DEPARTMENT OF TECHNOLOGY
SECOND YEAR B.TECH
FOOD TECHNOLOGY
Scheme of Teaching and Examination
Semester – III

Subject code	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical/ Tutorial		
		L	T	P	Credits	Scheme	Max. marks	Minimum Marks for Passing	Scheme	Max. marks	Minimum Marks for Passing
MA211	Engineering Mathematics III	3	1	-	04	CIE	50	20	IOE	50	20
						SEE	50	20	--------	-------	--------
FT 211	Principles of Food Preservation	3	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
FT 212	Food Chemistry	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
FT 213	Food Microbiology	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CH 214	Process Fluid Mechanics	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
FT 211 L	Principles of Food Preservation Lab	-	-	2	01	--------	--------	--------	EPE	50	20
FT 212 L	Food Chemistry Lab	-	-	2	01	--------	--------	--------	EPE	50	20
FT 213 L	Food Microbiology Lab	-	-	2	01	--------	--------	--------	EPE	50	20
CH 214 L	Process Fluid Mechanics Lab	-	-	2	01	------	----	-----	IPE	50	20
FT 214	Programming Practices	1	-	2	02	----------	---------	----------	IPE	50	20
		19	**1**	**10**	**25**		**500**	**----**		**300**	**-----**

HS222	Environmental Studies	2	-	-	----	Project	30	40	--------	-------	--------
						Theory	70				
Audit Course I											
HS211	Introduction to Foreign Language	2	-	-	-----	Institute Level	**-----**	**-------**	**-------**	**------**	**--------**

Total Credits: 25
Total Contact Hours/Week: 30 hrs

Note:
Note:
$: Minimum 40% marks required in CIE to become eligible for SEE.

• Tutorials and practical shall be conducted in batches with batch strength not exceeding 18 students.
CIE – Continuous Internal Evaluation, SEE – Semester End Examination,
IPE – Internal Practical Evaluation, EPE–External Practical Examination,
IOE– Internal Oral Evaluation, EOE–External Oral Examination

DEPARTMENT OF TECHNOLOGY
SECOND YEAR B.TECH
FOOD TECHNOLOGY
Scheme of Teaching and Examination
Semester – IV

Subject Code	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credits	Scheme	Max. Marks	Minimum Marks for Passing	Scheme	Max. Marks	Minimum Marks for Passing
FT 221	Food Process Engineering-I	3	1	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
FT222	Food Additives and Contaminants	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
FT223	Food Biochemistry	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
FT 224	Human Nutrition	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
CH224	Fundamentals and Applications of Heat Transfer	4	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
FT221L	Food Process Engineering- I Lab	-	-	2	01	--------	--------	--------	IPE	50	20
									EPE	50	20
FT222L	Food Additives and Contaminants Lab	-	-	2	01	--------	--------	--------	EPE	50	20
FT223L .	Food Biochemistry Lab	-	-	2	01	----------	------	---------	EPE	50	20
FT 224L	Human Nutrition Lab	-	-	2	01	----------	-----	---------	IPE	50	20
CH224L	Fundamentals and Applications of Heat Transfer Lab	-	-	2	01	------	-----	----	IPE	50	20
	Total	**19**	**1**	**10**	**25**	**------**	**500**	**-----**	**--------**	**300**	**-----**

HS222	Environmental Studies	2	-	-	-----	Project	30	40	**-------**	**------**	**--------**
						Theory	70				
Audit Course II											
HS221	Introduction to Performing Arts	2	-	-	-----	Institute Level	**-----**	**-------**	**-------**	**------**	**--------**

Total Credits: 25
Total Contact Hours/Week: 30 hrs
Note:
$: Minimum 40% marks required in CIE to become eligible for SEE.

• Tutorials and practical shall be conducted in batches with batch strength not exceeding 18 students.
CIE – Continuous Internal Evaluation, SEE – Semester End Examination,
IPE – Internal Practical Evaluation, EPE–External Practical Examination,
IOE– Internal Oral Evaluation, EOE–External Oral Examination

Detailed Examination Scheme

1. Out of total 100 theory marks, 50 marks are allotted for Continuous Internal Evaluation (CIE). In CIE minimum 20 marks are required to become eligible for Semester End Examination. (SEE).

2. CIE (50 marks) includes :

    - Internal Test – 1, of 25 marks in 5^{th} week on 1^{st} and 2^{nd} unit
    - Internal Test - 2, of 25 marks in 10^{th} week on 3^{rd} and 4^{th} unit

3. For the Semester End Examination (SEE), 100 marks (3 hrs.) paper will be set and finally it will be converted to 50 marks, in which student must secure minimum 40 % i.e. 20 marks as an university examination passing head.
4. Final theory marks (out of 100) will be the addition of CIE (out of 50 marks) and SEE (out of 50 marks).
5. Internal Practical Evaluation (IPE) will be assessed on the basis of Internal Oral/ Practical/Tutorials/seminar in which student must secure minimum 40% i.e. 20 marks.
6. *Semester End Examination duration will be 4 hrs.

Academic Autonomy:

1. Flexibility in deciding Structure and Contents of Curriculum with reasonable frequency for changes in the same.

2. Continuous Assessment of Students performance with newly adopted - Credit System based on Award of Grade.

3. Credits are quite simply a means of attaching relative values to courses different components. They are a currency of learning, and in general regarded as a measure of the time typically required to achieve a given curricular outcome.

4. All subjects (year-wise) under each course/discipline are unitized.

Credit system:

Education at the Institute is organized around the semester-based credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow a student to progress at an optimum pace suited to his/her ability or convenience, subject to fulfilling minimum requirements for continuation.

A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the programme. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All programmes are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

Course credits assignment:

Each course, except a few special courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week. This weightage is also indicative of the academic expectation that includes in-class contact and self-study outside of class hours.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Practical/Laboratory: One laboratory hour per week per semester is assigned half credit.

Example: Course : Principles of Food Preservation: 4 credits (3-0-2)

The credits indicated for this course are computed as follows:

3 hours/week lectures = 3 credits

0 hours/week tutorial = 0 credit

2 hours/week practical = 2 × 0.5 = 1 credit

Also, (3-0-2) **4** credit course = (**3** h Lectures + **0** h Tutorial + **2** h Practical) per week

= **5** contact hours per week

For each lecture or tutorial credit, the self study component is 1 hour/week and 2 hours/week. In the above example, the student is expected to devote 3 + 1 = 4 hours per week on self study for this course, in addition to class contact of 5 hours per week.

Earning credits:

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance, and allows the students to progress at an optimum pace suited to individual ability and convenience, subject to fulfilling minimum requirement for continuation.

Features of Credit System at Department of Technology, Shivaji University, Kolhapur:

Every subject is allotted credits based on its academic importance/weight age.

1. All subjects may not have same credits.
2. 25 Credits / Semester.
3. Absolute Grading System with 6 Passing Grades viz. AA, AB, BB, BC, CC, CD, DD and FF for failure.
4. Getting FF grades in 4 heads in the one academic year he/she considered as failed.
5. Continuous Evaluation: Internal Test 1 [25 marks], and Internal Test 2 [25 marks].
6. Standardization of courses; each course is of 6 units. T1 for unit 1 and 2, T2 for unit 3 and 4, SEE for all units.
7. Internal Test 1 & Internal Test 2 handled by internal; SEE mostly by external.
8. Under no circumstances will a request for re-test be entertained after internal test.
9. Re-examination after SEE; No examination for odd sem. courses in even sem. or vice-versa.

Attendance rule:

All students must attend every lecture, tutorial and practical class. However, to account for late registration, sickness or other such contingencies, the attendance requirement will be a minimum of 75 % of the classes actually held. A student with less than 75 % attendance in a course during the semester, in lectures, tutorials and practicals taken together (as applicable), will be awarded an 'XX' grade in that course irrespective of his/her performance in the tests.

The course coordinator will award 'XX' grade to the student who is deficient in attendance taking into account the consolidated attendance record for the whole semester. For the purpose of attendance calculation, every scheduled practical class will count as one unit irrespective of the number of contact hours.

Attendance record will be maintained based upon roll calls (or any equivalent operation) inevery scheduled lecture, tutorial and practical class. The course coordinator will maintain and consolidate attendance record for the course (lectures, tutorials and practicals together, as applicable).

Evaluation system:

1. Semester Grade Point Average (SGPA) =

$$\frac{\sum (\text{course credits in passed courses X earned grade points})}{\sum (\text{Course credits in registered courses})}$$

2. Cumulative Grade Point Average (CGPA) =

$$\frac{\sum (\text{course credits in passed courses X earned grade points) of all Semesters}}{\sum (\text{Course credits in registered courses) of all Semesters}}$$

3. At the end of B. Tech Program, student will be placed in any one of the divisions as detailed below (According to AICTE Handbook):

   Ist Division with distinction: CGPA $\geq$ 8.25 and above

   Ist Division : CGPA $\geq$ 6.75 and < 8.25

   IInd Division : CGPA $\geq$ 6.75 and < 6.25

An example of these calculations is given below:

Typical academic performance calculations - I semester

Course no.	Course credits	Grade awarded	Earned credits	Grade points	Points secured
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6 (col4 *col5)
MALXXX	5	CC	5	6	30
CSLXXX	4	CD	4	5	20
PHLXXX	4	AA	4	10	40
PHPXXX	2	BB	2	8	16
MELXXX	4	FF	0	0	00
TTNXXX	2	AB	2	9	18
Total	21		17	38	124

1. Semester Grade Point Average (SGPA) =

$$\frac{(124)}{(21)} = 5.90$$

2. Cumulative Grade Point Average (CGPA) =

Cumulative points earned in all passed courses = 124 (past semesters) + 124 (this sem.) = 248

Cumulative earned credits = 23 (past semesters) + 21 (this sem.) = 44

$$\frac{\sum (124 + 124)}{\sum (23 + 21)} = 5.63$$

System of Evaluation

Grade	Grade Points	Range	Description of Performance
AA	10	91-100	Outstanding
AB	09	86-90	Excellent
BB	08	76-85	Very Good
BC	07	66-75	Good
CC	06	56-65	Fair
CD	05	46-55	Average
DD	04	40-45	Poor
FF	00	Below 40	Fail (Eligible for Re-exam)
XX	--	--	Insufficient attendance
AB	--	--	Absent
$	--	--	Passed in Ist attempt

Audit Courses:

Additional courses shall be included as audit courses from the third semester onwards. While the performance of the student in audited courses shall be included in the Grade Card. These grades are not contributed to SGPA or CGPA of the concerned student.

Second Year UG Programme
(Branch: Food Technology)
SEMESTER- III

ENGINEERING MATHEMATICS – III (MA211)

Teaching Scheme: L: 3 hrs/week
: T: 1 hrs/week **Credits: 4**

Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**
		IOE	**Minimum Passing Marks**
		50	**20**

UNIT I Linear Differential Equations **(8 Hrs)**
Linear Differential Equations with constant coefficients, Homogenous Linear differential equations, method of variation of parameters

UNIT-II Partial Differential Equation **(6 Hrs)**
Four standard forms of partial differential equation of first order

Unit III Curve Fitting: **(8 Hrs)**
Fitting of Curves by method of Least-squares Coefficient of correlation, Spearman's rank correlation coefficient and lines of regression of bivariate date.

UNIT-IV Probability **(8 Hrs)**
Random variable, Probability mass function and probability density function, Binomial, Poisson and Normal distributions.

UNIT–V Laplace Transform **(8 Hrs)**
Definition, properties of Laplace transforms, transforms of derivatives, transforms of integral, Inverse Laplace transforms, Convolution theorem. Applications to initial value boundary problems, Heaviside Unit step function, Diracdelta function, Periodic function.

UNIT -VI Vector calculus **(10 Hrs)**
Differentiation of vectors, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function. Irrotational and solenoidal vector field.
The line integral, Surface integral volume integral Gauss's Divergence theorem, Stoke's theorem, Green's theorem (Without proof)

TEXT BOOKS/ REFERENCE BOOKS:

1. Wartikar J. N. & Wartikar , P. N. "A text book of Applied Mathematics: Vol. I, II and III" Vidyarthi Griha Prakashan, Pune.
2. Grewal.B. S. "Higher Engineering Mathematics" Khanna Publisher
3. Kreyszig Erwin "Advanced Engineering Mathematics" Willey Pub.
4. Bali N. P., Saxena Ashok and Iyengar N. Ch. S. N. "A textbook of Engineering Mathematics"Laxmi Publication, Delhi.

PRINCIPLES OF FOOD PRESERVATION (FT 211)

Teaching Scheme: L: 3 hrs/week **Credits: 3**

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

UNIT I Introduction to food processing & preservation (4 Hrs)

Scope and Importance of food processing, National and International perspectives

UNIT II Principles of food preservation (4 Hrs)

Basic principles of food preservation, various methods of food preservation

UNIT III Food preservation by low temperature (8 Hrs)

Cooling, Refrigeration, freezing and freeze drying

UNIT IV Food preservation by heating (8 Hrs)

Drying and dehydration, pasteurization, sterilization, blanching, extrusion cooking of food.

UNIT V Food preservation by Nonthermal method (8 Hrs)

Chemical preservation, fermentation methods for food preservation, irradiation, membrane technology.

UNIT VI Recent methods for food preservation (8 Hrs)

Pulsed electric field processing, high pressure processing, processing by using ultrasound, dielectric, ohmic and infrared heating etc.

TEXT BOOKS/ REFERENCE BOOKS:

1. Fellows, P. and Ellis H. 1990"Food processing technology: principles and practice", Wood Head Publishing Ltd.
2. Jelen, P. 1985. Introduction to Food Processing. Prentice Hall, Reston Virginia, USA.
3. Heldman, D.R. and Singh R. P.. Ed.IV 2009. Introduction to Food Engineering. Elsevier Pub.

FOOD CHEMISTRY (FT 212)

Teaching Scheme: L: 4 hrs/week **Credits: 4**

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

UNIT I Introduction to Food Chemistry (3 Hrs)

Importance, Scope and Recent Development

UNIT II Water (5 Hrs)

Role and types of water in foods, functional properties of water activity and sorption isotherm.

UNIT III Carbohydrate (8 Hrs)

Chemistry of carbohydrates (Classification, Structure and Sources and properties), Functional characteristics of carbohydrates and chemical changes, modification of carbohydrate.

UNIT IV Protein (8 Hrs)

Chemistry of proteins (Classification, Structure and Sources and properties) Functional characteristics of protein and chemical changes in protein, modification of protein, enzymatic and non-enzymatic browning

UNIT V Lipids (8 Hrs)

Chemistry of lipids (Classification, Structure and Sources and properties) Functional characteristics of lipids and chemical changes in lipids, hydrogenation of fat.

UNIT VI Vitamins & Minerals (16 Hrs)

Vitamins: Classification of Vitamins, Structure of Vitamins, Sources of Vitamins, properties, effect of processing on Vitamins and deficiency problems of Vitamins.

Minerals : Classification, Structure, Sources and properties of minerals, effect of processing on of minerals and deficiency problems of minerals.

TEXT BOOKS/ REFERENCE BOOKS:

1. Belitz, H.D.. Grosch “Food Chemistry” 3rd revised ed. Springer Berlin, Heidelberg, New York.
2. O.R.Fennema “Food Chemistry” Marcel Dekker, Inc., New York
3. Mayer Liiiian H. “Food Chemistry” AVI Publishing Co., Westport, CT, 1978, 3rd ed
4. Introductory foods, Bennion M. and Hughes, D. (1975), Macmillan publishing Co., New York.
5. Food facts and principles, Sakuntala Manay and shadaksaraswamy, M (1987) Allied Publishers, New Delhi.

FOOD MICROBIOLOGY (FT 213)

Teaching Scheme: L: 4 hrs **Credits: 4**

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

UNIT I Introduction to microbiology (10 Hrs)

Evaluation & Scope of microbiology. General Microbiology, Cultural characteristics and reproduction of bacteria, yeasts, fungi, actinomycetes, algae, protozoa and rickettsia. Genetic recombination, transduction, transformation and bacterial conjugation, mutation & mutagenesis.

UNIT II Growth curve (6 Hrs)

Physical & Chemical factors affecting growth and destruction of micro-organisms, growth curve.

UNIT III Viruses (6 Hrs)

Structure & reproduction with particular reference to food born viruses.

UNIT IV Food Preservation (12 Hrs)

Principles of Food Preservation, Methods of preservations, Drying, Dehydration, Freezing, Chemical Preservation, Mechanical destruction & Maintenance of anaerobic condition.

UNIT V Spoilage of Food (10 Hrs)

Microbial Spoilage & cereals & cereal products, milk & milk products, fruit & Vegetable products, meat, poultry egg & fish products, sugar & Sugar Products.

UNIT VI Food poisoning (4 Hrs)

Intoxication, Food born illness.

TEXT BOOKS/ REFERENCE BOOKS:

1. Prescott Dunn, " Industrial Microbiology" CBS Publisher
2. Purohit S. S. "Microbiology fundamentals and applications" Edition, 6. Publisher, Agrobios, 2003.
3. Doyle, Beuchat and Montville "Food Microbiology", ASM press Washington.
4. Frazier, W.C., and Westhoff, D.C. 1988. Food Microbiology, 4th ed. McGraw-Hill, New York.
5. Jay, J. M. 2000. Modern Food Microbiology. 6th ed. Chapman & Hall. New York, N.Y.
6. Mossel, D.A.A., Corry, J. E. L., Struijk, C. B., and Baird, R. M. 1995. Essentials of the Microbiology of Foods. John Wiley & Sons. New York, NY.

PROCESS FLUID MECHANICS (CH214)

Teaching Scheme: L: 4 hrs **Credits: 4**

Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

Unit I Unit systems and Introduction to Fluid statics 08Hrs

Physical quantities, S.I., CGS, FPS engineering units, Conversion of Units, Units and Equations, dimensional analysis, Application of dimensional analysis, Problems. Nature of fluids, Hydrostatic equilibrium, Barometric equation, Hydrostatic equilibrium in centrifugal field, Manometers, Example, U tube, inclined tube manometers.

Unit II Fluid flow phenomena and Basic equations of fluids flow 12Hrs

Behaviour of flowing fluid, Types of flow, Newtonian and non-Newtonian Fluids, viscosity and momentum flux, viscosities of gases and liquids, Turbulence, Reynolds experiment, Eddy viscosity, Flow in boundary layers, Laminar and Turbulent flow in Boundary layers, Boundary layer formation in straight tubes, Boundary layer separation and wake formation.

Mass balance, mass velocity, momentum balance, and Bernoulli's equation without and with friction, kinetic energy correction factor, correction for fluid friction, Pump Bernoulli's equation, Euler's equation, Problems.

Unit III Flow of incompressible fluids in conduits and thin layers 08Hrs

Shear stress distribution in a cylindrical tube, relation between skin friction and wall shear, the friction factor. Relations between skin friction parameters .Laminar flow in pipes, Laminar flow of Newtonian fluids. Average velocity, kinetic energy correction factor (Derivation), Momentum correction factor (Derivation), Hagen-poiseuille equation. Turbulent flow in pipes and closed channels. Velocity distribution for turbulent flow, universal velocity distribution equations for laminar sub layer and buffer layer, Relations between maximum and average velocities, Effect of roughness, the friction factor chart
(Moody's diagram), friction factor in flow through channels of non-circular section, friction from changes in velocity or direction, Effect of fittings and valves, couette flow, Layer flow with free surfaces , Flow through annulus, Problems.

Unit IV Transportation and metering of fluids 07Hrs

Pipe and tubing, joints and fittings. Prevention of leakage around moving parts. Valves like Gate valve, globe valve, checks valve butterfly valve, needle valve, ball valve etc. Measurement of flowing fluids. Venturimeter, orifice meter, pitot tube, Rota meters, target meters, vortex- shedding meters, turbine meters, positive displacement meters, magnetic meters: ultrasonic meters.

Unit V Flow past immersed bodies 05Hrs

Drag coefficients of typical shapes, form drag and stream lining, Friction in flow through beds of solids, Erguns equation, Kozeny- Carman equation, Burke Plummer equation, Fluidization,

Mechanism of fluidization, particulate and aggregative fluidization, minimum fluidization velocity, expansion of -fluidized beds, application of fluidization.

Unit VI Flow of compressible fluids and Agitation of fluids 08Hrs

Mach number, continuity equation, Total energy Balance, velocity of sound, ideal gas equations, the asterisk condition, stagnation temperature.

Agitation of liquids, Agitation equipment, flow patterns in agitated vessels, circulation rates, Flow numbers, power consumption, power correlations, power correlations for specific impellers, effect of system geometry and calculations for power consumption.

TEXT BOOK:

Mc Cabe W.L. and Smith J.C,'Unit operations of Chemical Engineering.' VII edition, Mcgraw Hill Book Co., International ed. 1993

REFERENCES:

1. Steeter U.L, 'Fluid Mechanics' V ed. Mc graw Hill Book Co., International Edn.1971.
2. Richardson J.E. and Coulson J.M. Chemical Engineering. 3rd ed. Vol. 1 Pergamon Press 1985.
3. Miohell B.I. Fluid and Particle Mechanics Pergamon Press 1970.
4. Gupta S.K., Momemtum Transfer Operations, Tata McGraw Hill, 1979.

Laboratory-I
PRINCIPLES OF FOOD PRESERVATION (FT 211) L

Teaching Scheme: P: 2 hrs/week **Credits: 1**

Evaluation Scheme: EPE : 50 **Minimum Passing Marks : 20**

PRACTICALS :

1. Demonstration of various machineries used in processing.
2. Demonstration of blanching on quality of food.
3. Preservation by using sugar (Jam /Jellies/Marmalade).
4. Preservation by using salt (Pickle).
5. Food preservation by drying /dehydration (drying of veg/ Potatoes).
6. Food preservation by using (Refrigeration/ cold storage).
7. Food preservation by maintaing anaerobic condition.
8. Osmotic dehydration of fruit, canning of fruits and vegetables.
9. Visit to canning or food processing Industry.

Laboratory-II
FOOD CHEMISTRY (FT 212) L

Teaching Scheme: P: 2 hrs/week **Credits: 1**

Evaluation Scheme: EPE : 50 **Minimum Passing Marks : 20**

PRACTICALS :

1. Determination of moisture content,
2. Qualitative test for carbohydrates, Qualitative tests for amino acid, Qualitative tests for lipid.
3. Estimation of crude fat
4. Estimation of crude protein by microkjldhal method.
5. Determination of reducing sugar by filling method ,
6. Determination of total sugar by filling method ,
7. Determination of acid value, saponification volume and iodine number of fats ,
8. Determination of Ca , Iron , phosphorus and Ash content of food .

Laboratory-III

FOOD MICROBIOLOGY (FT 213) L

Teaching Scheme: P: 2 hrs/week **Credits: 1**

Evaluation Scheme: EPE : 50 **Minimum Passing Marks : 20**

PRACTICALS :

1. Study of instruments used for microbiology, cleaning and sterilization of glassware.
2. Preparation of media, techniques of incubation,
3. Staining methods (monochrome staining, gram staining, flagella staining, capsule staining and endo spore staining),
4. Pure culture techniques (streak plate/pour plate), growth curve.
5. Isolation of molds from foods, microbial examination of cereal and cereal products.
6. Microbial examination of fruits and vegetables.
7. Microbial examination of milk and milk products, microbial examination of sugar, salt and spices.
8. Microbial examination of meat and meat products.

Laboratory-IV

PROCESS FLUID MECHANICS (CH214) L

Teaching Scheme: P: 2 hrs/week **Credits: 1**

Evaluation Scheme: IPE : 50 **Minimum Passing Marks : 20**

PRACTICALS:

(Any 10 experiments should be performed)
1. Venturimeter
2. Orifice meter
3. Reynolds's experiment
4. Bernoulli's experiment
5. Flow through helical coils
6. Flow through annular pipe
7. Flow through pipe & pipe fittings.
8. Flow through spiral coils.
9. Flow through packed bed
10. Flow through fluidized bed.
11. To study the properties of Newtonian and Non- Newtonian fluids.
12. Demonstration of –
a) Rotameter b) Pitot tube
13. Two phase flow system

PROGRAMMING PRACTICES (FT 214) L

Teaching Scheme: L: 1 hrs/week **Credits: 2**
P: 2hrs week

Evaluation Scheme: IPE : 50 **Minimum Passing Marks : 20**

Unit I Revision of C and C++ **03Hrs**

Unit II Beginning Visual Basic **03Hrs**

What is Visual Basic, Features of Visual Basic, The Visual Basic Philosophy , The integrated development environment, the anatomy of Form, Project Types

Unit III Dealing With Data **05Hrs**

Operators, Variables, Declaring Variables, Types Of Variables, Data types, Constants, Arrays: - Declaring Arrays, Specifying Arrays, Multidimensional Arrays, Dynamic Arrays, Arrays of Arrays,

Unit IV Writing Code **08Hrs**

Collections, Procedures, Subroutines, Functions, Calling Procedures, Object Browser, Creating Classes & Object, I/O Statements, Control Flow Statements, If—Then, If-then-else, Nested Control Statements, Select-Case, Loop Statements, Do—Loop, For—Next, While-Wend, Exit Statement

Unit V Creating an Application Using Controls **08Hrs**

What is on the toolbar, Textbox Control, Picture Box, Image Box, Label Box, Frame, List Box, Option Button, Combo Box, Command Button, Check Box, The Drive, Directory, File List Controls, the Line & Shape Control, Scroll Box, Data, Timer

Practicals/Laboratory:

1. To study VB environment
2. To design and develop form to perform mathematical operations.
3. To study date, string and math functions.
4. To design the form using image control and scroll bars.
5. To design menu editor as text editor.
6. To design stop watch.
7. To design form using file controls, OLE control.

TEXT BOOKS:

1. Leon Lapids, Digital Computation for Chemical Engineering McGraw Hill, 1962.
2. Gary J Bronson , C++ for Engineers & Scientists PWS
3.Wait Groups OOP in Turbo C++ Robert Lafore Galgotia
4.Schaums outline Programming with C++ MGH

REFERENCE BOOKS:

1. Byron S. Gottfried,Programming with C (Shaum Series) Tata McGraw Hill.
2. Kanetkar.Understanding Pointers in C
3. B. Ram, Computer Fundamentals Architecture and Organization, New Age Publication.
4. S. S. Khandare,Computer Science and Information Technology, S. Chand Publication.
5. Henry and Korth and Sudarshan, Database System Concepts.
6. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI.
7. Programming with VB 6.0 –Mohammed Azam
8. Mastering VB 6.0
9. Beginning VB 6.0 –Peter Wrights

AUDIT COURSE-I

INTRODUCTION TO FOREIGN LANGUAGES (HS 211)

Teaching Scheme **No Credits, University grade**
Lectures : 2 Hrs/week

General Information:

This is a special introductory course of Foreign Language meant for the regular Engineering students of **S.Y.B. Tech** of Department Of Technology, Shivaji University, Kolhapur .

This course builds the skill sets needed to understand the basics of both language and communication. It is also interested in exploring the relationship between the two categories (language and communication) in order to work out how they relate to each other, it will include introductory concepts in semantics, semiotics, syntax, lexicography, and discourse analysis. It will also include an analysis of philosophical problems of reference, representation, rhetoric, sense, speech acts, and taxtuality. Students will have to submit a term paper and make an oral presentation on any aspect of language and/or communication that they wish to explore at length. Workshops are also included to help students internalize the concepts of communication to which they have been introduced.

AIMS & OBJECTIVES:

1. Introduction of Foreign alphabet, basic Foreign Grammar & Phonetic rules.
2. The Course is aimed at developing the listening, reading and writing skills in the learners.
3. The learner must be able to translate simple texts from and into foreign language.
4. Exposing the learners to simple aspects of life and culture of the foreign people.

SYLLABUS :
Translation:
A passage (approx. 100 words) from Foreign into English/Marathi.
Separate sentences from English into Foreign Language

COMPOSITION:

Simple Grammatical Exercises:
Topics: Recognising ***gender*** of noun, Formation of ***Plural*** noun, Inserting ***pronouns*** in correct forms, ***Conjugation*** of Verbs, Correct use of foreign ***adjectives***, Use of correct **C*ase forms.***

Second Year UG Programme
(Branch : Food Technology)
SEMESTER- IV

FOOD PROCESS ENGINEERING-I (FT 221)

Teaching Scheme: L: 3 hrs **Credits: 4**
:T: 1hrs

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

UNIT I Introduction & Size Reduction (6 Hrs)

Introduction: Unit operations in food engineering, Mass and energy balance

Size Reduction : Particle size analysis, equipments, application to food industries.

UNIT II Mixing (6 Hrs)

Basic theory of Solid – solid mixing, liquid- liquid mixing, equipments, applications to food industries

UNIT III Filtration & Centrifugation (12 Hrs)

Filtration :Theory of filtration, industrial filters, equipments, applications to food industries

Centrifugation: Theory of centrifugation, equipments, applications to food industries

UNIT IV Distillation (10 Hrs)

Vapour liquid equilibria, batch & continuous distillation, azeotropes, steam distillation, equipments and applications to food industries

UNIT V Absorption (6 Hrs)

Diffusivity, Henry's law, equipments, scrubbers, applications to food industries

UNIT VI Extraction (8 Hrs)

Solvent extraction, leaching, equipments. applications to food industries

TEXT BOOKS/ REFERENCE BOOKS:

1. McCabe and Smith "Unit Operations" McGraw-Hill, New York
2. Transport Process and Unit Operations: Geankoplis, 3rd Edn. PHI
3. Singh and Heldman "Introduction to food engineering" Academic Press publications

FOOD ADDTIVES AND CONTAMINANTS (FT222)

Teaching Scheme: L: 4 hrs **Credits: 4**

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

UNIT-I Food Additives (12 Hrs)

General attributes, buffer system/salt/, acids, antimicrobial agents, chelating agent and sequestrants,

UNIT- II Bakery and Confectionery Additives (6Hrs)

Antioxidants, emulsifiers, non nutritive and low calories sweeteners, stabilizer and thickeners and dough improvers.

UNIT-III Flavour (8 Hrs)

Philosophy and defination of flavour, chemistry of flavouring compounds.

UNIT-IV Pigments (8Hrs)

Chlorophyll, carotenoid, phenolic & flavonoids, Betalins effect of processing on pigments, Retention of natural food colours, Food colourants ,Regulatory aspects.

UNIT-V Sensory Assessment (6Hrs)

Sensory assessment of flavours ,technology for flavour retention.

UNIT-VI Food Toxicology (8 Hrs)

Inherent toxicants terms in toxicology, safety evaluation using traditional & modern approach contaminants, pesticide residues, toxicology & public health.

REFERENCE BOOKS:

1. Furia,T. E., Handbook of Food Additives, CRC Press, Boca Raton, Flor., 1980
2. Branen, A. F. et al (2001). Food Additive s, 2nd Edition, Marcel. Dekker
3. Fennema O.R. “Food Chemistry” Francois Castaigne, Rohanie Maharaj - 1996
4. DeMan “Food chemistry” Hardcover, A V I Publishing Company, 1982

FOOD BIOCHEMISTRY (FT223)

Teaching Scheme: L: 4 hrs **Credits: 4**

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

UNIT-I Digestion, absorption and metabolism **(12 Hrs)**

Digestion, absorption and metabolism of carbohydrate, fat and protein.

UNIT-II Enzymes **(8 Hrs)**

Chemical nature and nomenclature, classification, sources and properties, mechanism of action, Coenzyme and prosthetic groups application.

UNIT-III Biochemical changes in meat **(8 Hrs)**

Biochemical changes in meat and meat products during processing.

UNIT-IV Biochemical changes in fruits and vegetables **(8 Hrs)**

Biochemical changes in fruits and vegetables during post harvest handling, processing and storage.

UNIT-V Biochemical changes in milk **(8 Hrs)**

Biochemical changes in milk and milk products during handling, processing and storage.

UNIT-VI Hormones **(4 Hrs)**

Hormones – related to metabolic process.

REFERENCE BOOKS:

1 Lehninger, “Biochemistry”, CBS. *Publications*, 1993.

2. Stryer, “Biochemistry” W H Freeman, New York. 1988

3. Voet and Voet, “ Principles of Biochemistry” John Wiley & Sons, Inc.. Edition

HUMAN NUTRITION (FT224)

Teaching Scheme: L: 4 hrs **Credits: 4**

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

UNIT-I Introduction (8 Hrs)

Scope, concepts and importance of nutrition, human digestive system

UNIT- II Nutritional aspects (8 Hrs)

Nutritional aspects of carbohydrate, protein, lipids, water, vitamin and minerals, food, fad and faddism.

UNIT- III Energy and water balance (8 Hrs)

Energy and water balance, Water intake and losses, energy requirement, and physiological energy value, bomb colorimeter.

UNIT- IV Malnutrition (8 Hrs)

Types of malnutrition, multi-factorial causes, epidemiology of under nutrition and over nutrition, nutrition infection and immunity, nutrition education.

UNIT- V Balance diet (8 Hrs)

Balance diet, types of balance diet, diets for specific purposes.

UNIT- VI Undesirable Constituents & toxic substances (8 Hrs)

Undesirable Constituents & toxic substances and their disorders, hormones.

REFERENCE BOOKS:

1. Shubhangini A. Joshi, "Nutrition and Dietetics" "Tata Mc Grow- Hill *publishing* Company Ltd,. New Delhi (1992)
2. Dr. M. Swaminathan, Vol I & II "Foods and Nutrition" NIN Publications
3. Swaminathan, N.Food Science and experimental foods, (1987) Ganesh Publications, Madras.

FUNDAMENTALS AND APPLICATIONS OF HEAT TRANSFER (CH224)

Teaching Scheme: L: 4 hrs **Credits: 4**

Evaluation Scheme:	CIE	SEE	Minimum Passing Marks
	(25 + 25)	50	40

Unit I Mechanism of heat flow **04Hrs**

Introduction to basic modes of heat transfer namely conduction, convection, radiation.

Unit II Heat transfer by conduction in solids **08Hrs**

Fourier's law, steady state heat conduction through walls, single and multilayer. Heat flow through a cylinder, Sphere, unsteady state heat conduction, equation for one and three dimensional conduction, and introduction to semi-infinite solid and critical radius of lagging, numerical problems.

Unit III Principles of heat flow in fluids **08Hrs**

Typical heat exchange equipment, co-current and counter current flow. Energy balances, rate of heat transfer, overall and individual heat transfer coefficient. Calculation of overall heat transfer coefficients from individual heat transfer coefficients, fouling factors. Transfer units in heat exchangers, numerical problems.

Unit IV Heat transfer to fluids with and without phase change **10Hrs**

Regimes of heat transfer in fluids, thermal boundary layer, heat transfer by forced convection in laminar flow. Laminar flow heat transfer to flat plate, the Graetz and Peclet number. Average heat transfer coefficient in Laminar flow. Heat transfer by forced convection in turbulent flow, dimensional analysis method, Effect of tube length, empirical equations, estimation of wall temperature, analogy equations. Heat transfer in transition region, heat transfer to liquid metals, heat transfer by forced convection outside tubes, natural convection, numerical problems. Heat transfer from condensing Vapors, drop wise and film wise condensation, coefficients for film type condensation, derivation and practical use of Nusselt equation, condensation of superheated vapors, effect of Non-condensable gases, numerical problems.

Unit V Heat transfer to boiling liquids, Heat exchange equipment **10Hrs**

Types of boiling, boiling of saturated liquid maximum flux and critical temperature drop, minimum heat flux film boiling and sub cooled boiling, Problems. Types of heat exchangers, single and multipass exchangers, correction of LMTD for cross flow. Simple design calculations of heat exchangers, introduction to compact heat exchanger i.e. plate type heat exchanger, different types of condensers and boilers, air cooled heat exchangers, introduction to heat transfer in agitated vessel, types, construction, definition of fin efficiency, problems.

Unit VI Radiation heat transfer 10Hrs

Fundamentals of radiation, wavelength of radiation.emisivity.Laws of black body radiation, reflectivity, absorptivity of an opaque solid. Kirchhoff's law, radiation between two surfaces. Calculation of radiation between black surfaces, combined heat transfer by conduction - convection and radiation, problems. General heat transfer Characteristics, Calculation for Heat transfer co-efficient.

TEXT BOOKS:

1. McCabe W.L., Smith J.C. and Harriott P., "Unit Operations in Chemical Engineering" , 7th edition McGraw Hill,2005.
2. Sukhatme S.P., "Heat Transfer", 5th edition ,University Press India Ltd.,1996.

REFERENCES:

1. William H. Mcadams, "Heat transmission", 3rd ed. McGraw Hill Series
2. Alan J. Chapman. "Heat Transfer", 4th ed. Macmilan Publishing Company, New York
3. Frank Kreith & Mark S. Bohn. , "Principles of Heat Transfer", 4th ed. Harper and Row Publishers, New York,
4. Coulson J.M. & Richardson J.F.,"Chemical Engineering" , 3rd ed. Vol.1
5. J.P. Holman. , "Heat Transfer" , 8th ed. Mc-Graw Hill Inc.1997.

Laboratory-I
FOOD PROCESS ENGINEERING-I (FT 221) L

Teaching Scheme: P: 2 hrs/week **Credits: 1**

Evaluation Scheme: EPE : 50 **Minimum Passing Marks : 20**
IPE : 50 **Minimum Passing Marks : 20**

Practicals :

1. Particle size analysis ,
2. Size reduction- Grains / milling,
3. Filtration- Fibers extraction,
4. Centrifugation- Starch, protein, cream,
5. Mixing- Dry solids ,
6. Distillation- Spices, volatile oil,
7. Solvent extraction ,
8. Leaching.

Laboratory-II
FOOD ADDTIVES AND CONTAMINANTS (FT222) L

Teaching Scheme: P: 2 hrs/week **Credits: 1**

Evaluation Scheme: EPE : 50 **Minimum Passing Marks : 20**

Practicals:

1. Determination of Food adulterants
2. Determination of carotenoids
3. Assessments of hydrocolloids as food additives
4. Estimation of tannins
5. Estimation of phytic acids
6. Solubility characteristics of starches.
7. Determination of Vitamin E
8. Effect of emulsifier in food products

Laboratory-III
FOOD BIOCHEMISTRY (FT223) L

Teaching Scheme: P: 2 hrs/week **Credits: 1**

Evaluation Scheme: EPE : 50 **Minimum Passing Marks : 20**

Practical :

1. Preparation of standard solutions and buffers
2. Quantitative determination of carbohydrate (DNSA &)
3. Isolation and characterization of starch
4. Quantitative determination of protein
5. Determination of vitamins (Vit C, Vit A)
6. Isolation of enzymes from various sources
7. Enzyme assay methods
8. Immobilization of enzymes.

Laboratory-IV
HUMAN NUTRITION (FT224) L

Teaching Scheme: P: 2 hrs/week **Credits: 1**

Evaluation Scheme: EPE : 50 **Minimum Passing Marks : 20**

Practical:

1. Calculation of BMR and body surface area,
2. calculation of energy value of food.
3. Preparation of balance diet,
4. anthropometric measurements,
5. Biochemical analysis of blood
6. Biochemical analysis of urine.
7. Computation of energy requirement on the basis of physical activity
8. ACU units.

Laboratory-V

FUNDAMENTALS AND APPLICATIONS OF HEAT TRANSFER (CH224) L

Teaching Scheme: P: 2 hrs/week **Credits: 1**

Evaluation Scheme: IPE : 50 **Minimum Passing Marks : 20**

Practicals:

(Minimum 10 experiments should be performed)
1. Emissivity measurement apparatus.
2. Natural convection.
3. Forced convection.
4. Heat transfer through lagged pipe.
5. Thermal conductivity of metal rod.
6. Double pipe heat exchanger.
7. Packed bed heat exchanger.
8. Climbing film evaporator.
9. Heat transfer through agitated vessel.
10. Shell and tube heat exchanger.
11. Fin tube heat exchanger.
12. Compact heat exchanger.

AUDIT COURSE- II
Introduction to Performing Arts

Teaching Scheme: L: 2 hr/week **No Credits, University grade**

This course will introduce students to problems of performing arts & theatrical representation. It will include readings from ancient & modern performing arts & engage with some of leading theorists. Students will be exposed to the generic difference between different forms of drama / music / dance.

Students will be encouraged to stage scenes from well-known plays / music's / dances as a part of assessments.

Environmental Studies (HS 222)

Teaching Scheme: L: 2 hrs/week **No Credits, University grade**

Evaluation Scheme:	SEE	Minimum Passing Marks
	(70+30)	40

Unit I Nature of Environmental Studies (2Hrs)

Definition, scope and importance. Multidisciplinary nature of environmental studies Need for public awareness.

Unit II Natural Resources and Associated Problems (8 Hrs)

a) Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: Usage and exploitation, environmental effects of extracting and using mineral resources.
d) Food resources: World food problem, changes caused by agriculture effects of modern agriculture, fertilizer-pesticide problems.
e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
g) Role of an individual in conservation of natural resources.
h) Equitable use of resources for sustainable lifestyle.

Unit III Ecosystems (8 Hrs)

Concept of an ecosystem
Structure and function of an ecosystem
Producers, consumers and decomposers
Energy flow in the ecosystem
Ecological succession.
Food chains, food webs and ecological pyramids.
Introduction, types, characteristics features, structure and function of the following
Ecosystem
a) Forest ecosystem,
b) Grassland ecosystem,
c) Desert ecosystem,
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit IV Biodiversity and its Conservation (8 Hrs)

1.Introduction – Definition: genetic, species and ecosystem diversity.
2.Biogeographical classification of India.
Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
3.Biodiversity at global, National and local levels.
4.India as a mega-diversity nation.
5.Western Ghat as a bio-diversity region.
6.Hot-spots of biodiversity.
7.Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
8.Endangered and endemic species of India.

9.Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit V Environmental Pollution, Environmental Protection (16 Hrs)

Definition: Causes, effects and control measures of:
a) Air pollution,
b) Water pollution,
c) Soil pollution,
d) Marine pollution,
e) Noise pollution,
f) Thermal pollution,
g) Nuclear hazards
• Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
• Role of an individual in prevention of pollution.
• Pollution case studies
• Disaster management: Floods, earthquake, cyclone and landslides. Tsunami
• Environment Protection Act.
• Air (Prevention and Control of Pollution) Act.
• Water (Prevention and control of Pollution) Act
• Wildlife Protection Act
• Forest Conservation Act
• Population Growth and Human Health, Human Rights.

Unit VI Social Issues and the Environment (16 Hrs)

• From Unsustainable to Sustainable development
• Urban problems related to energy
• Water conservation, rain water harvesting, watershed management
• Resettlement and rehabilitation of people; its problems and concerns.
• Environmental ethics: Issue and possible solutions.
• Climate change, Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
• Wasteland reclamation.
• Consumerism and waste products.

Field Work

• Visit to a local area to document environmental as set river/ forest/grassland/hill/mountain
• Visit to a local polluted site – Urban/rural/Industrial/Agricultural or
• Study of common plants, insects, birds. or
• Study of simple ecosystems-ponds, river, hill slopes, etc.

REFERENCES:

1. Agarwal, K. C. 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India, Email:mapin@icenet.net (R)
3. Brunner R. C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R. S., Marine Pollution, Clanderson Press Oxford (TB)
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5. Cunningham, W. P. Cooper, T. H. Gorhani, E. & Hepworth, M. T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
6. De A. K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H., 1993, Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 473p

9. Hawkins R. e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V. H. & Watson, R. T. 1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140p.
11. Jadhav, H. & Bhosale, V. M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
12. Mckinney, M. L. & Schocl. R. M. 1996, Environmental Science Systems & Solutions, Web enhanced edition, 639p.
13. Mhskar A. K., Matter Hazardous, Techno-Science Publications (TB)
14. Miller T. G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E. P. 1971, Fundamentals of Ecology, W. B. Saunders Co. USA, 574p.
16. Rao M. N. & Datta, A. K. 1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd., 345p.
17. Sharma B. K., 2001, Environmental Chemistry, Goel Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend C., Harper, J. and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
20. Trivedi R. K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media (R)
21. Trivedi R. K. and P. K. Goel, Introduction to air pollution, Techno-Science Publications (TB)
22. Wagner K. D., 1998, Environmental Management, W. B. Saunders Co. Philadelphia, USA 499p.
(M) Magazine
(R) Reference
(TB) Textbook
23. Gholap T. N.Paryavaram Swhastra
24. Gharapure , Paryavaram Shastra .
25. V. R. Ahirrao, Paryavaran Vighyan, Nirali Prakashan, Pune.
26. Jay Kumar Magar, Paryavaram Shastra Parichay ,Vidya Prakashan, Nagpur.
27. Anupam Misra, Desh Ka Paryavaran , Ganolai santi Pratisthan. New Delhi.

Equivalence of S.Y B.Tech(Food Tech.) Semester III & IV

The above detailed syllabus is a revised version of the S.Y. B. Tech (Food Technology) course being conducted by the Shivaji University at the Technology Department of the University. This syllabus is to be implemented from June 2012(academic year2011-12)

The Equivalence for the subjects of Food Technology at S.Y. B. Tech Semester III and IV pre-revised course under the faculty of Engineering and Technology is as follows.

S.Y.B Tech Semester III (Food Technology)

Sr. No.	S. Y. B. Tech(Food Tech.) Pre-revised syllabus	S. Y. B. Tech (Food Tech.) Revised syllabus	Remark
1.	Applied Mathematics III	Engineering Mathematics III	In revised syllabus it is only renamed to make up with other divisions of the departments
2.	Food Microbiology	Food Microbiology	No change in syllabus content
3.	Principles of Food Preservation	Principles of Food Preservation	No change in syllabus content
4.	Food Chemistry- I	Food Chemistry	In revised syllabus, Food Chemistry-I will be only renamed as Food Chemistry since in semester IV Food Chemistry-II is merged in subject Food Additives and Contaminants.
5.	Heat Transfer & Fluid Flow	Process Fluid Mechanics	For better development of students in revised syllabus Heat Transfer is separated and introduced as Fundamentals and Applications of Heat Transfer in Semester- IV. Syllabus of S.Y. B. Tech (Chem. Tech.) will be followed for the subject Process Fluid Mechanics
6.	Introduction to Foreign Languages	Introduction to Foreign Languages	No change in syllabus content
7.	--	Programming Practices Lab	Addition of the subject to learn the students the some basic languages of computer

S.Y.B Tech Semester IV (Food Technology)

Sr. No.	S. Y. B. Tech(Food Tech.) Pre-revised syllabus	S. Y. B. Tech(Food Tech.) Revised syllabus	Remark
1.	Food Process Engineering-I	Food Process Engineering-I	No change in syllabus content
2.	Food Chemistry-II	Food Additives and Contaminants	As per the suggestion of sub- committee in revised syllabus Food Chemistry-II will be renamed and will be introduced as Food Additives and Contaminants with appropriate syllabus.
3.	Human Nutrition	Human Nutrition	No change in syllabus content
4.	Food Biochemistry	Food Biochemistry	No change in syllabus content
5.	Fluid Mechanics	Fundamentals and Applications of Heat Transfer	For better development of students and to make up with B. Tech (Chem. Tech.) in revised syllabus Fluid mechanics is shifted to Semester III which is renamed as Process fluid mechanics. Heat Transfer is shifted from semester III to this semester as Fundamentals and Applications of Heat Transfer. Syllabus of S.Y. B. Tech (Chem. Tech.) will be followed for this subject.
6.	Introduction to Performing Arts	Introduction to Performing Arts	No change in syllabus content