isothermal evaporation of water into air unsteady state 3 dimensional mass diffusion in stationary media.

B.Tech. (Food Tech.) IV Sem

Food Biochemistry and Human Nutrition (3+1+3)

UNIT -I

Structure and functions of biomolecules -

1. Carbohydrate - Definition, classification specially chemical and Ring structures.
2. Proteins and Amino acids - Definition and structure of peptide bonds, chemical structures of proteins (primary, secondary, tertiary and quaternary)
3. Definition, classification and nutritional importance of lipids.

UNIT -II

1. Structure and chemistry of Nucleic Acids-DNA and RNA and its importance
2. Vitamins- Sources, structure, functions and dietary allowances.

UNIT -III

Enzymes and coenzymes- Definition, classification and factors affecting the catalytic activity of enzymes.

1. Biochemical separation methods (chromatography, GLC TLC and HPLC and photometry.
2. Biological membranes and transport across them.
3. Bioenergetics.

UNIT -IV

1. Major anabolic and catabolic pathways and their regulation, glycogenesis, glycolysis, Kreb's cycle, H.M.P. shunt pathways.
2. Synthesis of protein and catabolic processes i.e. - Deamination, transamination decarboxylation and urea cycle.
3. Biosynthesis of fatty acids and Beta-oxidation of fatty acids.
4. Metabolic pathways of typical microbes.

UNIT -V

1. Functions of Foods and Energy requirements.
2. Nutritive value of protein. Nutritional significance of Carbohydrates, fats and Minerals & vitamins.
3. Recommended dietary allowances for various age groups.
4. Weaning foods, Malnutrition (CM, PCM)

B.Tech. (Food Tech.) IV Sem

Unit Operation (3+1+3)

UNIT -I

Distillation : Flash distillation of binary mixtures. Continuous distillation with reflux (Rectification). Rectification on an ideal plate, combination of rectification and stripping. Material balance for two component system, equation for operating lines & feed line, Number of ideal plates, Mc Cabe- Thiele method. constant Molal overflow, Reflux ratio, Feed plate location, minimum number of plates, Fenske equation, minimum reflux & optimum reflux ratio, overall and Murphree & local efficiencies of plates.

UNIT -II

Drying of solids : Humidity chart or psychometric chart, use of wet bulb temperature and measurement of Humidity. Moisture content of solids on wet and dry basis. Principle of drying. equilibrium moisture Curve (Phase equilibria). Equilibrium and free moisture content. Rate of drying for porous and non-porous solids under constant drying conditions.

(a)- Constant rate period

(b)- Critical moisture content and falling rate period, Non-pours solids, diffusion, shrinkage and case hardening, flow of moisture in porous solids by capillary action. Calculation of drying time equation under constant drying conditions.

UNIT -III

Leaching : Leaching, leaching by percolation through stationary solid beds, moving bed and disperse solid leaching counter current leaching operating line, number of ideal stages for constant under flow.

UNIT -IV

Principles of comminution, characteristics of comminuted products, energy and power requirements in connection to Crushing efficiency Rittinger;s and Kick's law, Bond's crushing law and work index.

UNIT -V

Mechanical separation : Screening, material balance over screen, screen effectiveness, capacity and effectiveness, capacity and effectiveness of screens capacity of actual screens.

Reference :

1. Unit operation of Chemical Engg. MC Cabe & Smith

B.Tech. (Food Tech.) IV Sem Principles of Food Preservation (3+1+3)

UNIT -I : High temperature preservation

Introduction to heat processing : Death of bacteria subject to moist heat, Lethality of thermal processes, Basic considerations, the general & mathematical methods. adequacy of thermal process time, Canning : introduction, Applications & steps involved ; Blanching, Pasteurization and sterilization.

UNIT -II : Low Temperature preservation

Metabolism as a function of temperature, refrigerated or chilling storage of foods, Disorders of refrigerated stored foods. Freezing point of foods, ice crystals formation, quick and slow freezing, various methods of freezing, comparison of chilling and frozen storage.

UNIT -III- Radiation Preservation

Type of radiations important in irradiation of foods, physical and chemical changes induced by radiations, interaction of radiation with living organisms. Radiated foods, cost, shelf life, nutrient and other losses, wholesomeness, safety of working personnel and dosimetry.

UNIT -IV :

Principles of preservation by drying and dehydration, Treatments prior to drying, drying procedures, sun drying, mechanical drying and freeze drying, comparison between different methods, Effect of water removal on foods, Reconstitution and cooking, storage of dried foods, osmosis in dehydration of foods.

UNIT -V : Chemical Preservatives

Definitions and classifications, bacteriostatic agents, fungistatic agents, germicidal agents, antioxidant, neutralizers, stabilizers and firming agents, use of sulphur dioxide and benzoic acid, tolerance of chemical preservative, use of antibiotics, sugars and salts.

Practicals:

1. Canning of fruits and Vegetables (Peas)
2. Chemical preservation (KMS for citrus juice)
3. Adequacy of blanching.
4. Drying of foods - drying curve.
5. Drying time, dehydration ratio & rehydration.

6. Preservation by sugar and salt.

Reference -

1. Fenema O.R. Ed., 1985, principles of food science by part ii physical principles of food preservation, Marcel Dekker, New York.
2. Potter, N.N. , 1978, Food science, CBS Pub, New Delhi.

B.Tech. (Food Tech.) V Sem **Sub: Fluid Mechanics (3+1+2)**

UNIT -I

1. Introduction : Properties of fluids- density, specific weight, specific-volume, specific gravity, surface tension, capillarity, vapour pressure, equation of state, gas constant.
2. Hydrostatics : Pressure at a point, pressure head, Pascal's law, atmospheric, absolute, gauge & vacuum pressures, vapour pressure, Measurement of pressure manometers-simple manometer.

UNIT -II

1. Hydrostatic pressure - total pressure, centre of pressure of horizontal & vertical plane surfaces.
2. Buoyancy : buoyancy, Buoyant force and centre of buoyancy, metacentre and metacentric height, stability of submerged & floating bodies.
3. Kinematics of Fluid flow : Introduction to general types of fluid flow- steady/unsteady, uniform/non-uniform, laminar/turbulent, Equation of continuity for one dimensional steady flow.

UNIT -III

Dynamics of Fluid flow : various forms of energies - elevation energy, kinetic (velocity) energy, pressure (flow) energy.

Energy equation for steady flow- Bernoulli's theorem. Euler's equation of motion and derivation of Bernoulli's equation.

Linear momentum equation & impulse momentum equation.

Types of fluid motion - introduction to rectilinear, radial, Reynolds number.

UNIT -IV

Application of dynamic fluid flow : Venturimeter, orifice meter nozzle & pitot tube : discharge measurement through pipes - its principle, equation of discharge through venturimeter, orifice meter- description, discharge calculation introduction to nozzle & pitot tube.

UNIT -V

1. Orifices & Mouthpieces : Definition, classification, orifice discharge free, definitions of Vena-contracta, Hydraulic coefficient, coefficient of velocity, coefficient of contraction, coefficient of discharge, coefficient of resistance.
2. Introduction to weir and notches.

PRACTICALS

1. To study the head losses in pipes - Frictional losses, sudden expansion, sudden contraction, Graduated band and sharp band.
2. To study the impact of jet
3. To verify the Bernoulli's theorem
4. To measure the discharge through notches and weirs

References:

1. Fluid mechanics & Hydraulics - Jagdish Lal
2. Fluid Mechanics - M.Manohar
3. Fluid Mechanics & Hydraulic Machine - Modi & Seth.

B.Tech. (Food Tech.) V Sem Cereal Technology (3+1+3)

UNIT -I

Composition, structure and characteristics of wheat, paddy and corn. Physical properties : Shape and size, Density, porosity , frictional properties, Aerodynamic properties, thermal properties of grains.

UNIT -II

Separation of foreign material from grains, Various separating equipments used. Dehusking and equipments used. Polishing and equipments used.

UNIT -III

Milling and parboiling of paddy, wheat flour milling. Wet and dry milling of corn.

UNIT -IV

Baking : Technology of manufacturing Bread, Biscuits etc quality control procedures for flour, fat, bakers yeast, sugar and salt, I.S.I. standards for flour, fat, Baker's yeast.

UNIT -V

Extrusion : extruded food products, Technology of Macaroni and pasta products, extrusion cooking.

Reference -

1. Unit Operation in Ag. Engg. - Sahay & Saxena
2. Oilseed Pulses & Cereal Tech. - Chakroborty
3. Baking technology - S.A. Matz

B.Tech. (Food Tech.) V Sem Fruits & Vegetables Processing (3+1+3)

UNIT -I

Composition, structure and characteristics of fruits and vegetables, Post harvest changes, storage, handling and preservation of fresh fruits & vegetables, controlled and modified atmosphere storage, fruits & vegetable industry in India the present scenario.

UNIT -II

Canning : Machinery and equipment, process, Defects, spoilage, canning of fruits (Guava, Mango, Pineapple, Banana etc) & vegetables (Peas, Mushroom, Potato, Spinach, Cauliflower etc.)

Unit-III

Equipment for fruit juice extraction training, filtration and clarification, Different methods of juice preservation.

UNIT -IV

Non-fermented fruit beverages : squash, cordials, nectar, syrups, fruit juice concentrate and powder, carbonated beverages.

UNIT -V

Other fruits and vegetable products : Jam, Jellies & Marmalades, candied & crystallized, Tomato products, Chutneys, Pickles, Dried fruits & vegetables, sauces, introduction to FPO.

References :

1. Preservation of fruits & Vegetables by G. Lal & Sidhappaa published ICAR

B.Tech. (Food Tech.) V Sem
Oil Seed and Pulses Technology (3+1+0)

UNIT -I

Oil seed handling and preparation prior to solvent extraction, cleaning, dehulling, size reduction, prepressing, flaking, extrusion, pelletisation, stabilization, (Rice bran etc.). Process for above and the m/c and equipments.

UNIT -II

Solvent extraction theory, solvent and their availability, selection of solvents, advantages, batch and continuous, plants, desolventization of meal and micella, use of SCF for extraction and liquified gas for oil extraction.

V-III

Pulse milling and preparation for milling. Easy to dehusk pulses, difficult to dehusk, Hydrothermal, treatment and other pretreatments and their affects modern method for minimise breaking and scouring losses.

UNIT -IV

Mechanical oil expression. Hydraulic pressing & screw press.

UNIT -V

Refining, bleaching, decolourization of oil.

References:

1. Oilseed processing technology- Shukla B.D. am K. Gupta & P.K. Srivastava
2. Post Harvest Tech. - Dey & Chakorvorty
3. Oilseed Tech. - Jaswant Singh & P.K. Srivastava
4. Processing and storage of Oilseeds and products for Food uses - Dr. S.D. Kulkarni, Dr. R.K. Gupta

B.Tech. (Food Tech.) V Sem
Principles of Management & Managerial Economics (3+1+0)

UNIT -I

Management Concept:

- 1.1 Management meaning & Definition.
- 1.2 Concept of management
- 1.3 Characteristics of management
- 1.4 Importance & scope of management
- 1.5 Business management. Administration, its difference & relation with Management

UNIT -II

Principles of Management:

- 2.1 Principles of management
- 2.2 Basic Elements of business
- 2.3 Process of management
- 2.4 Functions of management
- 2.5 Levels of management

UNIT -III

Organization & Decision Making:

- 3.1 Definition & concept of organization
- 3.2 Types of organization
- 3.3 Line, staff, functional organization
- 3.4 Socio-psychological aspects of organization
- 3.5 Decision making- Definition & Types
- 3.6 Techniques of Decision making

UNIT -IV

Managerial Economics:

- 4.1 Introduction
- 4.2 Managerial Economics
- 4.3 Nature, purpose & functions of Engg. Economics
- 4.4 Economic relationship- Economic good, utility, value, price, wants & its application
- 4.5 Micro & macro Economics.

UNIT -V

Business firms & Costing:

- 5.1 Theory of cost
- 5.2 Types of cost- prime cost, direct and indirect cost, overhead, fixed and variable cost, incremental & opportunity cost, marginal cost.
- 5.3 Business firms- single entrepreneurship & partnership.
- 5.4 Joint stock company- private, public Ltd, & its formation.
- 5.5 Productivity
- 5.6 Factors affecting Productivity.

References:

- 1. Principles of Management & Economics by S. Sachdeva – Deepak Prakashan
- 2. Principles of Management by L. M. Prasad – S Chandra & Company Delhi

B.Tech. (Food Tech.) VI Sem
Instrumentation (3+1+2)

UNIT -I :

Definition of measurement. Importance of measurement requirement for static and dynamic measurement, errors. Sensitivity, accuracy, speed of response and range in measurements, mechanical and electrical measuring systems, calibration of measuring system.

UNIT -II

Electrical circuits and terminating devices, Electronic counter and its use, cathode ray, oscilloscope and its use, galvanometer type recording techniques.

Motion measurement, Electrical resistance strain gauges, wire and foil type gauge factor, gauge material and selection.

UNIT -III

Temperature measurement, types of temp. measuring instruments and their appropriate temp. range, Bimetallic thermometer, and pressure thermometer etc.

UNIT -IV

Pressure measurement, types of pressure measurement instruments, U tube manometer, pitot tube, inclined U tube Bourdon tube pressure gauge and Vacuum gauge.

UNIT -V

Elementary knowledge of capacitance and inductance type piezo electric pickups.

Measurement of relative humidity, sling psychrometer and use of Hygrometers (indication and recording type)

B.Tech. (Food Tech.) VI Sem Dairy Technology (3+1+2)

UNIT -I

Market milk - Definition, composition, factors, affecting composition, physico chemical properties of milk and other dairy products, milk reception and storage, Microbiology of milk.

UNIT -II

Liquid milk processing- pasteurization, sterilization homogenization, standardization. Fortification of milk and milk products.

UNIT -III

Production and preservation of cream, butter, ghee, butter oil and flavoured milk.

UNIT -IV

Technology and process calculations for dried, evaporated and condensed milk products.

UNIT -V

Technology and chemistry of cheese, Ice-cream and Indian dairy products- Dahi, Srikhand, Panir, Chhana. Cleaning, Sanitation and corrosion control in Dairy plants.

References :

1. Dairy Technology - Sukumar & Dey
2. Dairy Engineering & Management - Tanfil Ahmed

B.Tech. (Food Tech.) VI Sem Fermented Food Products (3+1+0)

UNIT -I :

Introduction - Definition and scope of Industrial Microbiology.
Fermentation Equipment and its use.

UNIT -II

Industrial costing - Classification of costs-direct labour direct material, overhead, prime cost, Basis and Development of Industrial Fermentation Processes
Screening (i) Primary screening (ii) Secondary screening.

UNIT -III

Detection and Assay of fermentation products :
(i) Physical chemical analysis (ii) Biological assay

Stock cultures, Fermentation media -

- (i) Media composition
- (ii) Media sterilization and contamination
- (ii) Inoculum media
- (iv) Screening for fermentation media

UNIT -IV

Inoculum preparation

Scale up of fermentations

Alcoholic fermentations, production of industrial alcohol, mechanism of ethyl alcohol fermentation.

UNIT -V

Economic study patterns- Basic economic study patterns, steps in making economic studies of new Beer production : Medium preparation : Malting, mashing, separation of wort, wort boiling & hops addition, fermentation separation & maturation, carbonation, packaging.

Fermentation food - Cheese, sauerkraut, Soya sauce, yoghurt

Vitamin B12 & Riboflavin, Penicillin & Streptomycin

Vinegar and Acetic acid manufacture, its spoilage and prevention. Fulfillment

B.Tech. (Food Tech.) VI Sem

Storage Engineering (3+1+0)

UNIT -I:

Importance of grain conservation History and Development of food grain storage principles and method of storage.

UNIT -II

Sphericity, porosity, coefficient of friction and angle of repose, effect of hot air, temperature and quality of food grain-protein, starch fat, vitamins, drying method, deep bed, thin layer drying method of estimating, moisture estimation, ISI method, storage method **dabule atug**. Method **hysteresia**, bound moisture, unbound moisture free moisture, Effect of deferent factor and drying process, effect of air, temp, air velocity, air humidity and exposure time.

UNIT -III

Method of Grain Drying - **Camdueem drying, carveehan drying- natural air drying supplimutal heat** drying heated air drying radiant drying.

UNIT -IV

Storage structures - On the form, farm silo-types of silo pits, pit silo, design of silo pits, **trenec** silo, design **tranc** silo. Concept of food storage, food grain storage structure, requirement of good storage structure.

UNIT -V

Types of gain storage structure - (a) Bukhari, Kothartype and grain bins, Bog storage, structure. Design of storage and structure Grain pressure **theemes**. Storage structures.

B.Tech. (Food Tech.) VI Sem

Food Packaging/Packaging Technology (3+1+0)

UNIT -I

Basic concept of food packaging, function of food package, packaging materials- glass, metal, metal foils, papers, films and their composites, common packaging forms under rigid, semi rigid and flexible class of package, Retortable flexible package, Aseptic packaging.

UNIT -II

Selection of material, Machinery and method of packaging, package printing and labeling standards and their requirements.

UNIT -III

Development of package, evaluation of packaging materials and package performance.

Unit-IV

Product characteristics viz-a-viz package requirement for dairy industry, Bakery and confectionery, fresh fruits and vegetables.

UNIT -V

Product characteristics viz-a-viz package requirement for frozen fruits and vegetables, processed fruits and vegetables, snack foods.

B.Tech. (Food Tech.) VII Sem
Refrigeration and Air Conditioning (3+1+0)

UNIT -I

Introduction to the first and second laws of thermodynamics, Introduction to refrigeration system, Carnot refrigeration cycle, COP, Unit of refrigeration, Refrigerants : Nomenclature, Desirable properties of refrigerants.

UNIT -II

Air Refrigeration cycle (Brayton cycle), optimum cop and pressure ratio.

Air craft refrigeration system, Necessity of air craft refrigeration system, Advantages of air cycle for aircraft refrigeration

UNIT -III

Vapour compression system, Effect of pressure change on cop. Use of PH chart, effect of subcooling of condensate on COP, Effect of super heating of vapour before compression

Introduction to vapour absorption system.

UNIT -IV

Air conditioning : Introduction to air conditioning, Use of psychrometric chart for air conditioning. Air conditioning process, SHF and its use, GSHF, ESHF, heating load calculation

UNIT -V

Applications : Food Preservation, Cold storage, Ice Cream manufacture, Water coolers.

B.Tech. (Food Tech.) VII Sem
Food Industry Waste Management (3+1+0)

UNIT -I

By products of and their utilisation from

1. Cereal (Corn, wheat, rice)
2. Oil-seeds (Ground nut, Mustard, Sunflower, coconut, cotton seed, etc. Pigeon pea, black and green gram, Bengal gram etc.)

UNIT -II

By Product of and their utilisation from

1. Fruits (Apple, grape, papaya, orange, citrus, mango)
2. Dairy (Cream/Butter, Chees/Paneer)
3. Tea leaves, coffee beans, cashewnut.

UNIT -III

Characterisation of food industry waste

BOD, COD, TOD, pH, dissolved O₂, O₃, total organic content, types of solids (Floatable, suspended settleable), Froth floatation & floatation techniques, sedimentation & screening, types of sedimentation.

UNIT -IV

Biological Oxidation

Various types of biological reactions occurring in biological oxidation (Methanogenesis, nitrification, denitrification, biomass synthesis, endogenous respiration, photosynthesis type of air diffusers, lagoons, oxidation ditches, rotating biological contactor, trickling filters.

UNIT -V

Advanced (Tertiary treatment)

Polishing ponds/lagoons, micro filters/strainers, removal of nitrogen, phosphorus, sulphur.

References :

Waste Water collection, treatment & Disposal Engineering by Tata McGraw Hills, New Delhi

B.Tech. (Food Tech.) VII Sem

Food Plant Sanitation Practice (3+1+0)

UNIT -I

Food Plant Design and Construction

Sanitary considerations of (a) Exterior aspects (b) Interior Aspects.

1. Exterior aspects - Site selection and plant location, Grounds, Exterior, Design, Layout, roof of a food industry.
2. Interior Aspects - Walls and priming, door & doorways, ceiling, floor, lighting, noise, elevators, stairwell and stairs, ventilation, paint/white washing of a food industry.

UNIT -II

Personal Hygiene -

Sanitary considerations of personal Hygiene in terms of

(a) Physical examinations (b) Hand washing (c) Use of caps and gloves (d) Rest room facilities (e) Clothing (f) Jewelry (g) Eating and personal habits.

UNIT -III

Food Transport sanitation

Regulatory aspects, of transport sanitation, importance of inspection in receiving, loading, unloading, sanitary design considerations of transport vehicle, pest & rodent control by fumigation, spray.

UNIT -IV

Cleaning and sanitization

Differentiation between cleaning and sanitization, types of soil, cleaning agents. Soaps detergent, mechanism of cleaning criterion for selection of a cleaning agent, water for cleaning, cleaning system like CIP, sanitising agents for food industry, selection of a sanitising agent for a food industry, dry cleaning & vacuum cleaning.

UNIT -V

Water Sanitation

Water & Steam for food industry sanitation, source & quality of water treatment like chlorination, deionisation, coagulation/filtration.

References:

1. Sanitary design principles for food processing plants - Stinson W.S.
2. Food plant Sanitation - J.H. Litchfield, ME Parber,

B.Tech. (Food Tech.) VII Sem

Food Quality (3+1+0)

UNIT -I

Quality attributes : Appearance, Texture, Flavor, Nutritive value and other hidden attributes of foods.

UNIT -II

Physical, Mechanical, Chemical and Sensory evaluation of foods and food quality.

UNIT -III

Microbiological quality of foods, browning reactions & changes in quality of foods as a result of processing, preservation and storage.

UNIT -IV

Quality control and quality assurance in food industries, food plant hygiene sanitation standard, food laws & regulations,

UNIT-V

Safety of processed & preserved foods.

References:

Quality control for Food Industry, A. Kramer & B.A. Twig, publication AVI Westport.

B.Tech. (Food Tech.) VII Sem

Process Equipment & Design (3+1+0)

UNIT -1

Introduction

Various factors for selection of equipments, design & selection criterions for process equipment.

UNIT-II

Design of Material Handling & Equipment

Selection of material for handling (e.g. course grains) classification of conveying equipment (horizontal, vertical, inclined), selection of conveying equipment.

1. Belt Conveyor : Its design, find out maximum length of belt in open & cross belt, to find out diameter & speed of pulley, considering slip and without slip, considering thickness of belt, neglecting thick ness of belt conveyor, to find out tension in black side & tight side, to find horse power required to run belt conveyor.
2. Chain conveyor : To find out number of teeth and length of chain for chain conveyor, horsepower required, type of chain conveyor thermal power requirement of the trolley, scrapes, apron.
3. Screw & Auger Conveyor : Its importance and various uses in food industry, design factor.
4. Pneumatic conveyor : Its importance and importance with respect to food industry, design considerations.
5. Design of bucket elevator.

Unit-III Shafts

Various uses of shaft, design of shaft (hollow, solid) on the basis of load requirement special consideration of simply supported shaft.

Unit-IV : Heat Exchanger :

Design of heat exchanges, functional difference between plate & tube heat exchanges, calculation of maximum area required overall heat transfer coefficient for milk & water, design considerations for designing these equipments.

Unit - V

Design of single pan evaporator, its used, its types.

References:

1. Process Equipment Design by Pary & Handerson
2. Sedd Processors by R.P. Sensemat.

B.Tech. (Food Tech.) VIII Sem
ELECTIVES
Food Beverages (3+1+0)

UNIT - 1

Scope of study of food beverages. Current national and international status. Definition and classification of food beverages. Raw materials used for beverages. PFA- standards for food beverages.

UNIT -II

Synthetic soft drinks, process of manufacture of soft drinks, quality of water, for soft drinks. Food additives used in soft drinks. Quality control in a soft drink manufacturing industry.

UNIT -III

Fruit Beverages - RTS, squash, fruit juice, nectar etc. process of manufacture & quality control in Beverage industry, FPO standards for fruit Beverages.

UNIT -IV

Hard Drinks : Wine (Grape), champagne, process of their manufacture and quality control.

UNIT -V

Tea & coffee, chemical compositions, process of brewing & instantisation.

References :

1. Food Science - Norman and Potter
2. PFA 1954
3. FPO 1955
4. Fruits and Vegetable Preservation - G. Lal & Sidhapps
5. Fermented Food Products-Prescott & Dunn.

B.Tech. (Food Tech.) VIII Sem
Bioprocess Engineering (3+1+0)

UNIT I

Biochemical and biological reaction systems. bioenergetics, enzyme kinetics, immobilized enzyme systems.

UNIT II

Batch growth of microorganisms, growth patterns and growth kinetics in batch culture.

UNIT III

Kinetics of product formation. Bioreactors, design of batch and continuous stirred tank fermentors, design of batch and continuous, stirred tank fermentors, multi-stage systems.

UNIT IV

Aeration and agitation systems. Media and sir sterilisation, kinetics of thermal death, design of sterilisation equipment.

UNIT V

Mixed culture systems, biological waste water treatment, biogas reactor and activated sludge process, downstream processing, recovery and purification of products-alcohols, acids, antibiotics and enzymes.

B.Tech. (Food Tech.) VIII Sem
Marketing Management (3+1+0)

UNIT I

Core concepts- needs, wants, demands, value, utility, product, exchange, transaction, relationship, markets, marketers,

UNIT II

Marketing. Agro commodity/food product markets – consumer market, industrial market, from commodity to branded product market.

UNIT III

Marketing plan, quantitative in resource allocation.

UNIT IV

Product life cycle-related strategies. Sales management. Export market for agro products.

UNIT V

Elements of communication and media planning.

B.Tech. (Food Tech.) VIII Sem
Advanced Food Engineering & Technology (3+1+0)

UNIT I

Basic process principles – Basic principles of food preservation and processing: preservation of food by removal of heat, addition of heat, removal of moisture, irradiation, addition of chemicals and fermentation :

UNIT II

CA/MA storage, water activity and food stability emerging techniques in food processing.

UNIT III

Food Products Technology – Technological process outlines for industrial manufacture of selected food commercial importance from plant and animal sources,

UNIT IV

Jam, Jelly, Marmalade pickles, carbonated beverage, Fruit juice based beverages, hydrogenated vegetable oil.

UNIT V

Tea, coffee, cocoa, Bakery and confectionary products, breakfast cereals, butter, ice-cream, condensed milk, cheese, milk powder. malted foods and low fat spread. Food packaging. quality control and food industries.