JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For UG – R20

B. TECH - FOOD ENGINEERING

(Applicable for batches admitted from 2020-2021)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

I YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Mathematics-M1	3	0	0	3
2		Fundamental Chemistry	3	0	0	3
3		Programming for Problem Solving using C	3	0	0	3
4		Communicative English	3	0	0	3
5		Engineering Drawing	1	0	4	3
6		Fundamental Chemistry Lab	0	0	3	1.5
7		Programming for Problem Solving using C Lab	0	0	3	1.5
8		English Communication Skills Laboratory	0	0	3	1.5
9		Environmental Science	3	0	0	0
Total Credits						**19.5**

I YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Mathematics-M2	3	0	0	3
2		Engineering Physics	3	0	0	3
3		Engineering Mechanics	3	0	0	3
4		Basic Electrical & Electronics Engineering	3	0	0	3
5		Computer Aided Engineering Drawing	2	0	2	3
6		Workshop Practice Laboratory	0	0	3	1.5
7		Engineering Physics Laboratory	0	0	3	1.5
8		Basic Electrical& Electronics Engineering Laboratory	0	0	3	1.5
9		Constitution of India	2	0	0	0
Total Credits						**19.5**

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II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Probability and Statistics	3	0	0	3
2		Principles of Food Engineering -I	3	0	0	3
3		Mechanical Operations in Food Processing	3	0	0	3
4		Fluid Mechanics in Food Processing	3	0	0	3
5		Food Microbiology	3	0	0	3
6		Mechanical Operations in Food Processing Lab	0	0	3	1.5
7		Fluid Mechanics in Food Processing Lab	0	0	3	1.5
8		Food Microbiology Lab	0	0	3	1.5
9		Food Handling & Storage Engineering	2	0	0	2
10		Professional Ethics &Human Values	2	0	0	0
Total Credits						**21.5**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1		Python Programming	3	0	0	3
2		Principles of Food Engineering - II	3	0	0	3
3		Food Chemistry	3	0	0	3
4		Processing of Cereals, Pulses and Oilseeds	3	0	0	3
5		Managerial Economics & Financial Analysis	3	0	0	3
6		Python Programming Lab	0	0	3	1.5
7		Food Chemistry Lab	0	0	3	1.5
8		Processing of Cereals, Pulses and Oilseeds Lab	0	0	3	1.5
9		Instrumentation & Process Control	1	0	2	2
Total Credits						**21.5**

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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-M1 (Common to all Branch's for I Year B. Tech)					

Course Objectives:

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behavior of newones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and theirapplications.

Course Outcomes: At the end of the course, the student will be ableto

- utilize mean value theorems to real life problems(L3)
- solve the differential equations related to various engineering fields(L3)
- familiarize with functions of several variables which is useful in optimization(L3)
- Apply double integration techniques in evaluating areas bounded by region(L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

UNIT I: Sequences, Series and Meanvaluetheorems: (10 hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz'srule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, problems and application on the above theorem.

UNIT II: Differential equations of first order andfirstdegree: (10 hrs)

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exactform.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

UNIT III: Linear differential equations ofhigherorder: (10 hrs)

Homogenous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

Applications: LCR circuit, Simple Harmonic motion.

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UNIT IV:Partialdifferentiation: (10 hrs)

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.

UNIT V:Multipleintegrals: (8 hrs)

Double and Triple integrals – Change of order of integration – Change of variablesto polar, cylindrical and spherical coordinates.

Applications: Finding Areas and Volumes.

Textbooks:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, KhannaPublishers.
2. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition,Wiley-India.
2. **Joel Hass, Christopher Heil and Maurice D. Weir,** Thomas calculus, 14th Edition,Pearson.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press,2013.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford UniversityPress.

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I Year - I Semester		L	T	P	C
		3	0	0	3
FUNDAMENTAL CHEMISTRY					

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objectives:

- To familiarize chemistry and itsapplications
- To train the students on the principles and applications of electrochemistry, polymers and surfacechemistry
- To impart the concept of soft and hard waters, softening methods of hardwater

UNIT I: STRUCTURE ANDBONDINGMODELS (10 hrs)

Planck's quantum theory, dual nature of matter, significance of Ψ and Ψ^2, Schrodinger wave equation, Atomic and molecular orbitals, Linear combination of atomic orbitals (LCAO), bonding in homo- and heteronuclear diatomic molecules (level diagrams of O_2 and CO molecules), Salient features of crystal field splitting (CFT) of transition metal ion d- orbitals in tetrahedral, octahedral, and square planar geometries. Band theory of solids – band diagrams for conductors, semiconductors and insulators, Effect of doping on bandstructures.

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Apply*** Schrodinger wave equation to hydrogen and particle in abox.
- ***Illustrate***the molecular orbital energy level diagram of different molecularspecies.
- ***Explain*** the band theory of solids for conductors, semiconductors, andinsulators.
- ***Discuss***the magnetic behavior and color ofcomplexes.

UNIT II:POLYMERTECHNOLOGY (8 hrs)

Polymerisation:-Introduction, methods of polymerization (emulsion and suspension), mechanicalproperties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties, and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers: **-** Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradablepolymers, biopolymers, biomedicalpolymers.

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Analyze*** the different types of composite plastic materials and ***interpret***the mechanism of conduction in conductingpolymers.

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UNIT III: ELECTROCHEMICAL CELLSANDCORROSION (10 hrs)

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Corrosion: -Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]).

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Utilize*** the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and c***ategorize*** the reasons for corrosion and study methods to controlcorrosion.

UNIT IV:SURFACECHEMISTRY (10 hrs)

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (any two methods with examples), preparation of nanometals (chemical reduction method) and metal oxides (sol-gel method), characterization of surface by physicochemical methods (SEM, TEM, X-ray diffraction), BET equation (no derivation), calculation of specific surface area of solids, applications of colloids and nanomaterials.

Thermal analysis techniques: Instrumentation and applications of thermogravimetric analysis (TGA), differential thermal analysis (DTA).

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Summarize*** the applications of SEM, TEM and X-ray diffraction in surfacecharacterization.
- ***Explain***the synthesis of colloids with examples.
- ***Outline***the preparation of nanomaterials and metal oxides.
- ***Identify*** the application of colloids and nanomaterials in medicine, sensors andcatalysis

UNIT V:WATERTECHNOLOGY (8 hrs)

Hardness of water, determination of hardness by complexometric method, boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement), internal treatments, softening of hard water (zeolite process and related sums, ion exchange process), treatment of industrial waste water, potable water and its specifications, steps involved in purification of water, chlorination, break point chlorination-desalination (reverse osmosis and electro dialysis).

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Analyze*** the suitable methods for purification and treatment of hard water andbrackish water.

Standard Books:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", 15/e, Dhanpat Rai & Sons, Delhi, (Latestedition).
2. Shikha Agarwal, "**Engineering Chemistry**", Cambridge University Press, NewDelhi, (2019).

3. S.S. Dara, "**A Textbook of Engineering Chemistry**", S.Chand& Co,(2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latestedition).

References:

1. K. SeshaMaheshwaramma and MridulaChugh, "**Engineering Chemistry**", Pearson India Edn.
2. O.G. Palana, "**Engineering Chemistry**", Tata McGraw Hill Education PrivateLimited, (2009).
3. CNR Rao and JM Honig (Eds) "**Preparation and characterization of materials**" Academic press, New York (latestedition)
4. B. S. Murthy, P. Shankar and others, "**Textbook of Nanoscience and Nanotechnology**", University press (latestedition)

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I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C					

COURSE OBJECTIVES:

The objectives of Programming for Problem Solving Using C are

1) To learn about the computer systems, computing environments, developing of a computer program and Structure of a CProgram
2) To gain knowledge of the operators, selection, control statements and repetition inC
3) To learn about the design concepts of arrays, strings, enumerated structure, and union types. To learn about theirusage.
4) To assimilate about pointers, dynamic memory allocation and know the significance of Pre-processor.
5) To assimilate about File, I/O and significance offunctions

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application

Processor Commands: Processor Commands

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UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXTBOOKS:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg,CENGAGE
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e,Pearson

REFERENCES:

1. Computer Fundamentals and Programming, Sumithabha Das, Mc GrawHill
2. Programming in C, Ashok N. Kamthane, Amit Kamthane,Pearson
3. Computer Fundamentals and Programming in C, PradipDey, ManasGhosh,OXFORD

COURSE OUTCOMES:

Upon the completion of the course the student will learn

1) To write algorithms and to draw flowcharts for solvingproblems
2) To convert flowcharts/algorithms to C Programs, compile and debugprograms
3) To use different operators, data types and write programs that use two-way/ multi-way selection
4) To select the best loop construct for a given problem
5) To design and implement programs to analyze the different pointerapplications
6) To decompose a problem into functions and to develop modular reusablecode
7) To apply File I/Ooperations

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I Year - I Semester		L	T	P	C
		3	0	0	3
COMMUNICATIVE ENGLISH					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

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Unit I

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchandfrom "**The Individual Society",**Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.
Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit II

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansodefrom "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

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Unit III

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications. (Non-detailed**)**

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.FunctionalEnglish:Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words.
Unit IV

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.
Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.Writing SOP, writing for media.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

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Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit V

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.Functional English: Suggesting/Opinion giving.
Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.
Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words
Prescribed text books for theory for Semester-I:

1. "**Infotech English**", Maruthi Publications. (Detailed)

2."**The Individual Society",** Pearson Publications.(Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. "**Infotech English**", Maruthi Publications. (with Compact Disc)

Reference Books:

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

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I Year - I Semester		L	T	P	C
		1	0	4	3

ENGINEERING DRAWING

Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons oncircles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents &normals for the curves.

Scales: Plain scales, diagonal scales and Vernier scales

Unit II

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to otherplane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

Unit III

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Unit IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

UnitV

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

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Note: In the End Examination there will be no question from CAD.

TEXTBOOKS:

1. Engineering Drawing by N.D. Butt, ChariotPublications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw HillPublishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, ScitechPublishers
2. Engineering Graphics for Degree by K.C. John, PHIPublishers
3. Engineering Graphics by PI Varghese, McGrawHillPublishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, NewAge

Course Outcome: The student will learn how to visualize 2D & 3D objects.

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I Year - I Semester		L	T	P	C
		0	0	3	1.5

FUNDAMENTAL CHEMISTRY LAB

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na2CO3solution.
2. Determination of alkalinity of a sample containing Na2CO3 andNaOH.
3. Determination of Mn (II) using standard oxalic acidsolution.
4. Determination of ferrous iron using standard K2Cr2O7solution.
5. Determination of copper (II) using standard hyposolution.
6. Determination of temporary and permanent hardness of water using standardEDTA solution.
7. Determination of iron (III) by a colorimetricmethod.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometricmethod.
10. Determination of the concentration of strong acid vs strong base (byconductometric method).
11. Determination of strong acid vs strong base (by potentiometricmethod).
12. Determination of Mg+2 present in an antacid.
13. Determination of CaCO3 present in an eggshell.
14. Estimation of VitaminC.
15. Determination of phosphoric content in softdrinks.
16. Adsorption of acetic acid bycharcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstrationonly).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LABORATORY					

Course Objectives:

1) Apply the principles of C language in problemsolving.
2) To design flowcharts, algorithms and knowing how to debugprograms.
3) To design & develop of C programs using arrays, strings pointers &functions.
4) To review the file operations, preprocessorcommands.

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of sixcharacters and width of five and fourcharacters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7inches and width of 5inches.
3. Write a C program to display multiplevariables.

Exercise 2:

1. Write a C program to calculate the distance between the twopoints.
2. Write a C program that accepts 4 integers' p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greaterthan the sum of p and q print "Correct values", otherwise print "Wrongvalues".

Exercise 3:

1. Write a C program to convert a string to a longinteger.
2. Write a program in C which is a Menu-Driven Program to compute the area of thevariousgeometricalshape.
3. Write a C program to calculate the factorial of a givennumber.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and theirsum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/nterms.
3. Write a C program to check whether a given number is an Armstrong number ornot.

Exercise 5:

1. Write a program in C to print all unique elements in anarray.
2. Write a program in C to separate odd and even integers in separatearrays.
3. Write a program in C to sort elements of array in ascendingorder.

Exercise 6:

1. Write a program in C for multiplication of two squareMatrices.
2. Write a program in C to find transpose of a givenmatrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sortedmatrix.
2. Write a program in C to print individual characters of string in reverseorder.

Exercise 8:

1. Write a program in C to compare two strings without using string libraryfunctions.

2. Write a program in C to copy one string to anotherstring.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in theprogram.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers usingpointers.

Exercise 11:

1. Write a program in C to add numbers using call byreference.
2. Write a program in C to find the largest element using Dynamic MemoryAllocation.

Exercise 12:

1. Write a program in C to swap elements using call byreference.
2. Write a program in C to count the number of vowels and consonants in a string usinga pointer.

Exercise 13:

1. Write a program in C to show how a function returningpointer.
2. Write a C program to find sum of n elements entered by user. To perform thisprogram, allocate memory dynamically using malloc( )function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference betweenthe above twoprograms
2. Write a program in C to convert decimal number to binary number using thefunction.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using thefunction.
2. Write a program in C to get the largest element of an array using thefunction.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a textfile.
2. Write a program in C to copy a file in anothername.
3. Write a program in C to remove a file from thedisk.

Course Outcomes:

By the end of the Lab, the student

1) Gains Knowledge on various concepts of a Clanguage.
2) Able to draw flowcharts and writealgorithms.
3) Able design and development of C problem solvingskills.
4) Able to design and develop modular programmingskills.
5) Able to trace and debug aprogram

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY					

TOPICS

UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:

Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III:

Stress in compound words, rhythm, intonation, accentneutralization.

UNIT IV:

Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions in speaking.

UNIT V:

Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

Prescribed textbook: "**Infotech English**", Maruthi Publications.

References:

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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I Year - I Semester		L	T	P	C
		3	0	0	0
ENVIRONMENTAL SCIENCE					

Learning Objectives:

The objectives of the course are to impart:

- Overall understanding of the naturalresources.
- Basic understanding of the ecosystem and itsdiversity.
- Acquaintance on various environmental challenges induced due tounplannedanthropogenicactivities.
- An understanding of the environmental impact of developmentalactivities.
- Awareness on the social issues, environmental legislation and globaltreaties.

UNIT-I:

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health.

Ecosystems: 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, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II:

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; equitable use of resources for sustainable lifestyles.

UNIT-III:

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation ofbiodiversity.

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UNIT – IV Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and hiswellbeing.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Textbooks:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers,Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford UniversityPress.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. ManjulaRani; Pearson Education,Chennai

Reference:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, CengageLearning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, NewDelhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, NewDelhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New AgeInternational Publishers, 2014

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I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-M2					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraicequations
- To elucidate the different numerical methods to solve nonlinear algebraicequations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and theirapplications.

Course Outcomes: At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications(L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel(L3)
- evaluate approximating the roots of polynomial and transcendental equations by different algorithms(L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals(L3)
- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations(L3)

Unit I: Solving systems of linear equations, Eigen values and Eigen vectors: (10 hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties (article-2.14 in text book-1).

Unit-II: Cayley-Hamilton theorem andQuadraticforms: (10 hrs)

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.

Singular values of a matrix, singular value decomposition (text book-3).

UNIT III:Iterative methods: (8 hrs)

Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNITIV:Interpolation: (10 hrs)

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

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UNIT V: Numerical differentiation and integration, Solution of ordinary differential equations withinitial conditions: (10 hrs)

Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's 1/3rd and 3/8th rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method – Runge-Kutta method (second and fourth order).

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, KhannaPublishers.

2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

3. David Poole, Linear Algebra- A modern introduction, 4th Edition,Cengage.

Reference Books:

1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. GrawHillEducation.

2. M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and EngineeringComputation, New Age InternationalPublications.

3. Lawrence Turyn, Advanced Engineering Mathematics, CRCPress.

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B. Tech-FOOD ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
ENGINEERING PHYSICS					

UNIT-IWAVEOPTICS (12hrs)

INTERFERENCE: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications -Colors in thin films- Newton's Rings-Determination of wavelength and refractiveindex.

DIFFRACTION: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Grating - Dispersive power and resolving power of Grating (Qualitative).

POLARIZATION: Introduction-Types of polarization - Polarization by reflection, refraction and double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Outcome:

The students will be able to

- Explain the need of coherent sources and the conditions for sustained interference(L2)
- Identify engineering applications of interference(L3)
- Analyse the differences between interference and diffraction with applications(L4)
- Illustrate the concept of polarization of light and its applications(L2)
- Classify ordinary polarized light and extraordinary polarized light(L2)

UNIT-II LASERS ANDFIBEROPTICS (10hrs)

LASERS: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion –Lasing action- Pumping mechanisms –Ruby laser – He-Ne laser - Applications oflasers

FIBER OPTICS: Introduction –Principle of optical fiber- Acceptance Angle-Numerical Aperture- Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Applications.

Outcome:

The students will be able to

- Understand the basic concepts of LASER light Sources (L2)
- Apply the concepts to learn the types of lasers(L3)
- Identifies the Engineering applications of lasers(L2)
- Explain the working principle of optical fibers(L2)
- Classify optical fibers based on refractive index profile and mode of propagation(L2)
- Identify the applications of optical fibers in various fields(L2)

UNIT-IIIENGINEERINGMATERIALS (8hrs)

DIELECTRIC MATERIALS: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation-Piezoelectricity.

MAGNETIC MATERIALS: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment -

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Classification of magnetic materials: Dia, para, Ferro, antiferro&Ferrimagnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

Outcome:

The students will be able to

- Explain the concept of dielectric constant and polarization in dielectric materials(L2)
- Summarize various types of polarization of dielectrics(L2)
- Interpret Lorentz field and Claussius- Mosotti relation indielectrics(L2)
- Classify the magnetic materials based on susceptibility and their temperature dependence(L2)
- Explain the applications of dielectric and magnetic materials(L2)
- Apply the concept of magnetism to magnetic devices(L3)

UNIT-IV ACOUSTICSANDULTRASONIC (10hrs)

ACOUSTICS: Introduction – requirements of acoustically good hall– Reverberation – Reverberation time– Sabine's formula (Derivation using growth and decay method) - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

ULTRASONICS: Introduction - Properties - Production by magnetostriction and piezoelectric methods– Detection - Acoustic grating - Non Destructive Testing – pulse echo system through transmission and reflection modes - Applications

Outcome:

The students will be able to

- Explain how sound is propagated in buildings(L2)
- Analyse acoustic properties of typically used materials in buildings(L4)
- Recognize sound level disruptors and their use in architectural acoustics(L2)
- Identify the use of ultrasonics in different fields(L3)

UNIT-V CRYSTALLOGRAPHY ANDX-RAY DIFFRACTION (10hrs)

CRYSTALLOGRAPHY: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattice – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl)planes.

X- RAY DIFFRACTION: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue'sandpowdermethods

Outcome:

The students will be able to

- Classify various crystal systems(L2)
- Identify different planes in the crystal structure(L3)
- Analyse the crystalline structure by Bragg's X-ray diffractometer(L4)
- Apply powder method to measure the crystallinity of a solid(L4)

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Textbooks:

1. Engineering Physics – Dr. M.N. Avadhanulu& Dr. P.G. Kshirsagar, S. Chand and Company.
2. Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford Universitypress.
3. Engineering Physics by P.K.PalanisamySciTechpublications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley&Sons
2. Engineering Physics – M.R.Srinivasan, New AgePublications
3. Engineering Physics – D K Pandey, S. Chaturvedi, CengageLearning
4. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, UniversityPress

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
ENGINEERING MECHANICS					

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT II

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle offorces.

Equilibrium of Systems of Forces: Free Body Diagrams, ,Lami'sTheorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.

UNIT – III

Objectives: The students are to be exposed to concepts of centre of gravity. The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of compositebodies.

UNIT – IV

Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics- Work Energy method and applications to particle motion- Impulse momentum method.

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UNIT – V

Objectives: The students are to be exposed to rigid motion kinematics and kinetics

Rigid body Motion: Kinematics and kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse momentum method.

TEXT BOOK:

1. Engg. Mechanics - S.Timoshenko&D.H.Young., 4th Edn- , Mc Graw Hill publications.

Course outcomes:

1. The student should be able to draw free body diagrams for FBDs for particles and rigidbodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters.
2. He should be able to determine centroid for lines, areas and center of gravity for volumesandtheircomposites.
3. He should be able to determine area and mass movement of inertia for compositesections
4. He should be able to analyze motion of particles and rigid bodies and apply the principlesof motion, work energy and impulse –momentum.

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B. Tech-FOOD ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
BASIC ELECTRICAL & ELECTRONICS ENGINEERING					

Preamble:

This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines and electronic components to perform well in their respective fields.

Learning Objectives:

- To learn the basic principles of electrical circuital law's and analysis ofnetworks.
- To understand principle of operation and construction details of DCmachines.
- To understand principle of operation and construction details of transformers,alternator and 3-Phase inductionmotor.
- To study operation of PN junction diode, half wave, full wave rectifiers andOP-AMPs.
- To learn operation of PNP and NPN transistors and variousamplifiers.

Unit - I

Electrical Circuits

Basic definitions – types of network elements – Ohm's Law – Kirchhoff's Laws – inductive networks – capacitive networks – series – parallel circuits – star-delta and delta-star transformations.-Numerical Problems.

Unit - II

DC Machines

Principle of operation of DC generator – EMF equation – types of DC machines – torque equation characteristics of DC motors – applications – three point starter – speed control methods of DC motor – Swinburne's Test-Brake test on DC shunt motor-Numericalproblems.

Unit - III

AC Machines:

Transformers

Principle of operation and construction of single phase transformers – EMF equation – Losses – OC & SC tests – efficiency and regulation-Numerical Problems.

AC Rotating Machines

Principle of operation and construction of alternators – types of alternators Regulation of alternator by synchronous impedance method – principle of operation of synchronous motor – principle of operation of 3-Phase induction motor – slip-torque characteristics – efficiency – applications- Numerical Problems.

Unit IV

Rectifiers & Linear ICs

PN junction diodes – diode applications (half wave and bridge rectifiers). Characteristics of operation amplifiers (OP-AMP) – application of OP-AMPs (inverting, non-inverting, integrator and differentiator)-Numerical Problems.

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Unit V

Transistors

PNP and NPN junction transistor, transistor as an amplifier– frequency response of CE amplifier – Basic concepts of feedback amplifier-Numericalproblems.

Learning Outcomes:

The student should be able to:

- Analyse various electrical networks.
- Understand operation of DC generators,3-point starter and DC machine testing by Swinburne's Test and Braketest.
- Analyse performance of single-phase transformer and acquire proper knowledge and working of 3-phase alternator and 3-phase inductionmotors.
- Analyse operation of half wave, full wave bridge rectifiersandOP-AMPs.
- Understanding operations of CE amplifier and basic concept of feedbackamplifier.

Text Books:

1. Electrical Technology by Surinder Pal Bali, PearsonPublications.
2. Electronic Devices and Circuits by R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

Reference Books:

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &FrancisGroup
2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMHPublications
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2ndedition
4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2ndedition
5. Industrial Electronics by G.K. Mittal,PHI

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I Year - II Semester		L	T	P	C
		2	0	2	3

COMPUTER AIDED ENGINEERING DRAWING

Course Objective: To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modelling.

UNIT-I:

Objective: The knowledge of projections of solids is essential in 3D modelling and animation. The student will be able to draw projections of solids. The objective is to enhance the skills they already acquired in their earlier course in drawing of projection.

PROJECTIONS OF SOLIDS: Projections of Regular Solids inclined to both planes – AuxiliaryViews.

UNIT-II:

The knowledge of sections of solids and development of surfaces is required in designing and manufacturing of the objects. Whenever two or more solids combine, a definite curve is seen at their intersection.

SECTIONS OF SOLIDS: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

DEVELOPMENT AND INTERPENETRATION OF SOLIDS: Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid, Cone and their parts.

UNIT-III:

The intersection of solids also plays an important role in designing and manufacturing. The objective is to impart this knowledge through this topic. A perspective view provides a realistic 3D View of an object. The objective is to make the students learn the methods of Iso and Perspective views.

INTERPENETRATION OF RIGHT REGULAR SOLIDS: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

PERSPECTIVE PROJECTIONS: Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).

In part B computer aided drafting is introduced.

UNIT IV:

The objective is to introduce various commands in AutoCAD to draw the geometric entities and to create 2D and 3D wire frame models.

INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, dimensioning. Types of modelling: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modelling, 3D wire frame modelling,.

UNIT V:

By going through this topic the student will be able to understand the paper-space environment thoroughly.

VIEW POINTS AND VIEW PORTS: view point coordinates and view(s) displayed, examples to exercise different options like save, restore, delete, joint, single option

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

The objective is to make the students create geometrical model of simple solids and machine parts and display the same as an Isometric, Orthographic or Perspective projection.
COMPUTER AIDED SOLID MODELING: Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

TEXT BOOKS:

1. Engineering drawing by N.D Bhatt, Charotarpublications.
2. Engineering Graphics, K.C. john, PHIPublications

REFERENCES:

1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDCPubl.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan,vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, NewAge
5. Engineering Drawing – RK Dhawan, SChand
6. Engineering Drawing – MB Shaw, BC Rana,Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah,Scitech
8. Engineering Drawing – Agarwal and Agarwal, Mc GrawHill
9. Engineering Graphics – PI Varghese, Mc GrawHill
10. Text book of Engineering Drawing with auto-CAD, K.venkatareddy/B.S.publications.
11. Engineering Drawing with Auto CAD/ James D Bethune/PearsonPublications
12. Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, SarkarA.K/PHI Publications

End Semester examination shall be conducted for **Four** hours with the following pattern:
a) Two hours-Conventionaldrawing
b) Two hours – Computer AidedDrawing

Course outcomes:

1. Student get exposed on working of sheet metal with help of development ofsurfaces.
2. Student understands how to know the hidden details of machine components with the help of sections and interpenetrations ofsolids.
3. Student shall exposed to modeling commands for generating 2D and 3D objects using computer aided drafting tools which are useful to create machine elements for computer aided analysis

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B. Tech-FOOD ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1.5
WORKSHOP PRACTICE LAB					

Course Objective: To impart hands-on practice on basic engineering trades and skills.
Note: At least two exercises to be done from each trade.
Trade:

1. **Carpentry**	1. T-LapJoint
	2. Cross LapJoint
	3. Dovetail Joint
	4. Mortise and TenonJoint
2. Fitting	1. Vee Fit
	2. SquareFit
	3. Half RoundFit
	4. DovetailFit
3. BlackSmithy	1. Round rod to Square
	2. S-Hook
	3. Round Rod to FlatRing
	4. Round Rod to Square headedbolt
4. HouseWiring	1. Parallel / Series Connection of threebulbs
	2. Staircasewiring
	3. Florescent LampFitting
	4. Measurement of Earth Resistance
5. **TinSmithy**	1. Taper Tray
	2. Square Box withoutlid
	3. OpenScoop
	4. Funnel
6. **ITWorkshop**	1.Assembly & Disassembly ofComputer

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
ENGINEERING PHYSICS LAB					

(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

1. Laser: Determination of wavelength using diffractiongrating.
2. Young's modulus of given material by Strain gaugemethod.
3. Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart &Gee'smethod.
4. Determination of ultrasonic velocity in given liquid (Acousticgrating).
5. Determination of dielectric constant using charging and dischargingmethod.
6. Study the variation of B versus H by magnetizing the magnetic material (B-Hcurve).
7. Estimation of Planck's constant using photoelectriceffect.
8. Rigidity modulus of material of a wire-dynamic method (Torsionalpendulum).
9. Determination of numerical aperture and acceptance angle of an opticalfiber.
10. Determination of thickness of thin object by wedgemethod.
11. Determination of radius of curvature of given plano convex lens by Newton'srings.
12. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidenceconfiguration.
13. Determination of dispersive power of theprism.
14. Sonometer: Verification of laws ofstring.
15. Measurement of magnetic susceptibility by Kundt'stubemethod

References:

S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S ChandPublishers, 2017.

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
BASICS ELECTRICAL & ELECTRONICS ENGINEERING LAB					

Learning Objectives:

- To predetermine the efficiency of dc shunt machine using Swinburne'stest.
- To predetermine the efficiency and regulation of 1-phase transformer withO.C and S.C tests.
- To obtain performance characteristics of DC shunt motor &3-phase inductionmotor.
- To find out regulation of an alternator with synchronous impedancemethod.
- To control speed of dc shunt motor using Armature voltage and Field fluxcontrol methods.
- To find out the characteristics of PN junction diode &transistor
- To determine the ripple factor of half wave & full waverectifiers.

Section A: Electrical Engineering:

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine (predetermination of efficiency of a given D.C. shunt machine working as motor andgenerator).
2. OC and SC tests on single phase transformer (predetermination of efficiency andregulation at given powerfactors).
3. Brake test on 3-phase Induction motor (determination of performancecharacteristics)
4. Regulation of alternator by Synchronous impedancemethod.
5. Speed control of D.C. Shunt motor by

a) Armature Voltage control b) Field flux control method

6. Brake test on D.C. ShuntMotor.

Section B: Electronics Engineering:

The following experiments are required to be conducted as compulsory experiments:

1. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and resistance calculations)
2. Transistor CE characteristics (input andoutput)
3. Half wave rectifier with and withoutfilters.
4. Full wave rectifier with and without filters.
5. CEamplifiers.
6. OP- amp applications (inverting, non-inverting, integrator anddifferentiator)

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Learning Outcomes:

The student should be able to:

- Compute the efficiency of DC shunt machine without actual loading of themachine.
- Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SCtests.
- Analyse the performance characteristics and to determine efficiency of DC shunt motor &3-Phase inductionmotor.
- Pre-determine the regulation of an alternator by synchronous impedancemethod.
- Control the speed of dc shunt motor using Armature voltage and Field flux control methods.
- Draw the characteristics of PN junction diode &transistor
- Determine the ripple factor of half wave & full waverectifiers.

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B. Tech-FOOD ENGINEERING

I Year - II Semester		L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA					

Course Objectives:

- To Enable the student to understand the importance ofconstitution
- To understand the structure of executive, legislature andjudiciary
- To understand philosophy of fundamental rights andduties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial andadministrative.

UNIT-I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:

After completion of this unit student will

- Understand the concept of Indianconstitution
- Apply the knowledge on directive principle of statepolicy
- Analyze the History, features of Indianconstitution
- Evaluate Preamble Fundamental Rights andDuties

UNIT-II Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: -After completion of this unit student will

- Understand the structure of Indiangovernment
- Differentiate between the state and central government
- Explain the role of President and PrimeMinister
- Know the Structure of supreme court and Highcourt

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: -After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and ChiefMinister
- Explain the role of stateSecretariat
- Differentiate between structure and functions of statesecretariat

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B. Tech-FOOD ENGINEERING

UNIT-IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes: -After completion of this unit student will

- Understand the localAdministration
- Compare and contrast district administration role andimportance
- Analyze the role of Myer and elected representatives ofMunicipalities
- Evaluate Zillapanchayat block levelorganisation

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes:-After completion of this unit student will

- Know the role of Election Commission applyknowledge
- Contrast and compare the role of Chief Election commissioner andCommissiononerate
- Analyze role of state electioncommission
- Evaluate various commissions of viz SC/ST/OBC andwomen

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd..NewDelhi
2. SubashKashyap, Indian Constitution, National BookTrust
3. J.A. Siwach, Dynamics of Indian Government &Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government andPoliticsHans
7. J. Raj IndianGovernmentandPolitics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in ConstitutionalLaw, Prentice – Hall of India Pvt.Ltd..NewDelhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press2012

E-resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

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B. Tech-FOOD ENGINEERING

Course Outcomes:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democraticIndia.
- Understand the functioning of three wings of the government ie., executive, legislative andjudiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and localself-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustainingdemocracy.

1. Know the sources, features and principles of IndianConstitution.
2. Learn about Union Government, State government and itsadministration.
3. Get acquainted with Local administration and PachayatiRaj.
4. Be aware of basic concepts and developments of HumanRights.
5. Gain knowledge on roles and functioning of ElectionCommission

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
PROBABILITY AND STATISTICS (Common to all Branches)					

Course Objectives

- To familiarize the students with the foundations of probability and statistical methods.
- To impart probability concepts and statistical methods in various applications Engineering.

Course Outcomes

Upon successful completion of this course, the student should be able to

- Classify the concepts of data science and its importance (L4) or (L2)
- Interpret the association of characteristics and through correlation and regression tools (L4)
- Make use of the concepts of probability and their applications (L3)
- Apply discrete and continuous probability distributions (L3)
- Design the components of a classical hypothesis test (L6)
- Infer the statistical inferential methods based on small and large sampling tests (L4)

Unit – I: Descriptive statistics and methods for data science: (10 hrs)

Data science – Statistics Introduction – Population vs Sample –Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT – II: Correlation and Curve fitting:

Method of least squares – Correlation – Correlation coefficient – Rank correlation – Regression coefficients and properties – Regression lines –Straight line – Parabola – Exponential – Power curves.

UNIT – III: Probability and Distributions: (10 hrs)

Probability– Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT – IV: Sampling Theory: (8 hrs)

Introduction – Population and Samples– Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Representation of the normal theory distributions– Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

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UNIT – V: Tests of Hypothesis: (10 hrs)

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Textbooks:

1. **Miller and Freund's**, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. **S. C. Gupta and V.K. Kapoor**, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. **Sheldon M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. **Johannes Ledolter and Robert V. Hogg**, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

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B. Tech-FOOD ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
PRINCIPLES OF FOOD ENGINEERING - I					

Course Objectives

- To familiarize the importance and usage of units.
- To understand the fundamental laws and principles and its application.

Course Outcomes

- Students will learn the importance of units.
- Students will understand the basic laws and principles and its application in Food engineering.

UNIT I

Introduction to Food Engineering: Definition of terms, System of measurements, The S.I System, Conversion of Units

Learning Outcomes

At the end of unit, students will be able to

1. Basic terminology related to Food Engineering.
2. Importance and how to use the units.
3. Convert the units.

UNIT II

Steam Generation & Utilization: Concept of normal boiling point, Properties of Steam: Wet, dry saturated, superheated steam. Dryness fraction of steam. Pressure-Enthalpy diagram, Problems; Boilers: Classification, Types, Criteria for selection, Maintenance & Applications

Learning Outcomes

At the end of unit, students will be able to

1. Basic knowledge on steam properties.
2. Importance of steam tables.
3. Classify the boilers and their selection.

UNIT III

Basic principles of Physics & Chemistry: PVT relationships

Gases and Vapors: Behavior of Gases – Kinetic Theory of gases – Perfect Gas – Gas laws – Ideal gas laws – Real gas- Van der Waal's equation -pure component vapour pressure- partial pressure Dalton's law. Pure component volume-Amagat's law; Problems.

Learning Outcomes

At the end of unit, students will be able to

1. Explain the Ideal gas law and PVT relationships.
2. Importance and applicability of these laws.

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UNIT IV

Thermodynamics: Basic concepts of Thermodynamics: Definitions, approaches, thermodynamic processes (Adiabatic, Isothermal, Isobaric, Isocratic), thermodynamic systems, thermodynamic properties and equilibrium, state of a system, state diagram, path and process, different modes of work.

Zeroth law of thermodynamics: concept of temperature, heat, Gibb's free energy, Entropy

First law of thermodynamics: Energy, enthalpy, specific heats, applications of first law.

Second law of thermodynamics: Kelvin-Planck and Clausius statements, reversible and irreversible processes, thermodynamic temperature scale.

Learning Outcomes

At the end of unit, students will be able to

1. Explain the terminology related to thermodynamics.
2. Applications of laws of thermodynamics.

UNIT V

Refrigeration: Basic concepts, Joule-Thomson effect, Refrigerants-Classification &selection,Refrigeration Load, Problems, Refrigeration types- Vapor compression refrigeration and vapor absorption refrigeration, comparison of both systems. Applications

Learning Outcomes

At the end of unit, students will be able to

1. Basic concepts of refrigeration.
2. Knowledge on selection of refrigerant.
3. Various refrigeration systems.

Textbooks

1. Rajput RK. Engineering thermodynamics: A computer approach (SIunits version). Jones & Bartlett Publishers; 2009 Mar 12.
2. SMITH PG. Introduction to food process engineering. Chemical engineer. 2003(742):56-.

References

1. Smith JM. Introduction to chemical engineering thermodynamics, 2005.
2. Paul Singh R, Heldman DR. Introduction to food engineering, 2009
3. Berk Z. Food process engineering and technology. Academic press; 2018 Feb 13.
4. Rao DG. Fundamentals of food engineering. PHI Learning Pvt. Ltd.; 2009 Nov 30.
5. Geankoplis CJ. Transport processes and separation process principles:(includes unit operations). Prentice Hall Professional Technical Reference; 2003.
6. McCabe WL, Smith JC, Harriott P. Unit operations of chemical engineering. New York: McGraw-hill; 1993.

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B. Tech-FOOD ENGINEERING

II Year -I Semester		L	T	P	C
		3	0	0	3
MECHANICAL OPERATIONS IN FOOD PROCESSING					

Course Objectives

To impart knowledge to the students on principles and operation of various food processing equipment viz.cutting, grinding, screening, sedimentation, filtration, centrifugation, mixing extruder and enrobers.

Course Outcomes

By the end of the course, the students will be able to

- Understand different food processing equipment that are being used in food industries.
- Study about the principles, operation, and maintenance of food processing equipment viz., material handling, cleaning, grading, mixing, forming, size reduction, cutting, grinding, centrifugation, filtration, evaporation and drying.

UNITI

Size reduction**:** Review of Theory: Mechanisms of grinding, grinding laws, properties of materials, factors affecting grinding. Equipment: Types and selection, calculation of crushing strength, work index and power. Advances: Cryogenic grinding. Screening**:** Review of Theory: Average particle size, distribution, standard sieves. Equipment: Types and selection of screens, calculation of screen effectiveness.

Learning Outcomes

At the end of unit, students will be able to

1. Describe the size reduction and principles, equipment, and recent developments.
2. Acquire basic knowledge on screening and their equipment.

UNITII

Grading**:** Review of Theory. Equipment: Types of graders and their working principle, Destoner, Air classifier, Paddy Separators, Indent cylinder, magnetic, cyclone and color separator. Grading efficiency & Selection of graders. Sedimentation**:** Principle of sedimentation, batch sedimentation, minimum area of thickener for continuous sedimentation and sedimentation equipment.

Learning Outcomes

At the end of unit, students will be able to

1. Get various types of separators/Graders and its application.
2. Acquires knowledge on using graders for different food materials.
3. Know the detailed working mechanism of sedimentation and design calculations.

UNITIII

Filtration: Introduction, Mechanism of Filtration, Constant pressure and constant rate filtration and types of filtration equipment, Plate and frame filter press, Pressure leaf filter press and Rotary vacuum filter press, selection of filter press and application of filtration in food processing includingmembrane filtration. Centrifugation**:** Principle of centrifugation, classification of centrifuges; Tubular centrifuge, Disc bowl centrifuge, Basket centrifuge and applications in Food Processing.

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Learning Outcomes

At the end of unit, students will be able to

1. Acquire basic knowledge on filtration and their equipment.
2. Explain the principles of centrifugation and equipment used.
3. Learn various applications in filtration and centrifugation in food processing.

UNITIV

Mixing**:** Review of Theory: Characteristics of mixtures, mixing index, mixing time. Equipment: Types of mixing equipment for solids (powder and particle); planetary mixer, kneader, ribbon mixer, double cone mixer and pastes, liquids and gases, power required for mixing, selection of mixers and applications. Coating: Enrobing, dusting and pan coating; soft, hard & chocolate coating.

Learning Outcomes

At the end of unit, students will be able to

1. Know the importance of mixing in solid and liquid foods.
2. Understand working of mixing equipment for various foods.
3. Gain knowledge in coating and enrobing technology used in processed foods.

UNITV

Extrusion: Principle of working, types of extruders, Single screw extruder: principle of working, net flow, factors affecting extrusion process, co-kneaders. Twin screw extruder: counter rotating and co-rotating twin screw extruder. Screw design, screw speed, screw configurations, die design.

Learning Outcomes

At the end of unit, students will be able to

1. Understand the process and significance of extrusion process.
2. Acquire knowledge on factors affecting the extrusion.
3. Know types and applications of extrusion.

Textbooks

1. Rao DG. Fundamentals of food engineering. PHI Learning Pvt. Ltd.; 2009 Nov 30.
2. Earle RL, Earle MD. Unit operations in food engineering,1983.

References

1. Sahay KM, Singh KK. Unit operations of agricultural processing. Vikas Publishing House Pvt. Ltd.; 1996.
2. Cabe Mc., Smith J.C and Harriot P. Unit operations of Chemical Engineering. McGraw Hill Publishers. New Delhi.
3. Toledo, R. T. Fundamental of Food Process Engineering, CBS.
4. Coulson JM, Richardson JF. Chemical and biochemical reactors and process control. Elsevier; 1994 Jan 15.
5. Fellows PJ. Food processing technology: principles and practice. Elsevier; 2009 Jun 22.

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B. Tech-FOOD ENGINEERING

II Year -I Semester		L	T	P	C
		3	0	0	3
FLUID MECHANICS IN FOOD PROCESSING					

Course Objectives

- The basic concepts of fluid types and fluid-flow phenomena.
- To enable the students to understand the concept and importance of friction factor.
- To understand the friction losses through pipes.
- To classify and select the pumps depending on suitability and acquire knowledge on power requirements in pumps.

Course Outcomes

By the end of the course the students will be able to

- Gain knowledge on various types of fluids available and their classification with examples.
- Acquires knowledge on different types of flow regimes that fluid can flow.
- Know the applications and usage of Bernoulli's theory, Buckingham's Pi theorem, Hagen-Poiseuilli and Rabinowitsch-Mooney equation.
- Gain the knowledge on significance of friction factor and their calculations.
- Understand frictional losses through pipes and pipe fittings.
- Have knowledge on selection of pumps and their performance evaluation.

UNIT I

Types of Fluids: Newtonian & Non-Newtonian Fluids-dilatant, pseudoplastic, bingham plastic, binghampseudoplastic; classification of fluids based on time dependance: Thixotropic and Rheopectic; classification of fluids based on density Compressible and incompressible fluids.

Learning Outcomes

At the end of unit, students will be able to

1. Differentiate Newtonian and non-Newtonian fluids.
2. Get basics behind classification of fluids.
3. Differentiate fluids with examples.

UNIT II

Fluid Flow:Reynold'sexperiment, Laminar and turbulent flows, Reynolds Number; Equation of Continuity, Bernoulli's equation, applications of Bernoulli's equation, Cavitation, laminar and turbulent flow in pipes (Concept of Boundary Layer & Entrance Length)

Learning Outcomes

At the end of unit, students will be able to

1. Know basic types of flows in fluids.
2. Acquire knowledge on Equation of continuity and application of Bernoulli's equation.
3. Get concept of Boundary layer and Entrance length.

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UNIT III

Friction Factor: Definition of Friction Factor; relationship between Friction factor and Reynolds Number by using Dimensionless analysis, concept of Friction Factor: Derivation of friction factor for Laminar Flow, Hagen-Poiseuille equation; Friction Factor for Turbulent Flow, Moody Chart, Friction factor for Non- Newtonian Fluids (Power Law Fluids); Generalized Reynolds Number; Rabinowitsch-Mooney equation and Friction Chart.

Learning Outcomes

At the end of unit, students will be able to

1. Know the study of friction factor.
2. Concept of Reynold number and friction factor using Dimensionless analysis.
3. Understand the friction factor by using Hagen-Poiseuille and Rabinowitsch-Mooney equation.
4. Get the knowledge on Generalized Reynold number and Friction charts.

UNIT IV

Pressure Losses in Pipes & Flow Measurement**:** Energy equation for steady flow of fluids: Pressure, Kinetic & Potential Energy. Major Losses: Frictional Losses; Minor losses: Energy Losses due to sudden expansion, contraction & energy losses due to pipe fittings; Measurement of Flow in Pipes: Venturimeter, Pitot tube, Rotameter and others.

Learning Outcomes

At the end of unit, students will be able to

1. Know the energy equations used for steady flow of fluids.
2. Calculate the frictional losses (major and minor) in pipes & pipe fittings.
3. Knowledge on various flow measurement devices.

UNIT V

Pumps, Pipes & Fittings: Classification of Pumps: Centrifugal pumps, Reciprocating pumps, Rotary Pumps; Pressure Head, Suction Head, Discharge Head, Net Positive Suction Head; Power requirement of Pump; Selection of Pumps & Performance Evaluation. Pipe & Pipe Fittings & their selection.

Learning Outcomes

At the end of unit, students will be able to

1. Know various types of pumps.
2. Calculate power requirements for pumps.
3. Understand how to select the pumps and their evaluation in terms of performance.
4. Have needed knowledge on selection of pipe and pipe fittings.

Textbooks

1. Rao DG. Fundamentals of food engineering. PHI Learning Pvt. Ltd.; 2009 Nov 30.
2. SMITH PG. Introduction to food process engineering. Chemical engineer. 2003(742):56-.

References

1. Geankoplis CJ. Transport processes and separation process principles:(includes unit operations). Prentice Hall Professional Technical Reference; 2003.
2. Paul Singh R, Heldman DR. Introduction to food engineering.2009
3. Berk Z. Food process engineering and technology. Academic press; 2018 Feb 13.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year -I Semester		L	T	P	C
		3	0	0	3
FOOD MICROBIOLOGY					

Course Objectives

- To impart knowledge on importance of microbes in foods and their classification along with the calculations of shelf life.
- To understand microbial types (and their levels where possible) that can be expected under normal conditions in different food groups.
- To gain proper knowledge on the difference between harmful and beneficial micro-organisms, the factors affecting microbial growth and microbial growth characteristics.

Course Outcomes

At the end of the unit students will gain knowledge on:

- Basic information that is important to understand the mechanisms of food spoilage, foodborne diseases, food bioprocessing and strain improvement, and their detection from food.
- Microorganisms are present in mixed cultures in food and can interact with each other during growth.

UNIT I

The science of microbiology**:**Its origin and scope. Importance of micro-organisms in foods. Classification of microbes:Bacteria, yeast, moulds, viruses. Common bacterial groups in foods. Calculation of shelf life, shelf-life environments, deteriorative reactions, accelerated testing; Simulations of product: Package environment interaction, shelf-life simulation for moisture, oxygen, and light sensitive products.

Learning Outcomes

At the end of the unit students will gain knowledge on:

1. Importance of micro-organisms in foods and their classification.
2. Calculations of shelf life of products in particular environment, their deteriorative reactions and shelf-life simulation of product for different parameters.

UNIT II

Factors influencing microbial growth:Intrinsic factors (food environment): Nutrients in foods, growth factors and inhibitors in foods. Water activity: principle, water activity of foods, water activity and microbial growth. pH: principle, pH in foods, pH and microbial growth. Redox potential and oxygen: principle, redox potential in foods, redox potential, and microbial growth. Extrinsic factors: RH & presence of other gases, temperature-principle, food and temperature, microbial growth, and viability.

Learning Outcomes

At the end of the unit students will gain knowledge on:

1. Extrinsic and intrinsic factors influencing microbial growth.
2. Different factors interacting with the foods containing micro-organisms.

UNIT III

Microbial growth characteristics**:** Microbial growth or reproduction: Binary fission, generation time (or) doubling time, specific growth rate, optimum growth, growth curve. Nature of microbial growth in food: Mixed population, sequence of growth, symbiotic growth, synergistic growth and antagonistic growth.

Learning Outcomes

At the end of the unit students will gain knowledge on:

1. Basic information that is important to understand the mechanisms of food spoilage, foodborne diseases, food bioprocessing and strain improvement, and their detection from food.
2. Microorganisms are present in mixed cultures in food and can interact with each other during growth.

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UNIT IV

Harmful Micro-organism and Beneficial Micro-organism: Food borne diseases – food infection and food intoxication, Food borne viruses: types of food involved, noroviruses, Rota viruses, prion diseases, toxicity, and symptoms. Microbial toxins: Bacterial toxins, fungal toxins, algal toxins – symptoms, causes and control measures. Microorganisms as food- Single Cell Protein, Fermented food- pickles, sauerkraut- vinegar and lactic acid.

Learning Outcomes

At the end of the unit students will gain knowledge on:

1. Uses of beneficial micro-organisms and effects of harmful micro-organisms on health.
2. Food infections and food intoxications caused by food borne viruses and microbial toxins produced by micro-organisms.

UNIT V

Microbiological quality of foods and its significance: Fruits and vegetables, nuts, cereals, starches, and gums, RTE meat products, Raw and pasteurized milk, fish and shellfish, shell egg and liquid egg, canned foods, soft drinks, fruits and vegetables drinks,bottled water, spices and condiments, sugars and confectionaries, mayonnaise, and salad dressing.

Learning Outcomes

At the end of the unit students will gain knowledge on:

1. Microbial population in a food comes from those that enter from different sources as well as from growth of the contaminants before a food is examined.
2. Effect of conditions on microbial load.
3. Information on normal microbial load helps to determine microbiological quality of a food and to set up microbiological standards and specifications.

Textbooks

1. BanawartGJ, BasicFood Microbiology. 2nd Ed. AVI Publ, 1989.
2. Frazier J &Westhoff DC, Food Microbiology. 4th Ed. McGraw Hill, 1988
3. Garbutt J., Essentials of Food Microbiology. Arnold Heinemann. 1997.
4. Jay JM, Loessner MJ, Golden DA. Modern food microbiology. Springer Science & Business Media; 2008 Feb 5.
5. Ray B., Fundamentals of Food Microbiology.3rd Ed. CRC. 2004

References

1. K. S. Bilgrami; Essentials of Microbiology; CBS Publishers, Delhi
2. Pelczar, Chan and Krieg, Microbiology; Tata McGraw Hill, Delhi
3. M. R. Adams, Food Microbiology.
4. Bisen, Handbook of Microbiology.

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year -III Semester		L	T	P	C
		0	0	3	1.5
MECHANICAL OPERATIONS IN FOOD PROCESSING LAB					

Course Objectives

To impart practical orientation of usage of different mills, concept of terminal and settling velocity. Calculation of filter cake resistances.

Course Outcomes

By the end of the course, the students will be able to

- Find out screen efficiency, grading efficiency & separation efficiency.
- Find out particle size distribution.
- Find out grinding index.
- How to find out resistances in filtration.

Laboratory Experiments

1. Particle size distribution using sieve shaker.
2. To find out the screen effectiveness of a given sample by vibratory screen.
3. To find out the grading efficiency of a given sample by destoner.
4. To find out the grading efficiency of a given sample in specific gravity separator.
5. To find out the grading efficiency of a given sample in spiral separator.
6. Estimation of work index of material in grinding.
7. Mixing experimentation and determination of mixing index in Ribbon Mixer &Sigma Mixer.
8. Determination of power consumption in mixing/agitation.
9. Determination of equivalent and specific cake resistance in filtration (Plate & Frame Filter Press, Leaf Filter, Rotary Vacuum Filter).
10. Determine the efficiency of Cyclone separator.
11. Determination of Settling velocity of a particle by sedimentation.
12. Determination of separation efficiency of suspension by using tubular bowl/nozzle centrifuge/Basket Centrifuge.
13. Determine the efficiency of Ball Mill, Hammer Mill & Rod Mill for grinding a material of known work index (Wi).

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year -I Semester		L	T	P	C
		0	0	3	1.5
FLUID MECHANICS IN FOOD PROCESSING LAB					

Course Objectives

To impart knowledge on coefficient of discharge, friction factor, pressure drop on different fluids. Importance of pipe fittings and application of various pumps in food industry.

Course Outcomes

By the end of the course the students will be able to

- Know the measurement of fluid pressure, measurement of discharge and measurement of time.
- Know how to determine the Coefficient of discharge from the pitot tube experiment.
- Know how to measure the water level from 'U' tube manometer.

List of Experiments

1. To determine the coefficient of discharge of an orifice (or a mouthpiece) of a given shape.
2. Determination of Coefficient of discharge for a small orifice and mouthpiece by a constant headand variable head method.
3. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
4. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number.
5. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
6. To study the velocity distribution in a pipe and to compute the discharge by integrating the velocity profile.
7. To study the variation of friction factor, 'f' for turbulent flow in smooth and rough commercial pipes.
8. To determine the loss coefficients for the pipe fittings.
9. To verify Bernoulli's equation experimentally.
10. To determine the flow rate and coefficient of discharge using Venturi meter.
11. To measure discharge through Rotameter.
12. To determine the Reynolds number and types of flow (Laminar or Turbulent), the flow rate and coefficient of discharge using Orifice meter.
13. To determine losses due to pipe fitting, sudden enlargement, and contraction.
14. Measurement of viscosity and surface tension of liquids.
15. To determine the characteristics of centrifugal pump and to find out total head, pump efficiency and overall efficiency of pump.
16. Study of various types of pipes and pipe fittings.
17. Study of different types of valves.
18. Study of reciprocating pump.
19. Determination of frictional coefficient of given pipe.

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year -I Semester		L	T	P	C
		0	0	3	1.5
FOOD MICROBIOLOGY LAB					

Course Objectives

The major learning objective of this course will be to study:

- Important genera of microorganisms associated with food and their characteristics.
- To learn various techniquesfor enumeration and control of microorganisms in food.

Course Outcomes

Upon successful completion of this course student should be able to:

- Describe the characteristics of foodborne, waterborne and spoilage microorganisms, and methods for their isolation, detection, and identification.
- Explain the significance and activities of microorganisms in food.

List of Experiments

1. Microscope its parts and utility in identification and differentiation of various microorganism asbacteria, yeast and mould.
2. Familiarization with common techniques for handling pure culture serial dilution, Inoculation, slidepreparation incubation, counting etc.
3. Simple and differential staining of microorganisms and their examination.
4. Preparation and sterilization of media and glassware for microbial counts.
5. Determination of Standard Plate Count (SPC) in natural and/or processed foods.
6. Isolation of bacteria and moulds from foods.
7. Microbial examination of cereal and cereal products: Identification, isolation, and confirmation.
8. Microbial examination of vegetable and fruits: Identification, isolation, and confirmation.
9. Microbial examination of vegetable and fruits: Identification, isolation, and confirmation.
10. Microbial examination of fish and other sea foods: Identification, isolation, and confirmation.
11. Microbial examination of fish and other sea foods: Identification, isolation,and confirmation.
12. Microbial examination of milk and milk products: Identification, isolation, andconfirmation.
13. Microbial examination of sugar, salts, and spices.
14. Microbial examination of canned products: Identification, isolation, andconfirmation.
15. Determination and enumeration of pathogenic and indicator organisms infoods (*Coliform/Enterococcus*)
16. Thermal death time determination
17. Detection of *Salmonella* from food sample.
18. Detection of *coliforms* from water by MPN method.
19. Detection of *Staphylococcusaureus* from food sample.

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year -I Semester		L	T	P	C
		2	0	0	2
FOOD HANDLING & STORAGE ENGINEERING					

Course Objectives

- To study the all the equipment used for handling of foods.
- To develop appropriate storage structures with engineering principles.

Courses Outcomes

By the end of the course the students will be able to

- To understand the design of storage systems.
- To learn about the types, selection and design of food conveying systems.

UNIT I

Pneumatic conveying system: air-pressure and vacuum system, lean and dense phases, capacity and power requirement; Gravity conveyor design considerations, capacity and power requirement. Selection, design and applications of pneumatic conveyors. Hydraulic conveyors. Hygienic considerations

Learning Outcomes

At the end of unit, students will be able to

1. Understand the concept of pneumatic conveying systems.
2. Know the importance of lean and dense phases in pneumatic systems.
3. Get knowledge on hydraulic conveyors and hygienic considerations for pneumatic conveying systems and hydraulic conveyors.

UNIT II

Mechanical Conveyors: Belt conveyor - Principle, characteristics, design, relationship between belt speed and width, capacity, inclined belt conveyors, idler spacing, belt tension, drive tension, belt tripper; Uniform belt and segmented belt conveyors and their applications. Screw conveyor: Principle of operation, capacity, power, troughs, loading and discharge, inclined and vertical screw conveyors. Hygienic considerations

Learning Outcomes

At the end of unit, students will be able to

1. Acquire knowledge on belt conveyors from principle to design considerations.
2. Understand the concept regarding details of screw conveyors.
3. Know the hygienic considerations for belt and screw conveyors.

UNIT III

Mechanical Conveyors: Bucket elevator: Principle, classification, operation, advantages, disadvantages, capacity, speed, bucket pickup, bucket discharge, relationship between belt speed, pickup and bucket discharge, buckets types; Selection, design and applications of Bucket elevator.

Roller and stake wheel conveyors, chain conveyors, Flexible conveyors, Mobile Transport Systems, Hoists Cranes, and Elevators. Vibratory conveyors and overhead conveyors. Robots. Hygienic considerations

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Learning Outcomes

At the end of unit, students will be able to

1. Learn about bucket elevators from principle to all concepts.
2. Understand the various other mechanical conveyors like Roller and stake wheel conveyors, chain conveyors, Mobile Transport Systems, Hoists Cranes, and Elevators. Vibratory conveyors, overhead conveyors&Robots.
3. Know the hygienic considerations for remaining mechanical conveyors.

UNIT IV

Storage structures Traditional storage structures, improved storage structures, modern storage structures, godown layout, staking pattern and rodent proof godown design; Farm silos: Horizontal silos, tower silos, pit silos, trench silos, size and capacity of silos.Storage of perishables Cold storage controlled and modified atmospheric storage, hypobaric storage, evaporative cooling storage.

Learning Outcomes

At the end of unit, students will be able to

1. Get knowledge on storage structures both traditional and improved methods.
2. Understand the concepts involved while storing perishables and different types of storage methods.

UNIT V

Design of storage structures Functional and structural design of grain storage structures, pressure theories, pressure distribution in the bin, grain storage loads, pressure and capacities, warehouse and silos, functional, structural and thermal design of cold stores.

Learning Outcomes

At the end of unit, students will be able to

1. Understand the design criteria for various storage structures.
2. Know the significance of important parameters involved in silo load calculations.

Textbooks

1. Saravacos GD, Kostaropoulos AE. Handbook of food processing equipment. Kluwer Academic/Plenum; 2002.
2. Sahay KM, Singh KK. Unit operations of agricultural processing. Vikas Publishing House Pvt. Ltd.; 1996.

References

1. William Andrew, Inc., Norwich, Handbook of Farm, Dairy, and Food Machinery; 2004.
2. L.W. Newbaver and H.B. Walker, Principal of Agricultural Engineering, 2003.
3. Hall CW, Olsen WC, editors. The literature of agricultural engineering. Cornell University Press; 1992.
4. Hall CW. Drying and storage of agricultural crops. AVI Publishing Company Inc.; 1980.

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year -I Semester		L	T	P	C
		2	0	0	0
PROFESSIONAL ETHICS & HUMAN VALUES					

Course Objectives

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty.
- To appreciate the rights of others.
- To create awareness on assessment of safety and risk.

Course Outcomes

Students will be able to:

- Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field.
- Identify the multiple ethical interests at stake in a real-world situation or practice.
- Articulate what makes a particular course of action ethically defensible.
- Assess their own ethical values and the social context of problems.
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects.
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.
- Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

Unit I

Human Values:Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation–Commitment – Empathy –Self Confidence Character –Spirituality.

Learning Outcomes

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment.
4. Learn how to live peacefully.

Unit II

Engineering Ethics**:** Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas –Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Learning Outcomes

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management.
4. Learn about the different professional roles.

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B. Tech-FOOD ENGINEERING

Unit III

Engineering as Social Experimentation**:** Engineering as Social Experimentation –Framing the problem – Determining the facts –Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons.

Learning Outcomes

1. Demonstrate knowledge to become a social experimenter.
2. Provide depth knowledge on framing of the problem and determining the facts.
3. Provide depth knowledge on codes of ethics.
4. Develop utilitarian thinking.

UNIT IV

Engineers Responsibility for Safety and Risk:Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

Learning Outcomes

1. Create awareness about safety, risk & risk benefit analysis.
2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

UINIT V

Global Issues: Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts –Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.

Learning Outcomes

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics.
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

Textbooks

1. M.Govindarajan, S.NatarajanV.S.SenthilKumarEngineering Ethics includes Human Values;2009.
2. Harris, Pritchard RabinsEngineering Ethics, India Edition, 2009.
3. Mike W. Martin Roland SchinzingerEthics in Engineering. Tata McGraw-Hill–2003.
4. A.R.Aryasri, DharanikotaSuyodhanaProfessional Ethics and Morals. Maruthi Publications.
5. Alavudeen A, Rahman RK, Jayakumaran M. Professional ethics and human values. Firewall Media;2008.
6. D.R.KiranProfessional Ethics and Human Values.
7. PSR Murthy Indian Culture, Values and Professional Ethics. BS Publication.

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year - II Semester		L	T	P	C
		3	0	0	3
PYTHON PROGRAMMING (Common to all Branches)					

Course Objectives

The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes

- Develop essential programming skills in computer programming concepts like data types, containers.
- Apply the basics of programming in the Python language.
- Solve coding tasks related conditional execution, loops.
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming.

UNIT I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from theKeyboard, Performing Calculations, Operators. Type conversions, Expressions, More about DataOutput.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types andCharacter Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested DecisionStructures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration the While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top-Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.

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UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read (), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study an ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming: Introduction to Programming Concepts with Scratch.

Textbooks

1. Lambert KA, Osborne M. Fundamentals of Python. Delmar Learning; 2011 Mar 1.
2. VamsiKurama, Pearson Python Programming: A Modern Approach,

References

1. Gowrishankar S, Veena A. Introduction to Python Programming. CRC Press; 2018 Dec 7.
2. Liang YD. For Introduction to Programming Using Python. displays. 2013;8(8):8.

e-Resources

1. https://www.tutorialspoint.com/python3/python_tutorial.pdf

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year - II Semester		L	T	P	C
		3	0	0	3
PRINCIPLES OF FOOD ENGINEERING - II					

Course Objectives

To impart knowledge to the students on basic concepts and applications of Psychrometric chart, humidifiers, and dehumidifiers. Problems on material and energy balance, importance of dimensional analysis and engineering properties of foods.

Course Outcomes

- Understand the fundamental concepts of psychrometric chart.
- Learn about the material and energy balances for equipment sizing.
- Gain knowledge on properties of foods and its applicability.

UNITI

Humidity & Humidification: Humidity & Relative Humidity, Saturation Humidity, Percentage Humidity, Humid Heat, Humid volume, Dew point, Enthalpy of Humid air, Dry bulb temperature, Wet bulb temperature, Problems, Psychrometric Chart-Utilization, problems; Humidifiers &Dehumidifiers, Applications. Water activity – concepts and importance. sorption isotherms, three stages of water, phase diagram for water, vapor pressure-temperature curve for water, heat requirement for vaporization, measurement of humidity.

Learning Outcomes

At the end of unit, students will be able to

1. Study the importance of properties of water vapor.
2. Learn the concept of water activity.
3. Understand the psychrometric chart.

UNITII

Material balance: Law of Conservation of mass- Process flow diagram-system boundaries -overall mass balance – component mass balance –basis and tie material- Continuous vs. Batch-Recycle and bypass-unsteady state - mass balance problems on concentration, dehydration, evaporation, crystallization, mixing, solvent extraction – multistage process.Problems

Learning Outcomes

At the end of unit, students will be able to

1. Know the significance of material balance in food processing.
2. Calculate the material balance for various unit operations in food processing.

UNITIII

Energy balance and evaluation of Heat requirements: Heat capacity – gases – solids – liquids -Latent heat – sensible heat -energy balance for a closed system and open system -total energy balances. Energy balance problems in heat exchangers- Problems

Learning Outcomes

At the end of unit, students will be able to

1. Understand the importance of energy balance in food processing.
2. Calculate the energy balance for various unit operations in food processing.

UNITIV

Dimensional Analysis Dimensional Consistency, Fundamental -derived units. Definitions of some basic physical quantities – Force, momentum, pressure, work and energy, power, heat, and enthalpy. Mole – atomical molar

mass, Conversion of Dimensional equations – Uses, Methods (Rayleigh's &Buckingham's) Examples: Nusselts Number, Reynolds number, Prandtl's number, Froude's number.

Learning Outcomes

At the end of unit, students will be able to

1. Know the concept of dimensional analysis.
2. Derive various parameters by using dimensional analysis.

UNITV

Engineering properties of Food Materials: Mass- volume- area related properties of foods, rheological properties of fluid foods & solid foods, thermal properties of frozen & unfrozen foods, electrical conductivity of foods, dielectric properties of foods, colorimetric properties of foods, surface properties, ultrasound properties.

Learning Outcomes

At the end of unit, students will be able to

1. Study the important engineering properties.
2. Know the significance of other properties useful in food processing.

Textbooks

1. Paul Singh R, Heldman DR. Introduction to food engineering, 2009.
2. Berk Z. Food process engineering and technology. Academic press; 2018 Feb 13.

References

1. Smith JM. Introduction to chemical engineering thermodynamics,2005
2. Rao DG. Fundamentals of food engineering. PHI Learning Pvt. Ltd.; 2009 Nov 30.
3. MA R, Syed SH R, Ashim K D. Engineering properties of foods,2005.
4. Rajput RK. Engineering thermodynamics: A computer approach (siunits version). Jones & Bartlett Publishers; 2009 Mar 12.
5. McCabe WL, Smith JC, Harriott P. Unit operations of chemical engineering. New York: McGraw-hill; 1993.
6. SMITH PG. Introduction to food process engineering. Chemical engineer. 2003(742):56-.
7. Geankoplis CJ. Transport processes and separation process principles:(includes unit operations). Prentice Hall Professional Technical Reference; 2003.

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SCHOOL OF FOOD TECHNOLOGY

B. Tech-FOOD ENGINEERING

II Year - II Semester		L	T	P	C
		3	0	0	3
FOOD CHEMISTRY					

Course Objectives

- To impart knowledge to the students on chemistry involved in foods and their importance in foods along with introduction to different analytical methods followed.
- To provide basic knowledge about nutritional composition of foods like carbohydrates, proteins, fats, vitamins & minerals and their analysis.
- To provide knowledge on chromatographic techniques with their principle, working procedure, accessories, and its applications in food industry.

Course Outcomes

- Understand the concepts of Techniques in food analysis,
- Understand proximate analysis of foods.
- Understand Biochemical methods and approaches used in Food analysis.

UNITI

Introduction to food chemistry, Importance of food chemistry. Official analytical methods: AOAC, AACC, ASTA. Sampling and sampling techniques used for foods. Determination of moisture, PH, Titrable acidity, acid value, Total soluble solids (TSS) and free fatty acids (FFA) in foods.

Learning Outcomes

At the end of unit, students will be able to

1. Briefs of different analytical methods and its importance in food chemistry.
2. Some basic analysis of foods like moisture, pH, Titrable acidity, acid value, TSS and free fatty acids (FFA) along with their principle, working procedure and instruments (or) equipment's used for it.

UNITII

Carbohydrates: Introduction to carbohydrate, classification of carbohydrates and its properties. Carbohydrates Analysis: - Chromatographic & electrophoretic methods, chemical methods, enzymatic methods, physical methods, Immunoassay.

Learning Outcomes

At the end of unit, students will be able to

1. Carbohydrates structure, types of carbohydrates, the foods containing different sugars and their properties when processed.
2. Analysis of reducing and non-reducing sugars by different analytical methods

UNITIII

Proteins and Fats: Introduction to protein, classification of proteins and its properties. Protein Analysis: Kjeldhal method, Titration method, Dumas method, protein assays: Biuret method, Lowry method, Bicinchronic acid method, UV-280nm absorption method. Fats: - Introduction to fat, classification of fat and its properties. Fat Analysis: soxhlet method, Gerber fat method, Babcock methods of fat extraction and other methods.

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Learning Outcomes

At the end of unit, students will be able to

1. Protein and fat structures, types of proteins and fats, the foods containing different proteins and fatty acids and their properties when processed.
2. Analysis of proteins and fats by different analytical methods.

UNITIV

Vitamins and Minerals: Introduction to vitamins, classification of vitamins & its deficiency, susceptibility to light, air, heatand its properties. Vitamin Analysis: liquid chromatography, HPLC, Redox titration and fluorimetry. Minerals: Introduction to minerals, classification of minerals and its properties. Mineral Analysis: Determination ash content, colorimetric methods, Gravimetric analysis, EDTA complexometric titration, Atomic absorption spectroscopy.

Learning Outcomes

At the end of unit, students will be able to

1. Different types of vitamins and minerals, sources of food and their deficiency causing diseases.
2. Analysis of vitamins and minerals by different analytical methods.

UNITV

Chromatographic Techniques: Definition of chromatography, different types of chromatographic techniques, planar chromatography:paper chromatography, thin layer chromatography. Column chromatography: size exclusion chromatography, affinity chromatography, high performance chromatography, gas chromatography,reverse phase chromatography, hydrophobic interaction chromatography.

Learning Outcomes

At the end of unit, students will be able to

1. Different types of chromatographic techniques, principle, working procedure and accessories.
2. Wide applications of chromatographic techniques in food industry.

Textbooks

1. S.S. Nilson, Food Analysis, Aspen Publishers, Gaithery Berg, Mary Land. AOAC methods For Food Analysis.
2. Y. Pomeranz and C.E. Meloan, Food Analysis, Theory and practice, A.V.I Publishing Company, INC West Port, Connecticut, U.S.A.
3. R.Fennema –Food chemistry (Third edition)

References

1. Mu P, Plummer DT. Introduction to practical biochemistry. Tata McGraw-Hill Education; 2001.
2. Sadasivam S. Biochemical methods. New age international; 1996.
3. Mano RanjanKalia, Food Analysis and Quality Control. Kalyani Publishers, 2002
4. Jayaraman J, Jayaraman J. Laboratory manual in biochemistry. Delhi: Wiley Eastern; 1981.

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II Year - II Semester		L	T	P	C
		3	0	0	3
PROCESSING OF CEREALS, PULSES AND OILSEEDS					

Course Objectives

- To learn about the processing of major cereals, pulses&oil seeds.
- To acquaint with production trends, structure, composition, quality evaluation and processing technologies for product development and value addition of various cereals, pulses, and oilseeds.

Course Outcomes

At the end of this module, the student will be able to:

- Understand the basic composition and structural parts of food grains.
- Aware the importance of physico-chemical properties of food grains.
- Understand the basics of milling operations for food grains.
- Identify the problems associated with milling of grains and their solution.
- Get information about the classification of various grains.
- Exposed to various processing methods and machinery used.
- Learn value added products from all grains.

UNITI

Importance of Cereals Pulses and Oilseeds, Composition, Structure and processing characteristics of Cereal grains, Legumes and Oilseeds, Post-harvest technology, Post-harvest processing practices for safe storage. Rice: Structure, types, composition, quality characteristics and physicochemical properties of Rice. Milling and parboiling of paddy, Curing, and ageing of paddy and rice. Criteria and assessment of milling, cooking, nutritional and storage qualities of raw & parboiled rice. Processed rice products (flaked, expanded, and puffed rice), By-products of rice milling.

Learning Outcomes

At the end of unit, students will be able to

1. Learn composition, structure and processing of cereals, legumes & oilseeds.
2. Know the post processing operations for storage and further processing.
3. Knowledge of milling and parboiling of paddy and other processing methods.
4. Importance of quality assessment related to rice and rice products.
5. Knowledge on value added products and by products of rice.

UNITII

Wheat-Structure, Composition, Types, quality characteristics for milling into flour and Semolina. Flour milling, Turbo grinding and air classification, blending of flours, Flour grades and their suitability for baking purposes, Milling equipment and milled products (Dalia, Atta, Semolina and flour). Assessment of flour quality and characteristics, Macaroni products. Dough rheology- influence of flour constituents in dough rheology.Baked products-Ingredients Technology and quality parameters: Bread, Biscuits and Cakes, Crackers.

Learning Outcomes

At the end of unit, students will be able to

1. Acquired knowledge on fundamentals of wheat and its milling.
2. Detailed description of quality parameters and value-added products from wheat.

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UNITIII

Other Cereals: Corn- Structure, types and composition. Dry and wet milling of Corn. Starch and conversion products. Processed corn products (popped corn, corn flakes etc.) Structure and composition of Barley, Malting of barley, Bajra, Jowar and other cereal grains and millets. Pearling of millets. Parched and snack products. Cereal Malts: Basic malting process, malting plant, malt storage, malt characteristics, malt extract, uses; Breakfast cereals – types and manufacturing methods.

Learning Outcomes

At the end of unit, students will be able to

1. Variations in processes of dry and wet milling of corn.
2. Advantages of value-added products from corn.
3. Knowledge of millets and malting process.

UNITIV

Pulses: Pulses production, types, chemical composition, anti-nutritional factors, milling of pulses, milling equipment, factors affecting quality, secondary processing of pulses, processed products, fermented products, traditional products, Value addition; effect of processing on nutritive value. Milling of legume-pulses by traditional and improved processes.

Learning Outcomes

At the end of unit, students will be able to

1. Description of pulses and their importance.
2. Impact of anti-nutritional factors in pulses on processing.
3. Knowledge on milling of pulses and value-added products.

UNITV

Processing of oil seeds for direct use and consumption, Oil extraction methods- mechanical (Ghani and Expellers) and chemical methods (solvent extraction), Processing of extracted oil: Refining, Hydrogenation, Interesterification. Processing of deoiled cake into protein concentrates and isolates, Texturized vegetable protein, Functional protein preparations. Peanut butter, Margarine and Spread.

Learning Outcomes

At the end of unit, students will be able to

1. Explanation of oil extraction methods
2. Need of refining and other processes like hydrogenation etc.
3. Importance of protein derivatives from oilseeds

Textbooks

1. Matz SA. Chemistry and technology of cereals as food and feed. Springer Science & Business Media; 1991 Apr 30.
2. Owens G, editor. Cereals processing technology. CRC Press; 2001 Apr 12.

References

1. D.A.V. Dendy and B.J.Dobraszczyk,Cereals and Cereal products: Chemistry and Technology. Springer, 2001.
2. B.O.Juliano, Rice: Chemistry and Technology, AACC, 2nd Edition, 1985.
3. Y.Pomeranz, Wheat: Chemistry and Technology, AACC, 3rd Edition, 1988.
4. Briggs, Malts and Malting, D. E. Kluwer Academic Publication, 1st Edition, 1997.
5. A. Karleskind, Oils and Fats manual, Lavoisier Publisher, Paris, 1st Edition, 1996.
6. R.H. Mathews, Marcel Dekker, Legumes: Chemistry, Technology and Human Nutrition, 1st Edition, 1989.
7. D. Swer, John Wiley & Sons, Bailey's Industrial Oil & Fat Products, 5th Edition, 2005.
8. K. Kulp and J. G. Ponte. Jr., CRC, Handbook of Cereal Science and Technology, 2nd Edition, 2000.

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II Year - II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS (Common to all Branches)					

Course Objectives

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship, and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects – Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:

Theories of Production and Cost Analyses:

Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

Unit – IV:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

Unit – V:

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Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXTBOOKS:

A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd,

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II Year - II Semester		L	T	P	C
		0	0	3	1.5
PYTHON PROGRAMMING LAB (Common to all Branches)					

Course Objectives

The aim of Python Programming Lab is

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python.

Course Outcomes

By the end of this lab, the student can

- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and Dictionaries
- Use various applications using python.

1. Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2. Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3. Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4. Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5. Use a for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

   ```
   *
   **
   ***
   ****
   ```
6. Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7. Write a program that asks the user for two numbers and prints Close if the numbers are within .001 of each other and Not close otherwise.
8. Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9. Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters abcde and *ABCDE* the program should print out *AaBbCcDdEe*.
10. Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.

11. In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
12. Write a program that generates a list of 20 random numbers between 1 and 100.
    (a) Print the list.
    (b) Print the average of the elements in the list.
    (c) Print the largest and smallest values in the list.
    (d) Print the second largest and second smallest entries in the list
    (e) Print how many even numbers are in the list.
13. Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
14. Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.
15. Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
16. Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.
17. Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
18. Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
19. Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
20. Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
21. Write a function called root that is given a number x and an integer n and returns x1/n. In the function definition, set the default value of n to 2.
22. Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
23. Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
    (a) Do this using the sort method. (b) Do this without using the sort method.
24. Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
25. Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
26. Write a program that reads a list of temperatures from a file called temps.txt, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.

27. Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method get_price that receives the number of items to be bought and returns the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called make_purchase that receives the number of items to be bought and decreases amount by that much.
28. Write a class called Time whose only field is a time in seconds. It should have a method called convert_to_minutes that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called convert_to_hours that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
29. Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.
30. Write a Python class to implement pow(x, n).
31. Write a Python class to reverse a string word by word.
32. Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
33. Write a program to demonstrate Try/except/else.
34. Write a program to demonstrate try/finally and with/as.

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B. Tech-FOOD ENGINEERING

II Year - II Semester		L	T	P	C
		0	0	3	1.5
FOOD CHEMISTRY LAB					

Course Objectives

To expertise the students to analyze the proximate composition and other important constituents present in the food.

Course Outcomes

By the end of the practical exercises, the students will be able to

- Adapts suitable method for food analysis.
- Apply the knowledge of Techniques in Food Analysis,
- Differentiate between Qualitative identification and Quantitative estimations.

Laboratory Experiments

1. Sampling plan; Sampling requirements, Sample collection and preparation for analysis procedures and methods
2. Determination of pH
3. Determination of moisture content of foods by oven drying and distillation methods.
4. Determination of Total and Acid insoluble ash content in foods
5. Determination of crude fat content by solvent extraction methods in foods
6. Determination of crude Protein by Kjeldahl, Lowry method & other methods
7. Determination of reducing and total sugar content in foods
8. Determination of crude fiber content in foods
9. Determination of specific mineral contents such as Calcium, Iron, Phosphorus, Chlorideetc. in foods.
10. Determination of specific vitamin content of food such as ascorbic acid, carotenes etc.
11. Determination of specific Natural and/ or added Coloring Matters in foods
12. Determination of specific added food Preservatives in foods

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II Year - II Semester		L	T	P	C
		0	0	3	1.5
PROCESSING OF CEREALS, PULSES AND OILSEEDS LAB					

Course Objectives

- Determination of parameters by qualitative and quantitative methods.
- Study on some important unit operations used for some grains.
- Preparation of standard food products.

Course Outcomes

- Students are exposed to learn various parameters determination and quantification.
- Students will be able to prepare and understand the technology involved in foods from grains.
- Students will acquire more knowledge by visiting industries.

Laboratory Experiments

1. Determination of physical properties (Bulk Density, Porosity, Sphericity, Angle of repose, Test weight, Particle size, Sieve analysis) of different grains.
2. Determination of Gluten content, sedimentation value, alcoholic acidity, water absorption capacity and Polenske value of wheat flour.
3. Determination of adulterant ($NaHCO_3$) in wheat flour/ Maida.
4. Determination of alkali score and gelatinization temperature of rice.
5. Effect of Traditional and improved pre-treatmentdehusking of some legumes.
6. Removal of anti-nutritional compounds from selected pulses and oilseeds.
7. Study of cooking quality of Dhal.
8. Pearling of some millets.
9. Determination of yeast activity.
10. Determination of different quality parameters of oils.
11. Determination of efficiency of oil extraction techniques (mechanical expelling and solvent extraction).
12. Preparation of Bread.
13. Preparation of Biscuits.
14. Preparation of Cookies.
15. Preparation of Cake.
16. Preparation of Rusk.
17. Preparation of Crackers.
18. Visit to a Bakery, Confectionery Unit
19. Visit to a modern roller flour mill and FCI godowns.
20. Visit to rice mill.

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B. Tech-FOOD ENGINEERING

II Year - II Semester		L	T	P	C
		1	0	2	2
INSTRUMENTATION & PROCESS CONTROL					

Course Objectives

- To understand the different instruments used in different operations of food industries.
- To impart knowledge about the various techniques used for the measurement of primary industrial parameters like flow, level, temperature, pressure etc.

Course Outcomes

- The students become familiar with the identification of different instruments and controls used in various operations.
- Solutions to tackle the problems encountered in use and operation of different instruments.

UNIT I

Introduction, definitions, characteristics of instruments, functional elements, performance characteristics of instrumentation systems-static and dynamic characteristics; Temperature and temperature scales; Various types of thermometers; thermocouples, resistance thermometers and pyrometers.

Learning Outcomes

At the end of unit, students will be able to understand the following:

1. Introduction, definitions, characteristics of instruments, functional elements
2. Performance characteristics of instrumentation systems-static and dynamic characteristics
3. Temperature and temperature scales
4. Various types of thermometers; thermocouples, resistance thermometers and pyrometers

UNIT II

Pressure and pressure scales, manometers, pressure elements differential pressure; Liquid level measurement, different methods of liquid level measurement; Flow measurement: Kinds of flow, rate of flow, total flow differential pressure meters, variable area meters, food flow metering; Weight measurement: Mechanical scale, electronic tank scale, conveyor scale.

Learning Outcomes

At the end of unit, students will be able to understand the following:

1. Pressure and pressure scales, manometers, pressure elements differential pressure
2. Liquid level measurement, different methods of liquid level measurement
3. Flow measurement: Kinds of flow, rate of flow, total flow differential pressure meters, variable area meters, food flow metering
4. Weight measurement: Mechanical scale, electronic tank scale, conveyor scale

UNIT III

Measurement of moisture content, specific gravity, measurement of humidity, measurement of viscosity, turbidity, color, measurement of density, brix, pH, enzyme sensors, automatic valves; Transmission: Pneumatic and electrical; Control elements, control actions, pneumatic and electrical control systems.

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Learning Outcomes

At the end of unit, students will be able to understand the following:

1. Measurement of moisture content, specific gravity and humidity
2. Measurement of viscosity, turbidity, color
3. Measurement of density, brix, pH, enzyme sensors, automatic valves
4. Transmission: Pneumatic and electrical; Control elements, control actions, pneumatic and electrical control systems

UNIT IV

Process control: Definition, simple system analysis, dynamic behavior of simple process, Laplace transform, process control hardware; Frequency response analysis, frequency response characteristics, Bode diagram and Nyquist plots and stability analysis; Transducers: Classification, self-generating transducers, variable parameter type, digital, actuating and controlling devices;

Learning Outcomes

At the end of unit, students will be able to understand the following:

1. Definition of Process control, simple system analysis, dynamic behaviour of simple process, Laplace transform, process control hardware.
2. Frequency response analysis, frequency response characteristics, Bode diagram and Nyquist plots and stability analysis.
3. Transducers: Classification, self-generating transducers, variable parameter type, digital, actuating and controlling devices.

UNIT V

Controllers and indicators: Temperature control, electronic controllers, flow ratio control, atmosphere control, timers and indicators, food sorting and grading control, discrete controllers, adaptive and intelligent controllers; Computer-based monitoring and control: Importance, hardware features of data acquisition and control computer, signal interfacing, examples in food processing.

Learning Outcomes

At the end of unit, students will be able to understand the following:

1. Temperature control, electronic controllers, flow ratio control, atmosphere control, timers, and indicators
2. food sorting and grading control, discrete controllers, adaptive and intelligent controllers
3. Computer-based monitoring and control: Importance, hardware features of data acquisition and control computer, signal interfacing, examples in food processing

Textbooks

1. E O Doeblin and D N Manik. Measurement Systems: Applications and Design - Tata McGraw Hill, 2003.
2. Lipták BG, editor. Instrument Engineers' Handbook, Volume One: Process Measurement and Analysis. CRC press; 2003 Jun 27.
3. Johnson CD. Process control instrumentation technology. Pearson; 2014.
4. D.V.S. Murty. Transducers and Instrumentation. Prentice-Hall of India Pvt. Ltd. New Delhi, 2004.

References

1. Harriott P. Process control. Tata McGraw-Hill Education; 1984.
2. Bandyopadhyay R, Patranabis D. A new autotuning algorithm for PID controllers using dead-beat format. ISA transactions. 2001 Jul 1;40(3):255-66.
3. B C Kuo. Automatic Control Systems, 2002.
4. Process system Analysis & Control, D.R. Coughanoowr, McGraw Hill Publication.

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B. Tech-FOOD ENGINEERING

INSTRUMENTATION & PROCESS CONTROL LAB

Course Objectives

- To calibrate and determine the time lag of various first and second order instruments.
- To determine the response in single and two capacity systems with and with-out interaction.
- To understand the advanced control methods used for complex processes in the industries. Different experiments like Flow, Level and Cascade control can be configured and studied.
- To study the open loop (Manual control) and the ON/OFF controller, Proportional controller, PI controller, PD controller, PID controller, Tuning of controller (Open loop and close loop methods).
- To understand the control valve operation and its flow characteristics.
- To determine the damping coefficient and response of U-tube manometer.

Course Outcomes

The student will be able to

- Understand the hysteresis of pressure gauge tester and control valves.
- Characteristics of different types of temperature sensors.
- Determine the discharge coefficient for different types of flow measurement apparatus.
- Estimate the dynamic characteristics of first and second order systems.
- Apply the advanced control methods used for complex processes in the industries.
- Screen and suggest controllers like On/Off, P, PI, PD and PID for process systems.
- Identify the stability of the system.

List of Experiments

1. Study of hysteresis of bourdon tube pressure gauge tester
2. Temperature Measurement apparatus:
    a) Study the characteristics of different types of temperature sensors: RTD, Thermistor,Temperature transmitter and thermocouple.
    b) Determine the time constant and study the characteristics of bi-metallic thermometer.
    c) Study the see back effect.
3. Flow measurement apparatus:
   Study of different types of flow measurement devices: Venturi meter, orifice meter, watermeter,rotameter, and Pitot tube.
4. Determination of time constant & transportation lag for mercury in glass thermometer with and without thermal well.
5. Sinusoidal response of mercury in glass thermometer with and without thermal well.
6. Study of dynamic response of single tank liquid level system, two tank non-interacting andinteracting liquid level systems.
7. Study of dynamic response of two tank Determination of damping coefficient for U-tube:
    a) Water manometer
    b) Mercury manometer
8. Study of control valve characteristics and determine valve flow coefficient for the following valves:
    a) Equal percentage valve
    b) Quick opening valve
    c) Linear valve

9. Determination of hysteresis for the following valves:
    a) Equal percentage valve
    b) Quick opening valve
    c) Linear valve
10. Temperature control trainer:
    a) Open loop response
    b) On-off control
    c) P-control
    d) PID-control
    e) Auto tuning
11. Level control trainer:
    a) Open loop response
    b) On-off control
    c) P-control
    d) PID-control
    e) Auto tuning
12. Pressure control trainer:
    a) Open loop response
    b) On-off control
    c) P-control
    d) PID-control
    e) Auto tuning
13. Force Measurement.
14. Measurement of level by capacitance method.