B.Tech Food Engineering & Technology Syllabus Structure and Details
(July 2020 onwards)

Course No.	Course Name	L	T	P	C	Course No.	Course Name	L	T	P	C
	Semester I						**Semester II**				
UPH101	Engineering Physics	3	1	0	8	UCH201	Engineering Chemistry	3	1	0	8
UMA101	Engineering Mathematics-I	3	1	0	8	UMA201	Engineering Mathematics-II	3	1	0	8
UEE101	Basic Electrical Engineering	3	1	0	8	UCSE201	Programming for Problem Solving	4	1	0	10
UHSS101	English Communication	2	0	0	4	UCE201	Engineering Drawing and Computer Graphics	1	0	0	2
UME101	Engineering Workshop	1	0	0	2	UHSS201	Professional Ethics and Human Value	2	0	0	4
UPH171	Engineering Physics Lab	0	0	3	3	UCH271	Engineering Chemistry Lab	0	0	2	2
UEE171	Basic Electrical Engineering Lab	0	0	2	2	UCSE271	Programming for Problem Solving Lab	0	0	3	3
UHSS171	English Communication Practice	0	0	2	2	UCE271	Engineering Drawing and Computer Graphics Lab	0	0	4	4
UME171	Workshop Practice	0	0	4	4						
Contact Hours: 26		**12**	**3**	**11**	**41**	**Contact Hours: 26**		**13**	**3**	**9**	**41**
	Semester III						**Semester IV**				
UFET301	Principles of Food Processing and Preservation	3	0	0	6	UFET404	Food Microbiology and Food Biotechnology	3	0	0	6
UFET302	Food Chemistry	3	0	0	6	UMA401	Numerical Methods & Computer Programming	3	0	0	6
UFET303	Biochemistry and Human Nutrition	3	0	0	6	UFET401	Food Product Technology-I (Fruits & Vegetables)	3	0	0	6
UFET304	Basic Microbiology	3	0	0	6	UFET402	Food Product Technology-II (Cereals & Legumes)	3	0	0	6
UME301	Basic Thermodynamics	3	0	0	6	UFET403	Fluid Mechanics	3	0	0	6
UME302	Engineering Mechanics	3	0	0	6	UHSS401	Engineering Economics	3	0	0	6
UFET371	Food Processing Lab	0	0	2	2	UFET471	Product Technology- I /II Lab	0	0	2	2
UFET372	Food Chemistry Lab	0	0	2	2	UFET474	Food Microbiology Lab	0	0	2	2
UFET373	Biochemistry and Human Nutrition Lab	0	0	2	2	UMA471	Numerical Methods & Computer Programming Lab	0	0	2	2
UHSS371	Language Lab	0	0	2	2						
Contact Hours: 26		**18**	**0**	**8**	**44**	**Total Contact Hours 24**		**18**	**0**	**6**	**42**
	Semester V						**Semester VI**				
UHSS501	Industrial Management and Entrepreneurship	3	0	0	6	UHSS601	Professional Communication	2	0	0	4
UFET501	Food Product Technology-III (Milk and Milk Products)	3	0	0	6	UFET601	Food Packaging Technology	3	0	0	6
UFET502	Food Process Engineering	3	0	0	6	UFET602	Food Analysis, Quality Control and Management	3	0	0	6
UFET503	Food Process Equipment Design	3	0	0	6	UFET61*	Elective-I	3	0	0	6
UFET504	Fundamentals of Heat and Mass Transfer	3	0	0	6	UFET61*	Elective-II	3	0	0	6
UFET505	Food Industry Waste Management	3	0	0	6	UIE604	Process Control and Instrumentation	3	0	0	6
UFET571	Product Technology-III Lab	0	0	2	2	UFET671	Food Packaging Technology Lab	0	0	3	3
UFET572	Food Engineering Lab	0	0	2	2	UFET672	Food Analysis and Quality Control Lab	0	0	2	2
UFET573	Process Equipment Drawing	0	1	3	4	UFET681	Product Technology- IV/V Lab	0	0	3	3
UFET574	Transfer Process Engineering Lab	0	0	2	2	UIE674	Instrumentation Lab	0	0	2	2
Total Contact Hours 25		**18**	**0**	**9**	**46**	**Total Contact Hours 27**		**17**	**0**	**10**	**44**
	Semester VII						**Semester VIII**				
UFET701	Food Hygiene and Plant Sanitation	3	0	0	6	UFET801	Plant Design and Project Engineering	3	0	0	6
UFET71*	Elective- I	3	0	0	6	UFET81*	Elective-I	3	0	0	6
UFET71*	Elective- II	3	0	0	6	UFET81*	Elective-II	3	0	0	6
UFET71*	Elective- III	3	0	0	6	UFET891	Major Project-II	0	0	12	12
UFET791	Major Project-I	0	0	10	10	UFET892	Project Defense	-	-	-	4
UFET792	Report and Presentation on Practical Training-II	-	-	-	3	UFET893	Comprehensive Viva Voce	-	-	-	4
UFET770	Seminar	0	0	3	3						
Contact Hours: 25		**12**	**0**	**10**	**40**	**Total Contact Hours: 21**		**9**	**0**	**12**	**38**
Total Mandatory Credits: 336											

Semester I

Paper code: UPH101
Paper name: Engineering Physics   **Credit: 8**
Total contact hours: 40   **L-T-P: 3-1-0**

1. **Mathematical Physics:**
   Vector and Scalar field, grad, divergence, curl, Laplacian, line integral, surface integral, volume integral, physical examples in the context of electricity and magnetism, Stokes theorem, Gauss theorem (No proof).   [5]

2. **Electrodynamics:**
   Gauss Law of electrostatics, Biot-Savart Law, Ampere's Law, Displacement current, Equation of Continuity, Maxwell's equations in differential and integral form, Maxwell's wave equation in free space, propagation of EM wave in free space, transverse nature of EM wave. [6]

3. **Heat and thermodynamics**:
   Thermodynamic system and state variables, Heat &Work, Zeroth Law, 1st and 2nd laws of thermodynamics, Isothermal and adiabatic changes, Carnot theorem, Carnot engine, entropy, pyrometer. [5]

4. **Wave and Oscillations:**
   - Transverse wave on a string, reflection and transmission of waves at boundary, impedance matching, standing waves and their eigen frequencies, acoustics waves and speed of sound.
   - Simple harmonic motion, Damped oscillation-its differential equation, energy decay in a damped oscillation, Forced vibration, Resonance, Sharpness of resonance and quality factor. [8]

5. **Introduction to Quantum Mechanics:**
   Wave-Particle duality, Black body radiation, Photoelectric effect, Compton effect, Uncertainty principle, wave function, the Schrodinger time dependent and time independent equations, application of Schrodinger equation for free particle in one dimensional infinite potential box. [6]

6. **Optics and Optoelectronics:**
   - Huygens' Principle, superposition of waves and interference of light, Young's double slit experiment, Newton's rings, Diffraction, Single slit diffraction, grating.
   - LASER: Einstein's theory of matter radiation interaction and A and B coefficients, amplification of light by population inversion, properties of laser: monochromaticity, coherence, directionality and brightness, different types of laser: gas lasers (He-Ne) and solid state laser (Ruby), applications of laser in science, engineering and medicine.

- Light emitting diodes (LED): device structure, materials, characteristics and figures of merit. [10]

Books / References:

1. *Engineering Physics, Malik and Singh, Tata Mc Graw Hill*
2. *Engineering Physics, Naidu, Pearson*
3. *Engineering Physics, Gupta & Gaur, Dhanpat Rai*
4. *Quantum Mechanics, Ajay Ghatak S. Lokanathan, Trinity*
5. *Quantum Mechanics: A Text Book for undergraduates, Mahesh C Jain, TMH*
6. *Thermodynamics and kinetic theory of gases*, W. Pauli, Dover Publications, 2010
7. *Electromagnetic Theory, Prabir K. Basu & Hrishikesh Dhasmana, AneBooks*
8. *Introduction to Electrodynamics, David Griffiths*
9. *Electricity, magnetism and light, W. Saslow*
10. *Oscillations and waves in physics, Ian G. Main,*
11. *The physics of vibrations and waves, H.J. Pain,*
12. *Arthur Beiser, Concepts of Modern Physics (Sixth Edition), Tata McGraw-Hill Publication, New Delhi (1988).*

Paper Name: Engineering Physics Lab   **Credit: 3**
Paper code: UPH171   **L-T-P: 0-0-3**

List of experiments:

Experiment No 1: To determine the magnetic moment of a bar magnet and the horizontal component of the earth's magnetic field.

Experiment No 2: To study the Hall Effect in semiconductor (Germanium Crystal) and then to calculate the Hall coefficient.

Experiment No 3: To Verify Stefan-Boltzmann law of thermal radiation by electrical method.

Experiment No 4: To determine the coefficient of thermal conductivity of a bad conductor (glass) by using Lee's Disc apparatus.

Experiment No 5: To study the variation of time period of a bar pendulum about different axes and determine the value of acceleration due to gravity (g) at the place.

Experiment No 6: To determine the wavelength of sodium light by measuring the diameters of Newton's Rings.

Experiment No 7: To determine the wavelength of Laser light by using diffraction grating.

Experiment No 8: To determine the grating element by using sodium vapour lamp.

Experiment No 9: To determine the value of Planck's constant with the help of vacuum phototube.

Experiment No 10: To study the current flowing through an external circuit by a potentiometer and determine the internal resistance of a standard cell.

Paper code: UMA101
Paper name: Engineering Mathematics-I   **Credit: 8**
Total contact hours: 40   **L-T-P: 3-1-0**

Module 1: Calculus-I   (15hours)

Successive derivative, Libnitz's Theorem, Tangentand Normal, Derivation of arc length (Cartesian and Polar coordinates), curvature, partial derivatives, homogeneous functions. Expansions of functions using Taylor's theorem

Beta and Gamma functions and their properties,applications of definite integrals.

Module 2: Sequences and Series   (10 hours)

Convergence of sequence and series, tests for convergence (Comparison test, Ratio test,Cauchy's Root test),Fourier series, Change of intervals, Half range sine and cosine series.

Module 3: Multivariable Calculus   (15 hours)

Differentiation of vector functions, scalar and vector filed, gradient of a scalar function, directional derivatives,divergence, curl and their properties, integration of vector functions, line, surface and volume integral, Green's, Gauss's and Stoke's Theorems.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics

Paper code: UHSS101
Paper name: ENGLISH COMMUNICATION   **Credit: 4**
Total contact hours:39   **L-T-P: 2-0-0**

Module 1: Vocabulary Building:
        1.1 Word Formation
        1.2 Root words from foreign languages and their use in English
        1.3 Understanding prefixes and suffixes to form derivatives
        1.4 Antonyms and Synonyms, Functional Vocabulary, Idioms and
            Phrasal Verbs
	Contact hours: 3

Module 2: Basic Writing Skills
        1.1 Sentence Structure
        1.2 use of phrases and clauses in sentences
        1.3 Importance of proper punctuation
        1.4 Creating Coherence
        1.5 Organizing Principles of paragraph in documents
        1.6 technicques of writing precisely
	Contact hours: 4

Module 3: Identifying Common Errors in Writing	Contact hours: 4

1.1 Subject-verb Agreement
    1.2 Noun-pronoun agreement
    1.3 Effective Principles of Sentence Structure
    1.4 Misplaced Modifiers
    1.5 Articles
    1.6 Prepositions
    1.7 Redundancies
    1.8 Cliches	

Module 4: Nature and Style of Sensible Writing	Contact hours: 4

1.1 Describing
    1.2 Defining
    1.3 Classifying
    1.4 Providing examples or evidence
    1.5 Writing Introduction and Conclusio	

Module 5: Business Writing	Contact hours: 4

1.5 Letter Writing, Memo, Report
    1.6 Email
    1.7 CV, Resume	

Module 6: Oral Communication (The Unit involves interactive practice sessions in language Lab) 6.1 IPA Symbols, pronunciation, Intonation, Stress and Rhythm 6.2 Listening Comprehension 6.3 Common Everyday Situations: Conversation and dialogues 6.4 Communication at work place 6.5 Interviews 6.6 Formal Presentations	Contact hours: 4
Module 7: Learning Language through Literature 7.1 Novel: R.K. Narayan *The Guide* 7.2 Poem: John Keats *Ode to a Nightingale* and *Ode to a Gracian Urn*	Contact hours: 4

BOOKS RECOMMENDED:
(1) Practical English Usage, Michael Swan, OUP,1995
(2) Remedial English Grammar, F.T. Wood, Macmillan, 2007
(3) On Writing Well, William Zinsser, Harper Resource Book, 2001
(4) Study Writing, Liz Hamp-Lyons and Ben Heasely, CUP, 2006
(5) Communication Skills, Sanjay Kumar and PushpLata, OUP, 2011
(6) Exercises in Spoken English, Parts-I-III, CIEFL, Hyderabad, OUP

Paper code: UHSS171;
Paper name: English Communication Practice   **Credit: 2**
Total contact hours: 40   **L-T-P-C: 0-0-2-2**

Module 1 Listening Practices
    1.1 Enhancing listening skills
    1.2 Different types of listening
    1.3 How to be a good listener
    1.4 Barriers to Effective Listening
	Contact hours: 3

Module 2: Speaking Skills
    2.1 The sounds of English
    2.2 Benefits of Speaking
    2.3 Self Development through Speaking Skills
	Contact hours: 4

Module 3: Reading Skills
    3.1 Definition
    3.2 Kinds of reading
    3.3 Critical Reading Practices
    3.4 Reading Method
    3.5 Reading Speed
       Skimming
       Scanning
       Active Reading
	Contact hours: 4

Module 4: Writing Skills
    4.1 Purpose
    4.2 Importance of Style
    4.3 Essay
    4.4 Business Writing
	Contact hours: 4

Module 5: Remedial English Grammar
    5.1 Tense
    5.2 Subject Verb agreement
    5.3 Relative Clauses
    5.4 Prepositions
    5.5 Understanding voice changes	

BOOKS and Software RECOMMENDED:
(1) Practical English Usage, Michael Swan, OUP,1995
(2) Remedial English Grammar, F.T. Wood, Macmillan, 2007
(3) On Writing Well, William Zinsser, Harper Resource Book, 2001
(4) Study Writing, Liz Hamp-Lyons and Ben Heasely, CUP, 2006
(5) Communication Skills, Sanjay Kumar and PushpLata, OUP, 2011
(6) Exercises in Spoken English, Parts-I-III, CIEFL, Hyderabad, OUP
(7) Study Skills in English, Michael J.Wallace, CUP]
(8) Sky Pronunciation
(9) Tense Buster
(10) Business Writing

Paper code: UME101
Paper name: Engineering Workshop   **Credits: 2**
Total contact hours: 12   **L-T-P: 1-0-0**

Module 1: Carpentry shop   (2 hrs)
         i.   Introduction with the shop
        ii.   Various structure of wood and types of wood
       iii.   Different types of tools, machine and accessories used in Carpentry shop
       iv.   Safety Precautions in workshop
Module 2: Fitting Shop   (2 hrs)

  i. Introduction with the fitting shop
  ii. Various marking, measuring, cutting, holding and striking tools
  iii. Different Operations like chipping, filing, marking drilling etc.
  iv. Working principle of drilling machine, lapping dies etc.

Module 3: Welding Shop   (2 hrs)
  i. Introduction
  ii. Types of Welding, Arc Welding, Gas Welding, Gas Cutting
  iii. Welding of dissimilar materials, selection of welding rod material, size of rod and work piece
  iv. 3 Different types of flames
  v. Elementary symbolic Representation
  vi. Safety and precautions

Module 4: Machine Shop   (2 hrs)
  i. Introduction
  ii. Study of Different types of Lathe machine, shaping machine, Drilling machine
  iii. Study of Different types of hand tools and machine tools and parts
  iv. Safety & precautions

Module 5 :Turning shop   (2 hrs)
 i. Introduction
 ii. Various marking, measuring, cutting, holding, and string tools
 iii. Working principle of Drilling machine, tapping, dies, its uses
 iv. Safety precautions

Module 6: Electrical Shop   (2 hrs)
 i. Introduction
 ii. Various terms and instruments used in electrical wiring
 iii. Study of different tools used in simple house wiring
 iv. Difference between ac and dc line

Suggested Text/Reference Books:
(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
(ii) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
(iii) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Paper code: UME171
Paper name: Workshop Practice   **Credits: 4**
Total contact hours: 36   **L-T-P: 0-0-4**

Module 1: Carpentry shop   (6 hrs)
  Demo of different wood working tools and machines
  Demo of different wood working processes
  Simple joints like T joints, Cross halving joint, dovetail joint etc.
  One simple utility job.

Module 2: Fitting Shop   (6 hrs)
  Demo of different fitting tools and machines and power tools
  Demo of different processes in fitting shop
  Squaring of a rectangular metal piece
  Making a V-block of metal piece
  One simple utility job.

Module 3: Welding Shop   (6 hrs)
  Demo of different welding tools and machines
  Demo of Arc Welding, Gas Welding, Gas Cutter and rebuilding of broken parts with welding
  Any one Composite job involving lap joint welding process.

Module 4: Machine Shop   (6 hrs)
  Demo of different machines and their operations
  Preferably prepare a simple job (e.g Turning operation etc)

Module 5 Turning shop   (6 hrs)
  Demo of lathe machine, drilling machine

One job related to plane and taper turning , threading and knurling
One job related to drilling and tapping

Module 6 Electrical Shop   (6 hrs)
Demo of simple house wiring and use of tools
One job related to simple house wiring
Fittings of cut outs, fuses and other simple fittings etc.
Difference between Single phase wiring and three phase wiring

Paper code: UEE101
Paper name: Basic Electrical Engineering   **Credit: 8**
Total contact hours: 40   **L-T-P: 3-1-0**

Module 1:   Contact hours: 2
Introduction: Sources of energy; General structure of electrical power systems, Power transmission and distribution via overhead lines and underground cables.

Module 2:   Contact hours: 6
DC circuits: Definitions of active, passive, linear, non-linear circuits elements and networks, Kirchoff's laws, Nodal and mesh analysis, voltage and current sources, network theoremssuperposition. Thevenin's, Norton's, maximum power transfer, millman's, and reciprocity
theorems, analysis of simple circuits with DC excitation.

Module 3:   Contact hours: 8
Single phase AC circuits: generation of single phase sinusoidal EMF, instantaneous, average and effective value, form and peak factor, examples of other alternating waveforms and average and effective value calculations, concept of phasor and phasor diagrams, lagging and leading of phasors, pure resistive, inductive and capacitive circuits, power factor, complex power, R-L, R-C and R-L-C series circuits, parallel AC circuits, series and parallel resonance.

Module 4:   Contact hours: 4
Three phase AC circuits: Generation of three phase EMF, delta and star connections, line and phase value of emf and current, solutions of simple 3-phase balance circuits with resistive and inductive loads, 3-phase power, comparison between 3-phase and 1-phase systems, applications of 3-phase systems.

Module 5:   Contact hours: 5
Magnetic circuits: Ampere's circuital law, B-H curve, definition of mmf, flux, flux-density and reluctance, comparison between electric and magnetic circuits, series, parallel and series-parallel circuits and their solutions, energy stored in magnetic circuit, lifting magnets, electromagnetic induction, self and mutual inductance, hysteresis and eddy current losses.

Module 6:   Contact hours: 5
Electrical machines: Introduction of electrical machines, classifications (DC and AC machines), transformers, technical specifications, reading of nameplate data, general applications (especially 1-phase and 3-phae induction motors).

Module 7:   Contact hours: 5
Electrical measuring instruments: Classification of instruments, essentials of indicating type instruments – deflecting torque, controlling torque, damping, types of indicating instruments, MC and MI type ammeters and voltmeters, extension of range, use of shunts and multiplier, errors and compensation.

Module 8:   Contact hours: 5
Electrical installations: Electrical wiring and type, fuse and its ratings, types of wires and cables, LT switch gears: MCB, ELCB, MCCB etc. Earthing and its importance. Electrochemical power sources: primary and secondary cells, classifications of secondary cells based on applications, Lead-acid cell, electrical characteristics of lead-acid cell, maintenance, charging methods of batteries.

Books / References:
(i) D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.

(ii) D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(iii) B.L. Thereja, A.K. Thereja, " A Textbook of Electrical Technology", S.Chand

Paper code: UEE171
Paper name: Basic Electrical Engineering Lab   **Credit: 2**
Total contact hours: 18   **L-T-P: 0-0-2**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, rheostat and wattmeter.
2. Make a measured resistance from a given rheostat
3. Verification of Kirchhoff's laws
4. Verification of Superposition theorem
5. Verification of Thevenin's theorem
6. Verification of Maximum Power Transfer theorem
7. Measurement of voltage, current, power and power factor in single phase AC circuits.
8. Measurement of lamp's filament resistance.
9. Wiring

Semester II

Paper code: UCH201
Paper name: Engineering Chemistry   **Credit: 8**
Total contact hours: 40   **L-T-P: 3-1-0**

UNIT:1 Molecular Structure and Quantum Mechanics: Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.Molecular orbital and quantum mechanics: Schrodinger equation, Eigen function, orthogonal and orthonormal.   (6L)

UNIT:2 Electrochemistry: Electrochemical Cells – EMF of a cell, Electrodes, reference electrodes, application of Nernst equation and related problems. Principle of fuel cell, lead acid battery. Corrosion and material oxidation   (4L)

UNIT:3 Reaction dynamics and Thermodynamics: Reaction laws: rate and order; molecularity; first and second order kinetics; (Arrhenious equation) catalysis. Laws and applications of thermodynamics, 1st law and 2nd law, Carnot cycle and related problems.   (8L)

UNIT:4 Instrumental Methods of Analysis: Introduction to sophisticated instrumental techniques for characterization of compounds, materials, metals such as Powder X-ray diffraction, surface area, IR, UV,-Vis, NMR, SEM, TEM and GCMS   (3L)

UNIT:5 Structure, Reactivity of Organic Molecules and Synthesis of Drug Molecule: Concept of electron displacement and their applications, types of intermediate organic species, brief study of some addition, elimination and substitution reaction, cyclization and ring openings. Benzyne reaction, Chichibabin reaction, Hoffman Exhaustive reactions, few important name reactions, to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.   (5L)

UNIT:6 Polymerization: Concepts, classifications and industrial applications; polymerization processes, degree of polymerization (addition and condensation polymerization); preparation, structure and use of some common polymers: plastic (PE, PP, PVC, Bakelite), rubber (natural rubber, SBR, NBR), fibre (nylon 6,6; polyester); conducting and semiconducting polymers.   (4L)

UNIT:7 Industrial Chemistry: Solid liquid and gaseous fuels; constituents of coal, carbonization of coal, coal analysis, proximate and ultimate analysis, classification of coal, petroleum, gasoline. Octane number, cetane number, aviation fuel, natural gas, water gas.   (4L)

UNIT:8 Materials Engineering: Concept of nano-chemistry, new forms of carbon, S.W.C.N.T., M.W.C.N.T., Liquid crystals.   (4L)

UNIT:9 Biochemistry: Carbohydrates, lipids, amino acids, proteins, Nucleic acid– DNA and RNA, Vitamins and hormones – sources and application.   (2L)

Paper name: Engineering Chemistry Lab   **Credit: 2**
Paper code: UCH271   **L-T-P: 0-0-2**

Experiment-1: <u>Aim of the experiment:</u>*To determine the coefficient of viscosity of the glycerol by using Ostwald's viscometer.*

Experiment-2: <u>Aim of the experiment:</u>*To determine the surface tension of the given liquid with respect to water at room temperature by using Stalagnometer.*

Experiment-3: <u>Aim of the experiment:</u>*To identify acid radicals be dry and wet tests.*

Experiment-4 <u>Aim of the experiment:</u>*To identify basic radicals be dry and wet tests*

Experiment-5 <u>Aim of the experiment:</u>*Preparation of standard solution of Na_2CO_3*

Experiment-6 <u>Aim of the experiment:</u>*Preparation of standard solution of oxalic acid.*

Experiment-7 <u>Aim of the experiment:</u>*Determination of strength of H_2SO_4 by titrating with 0.1 N Na_2CO_3*

Experiment-8 <u>Aim of the experiment:</u>*Determination of strength of NaOH by titrating with 0.1 N HCL*

Experiment-9 <u>Aim of the experiment:</u>*Redox Titration $KMnO_4$ Vs $H_2C_2O_4$*

Experiment-10 <u>Aim of the experiment:</u>*Introduction to sophisticated instruments like FT-IR, UV-Visible and GC*

Text/Reference Books:
1. S. Chawla, *A Text Book of Engineering Chemistry*, Dhanpat Rai Publishing Co.
2. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Co.
3. Atkins, *Physical Chemistry*, Oxford.
4. J. D. Lee, *Concise Inorganic Chemistry*, Blackwell Science.
5. V.R. Gowariker, N.V. Viswanathan, J. Sreedhar, *Polymer Science*, New Age International Publisher.
6. A.K. Chandra, *Introductory Quantum Chemistry*, 4th Edition, McGraw-Hill
7. S.K. Ghosh Advanced General Organic Chemistry (A Modern Approach) (Set I & Ii) NCBA Publisher, New Delhi, 2009
8. B. Viswanathan, P. S. Raghavan, Practical Physical Chemistry, Viva
9. Dr. S. Rattan, Experiments in Applied Chemistry, S. K. Kataria& Sons.

Paper code: UMA201
Paper name: Engineering Mathematics-II   **Credit: 8**
Total contact hours: 40   **L-T-P: 3-1-0**

Module –1: Matrices   (10 hours)

Inverse and rank of a matrix,rank-nullity theorem, System of linear equations, Symmetric, skewsymmetric and orthogonal matrices, Determinants, Eigenvalues and eigenvectors, diagonalisation of matrices,Cayley-Hamilton Theorem.

Module-2: First order ordinary differential equations   (10 hours)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree,equations solvable for p, equations solvable for x and y, and Clairaut'sform.

Module -3:Ordinary differential equations of higher orders   (8 hours)

Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation,System of linear differential equations.

Module -4: Probability and Statistics   (12 hours)

Probability spaces, conditional probability, independence; Discrete and continuous random variables and their properties, Independent random variables; Expectation of Discrete and continuous random variables, Moments, mean and variance.

Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions.

<u>Reference /Text Books</u>

1. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra,
Affiliated East–West press, Reprint 2005.

3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

7. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
8. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
9. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
10. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
11. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
12. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.

Paper code: UCSE201
Paper name: Programming for Problem Solving   **Credit: 10**
Total contact hours: 75   **L-T-P: 4-1-0**

Module 1: Introduction to Programming   **Contact hours: 10**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm.
Flowchart/ Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Module 2: Arithmetic expressions and precedence   **Contact hours: 7**

Module 3: Conditional Branching and Loops   **Contact hours: 8**

Writing and evaluation of conditionals and consequent branching
Iteration and loops

Module 4: Arrays   **Contact hours: 7**

Arrays (1-D, 2-D), Integer arrays and Strings

Module 5: Basic Algorithms   **Contact hours: 8**

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Module 6: Function   **Contact hours: 8**

Functions (including using built in libraries), Parameter passing in functions, call by value,
Passing arrays to functions: idea of call by reference

Module 7: Recursion   **Contact hours: 5**

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Module 8: Structure   Contact hours: 6

Structures, Defining structures and Array of Structures

Module 9: Pointers   Contact hours: 8

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Module 10: File handling   Contact hours: 8

Books / References:
1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Paper code: UCSE271
Paper name: Programming for Problem Solving Lab   Credit: 3
Total contact hours: 45   L-T-P: 0-0-3

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8 and 9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

Paper code: UCE201
Paper name: Engineering Drawing and Computer Graphics   Credit: 2
Total contact hours: 12   L-T-P: 1-0-0

Module 1: Theory of Lettering and Plane Curves   Contact hours: 2

Essentials of lettering, Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Module 2: Theory of Projection of Points, Lines and Plane Surfaces   Contact hours: 2

Introduction to orthographic projection - principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module 3: Theory of Projection of Solids   Contact hours: 2

Introduction to the concepts and description of methods of drawing projections of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

Module 4: Theory of Projection of Sectioned Solids and Development of Surfaces
Contact hours: 2
Introduction to the concepts and description of sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

Module 5: Theory of Isometric and perspective projections   Contact hours: 2

Principles of isometric projection – Introduction to the concepts and description of isometric scale – Isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions – Perspective projection of simple solids- Prisms, pyramids and cylinders by visual ray method.

Module 6: Basics of AutoCAD   Contact hours: 2

Introduction to AutoCAD, Basics of AutoCAD: applicability and capability, DRAW tools, MODIFY tools, TEXT, DIMENSION, PROPERTIES.

Books / References:

1. *Bhatt N.D. and Panchal V.M., —Engineering Drawing‖, Charotar Publishing House, 50th Edition, 2010.*
2. *Basant Agarwal and Agarwal C.M., —Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.*
3. *Venugopal K. and Prabhu Raja V., —Engineering Graphics, New Age International (P) Limited, 2008.*
4. *Natrajan K.V., —A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2009.*
5. *Gopalakrishna K.R., —Engineering Drawing (Vol. I&II combined), Subhas Stores, Bangalore, 2007.*
6. *N S Parthasarathy And Vela Murali, —Engineering Graphics, Oxford University, Press, New Delhi, 2015.*
7. *Shah M.B., and Rana B.C., —Engineering Drawing, Pearson, 2nd Edition, 2009.*

Paper code: UCE271
Paper name: Engineering Drawing and Computer Graphics Lab   **Credit: 4**
Total contact hours: 48   **L-T-P: 0-0-4**

Module 1: Lettering and drawing plane curves   Contact hours: 8

Lettering, Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Module 2: Drawing projection of points, lines and plane surfaces   Contact hours: 8

Drawing orthographic projection - Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module 3: Drawing projection of solids   Contact hours: 8

Drawing projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

Module 4: Drawing projection of sectioned solids and development of surfaces
Contact hours: 8
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

Module 5: Drawing isometric and perspective projections   Contact hours: 8

Drawing isometric projections – isometric scale –Isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions – Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Module 6: AutoCAD practice   Contact hours: 8

Familiarization of AutoCAD application software, Use of DRAW tools, MODIFY tools, TEXT, DIMENSION, PROPERTIES.

Paper code: UHSS201
Paper name: Professional ethics and human values   **Credit: 4**
Total contact hours: 40   **L-T-P-C: 2-0-0-4**

Module 1: Engineering Ethics Senses of 'engineering ethics' – variety of moral issues – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – professions and professionalism – professional ideals and virtues – theories about right action – self-interest – customs and religion – uses of ethical theories	**Contact hours: 4**
Module 2: Engineering as Social Experimentation Engineering as experimentation – engineers as responsible experimenters – codes of ethics – a balanced outlook on law – the challenger case study	**Contact hours: 4**
Module 3: Responsibility for safety Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk	**Contact hours: 4**
Module 4: Responsibilities and Rights Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee rights – intellectual property rights – discrimination	**Contact hours: 4**
Module 5: Global issues Multinational corporations – environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – sample code of conduct	**Contact hours: 4**

TEXTBOOKS/REFERENCES:

1. Mike Martin and Roland Schinzinger, "*Ethics in Engineering*", McGraw Hill, New York, 1996.
2. Charles D Fleddermann, "*Engineering Ethics*", prentice Hall, New Mexico, 1999.
3. LauraSchlesinger, "*How Could You Do That: The Abdication of Character, Courage, and Conscience*", Harper Collins, New York, 1996.
4. Stephen Carter, "*Integrity*", Basic Books, New York, 1996.

Semester III

Paper code: UFET301
Paper name: PRINCIPLES OF FOOD PROCESSING AND PRESERVATION   **Credit: 06**
Total contact hours: 40L   **L-T-P: 3-0-0**

Module 1:
Introduction to food preservation – Objectives and needs of food preservation, Classifications of food on the basis of perishability, pH, moisture content, etc., Causes of quality deterioration and spoilage of perishable foods, wastage of foods, Principles of food preservation, Techniques of food preservation

    Contact hours: 10L

Module 2:

Canning, Preservation principle of canning of food items, General process of canning of foods, Ascetic canning, Concepts in thermal destruction of microorganisms- D, Z, F, values, Thermal process time calculations for canned foods, Spoilage in canned foods   **Contact hours: 10L**

Module 3:

Water activity of food and its significance in food preservation; Dehydration and drying of food items; IMF; Low temperature preservation: cold storage, cold chain, freezing (including cryogenic freezing)

    Contact hours: 10L

Module 4:

Preservation by fermentation; Curing and pickling, Hurdle technology, Non-thermal (e.g. high pressure processing) and other minimal processing technologies, Ionization radiation; Use of preservative in foods: chemical preservative, bio-preservatives, antibiotics, lactic acid bacteria   **Contact hours:10L**

Books / References:

1. Technology of Food Preservation by Desrosier & Desrosier
2. Food Processing and Preservation by G. Subbulakshmi, Shobha A. Udipi
3. Food Science by N. N Potter
4. Preservation of fruits and vegetables by Girdhari Lal

Paper code: UFET302
Paper name: FOOD CHEMISTRY   **Credit: 06**
Total contact hours: 50L   **L-T-P: 3-0-0**

Module 1:

Water: Importance of water in foods, Physical properties of water, types of water, water activity and shelf life of food. Distribution of water in various foods and moisture determination   **Contact hours: 7L**

Module 2:

Carbohydrates: Nomenclature and classification, structure, Physical and chemical properties of carbohydrates –monosaccharides, disaccharides and polysaccharides (cellulose, starch, fructans, galactans, hemi-cellulose, pectic substances, carrageenan); changes in carbohydrates during processing. Browning reactions: Enzymic and non-enzymic browning.   **Contact hours: 9L**

Module 3:
Proteins: Classification, structure and properties of amino acids, structure of protein, physical and chemical properties of proteins. Changes in protein during processing, Proteins from plant and animal sources.

Contact hours: 7L

Module 4:

Lipids: Classification, structure, physical and chemical properties of fatty acids and fats. Lipids-simple & derived. Different types of fats, uses in food processing, food emulsions, fat replacers, importance of fats and oils in diet, introduction to hydrogenation and its importance, Changes during food processing.

Contact hours: 9L

Module 5:

Vitamins and Minerals: Sources and structures of minerals & vitamins; Effect of processing and storage of vitamins; Pro vitamins A & D; Vitamins as antioxidants, **Plant pigments and flavouring agents**: Importance, structure and properties of plant pigments- their chemical changes during food processing and storages.

Contact hours: 9L

Module 6:

Food additives: Definitions, uses and functions of Acid, Base, Buffer systems, Salts and chelating/sequestering agents, Masticatory substances. Low calorie and non-nutritive sweeteners, Polyols, Emulsifying and stabilizing agents, Anti-caking agents, thickeners, Firming agents. Flour bleaching agents and Bread improvers, Flavouring agents and related substances, Clarifying agents. Gases and Propellants. Tracers and other additives.   **Contact hours: 9L**

Books / References:
1. Food science Chemistry & Experimental Foods Dr.M.Swaminathan
2. Food chemistry by Lillian Hoagland Meyer
3. Food Chemistry by Fennema
4. Basic Food Chemistry by Lee
5. Principles of Biochemistry by Lehninger
6. Food Chemistry Belitz, Grosch

Paper code: UFET303
Paper name: BIOCHEMISTRY AND HUMAN NUTRITION   **Credit: 06**
Total contact hours: 40L   **L-T-P: 3-0-0**

Module 1:

Introduction to Biochemistry, usefulness of cells and organisms in biochemical studies. Proteins and protein structures; Essential amino acids. Metabolism of proteins (digestion and absorption); Nitrogen balance & nitrogen pool; Evaluation of quality of proteins **Contact hours: 10L**

Module 2:

Enzymes; Definition, function, classification, nomenclature & structure; Co-enzymes and its function; Mechanism of enzyme action, enzyme kinetics & environmental effects; Enzyme inhibition.
Contact hours: 10L

Module 3:

Carbohydrates; Definition & classification; General chemistry of carbohydrates; Metabolic pathways for breakdown of carbohydrates: glycolytic pathway, pentose phosphate pathway, citric acid cycle, electron transport chain, ATP balance, gluconeogenesis; General chemistry of lipids; Essential fatty acids; Digestion & absorption of lipids. **Contact hours: 10L**

Module 4:

Nutrition: Introduction to human nutrition; Nutritive values of foods; Basal metabolic rate; Techniques for assessment of human nutrition, Dietary requirements and deficiency diseases of different nutrients
Contact hours: 10L

Books / References:
1. Lehninger, Nelson & Cox, Principle of Biochemistry, CBS Publication
2. Modern Experimental Biochemistry, Boyer, Pearson Education
3. Lubert stryer, Biochemistry, Freeman & Co, N.Y.
4. Voet&Voet, Fundamentals of Biochemistry, Jonh Willey & Sons
5. Hames, B. D. (Ed), Biochemistry, Viva Books
6. Fundamentals of Food and Nutrition by Sumati. R. Muldambi
7. Nutrition and dietetics by Rose
8. Nutrition and dietetics by Joshi

Paper code: UFET304
Paper name: BASIC MICROBIOLOGY   **Credit: 06**
Total contact hours: 40L   **L-T-P: 3-0-0**

Module 1:

History and Scope of Microbiology; Classification of Microorganisms-Bacteria, Fungi, Virus, Alga, Protozoa; sterilization techniques, disinfectant and antiseptic agents. Microscopy - types of microscopes and their applications-simple and compound, bright field, dark field, fluorescence, phase-contrast and electron microscopes. **Contact hours: 10L**

Module 2:

Major groups of bacteria- Archaebacteria, Actinomycetes, Chemoautotrophs, Eubacteria, Pseudomonads, cyanobacteria, Rickettsias, chlamydias and spirochetes; Bacterial cell- structure and functions of cellular components-cell wall composition of Gram positive and Gram negative bacteria, sub-cellular organizations, flagella, capsule and spores; Bacterial Staining; antimicrobial agents-antibiotics, chemotherapeutic drugs-antibacterial agents-mode of action; antibiotic . **Contact hours: 10L**

Module 3:

Classification, morphology and characteristics of Virus, Fungi & Protozoa- structure of DNA -and RNA viruses, Viral replication, Bacteriophages- Lysogeny and Lytic cycle; Virus like agents satellites, viroids and

prions, antiviral and antifungal drugs; Classification of Helminthic parasites; Life cycle of malarial and filarial parasites. **Contact hours: 10L**

Module 4:

Microbial culture continuous culture and synchronous culture; composition of culture media -solid and liquid media, chemically defined media, complex and differential media; Effect of pH, temperature and radiation on microbial growth, Microbial nutrition : Heterotrophs, autotrophs; uptake of nutrients, Enrichment culture technique. Transformation of elements: Carbon, Nitrogen, Phosphorous and Sulphur **Contact hours: 10L**

Books / References:

1. Prescott, Harley and Klein- Microbiology-5th edition; Publisher: McGraw Hill science 2002
2. Gerard J. Tortora, Berdell, R. Funke, Christine L. Case, , Microbiology: An Introduction.
8th edition Hardcover: 944 pages, Publisher: Benjamin Cummings. 2004.
3. Kenneth J. Ryan,C. George Ray, John C. Sherris**,** Sherris Medical Microbiology : An Introduction to Infectious Diseases, Hardcover: 992 pages, Publisher: McGraw-Hill Professional, 2003.

Paper code: UME301
Paper name: BASIC THERMODYNAMICS **Credit: 06**
Total contact hours: 40L **L-T-P: 3-0-0**

Module 1:

Fundamental Concepts and Definitions: Definition of thermodynamics, system, surrounding and universe, phase, concept of continuum, macroscopic & microscopic point of view. Density, specific volume, pressure, temperature. Thermodynamic equilibrium, property, state, path, process, cyclic process, Energy and its form, work and heat, Enthalpy. **Contact hours: 10L**

Module 2:

Laws of thermodynamics: Zeroth law: Concepts of Temperature, zeroth law, First law: First law of thermodynamics. Concept of processes, flow processes and control volume, Flow work, steady flow energy equation, Mechanical work in a steady flow of process. **Contact hours: 10L**

Module 3:

Second law: Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator. Statements of second law. Carnot cycle, Clausius inequality. Concept of Entropy. **Contact hours: 10L**

Module 4:

Properties of steam and thermodynamics cycles: Properties of steam, use of property diagram, Steam-Tables, processes involving steam in closed and open systems. Rankine cycle. Introduction to I.C. Engines-two & four stoke S.I. and C.I. engines. Otto cycle, Diesel cycle. **Contact hours: 10L**

Books / References:

1. Van Wylen G.J. & Sonnlog R.E. : Fundamentals of classical thermodynamics, John Wiley & Sons, Inc. NY.
2. Wark Wenneth : Thermodynamics (2nd edition), Mc Graw Hill book Co. NY.
3. Holman, J.P. : Thermodynamics, MC Graw Hill book Co. NY.
4. Yadav R. : Thermodynamics and Heat Engines, Vol I & II (SI Edition) Central Publishing House Allahabad.
5. Yadav R. : Steam & Gas Turbines.
6. Kshitish Chandra Pal : Heat Power, Orient Longman Limited, 17, Chittranjan Avenue, Calcutta.
7. S. Rao, B.B. Parulekar, 'Energy Technology', Khanna Pub., New Delhi.

Paper code: UME302
Paper name: ENGINEERING MECHANICS   **Credit: 06**
Total contact hours: 44L   **L-T-P: 3-0-0**

Module 1: Forces and Moments
Force, Moment and Couple, Resultant of forces, Forces in space. Equilibrium, FBD, General equations of equilibrium, Analysis of forces in perfect frames. Brief introduction to vector approach.
                                                               Contact hours: 12L

Module 2: Friction
Introduction to dry friction. Laws of friction, friction of simple machines- inclined planes, Screw
Jacks.   **Contact hours: 8L**

Module 3: Basic Structural Analysis Contact hours: 6
Equilibrium in three dimensions; Method ofSections;Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams
                                                               Contact Hours: 6L
Module 4:

Center of gravity and moment of inertia
Center of gravity of axes, volume and composite bodies: Area moment of inertia and mass moment of Inertia for plane figures and bodies.   **Contact hours: 8L**

Module 5:

Kinetics of rigid bodies
Plane motion, force, mass, acceleration, work and energy. Impulse and momentum, rotational motion, centrifugal force, torque, angular motion and acceleration, angular momentum, Virtual work.
                                                               Contact hours: 10L
Books / References:
1. Engineering Mechanics: S Timoshenko & D H Young. McGrow Hill Int.

2. Engineering Mechanics: R S Khurmi. S Chand & Co.

3. Engineering Mechanics: R K Bansal. Laxmi Publication (P) Ltd

4. Engineering Mechanics: K L Kumar. McGrow Hill Publishing Co.

5. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall

6. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill

7. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.

Paper code: UFET371
Paper name: Food Processing Lab   **Credit: 02**
Total contact hours: 20   **L-T-P: 0-0-2**

   List of Experiments:

1. Preparation of Apple/Pineapple Jam   Contact Hours:2
2. Preparation of Guava Jelly   Contact Hours:2
3. Preparation of Orange Squash   Contact Hours:2
4. Preparation of Tomato Ketchup   Contact Hours:2
5. Preparation of Dried Potato/Banana Chips   Contact Hours:2
6. Preparation of Mango Pickle   Contact Hours:2
7. Making of Ice cream   Contact Hours:2
8. Freeze drying of Sessional Fruits and Vegetables   Contact Hours:2
9. Production of Milk/Potato powder by drum drier   Contact Hours:2
10. Preparation of Extruded Product   Contact Hours:2

Paper code: UFET372
Paper name: Food Chemistry Lab   **Credit: 02**
Total contact hours: 20   **L-T-P: 0-0-2**

List of Experiments:

1. Determination of moisture in food sample.   Contact Hours:2
2. Determination of protein in food sample.   Contact Hours:2
3. Determination of ash in food sample.   Contact Hours:2
4. Determination of crude Fat in food sample.   Contact Hours:2
5. Determination of titratable acidity of food and beverages.   Contact Hours:2
6. Determination of pH in food and beverages.   Contact Hours:2
7. Determination of total sugar of food samples.   Contact Hours:2
8. Determination non-reducing and reducing sugars of confectionary items.   Contact Hours:2
9. Determination of Vitamin C in food sample.   Contact Hours:2
10. Determination of Crude Fibre in food sample.   Contact Hours:2

Paper code: UFET373
Paper name: Biochemistry and Human Nutrition Lab   **Credit: 02**
Total contact hours: 24   **L-T-P: 0-0-2**

List of Experiments:

1. Separation of amino acids/sugars by Ascending Paper Chromatography   Contact Hours: 2
2. Separation of sugars/amino acids by Thin Layer Chromatography.   Contact Hours: 2
3. Separation and isolation of proteins/amino acids by Paper Electrophoresis.   Contact Hours: 2
4. Assay of Phosphatase activity   Contact Hours: 2
5, Assay of Protease activity   Contact Hours: 2
6. Effect of pH on enzymatic activity   Contact Hours: 2
7. Effect of Temperature on enzymatic activity   Contact Hours: 2
8. Separation and estimation of carbohydrate from plant tissue   Contact Hours: 2
9. Estimation of calcium in food sample   Contact Hours: 2

10. Estimation of iron in food products	Contact Hours: 2
11. Estimation of zinc in food sample	Contact Hours: 2
12. Estimation of tin in canned foods	Contact Hours: 2

Paper code: UHSS371
Paper name: Language Lab   **Credit: 2**
Total contact hours:40   **L-T-P-C: 0-0-2-2**

Module 1: Pronunciation Skills
    1.1 Introduction of English Speech sounds
    1.2 Vowel sounds, diphthongs and thripthongs
    1.3 IPA Symbols
    1.4 Transcription
	Contact hours: 3

Module 2: Workshop on Business Writing 2.1 Vocabularies used in Business Writing 2.2 Successful Letters 2.3 Successful E-mails 2.4 Resume 2.5 Report Writing	**Contact hours: 4**

Module 3: Remedial Grammars
    3.1 Tense and subject-verb agreement
    3.2 Relative Clauses
    3.3 Prepositions
    3.4 Prepositions
	Contact hours:4

Module 4: Public Speaking Skills and Presentation Skills	**Contact hours: 4**

BOOKS and Software RECOMMENDED:

(1) Soft Skills, S. Hariharan, N.Sundararajan, S.P.Shanmugapriya MJP Publishers, Chennai
(2) Communication Skills, Sanjay Kumar and PushpLata, OUP, 2011
(3) Exercises in Spoken English, Parts-I-III, CIEFL, Hyderabad, OUP
(4) Business Writing
(5) Sky Pronunciation
(6) Tense Buster