



**B.TECH BIOTECHNOLOGY
 (FOUR YEAR FULL TIME)
 CURRICULUM-2007
 SEMESTER I**

Code No.	Course Title	L	T	P	C
THEORY					
XBT101	Technical English	3	1	0	4
XBT102	Mathematics- I	3	1	0	4
XBT103	Applied Physics	3	1	0	4
XBT104	Applied Chemistry	3	1	0	4
XBT105	Engineering Graphics	2	0	3	4
XBT106	Basic Engineering I	3	0	0	3
PRACTICAL					
XBT107	Applied Physics Lab	0	0	3	2
XBT108	Applied Chemistry Lab	0	0	3	2
XBT109	Basic Workshop Practice	0	0	3	2

Total Hours:33

Total Credits: 29

SEMESTER II

Code No.	Course Title	L	T	P	C
THEORY					
XBT201	Mathematics – II	3	1	0	4
XBT202	Chemical Engineering - I	3	1	0	4
XBT203	Computer Programming	4	0	0	4
XBT204	Basic Engineering - II	3	0	0	3
XBT205	Biochemistry - I	4	0	0	4
XBT206	Microbiology	3	0	0	3
PRACTICAL					
XBT207	Computer Programming Lab	0	0	3	2
XBT208	Communication Skills Enhancement	2	0	2	3
XBT209	Basic Engineering Lab	0	0	4	2

Total Hours:33

Total Credits: 29

SEMESTER III

Code No.	Course Title	L	T	P	C
THEORY					
XBT301	Numerical Methods	3	0	0	3
XBT302	Professional Ethics and Human values (BT)	3	0	0	3
XBT303	Bioorganic chemistry	3	0	0	3
XBT304	Biochemistry - II	4	0	0	4
XBT305	Cell biology	4	0	0	4
XBT306	Chemical Engineering II	3	1	0	4
PRACTICAL					
XBT307	Cell Biology & Microbiology Lab	0	0	4	2
XBT308	Biochemistry Lab	0	0	4	2
TOTAL		20	1	8	25

Total Hours:29

Total Credits: 25

SEMESTER IV

Code No.	Course Title	L	T	P	C
THEORY					
XBT401	Environmental Science and Engineering	3	0	0	3
XBT402	Probability and Statistics	3	1	0	4
XBT403	Basic Industrial Biotechnology	3	0	0	3
XBT404	Chemical Engineering Thermodynamics	3	1	0	4
XBT405	Instrumental Methods of Analysis	3	0	0	3
XBT406	Molecular Biology & Genetics	4	0	0	4
PRACTICAL					
XBT407	Molecular Biology Lab	0	0	4	2
XBT408	Instrumental Methods of Analysis Lab	0	0	3	2

Total Hours:28

Total Credits: 25

SEMESTER V

Code No.	Course Title	L	T	P	C
THEORY					
XBT501	Total Quality Management	3	0	0	3
XBT502	Enzyme Engineering and Technology	3	0	0	3
XBT503	Bio-informatics	3	1	0	4
XBT504	Immunotechnology	3	0	0	3
XBT505	Bioprocess Principles	3	1	0	4
XBT506	Genetic Engineering	3	0	0	3
PRACTICAL					
XBT507	Chemical Engineering Lab	0	0	3	2
XBT508	Genetic Engineering Lab	0	0	4	2

Total Hours:27

Total Credits: 24

SEMESTER VI

Code No.	Course Title	L	T	P	C
THEORY					
XBT601	Chemical Reaction Engineering	3	1	0	4
XBT602	Mass Transfer operations	3	1	0	4
XBT603	Fermentation Engineering	3	1	0	4
XBT604	Bioethics & Biosafety	3	0	0	3
XBT605	Protein Engineering	3	0	0	3
XBT606*	Elective – I	3	0	0	3
PRACTICAL					
XBT607	Bioprocess Lab	0	0	4	2
XBT608	Immunotechnology Lab	0	0	3	2

Total Hours:28

Total Credits: 25

SEMESTER VII

Code No.	Course Title	L	T	P	C
THEORY					
XBT701	Entrepreneurial development management	3	0	0	3
XBT702	Downstream Processing	3	1	0	4
XBT703	Bio-pharmaceutical Technology	3	0	0	3
XBT704	Analytical Techniques in Biotechnology	3	0	0	3
XBT705*	Elective – II	3	0	0	3
XBT706*	Elective – III	3	0	0	3
PRACTICAL					
XBT707	Downstream Processing Lab	0	0	4	2
XBT708	Bio informatics Lab	0	0	3	2
XBT709	Mini Project	0	0	4	4
TOTAL		18	1	11	27

Total Hours:30

Total Credits: 27

SEMESTER VIII

Code No.	Course Title	L	T	P	C
THEORY					
XBT801	Social Engineering	3	0	0	3
XBT802	Bio-business and Management	3	0	0	3
XBT803*	Elective – IV	3	0	0	3
XBT804*	Elective – V	3	0	0	3
PRACTICAL					
XBT805	Project Work	0	0	24	12
TOTAL		12	0	24	24

Total Hours:28

Total Credits: 25

Over all Credits: 208

LIST OF ELECTIVES

ELECTIVE I

Code No.	Course Title	L	T	P	C
XBT606A	Environmental Biotechnology	3	0	0	3
XBT606B	Plant Tissue Culture	3	0	0	3
XBT606C	Process Equipments & Plant Design	3	0	0	3
XBT606D	Biophysics	3	0	0	3

ELECTIVE II

Code No.	Course Title	L	T	P	C
XBT705A	Genomics and Proteomics	3	0	0	3
XBT705B	Animal Biotechnology	3	0	0	3
XBT705C	Food Biotechnology	3	0	0	3
XBT705D	Cancer Biology	3	0	0	3

ELECTIVE III

Code No.	Course Title	L	T	P	C
XBT706A	Transport phenomena in Bioprocess	3	0	0	3
XBT706B	Process Instrumentation Dynamics and Control	3	0	0	3
XBT706C	Molecular Modeling and Drug Design	3	0	0	3
XBT706D	Bioreactor Design	3	0	0	3

ELECTIVE IV

Code No.	Course Title	L	T	P	C
XBT803A	Biological Spectroscopy	3	0	0	3
XBT803B	Biosensor and Bioelectronics	3	0	0	3
XBT803C	Bio-conjugate Technology	3	0	0	3
XBT803D	Computational Biology	3	0	0	3

ELECTIVE V

Code No.	Course Title	L	T	P	C
XBT804A	Gene Therapy	3	0	0	3
XBT804B	Biomedical Engineering	3	0	0	3
XBT804C	Nanobiotechnology	3	0	0	3
XBT804D	Stem Cells	3	0	0	3

Suggested Activities

Giving pairs of cause and effect statements to be linked with expressions like *as / since / because*. Rewriting imperative sentences using assertive form '*should*' (Store energy and tap it when required energy should be and tapped when it is required)

- Rewriting infinitive forms as gerunds (e.g., To modernize the administrative office with computers is expensive, Modernizing the administrative office with computers is expensive) Fill in the blanks with appropriate prepositions.
- Choosing sentences in a given text that use different tense forms
- Subject-verb agreement of the sentences given practical
- Providing a context for the use of the tense forms - rewriting the sentences in the impersonal passive form
- Rewriting the sentences in the reported speeches

UNIT III READING

10

Techniques of Reading – Technical articles on invention and discoveries, Reading comprehension on biographies of eminent scientists, engineers and successful entrepreneurs, Practicing - skimming and scanning, Rhetorical functions (narrative, descriptive and argumentative) sequencing of sentences. Connective adverbs. Idioms and phrases, phrasal verbs and cloze test.

Suggested Activities

- Taking a quick glance at the text to predict the content – reading to identify the main theme.
- Identifying the topic sentence in a paragraph – providing suitable titles for paragraphs – matching the titles with the paragraphs.
- Guessing the contextual meaning of words – comprehending a passage and answering questions of varied kinds.
- Transferring of information from a text to graphical representations like tree diagram / flow chart / bar chart / pie chart/ tables.
- Filling the gaps with appropriate missing words from the given list.
- Making notes based on a passage in the format given.
- Using an appropriate format to make notes from a given passage.
- Providing a suitable title after reading the passage.
- Identifying main and supporting ideas by scanning.
- Sequencing of jumbled sentences using linguistic clues (e.g.: reference words).

UNIT IV WRITING I

10

Framing questions and answering, (“Wh” type and “Yes or No”) type note making, (guided and open) making lists, stating problems and proposing solutions, recommendations, instructions, check lists, technical report writing, decoding from graphical representation (flow chart, pie chart, tree diagram) numerical expressions.

Suggested Activities

- Identifying the phrases used for making recommendations in given texts and employing them in making recommendations.
- Writing checklists in the appropriate format.
- Writing instructions for performing tasks at home or at work (use of imperatives).
- Summarizing the discussions and other oral practice activities like role play in the prescribed textbooks.
- Essay writing based on discussion of scientific and technical topics given in the prescribed textbooks.

UNIT V WRITING II

10

Paragraph writing, essay writing, technical report writing, letter writing, (personal, business, letter of application, letter to the editor) resume writing, drafting e-mails, minutes of meeting, memorandum, creative writing.

Suggested Activities

- Using appropriate expressions to define a concept / describe an object / device / process.
- Writing paragraphs on different scientific discourse patterns like classification, comparison and problem / solution – identifying the topic sentence.
- Using unity, cohesion and coherence in paragraph writing.
- Writing formal and business letters using the appropriate format.
- Note – making (guided and open).
- Summarizing and writing paragraphs based on listening tasks in the prescribed textbooks.
- Making recommendations by using modal auxiliary verbs like *should*, *must*, *ought to* etc.

L:45; T:15; Total: 60

TEXT BOOKS:

1. Department of Humanities and Social Sciences, Anna University, English for Engineers and Technologists, Vols. I & II (Combined Edition), Orient Longman Pvt. Ltd., 2006.

REFERENCES:

1. V.R. Narayanaswami, Strengthen Your Writing, 3rd Edition, Orient Longman, 2005.
2. Andrea J. Rutherford, Basic Communication Skills for Technology, 1st Edition, Pearson Education Asia (Singapore) Pvt. Ltd., Bangalore, 2001.
3. Nell Ann Pickett, Ann A. Laster, Katherine E. Staples, Technical English (Writing, Reading and Speaking), 8th Edition, Pearson Education, USA, Addison Wesley Longman Inc., 2001.
4. “ Power words in Pairs”. Emerald publishers – Chennai

XBT102 MATHEMATICS – I**3 1 0 4****UNIT I MATRICES****9**

Eigen values and Eigenvectors of a real matrix – Characteristic equation Properties of Eigen values and Eigen vectors - Cayley - Hamilton theorem (excluding proof) - Similarity transformation (Concept only) – Orthogonal matrix - Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to Canonical form by Orthogonal transformation.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY**9**

Direction Cosine and Ratios – Angle between two lines – Equation of plane – Equation of Straight line – Coplanar lines – shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere

UNIT III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS**9**

Curvature – Cartesian and polar co – ordinates – Centre and radius of curvature – Circle of curvature – Involutives and evolutes – Envelops – Properties of envelopes and evolutes .

UNIT IV FUNCTION OF SEVERAL VARIABLES**9**

Functions of two variables – Partial derivatives – Total differential – Taylor's expansion – Maxima and Minima – Constrained maxima and minima – Lagrange's Multiplier method – Jacobians .

UNIT V ORDINARY DIFFERENTIAL EQUATIONS (ODE) AND APPLICATIONS**9**

Linear equations of second order with constant and variable coefficients - Simultaneous first order linear equations with constant coefficients – Method of variation of parameters.

L:45; T:15; Total: 60**TEXT BOOKS:**

1. Grewal .B.S., "Higher Engineering Mathematics", 38th Edition- Khanna Publication –Delhi, 2004.
2. Kreyszi.E., "Advance Engineering Mathematics", 8th Edition-John Wiley & Son (Asia) Ltd, Singapore,. 2001.

REFERENCES:

1. Bali. N.P., Narayana Iyengar, and Chand.N., “Engineering Mathematics” Laxmi Publication Pvt. Ltd-New Delhi, 2003.
2. Veerarajan.T., “Engineering Mathematics (For First Year)”, 4th Edition , John Wiley & Son -Hill Publishing company Ltd, New Delhi, 2005.
3. Kandasamy. P., Thilagavathy. K, and Gunavathy. K., “Engineering Mathematics”-Volume I &II, S. Chand & Co, New Delhi, 2005.
4. Venkataraman. M. K., “Engineering Mathematics”-Volume I &II, Revised enlarged 4th Edition, The National Publishing Company-Chennai, 2004.

APPLIED PHYSICS
(Common to B.E. / B.Tech all Branches)

SEMESTER I

UNIT-I Acoustics and Ultrasonics 9

Acoustics: Classification of sound – Characteristics of musical sound – Loudness – Weber-Fechner law – Decibel – Absorption Coefficient – Reverberation – Reverberation time – Sabine's Formula (growth & decay) – Factors affecting acoustics of buildings (reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies.

Ultrasonics: Production: Magnetostriction and Piezo electric methods – Applications

UNIT-II Wave Optics, Lasers and Fibre Optics 9

Wave Optics: Photo elasticity: Birefringence – Stress-optic law - Effect of a stressed model in a plane polariscope – Isoclinic and Isochromatic fringes (definitions) – Photoelastic bench.

Laser: Nd – YAG laser, CO₂ laser, semiconductor laser (homojunction) – Uses of lasers – Holography.

Fibre Optics: Principle and propagation of light in optical fibres – Numerical Aperture and Acceptance angle – Types of optical fibres (material, refractive index, mode) – Applications: Fibre optics communication system (block diagram only).

UNIT-III Crystal Physics and NDT 9

Crystal Physics: Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – 'd' spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures.

NDT: Liquid penetrant method – Ultrasonic flaw detection – Ultrasonic flaw detector (block diagram)– X-ray Radiography: displacement method – X-Ray Fluoroscopy– Merits and Demerits of each method

UNIT- IV Conducting Materials

9

Conductors: Wiedermann Franz law - Lorentz number –Fermi distribution function – Density of energy states – carrier concentration - effect of temperature on fermi energy level

Semiconductors: Semiconductor-properties- types of semiconductor, Hall effect – Determination of Hall co-efficient.

Superconductors: Super conducting phenomena – Properties of superconductors – Meissner effect , Isotope effect – Type I and Type II superconductors– Applications – Magnetic levitation and SQUID

UNIT–V Dielectrics and New Engineering Materials

9

Dielectrics: Electrical susceptibility - Dielectric constant – Electronic, ionic, orientational and space charge polarization – Frequency and temperature dependence of polarization – Internal field – Claussius-Mosotti relation (derivation) - Dielectric loss – Dielectric breakdown – Uses of dielectric materials (Capacitor and Transformer).

Introduction to New Materials: Metallic glasses – Nano materials – Shape memory alloys – Bio-materials.

L:45; T:15; Total:60

TEXT BOOKS

1. Avadhanulu M.N. and Kshirsagar P.G., “A Text Book of Engineering Physics”, S.Chand & Company Ltd., 7th Enlarged Revised Ed., 2005.
2. Gaur R. K. and Gupta S. L., “Engineering Physics”, Dhanpat Rai Publishers,New Delhi, 2001.

REFERENCES:

1. Pillai S. O., “Solid State Physics”, New Age International Publication, New Delhi, Fifth Edition, 2003.
2. Rajendran V. and Marikani A., “Materials Science”, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004.

XBT104 APPLIED CHEMISTRY 3 1 0 4

UNIT I WATER TECHNOLOGY 9

Source and types of water – water quality parameters – definition and expression – hard water – estimation of hardness (EDTA method) and alkalinity – boiler feed water – requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning – demineralization process – desalination (RO method) – domestic water treatment.

UNIT II ELECTROCHEMISTRY 9

Electrode potentials – difference between electrolytic cells and electrochemical cells – Standard electrodes (H_2 and calomel electrodes) – Determination of pH using glass electrodes – Nernst equation – problems – electrochemical series – emf – measurements and its applications – Galvanic cells – Concentration cell – problems – reversible and irreversible cells – conductometric titrations.

UNIT III CORROSION AND ITS INHIBITION 9

Corrosion – principles of chemical corrosion – Pilling – Bedworth rule – principles of electrochemical corrosion – difference between chemical and electrochemical corrosion – types of corrosion – factors influencing corrosion – corrosion control methods – pre-treatment of metal surface – electroplating and electroless plating.

UNIT IV NUCLEAR ENERGY AND ENERGY STORAGE DEVICES 9

Nuclear fission process – definition, mechanism and characteristics – chain reactions – nuclear energy and its calculations – types of nuclear fission reaction – atom bomb – light water nuclear power plant – breeder reactor – batteries – introduction – types of batteries – primary and secondary batteries – dry cell – lead acid, Ni-Cd and Li batteries – alkaline batteries – principles and applications of solar cells.

UNIT V POLYMERS 9

Monomers and polymers – types of polymerization reaction – mechanism of polymerization (free radical) – engineering plastics – PVC, teflon, polycarbonate, polyurethane and thermocole – properties – applications – compounding of plastics, moulding methods – injection, compression moulding and blow moulding – polymer blends and alloys.

L:45; T:15; Total: 60

TEXT BOOKS:

1. P.C. Jain and Monicka Jain, Engineering Chemistry, Dhanpat Raj Publishing Company (P) Ltd, New Delhi – 2002.
2. S.S. Dara. A Text book of Engineering Chemistry, S. Chand & Company Ltd, New Delhi – 2003.

REFERENCES

1. B.K. Sharma, Engineering Chemistry, Krishna Prakasam Media (P) Ltd., Meerut, 2001.
2. Mars G. Fontana, Corrosion Engineering, Tata McGraw Hill Publishing Co., New Delhi, 2005.

XBT106 BASIC ENGINEERING I**3 0 0 3****UNIT - I MATERIALS AND BUILDINGS****9**

Introduction - Civil Engineering – Materials – Brick, Stone, Cement, Steel, Concrete – Properties – Uses – factor of safety. Buildings – Classification - Components of buildings - Foundations - Functions – Classification of foundations – Bearing capacity - Floorings – Requirements - Cement Concrete flooring – Mosaic flooring - Marble flooring - Roofs - Types – Requirements – Madras Terrace roof

UNIT - II TRANSPORTATION, WATER SUPPLY AND SEWAGE DISPOSAL 9

Transportation system - Classification – Components of Roads - Railway – Cross-section of permanent way- requirements, Bridges – bridge site and components of a bridge site - Harbour – classification. Water supply - Sources - Standards of drinking water – Distribution system – Sewage – types – septic tank – function and components.

UNIT - III SOURCES OF ENERGY**9**

Sources of energy. Conventional Energy – types, characteristic, advantages/disadvantages –Thermal – steam, gas and diesel - Hydro and Nuclear power plants – its layout, element / component description, advantages, disadvantages, locations in India.

Renewable sources of energy – Biomass- Solar- Wind- Tidal-OTEC etc types, characteristic, advantages/disadvantages.

UNIT - IV METAL JOINING AND SHEET METAL PROCESSES**9**

Welding-Gas and Arc welding only– Introduction, types, equipments, tools and accessories, techniques employed, applications, advantages / disadvantages. Introduction to Brazing and soldering , Advanced welding process. Sheet Metal Work-Introduction, equipments, tools and accessories, Sheet Metal working process – various types, applications, advantages / disadvantages.

UNIT - V METAL FORMING AND MACHINING**9**

Metal Forming Process-Defects, Advantages, Disadvantages Lathe – Introduction, types, description of main components, cutting tools, work holding devices, Basic operations performed. Drilling machine- Introduction, types, and description, drilling tools. Tapping – tap tools. Shaping machine

Total:45

TEXT BOOKS :

1. Raju K.V.B., Ravichandran P.T., Basics of Civil Engineering, Ayyappa Publications, Chennai, 2000.
2. Ramesh Babu, Elements of Civil Engineering, VRB Publishers, 2000
3. Willard H.A., Merit L.L and Dean J.A., "Instrumental methods of analysis" 6th Edition Van Nostrand, 1986.
4. Kamaraj P. & Arthanareeswari M., "Applied Chemistry", Sudhandhira Publications, 2nd Edition, 2003.
5. Venugopal.K., "Basic Mechanical Engineering", Anuradha Publishers, 1997.
6. Prabhu.T.J., Jai Ganesh.V., Jebaraj.S., "Basic Mechanical Engineering", Scitech Publications, 2000.

REFERENCES:

1. Hajra Choudhary S.K. & Hajra Choudhary A.K., "Elements of Manufacturing Technology" Vol. I & II", Media Publishers, 1986.
2. Rangwala,S.C., Engineering Materials, Charotar Publishing House, Anand, 1980.
3. National Building Code of India, Part V, Building Materials, 1983.
4. Surendra Singh, Building Materials, Vikas Publishing Company, New Delhi, 1996.

PHYSICS LABORATORY
(Common to all branches of B.E. / B.Tech)

XBT107 APPLIED PHYSICS LAB

0 0 3 2

Semester I

LIST OF EXPERIMENTS

1. Torsional Pendulum – Determination of moment of inertia of disc and rigidity modulus of the material of a wire.
2. Non -Uniform Bending – Determination of Young's Modulus.
3. Viscosity – Determination of Co-efficient of Viscosity of a liquid by Poiseuille's flow.
4. Spectrometer – Dispersive power of a prism.
5. Air wedge - Determination of thickness of thin wire.
6. Lee's Disc – Determination of thermal conductivity of a bad conductor.
7. Spectrometer – Determination of wavelength of Hg source using Grating.
8. Band gap determination of a semiconductor.
9. Spectrometer – id curve.
10. Semiconductor laser –
 - i. Determination of wavelength of Laser using grating.
 - ii. Particle size determination.
 - iii. Determination of numerical aperture and acceptance angle of an optical fibre.

Total: 45

LIST OF EXPERIMENTS (Any 10 Experiments)

- 1) Determination of total hardness, temporary & permanent hardness of water by EDTA method.
- 2) Determination of alkalinity of water sample.
- 3) Determination of chloride content of water sample by argentometric method.
- 4) Determination of DO content by Winkler's method.
- 5) Estimation of copper in brass.
- 6) Determination of strength of Hydrochloric acid by pH metric method.
- 7) Conductometric titration between strong acid and strong base.
- 8) Conductometric titration of mixture of acids.
- 9) Conductometric precipitation titration using barium chloride and sodium sulphate.
- 10) Determination of strength of iron by potentiometric method using dichromate.
- 11) Estimation of iron (1,10 – phenanthroline / thiocyanate method) or Ni (DMG) in the given solution by spectrometric method
- 12) Determination of sodium and potassium ions in water sample by flame photometric method.
- 13) Determination of molecular weight of a polymer by viscometry method.
- 14) Determination of percentage of calcium in limestone by EDTA method.

TOTAL: 45**References for Chemistry Laboratory**

- (1) J. Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, Pearson Education, 2004.
- (2) D.P. Shoemaker and C.W. Garland, Experiments in Physical Chemistry, McGraw Hill, London.

UNIT I MULTIPLE INTEGRALS**9+3**

Double integration-Cartesian and polar coordinates-change of order of integration-area as a double integral-change of variables between Cartesian and polar coordinates-triple integration.

UNIT II VECTOR CALCULUS**9+3**

Gradient, divergence and curl-directional derivative-irrotational and solenoidal vector fields-Line, Surface and Volume Integral - Greens theorem in a plane, Guass divergence theorem and Stoke's theorem (excluding proof)-simple applications.

UNIT III ANALYTICAL FUNCTIONS**9+3**

Function of a complex variable-analytic function -necessary and sufficient condition (excluding proof)-Cauchy - Riemann equation - properties of analytical function-harmonic conjugate-construction of analytic function.

UNIT IV COMPLEX INTEGRATION**9+3**

Statement and application of Cauchy's integral theorem and integral formula-Taylor and Laurent expansion -residues-cauchy residue theorem. Contour integration over unit circle and semicircular contours (excluding poles on boundaries)

UNIT V LAPLACE TRANSFORM**9+3**

Transform of elementary functions- properties-derivatives and integrals of transforms- Transform of derivatives and integrals -Transforms of unit step function and impulse function-Transform of periodic functions – Convolution Theorem – Inverse transforms – Application to solution of linear ordinary differential equations up to second order with constant coefficients.

L:45 ; T:15; Total: 60

TEXT BOOK:

1. Grewal .B.S. Higher Engineering Mathematics, Thirty eighth Edition, Khann Publication , Delhi 2004.
2. Kreyszig, E , Advance Engineering Mathematics, Eighth Edition, John Wiley and Son (Asia) Ltd Singapore 2001.

REFERENCES:

1. Bali N.P and Narayana Iyengar, N.Chand, Engineering Mathematics Laxman Publication Pvt, Ltd, New Delhi, 2003.
2. Veerarajan. T., Engineering Mathematics Fourth Edition , John Wiley and Son Hill Publishing company Ltd, New Delhi, 2005.
3. Kandasamy. P., Thilagavathy. K, and Gunavathy. K Engineering Mathematics Volume I , II and III S. Chand & Co, New Delhi, 2005.4. Venkataraman. M. K., Engineering Mathematics, Volume I and II Revised enlarge Fourth Edition, The National Publishing Company, Chennai, 2004.

TEXT BOOKS:

1. Byron Gottfried, "Programming with C", II Edition, (Indian Adapted Edition), TMH publications, 2006. Yeshwant Kanethker, "Let us C", BPB Publications, 2004

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Education Inc. (2005).
2. Behrouz A. Forouzan and Richard. F. Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks–Cole Thomson Learning Publications, 2001.
3. Johnsonbaugh R. and Kalin M., "Applications Programming in ANSI C", III Edition, Pearson Education India, 2003.

UNIT I INTRODUCTION TO CHEMICAL ENGINEERING 8

Units and Dimensions; phase rule - degree of freedom; P-v-T relations; Ideal Gas Law; Amagot's Law; Daltons Law; An introduction to various unit operations and processes – distillation ,evaporation, drying, crystallization, extraction leaching and dehumidification

UNIT II MATERIAL BALANCES 10

Overall and component balances; material balances without and with chemical reactions; steady and unsteady state; recycle, by pass and purging; humidity, drying and crystallization calculations.

UNIT III ENERGY BALANCES 9

Energy balances; sensible heat, latent heat; vapour pressure; steady state and combustion calculations.

UNIT IV FLUID MECHANICS 10

Fluids; fluid statics and applications in chemical engineering; fluid flow; laminar; turbulent pressure drops; rheology of fluids; multiphase flow concepts (packed and fluidized bed).

Measurement of fluid flow: Orifice meter, venturi meter, pitot tube, rotameter, weirs and notches Wet gas meter and dry gas meter. Transportation of fluids: Fluid moving machinery performance. Selection and specification. Air lift and diaphragm pump. Positive displacement pumps: Rotary & Reciprocating pumps. Centrifugal pumps and characteristics.Valves, types and its selection

UNIT V FLOW THROUGH SOLIDS 8

Friction - Friction factor – Form and skin friction; Drag -Drag co-efficient; Flow around solids and packed bedsp; Ergun's Equation - Motion of particles through fluids-Motion under gravitational and centrifugal fields - Settling -Terminal settling velocity. Fluidisation - Mechanism, types, general properties and its applications

L: 45 ; T:15; Total: 60

TEXT BOOKS:

1. Bhatt B.I., Vora S.M. Stoichiometry. 3rd Edition. Tata McGraw-Hill, 1977.
2. McCabe W.L., Smith J.C, Harriot P. "Unit Operations In Chemical Engineering", 5th Edition. McGraw-Hill Inc., 1993.
3. R.K. Bansal, "Fluid Mechanics and Hydraulic machines", Laxmi Publications (P) Ltd., New Delhi

REFERENCES:

1. J.M. Coulson and J. F.Richardson, "Chemical Engineering", Vol 1 3rd Edn.,Butterworth – Heinmann Publishers.
2. Noel.D. Nevers, "Fluid Mechanics for Chemical Engineers", McGraw Hill, International Edition. 1990
3. Geankoplis C.J. "Transport Processes and Unit Operations", Prentice Hall India, 2002.

XBT204 - BASIC ENGINEERING II

3 0 0 3

UNIT - I ELECTRICAL AND MAGNETIC CIRCUITS

8

Ohms Law -Kirchoffs Laws - steady state solution of D C Circuits - Introduction to AC circuits - Waveforms and RMS value - power and power factor, single phase and three phase balanced circuits. Definition of mmf flux and reluctance analysis of composite magnetic circuits, leakage flux, fringing, magnetic materials and B-H relationship Faradays laws, induced emf's and inductances. Energy storage in magnetic systems, Hysteresis and eddy currents

UNIT - II ELECTRICAL MACHINES AND MEASUREMENTS

9

Principles of operation and characteristics of D C machines, Transformers (single phase and three phase) - Synchronous Machines - three Phase and single-phase induction motors - (op. Principles). Moving coil and moving iron instruments (Ammeter and voltmeter). Dynamometer type wattmeters and energy meters (op. Principles)

UNIT - III SEMICONDUCTOR DEVICES & RECTIFIERS

9

Classification of solids based on energy band theory - Intrinsic semiconductors - Extrinsic semiconductors - P type and N type - P-N junction - V I characteristic of PN junction diode - Zener diode - Zener diode characteristics - Half wave and full wave rectifiers - Voltage regulation, SCR, Diac, Triac, Characteristics and simple applications.

UNIT-IV TRANSISTORS AND AMPLIFIERS

9

Bipolar junction transistor - CB, CE, CC – Configurations and characteristics – Biasing circuits - Field Effect Transistor - Configurations and characteristics - FET amplifier - UJT - characteristics and simple applications - switching transistors - concept of feed back - negative feed back - application in temperature and motor speed control. Elementary treatment of voltage amplifier - Class A, B and C power amplifiers principles of Tuned amplifiers.

UNIT - V SIGNAL GENERATORS AND LINEAR IC'S

10

Sinusoidal oscillators - positive feed back - RC phase shift, Hartley, Colpit's, Wien Bridge Oscillators -multivibrators - operational amplifier - adder, multiplier, integrator and differentiators -Integrated circuits. .Digital Electronics- Binary number system - AND, OR, NOT, NAND, NOR circuits - Boolean algebra Exclusive OR gate - Half and Full adders - flip flops - registers and counters - A/D, D/A conversion - Digital computer principle.

Total: 45

TEXT BOOKS:

1. Mittle, V.N., Basic Electrical Engineering, TMH Edition, New - Delhi, 1990
2. Del Taro, Electrical Engineering Fundamentals, Prentice Hall of India Pvt. Ltd., New Delhi, Second edition.
3. Muraleedharan K.A, Muthususbramanian R and Salivahanan S, "Basic Electrical, Electronics and Computer Engineering" Tata McGraw Hill 1999
4. Mehta V K, "Principles of Electronics", S.Chand & Co., 1980
5. Kalsi H S, "Electronic Instrumentation", ISTE publication, 1995

REFERENCES:

1. Millman & Halkias, Integrated Electronics, McGraw Hill, 1979
2. Kothari D P and Nagrath I J, "Basic Electrical Engineering", Tata McGraw Hill, 1991
3. Mithal G K, Electronic Devices & Circuits, Khanna Publications, 1997
4. Ben .G. Streetman, "Solid State Electronics Devices, Prentice Hall of India, 1999

UNIT- I BASIC PRINCIPLES OF ORGANIC CHEMISTRY AND BIOCHEMISTRY 12

Organic chemistry- Organic compounds, Properties, Homologous series, Type of bonds, Aliphatic and Aromaticity, Water – properties and its biological role, pH- Normal Value of the biological Fluids, Buffer- types of biological Buffers and its role.

UNIT - II CARBOHYDRATE AND PROTEINS 12

Carbohydrate- Definition, Classification and Biological Applications, Monosaccharides (Diose to Hexose) Chemical properties and Structure. Disaccharides Occurrence, Chemical properties, Structure and uses. Polysaccharides: Homopolysaccharide and Hetero polysaccharides, Cellulose, Starch, Glycogen, Inulin, Chondroitin Sulphate, N-Acetyl Glucose Amine, N-Acetyl Methyl amine, Chitin, Peptidoglycans and Agar. Test for Carbohydrates. Amino acids- classification and Chemical reaction. Proteins- Classification, properties, Structure of Proteins- Primary- Secondary- Tertiary and Quaternary structure for Hemoglobin. Test for Proteins

UNIT- III LIPIDS AND NUCLEIC ACIDS 12

Fatty Acids- Classification, Types with examples Acid Number, Saponification Number, Iodine Number and RM Number, Lipids – Classification (Glycerolipids, Phospholipids, Glycolipids, Sphingolipids, Steroids), Cholesterol and its target actions. Physiological role of lipids.
Nucleic Acids – Structure of Purines – Pyrimidines – Nucleosides - Nucleotides - Ribonucleic acids Deoxyribonucleic acids –Watson and Crick model.

UNIT- IV VITAMINS, ENZYMES AND INTERMEDIATE METABOLISM 12

Vitamins - Classification based of on Solubility, Biomedical importance and Deficiency diseases. Introduction to Enzymes- Properties, Inhibition and Applications. TCA cycle Glycolysis, Glyconeogenesis, Pentose phosphate shunt, Urea cycle, inborn errors of Amino acid metabolism and Interconnection of Pathways.

UNIT - V METABOLISM AND HIGH ENERGY COMPOUNDS 12

Biosynthesis and Degradation of Carbohydrate, Protein, Lipids, Nucleic Acids. High energy compounds and its colorific values, Electron Carriers, Electron Transport Chain, Inhibitors and Uncoupler

Total: 60

TEXT BOOKS:

1. Voet and Voet, Biochemistry 2nd Edition, John Wiley and Sons Inc., 1995
2. B.S. Bahl., Arun Bahl., Advanced Organic Chemistry 1st Edition, S. Chand & Co. Ltd., 2000.
3. J.L. Jain, Fundamentals of Biochemistry, fifth revised edition, S.Chand & Company., 2003.

REFERENCES:

1. Lehninger's Principles of Biochemistry by David L. Nelson and Michael M. Cox, Macmillan Worth publisher.
2. Lubert Stryer, Biochemistry, 4th Edition, WH. Freeman and co., 2000.
3. Murray, R.K., Granner, B.K., Mayes, P.A., Rodwell, V.W., Harper's Biochemistry Prentice Hall International.

UNIT-I INTRODUCTION 8

Basic of microbial existence; history of microbiology, classification and nomenclature of microorganism, microscopic examination of microorganisms, microscopy - light - dark - fluorescence and electron microscopy; SEM -TEM principles of different staining techniques like gram staining, acid fast, capsular staining, flagellar staining.

UNIT-II MICROBES-STRUCTURE AND MULTIPLICATION 10

Structural organization and multiplication of bacteria, viruses – viral classification – assay-lytic-lysogenic cycle. algae and fungi with a special mention of life history of actinomycetes, yeast, mycoplasma and bacteriophage.

UNIT-III MICROBIAL NUTRITION, GROWTH AND METABOLISM 9

Nutritional requirements of bacteria and different media used for bacterial culture; growth curve and different methods to quantitate bacterial growth, measurement of microbial growth (cell numbers, cell mass), growth yields and the effect of limiting factors continuous growth, chemostat, turbidostat, balanced and unbalanced growth. Aerobic and Anaerobic metabolism.

UNIT - IV CONTROL OF MICROORGANISMS 9

Control of microorganisms, Inhibition of growth and killing, sterilization and disinfection, physical, chemical agents. Characteristics & mode of action of antimicrobial agent. Classes of disinfectants. Factors affecting sterilization and disinfection. Evaluation of disinfectants.

Antimicrobial drugs - History of Chemotherapy, and antibiotics, mode of action of Antimicrobial drugs - tests to guide chemotherapy, the effectiveness of chemotherapeutic agents

UNIT-V INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY 9

Primary metabolites; secondary metabolites and their applications; preservation of food; production of penicillin, alcohol, vit.b-12; Biomethanation; bioremediation; Bioleaching of ores by microorganisms; Biosorption; Biofilters; Bio-fertilizers and bio-pesticides; microorganisms and pollution control; biosensors

Total: 45

TEXT BOOKS:

1. Talaron K, Talaron A, Casita, Pelczar And Reid. Foundations In Microbiology, W.C.Brown Publishers, 1993.
2. Pelczar MJ, Chan ECS and Krein NR, Microbiology, Tata McGraw-Hill Edition, New Delhi, India.

REFERENCE:

1. “ Microbiology” Prescott, Harley and Klen , McGraw Hill publications Fifth edition 2003

WORD

Spreadsheet

Power Point

'C' PROGRAMMING

1. Programs using Operators and Expressions
2. Programs using IO Formatting
3. Programs using Control Structures
4. Programs using Looping Structures
5. Programs using Arrays and String manipulations
6. Programs using Functions and Recursion
7. Programs using Structures and Unions
8. Programs using Pointers
9. Programs using Files
10. Programs using Command line arguments

TOTAL: 45

REFERENCES

1. Byron Gottfried, "Programming with C", II Edition, (Indian Adapted Edition), TMH publications, 2006. Yeshwant Kanethker, "Let us C", BPB Publications, 2004
2. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Education Inc. (2005).
3. Behrouz A. Forouzan and Richard. F. Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks–Cole Thomson Learning Publications, 2001.

UNIT I EXTENSIVE LISTENING**12**

Listening and typing –Listening and sequencing of information – Filling in the blanks – Listening and answering the question. Cloze Exercises- Vocabulary building – Dictionary habits a brief note on Thesaurus.

Listening to specific speeches, discussions, interviews, debates, lectures. (Instructional Aids: Audio cassettes, Tape recorders, Language Software.

Suggested Activities

- Gap filling activities while listening to a text
- Listening and identifying the missing words in a given text
- Listening to a brief conversation and answering questions orally
- Listening to commentaries on television or radio to improve listening skills

Paying attention to speaker's appearance, expressions, body movements and posture that convey meaning to his/her words.

UNIT II INTENSIVE LISTENING**12**

Listening for specific information – note taking-guided and open – listening comprehension- listening to specific speeches-interviews –debates lectures.

Suggested Activities

- Taking notes during lectures.
- Listening to a discourse and filling up gaps in a work sheet.
- Informational comprehension and literal comprehension tasks based on listening-post listening quiz.
- Listening to a passage preferably technical and answering questions choosing appropriate options (multiple choice)

Note : These listening activities can be done using a work sheet in a language laboratory or in the class room using a tape recorder.

UNIT III SPEAKING**12**

Oral practice –developing confidence-introducing oneself-asking for or eliciting information-offering suggestions and recommendations.

Analyzing problems and providing solutions- expressing opinions (agreement and disagreement) Role of idioms in Spoken Communication Pronunciation Practice-Stress intonation, accent, questions for oral discussions, describing objects, presenting

information, Process description, narrating events, giving introduction, welcome speech and proposing a vote of thanks.

Suggested Activities

- Introducing oneself and others
- Role play activities based on real –life situations
- Discussing travel plan / industrial visit
- Giving oral instructions for performing tasks at home, at class-room and at work place
(use of imperatives)
- Participating in a short classroom-discussion on a controversial topic (eg. For and against reservation policy in educational institutions)
- Oral presentation on topics related to science and technology.

UNIT IV CONVERSATION

12

Face-to-Face conversation- Telephonic conversation- Role-play activities (Students take on roles and engage in conversation) participating in an interview situational dialogues.

Suggested Activities

Making either telephonic conversations or face to face conversation- making request- Asking questions-making recommendations using modal verbs-Giving instructions using imperatives – Expressing purpose and function-obligation and preference- Accepting and offering counseling.

UNIT V LABORATORY PRACTICE

12

Resume/ Report preparation / Letter writing

Structure the resume/ report letter writing/ E-mail communication samples

Presentation skills

Elements of an effective presentation – structure of presentation- presentation tools- voice modulation- audience analysis – body language- video samples.

Soft skills

The management- articulation – assertiveness – psychometrics- innovation and creative – stress management and poise- video samples

Group discussion

Why is GD part of selection process?- Structure of GD- moderator – led and other GDs – Strategies in GD- Team spirit- Body language(gestures)- Mock GD- Video samples.

Interview skills

Kinds of interviews- required key skills – corporate culture – mock interview- video samples.

L:30; P:30; Total: 60

TEXT BOOKS:

1. Meenakshi Raman, Sangeetha Sharma: Technical Communication Principles and Practice, Oxford University Press.

REFERENCES:

1. Jeremy Comfort, Pamela Rogerson, Trish Stott and Derek Utley: Speaking Effectively, Cambridge University Press.
2. Jayashree Balan; Spoken English, Vijay Nicole Imprints Private Ltd., Chennai.
3. Jean Naterop and Rod Revell (1988) Telephoning in English (Cambridge University Press David Martur (1994), Tough Talking, University Press, Hyderabad.

I CIVIL ENGINEERING PRACTICE

1. Basic pipe connection using valves, taps, couplings, unions, reducers, elbows in household fitting.
2. Study of pipe connections on the suction and delivery pipe layouts.
3. Test on Pipe (Impact, pressure, freezing and thawing)
4. Compression, deflection, hardness (Rockwell and Brinnel), and torsion test

II MECHANICAL ENGINEERING PRACTICE

1. Study on 2, 4 –stroke IC engines
2. Study of steam generator, engine and gearbox.
3. Load test on 4- stroke diesel engine
4. Load test on 4- stroke P.S.G. diesel engine

III ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Calibration of ammeter and voltmeter.
3. Measurement of power using watt meter
4. Measurement of energy using single-phase energy meter.

IV ELECTRONICS ENGINEERING PRACTICE

1. (a) Study of Electronic components and equipment (i) Resistor colour coding (ii) usage of CRO & Multimeter.
(b) Soldering of simple electronic components and checking the continuity.
(c) Assembling electronic components on a PCB.
1. Characteristics of PN & Zener Diodes.
2. Measurement of ripple factor for HWR & FWR.
3. Input and output characteristics of CE transistor.

Total: 60

XBT302 PROFESSIONAL ETHICS AND HUMAN VALUES (BT)

3 0 0 3

UNIT I HUMAN VALUES

10

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS

9

Senses of 'Engineering Ethics' - variety of moral issues - 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.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk -. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES

8

Multinational corporations - Environmental ethics - computer ethics - weapons development .

Carbon trade - Co₂ Sequestration, and its environmental impact.

Engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics.

Total:45

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, " Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

UNIT I METABOLISM OF AMINO ACIDS I**12**

Nitrogen metabolism and urea cycle. Biosynthesis of Gly, Ser and Cys; Biosynthesis of six essential amino acids (Met, Thr, Lys, Ile, Val, Leu) and regulation of branched chain amino acids (concerted inhibition, allosteric regulation and enzyme multiplicity, sequential feed back) from oxaloacetate and pyruvate;

UNIT II METABOLISM OF AMINO ACIDS II**12**

Biosynthesis of aromatic amino acids. Metabolic disorders associated with branched chain and aromatic amino acid degradation. Important molecules derived from amino acids (auxins, DOPA, Serotonin, porphyrins, T3, T4, Adrenaline, Noradrenaline, histamine, GABA, polyamines etc)

UNIT III METABOLISM OF NUCLEIC ACIDS AND POLYSACCHARIDES**12**

Biosynthesis of nucleotides, *denovo* and salvage pathways for purines and pyrimidines, regulatory mechanisms: Degradation of nucleic acid by exo and endo nucleases. Biosynthesis and degradation of starch and glycogen.

UNIT III METABOLISM OF LIPIDS**12**

Biosynthesis and degradation of Lipids: Fatty acid synthesis and oxidative degradation, Triacylglycerol and phospholipid biosynthesis and degradation; Cholesterol biosynthesis and regulation and targets and action of cholesterol lowering drugs. Vitamins (fat and water-soluble), Co-enzymes, hormones (steroids like corticoids, amino acids derived like adrenaline and noradrenaline and peptides like insulin and growth hormone).

UNIT V STRUCTURAL PROTEINS AND CYTOSKELETON**12**

Protein targeting, signal sequence, secretion; Folding, Chaperons and targeting of organelle proteins, Protein degradation, receptor-mediated endocytosis, turnover Contractile proteins, Actin, myosin, actin polymerization, acto-myosin complexes, mechanism of myosin ATPase activity, excitation- contraction coupling and relaxation, microtubules, microfilaments and their role in organelle movements

Total : 60

TEXT BOOKS:

1. Lehninger's Principles of Biochemistry by David L. Nelson and Michael M Cox, Macmillan Worth Publisher
2. Lubert Stryer, Biochemistry, 4th Edition, WH Freeman & Co., 2000.

REFERENCES:

1. Voet and Voet, Biochemistry, 2nd Edition, John Wiley & Sons Inc., 1995.
2. Murray, R.K., Granner, B.K., Mayes, P.A., Rodwell. V.W., Harper's Biochemistry, Prentice Hall International.
3. Creighton. T.E., Proteins, Structure and Molecular Properties, 2nd Edition, W.H. Freeman and Co., 1993.
4. Salway, J.G., Metabolism at a Glance, 2nd Edition, Blackwell Science Ltd., 2000.

UNIT- I CELL STRUCTURE AND FUNCTION 12

Basic properties of cells; Cell theory; Cell complexity; Prokaryotic & Eukaryotic system; Plasma membrane- structure and function; Cytoplasm & Cytoskeleton; Microtubules, microfilaments & intermediate filaments. Intracellular Compartments: Structure and functions of Nucleus, Endoplasmic Reticulum, Golgi complex, Lysosomes, Peroxisomes, Chloroplast & Mitochondria. Protein Glycosylation, Sorting and Transport.

UNIT- II CELL DIVISION & CELL DIFFERENTIATION 12

Overview of the Cell Cycle, Interphase, Mitosis, Meiosis and Cytokinesis. Animal Cell & Yeast Cell Division, Cell Cycle Control & Checkpoints. General Characteristics of Cell Differentiation, Historical events in Cell differentiation, Cytoplasmic determinants, Nucleoplasmic Interactions; Stem Cell differentiation and its Biological Importance.

UNIT - III TRANSPORT ACROSS CELL MEMBRANES 12

Passive and Active Transport, Permeases, Na⁺/K⁺ Pump, ATPase pumps, Lysosomal & Vacuolar membrane ATP dependent Proton Pumps, Co-Transport Symport, Antiport, Transport into Prokaryotic Cells, Endocytosis and Exocytosis.

UNIT - IV RECEPTORS 12

Cytosolic, Nuclear & Membrane bound receptors, Examples and types of receptors; Chemo receptors of Bacteria (Attractants & Repellents).

UNIT - V SIGNAL TRANSDUCTION 12

Concept of Secondary messengers, cAMP, cGMP, Protein Kinases, G Proteins, Steroid / Peptide hormone regulation & Tissue specific regulation/ Autocrine and Endocrine systems

Total: 60

TEXT BOOKS:

1. The Cell by Cooper.
2. Cell and Molecular biology – De Robertis and De Robertis (1998) Waverly Pvt. Ltd.

REFERENCES:

1. Cell & Molecular Biology by Gerald Karp (2nd Ed.) Wiley publishers.
2. The World of the cell by Becker, Reece, Poenie (3rd edition) Benjamin Publishers.
3. Molecular Biology of the cell by Bruce Alberts.
4. The biochemistry of Cell Signalling-Ernst J.M.Helmreich. Oxford Press.
5. The world of Cell. 5th edition- Becker, Kleinsmith, Harden,-Pearson Publishers.
6. Cell & Molecular Biology by Phillip Sheeler and Donald E.Blanchi 3rd edition John Wiley &sons

UNIT I	FILTRATION	8
Filter media; filter aids; selection of filters –theory of filtrations. Constant pressure, constant volume - batch filtration; continuous filtration; industrial filters; settling and sedimentation; centrifugation		
UNIT II	MIXING AND AGITATION	8
Power for agitation; agitation of liquids; gas-liquid systems; gas-solid suspensions; agitator scale up.		
UNIT III	MECHANISM OF HEAT TRANSFER	10
Modes of heat transfer; Steady state conduction; combined resistances; unsteady state conduction; lumped heat capacity; extended surfaces;.		
UNIT IV	CONVECTION HEAT TRANSFER	10
Dimensional analysis; forced and natural convection; convection in flow over surfaces through pipes boiling and condensation. Combined conduction and convection		
UNIT V	HEAT EXCHANGERS AND EVAPORATORS	9
Equipments; overall heat transfer coefficients; design of heat exchangers; NTU concept; evaporators; single and multiple effects; mass and enthalpy balances.		
L:45; T:15; Total: 60		

TEXT BOOKS:

1. Geankoplis C.J. Transport Processes And Unit Operations. Prentice Hall India.2002.
2. McCabe W.L., Smith J.C. Unit Operations In Chemical Engineering.5th Edition.Mcgrawhill.1993.

REFERENCES:

1. Incropera F.P. Fundamentals Of Heat And Mass Transfer. John Wiley.1998.

XBT307 CELL BIOLOGY AND MICROBIOLOGY LAB 0042

1. Laboratory safety and sterilization techniques
2. Principles of microscopy, phase contrast and fluorescent microscopy.
3. Identification of given plant, animal and bacterial cells and their components by microscopy,
4. Preparation of culture media – nutrient broth and nutrient agar
5. Culturing of microorganisms – in broth and in plates (pour plates, streak plates, isolation and preservation of bacterial cultures)
6. Staining techniques – Grams', Differential, Leishman, Giemsa staining
7. Separation of Peripheral Blood Mononuclear Cells from blood,
8. Osmosis and Tonicity,
9. Tryphan Blue Assay,
10. Staining for different stages of mitosis in *AlliumCepa* (Onion)
11. Quantification of microorganisms.
12. Effect of disinfectants on microbial flora
13. Isolation and identification of microorganisms from different sources – soil, water and milk
14. Antibiotic sensitivity assay
15. Growth curve – observation and growth characteristics of bacteria and yeast.
16. Effect of different parameters on bacterial growth (ph, temperature & UV irradiation)

Total: 60

1. General Lab Practice on:
 - i) Laboratory Hygiene
 - ii) Laboratory Health Hazards
 - iii) Handling of the Glassware, instruments and its maintenance
 - iv) Laboratory Cleanliness
 2. Qualitative Analysis
 - i) Titration using pH meter
 - ii) Estimation of pH and Preparation of Buffer using pH Meter
 - iii) Estimation of Amino acid by the Sorenson's titration method
 - iv) Estimation of Sugar using BQR method
 - v) Estimation of the Acid from the Gastric Juice
 - vi) Normal and Abnormal Constituents of Urine
 3. Hematological Analysis
 - i) Blood Group identification
 - ii) Hemoglobin Count
 - iii) Blood cell Count
 - iv) Estimation of Glucose by an anthrone method
 - v) Estimation of Protein by Biuret method and Lowry et al., method.
 - vi) Estimation of Cholesterol by Zlatikis Zak Method
 4. Separation Techniques
 - i) Separation of Amino acid using Paper Chromatography
 - ii) Separation of Amino acids using Thin Layer Chromatography
 - iii) Separation of water and Alcohol Soluble Components through Soxhlet apparatus.
 - iv) Separation of Casein from Milk
 - v) Separation of Starch from Potato
-
1. Enzyme kinetics (Industrial enzyme)
 - a. Optimum pH
 - b. Optimum temperature
 - c. k_m value
 - d. Activity

Total: 60

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY 12

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests 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, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS AND BIODIVERSITY 12

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 the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III ENVIRONMENTAL POLLUTION 8

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Soil waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation – Consumerism and waste products – Environment 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

Population growth, variation among nations – Population explosion – Family Welfare Programme – Environment and human health – Human Rights – Value Education - HIV / AIDS – Women and Child Welfare – Role of Information Technology in Environment and human health – Case studies.

L:45; Total: 45

TEXT BOOKS:

1. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co.
3. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science.
4. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications.

REFERENCES:

1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media.
2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
3. Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.
4. S.K.Dhameja, Environmental Engineering and Management, S. K. Kataria and Sons, New Delhi, 1999.

XBT403 BASIC INDUSTRIAL BIOTECHNOLOGY 3 0 0 3

UNIT I INTRODUCTION TO INDUSTRIAL BIOPROCESS 7

An overview of industrial fermentation process – traditional and modern biotechnology. A brief survey of organisms, processes, products relating to modern biotechnology. Medium requirements for fermentation process-examples of simple and complex media; Industrial substrates. Isolation, improvement and maintenance of Industrial Micro- Organisms. A case study.- Global and Indian scenario of Industrial biotechnology

UNIT II PRODUCTION OF PRIMARY METABOLITES 10

A brief outline of processes for the production of some commercially important organic acids (e.g. citric acid, lactic acid, acetic acid); amino acids (glutamic acid, phenylalanine, aspartic acid) and alcohols (ethanol, butanol)

UNIT III PRODUCTION OF SECONDARY METABOLITES 10

Study of production processes for various classes of secondary metabolites: antibiotics: beta-lactams (penicillin, cephalosporin), aminoglycosides (streptomycin) macrolides (erythromycin), vitamins and steroids.

UNIT IV PRODUCTION OF ENZYMES AND OTHER BIOPRODUCTS 8

Production of industrial enzymes such as proteases, amylases, lipases, cellulases , Production of biopesticides, biofertilisers, biopreservatives (Nisin), cheese, biofuels, biopolymers (xanthan gum, PHB), single cell protein.

UNIT V PRODUCTION OF MODERN BIOTECHNOLOGY PRODUCTS 10

Production of recombinant proteins having therapeutic and diagnostic applications, production of vaccines. Production of monoclonal antibodies. Products of plant and animal cell culture. Strain improvement through physical and chemical mutation, molecular tools, protoplast fusion.

Total: 45

TEXT BOOKS

1. Casida Jr, L.E., "Industrial Microbiology", New Age International (P) Ltd.
2. Prescott, Dunn, "Industrial Microbiology", Agrobios (India).

REFERENCES

1. Wulf Cruger and Anneliese Crueger, "Biotechnology: A Textbook of Industrial Microbiology", Panima Publishing Corporation.
2. Murrey Moo & Young, "Comprehensive Biotechnology", Pergamon.

**XBT404 CHEMICAL THERMODYNAMICS AND
BIOTHERMODYNAMICS**

3 1 0 4

UNIT I THERMODYNAMIC PROPERTIES OF FLUIDS 8

Concept of lost work; entropy generation; calculation of real irreversible processes; power cycle; liquefaction. Volumetric properties of fluids exhibiting non ideal behavior; residual properties; estimation of thermodynamic properties using equations of state; calculations involving actual property exchanges; Maxwell's relations and applications. Laws of thermodynamics

UNIT II SOLUTION THERMODYNAMICS 9

Partial molar properties; concepts of chemical potential and fugacity; ideal and non-ideal solutions; concepts and applications of excess properties of mixtures; activity coefficient; composition models; Gibbs Duhem equation.

UNIT III PHASE EQUILIBRIA 9

Criteria for phase equilibria; v-l-e calculations for binary and multi component systems; liquid-liquid equilibria and solid-solid equilibria.

UNIT IV CHEMICAL REACTION EQUILIBRIA 9

Equilibrium criteria for homogeneous chemical reactions; evaluation of equilibrium constant; effect of temperature and pressure on equilibrium constant; calculation of equilibrium conversion and yields for single and multiple reactions.

UNIT V BIOTHERMODYNAMICS 10

Application of thermodynamics in biological systems; Stoichiometry and energetic analysis.

L: 45; T:15; Total: 60

TEXT BOOKS:

1. Smith J.M., Van Ness H.C., Abbot M.M. Chemical Engineering Thermodynamics. 6th Edition. McGraw-Hill, 2001.
2. Narayanan K.V. A Text Book Of Chemical Engineering Thermodynamics. Prentice Hall India, 2001.

REFERENCES:

1. Sandler S.I. Chemical And Engineering Thermodynamics. John Wiley, 1989.

XBT405 INSTRUMENTAL METHODS OF ANALYSIS 3 0 0 3

UNIT I BASICS OF MEASUREMENT 5

Classification of methods – calibration of instrumental methods – electrical components and circuits – signal to noise ratio – signal – noise enhancement.

UNIT II OPTICAL METHODS 5

General design – sources of radiation – wavelength selectors – sample containers – radiation transducers – types of optical instruments – Fourier transform measurements. Measurement of transmittance and absorbance – beer's law – spectrophotometer analysis – qualitative and quantitative absorption measurements. Nephelometry – Turbidimetry – fluorimetry techniques

UNIT III SPECTROSCOPY 15

Types of spectrometers – UV – visible – IR – Raman – NMR spectroscopy – X – ray diffraction – Mass spectroscopy -Theory – Instrumentation and applications

UNIT IV THERMAL METHODS 5

Thermo-gravimetric methods – differential thermal analysis – differential scanning calorimetry.

UNIT V SEPARATION METHODS 15

Introduction to chromatography – models – ideal separation – retention parameters – van – deemter equation – gas chromatography – stationary phases – detectors – kovats indices – HPLC – pumps – columns – detectors – ion exchange chromatography – size exclusion chromatography – supercritical chromatography – capillary electrophoresis

Total:45

TEXT BOOKS:

1. Instrumental Methods of Analysis; Willard and .H. Merrit, Phi, 1999.
2. Instrumental Methods of Analysis, D. Skoog, 2000.

UNIT I CLASSICAL GENETICS 12

Mendelian genetics, linkage, crossing over, classical experiments – Hershey and Chase; Avery McLeod & McCarty. Bacterial Conjugation, Transduction and Transformation.

UNIT II GENES 12

DNA/RNA as the genetic material. Double helical structure of DNA. Types of DNA. Super coiling and periodicity of DNA. Linking number of DNA. Nature of multiple alleles; Cis- acting sites and Trans-acting molecules; Euchromatin and heterochromatin. Nucleosomes. Organelle DNA- Mitochondrial and chloroplast DNA; Gene mapping, exons and introns, repetitive and non-repetitive DNA, C-value paradox; **DNA Replication:** Origin of DNA replication. Bacterial and eukaryotic replicons. DNA polymerases. Mechanism and regulation of DNA replication in prokaryotes and eukaryotes

UNIT III TRANSCRIPTION 12

Various RNA species and their properties- tRNA as an adapter and turnover of mRNA. **Transcription in Prokaryotes:** RNA polymerases. Mechanism of transcription- initiation, elongation and termination. Role of sigma factor in transcription. **Transcription in Eukaryotes:** RNA Polymerases. Downstream and upstream promoters. Techniques to define promoters- foot printing experiment. Mechanism of transcription. Interaction of upstream factors with basal apparatus. Role of enhancers. Post-transcriptional modifications of various RNA species. Transcription in mitochondria and chloroplast. **The Operon:** Positive and negative control of transcription, repressor-inducer complex, catabolite repression and attenuation.

UNIT IV GENETIC CODE 12

Evidence for triplet code. Properties of genetic code, Wobble hypothesis. Mitochondrial genetic code. Suppressor tRNAs. **Protein Synthesis :** Structure of prokaryotic and eukaryotic ribosomes and their role in protein synthesis. Mechanism of initiation, elongation and termination of protein synthesis. Regulation of translation in prokaryotes and eukaryotes. Posttranslational modifications of proteins. **Protein folding:** Role of molecular chaperones.

UNIT V NUCLEAR SPLICING

12

Lariat formation, Sn RNAs, cis-splicing and trans-splicing reactions. Catalytic RNA- Ribozymes- Ribonuclease P, small RNAs types, group I & II introns. **Transposons:** Transposition by replicative and non-replicative mechanisms. Intermediates of transposition. Retroviruses and retroposons

Total: 60

TEXT BOOKS:

1. Genes VIII, Lewin, Benjamin(2002)OUP, Oxford.
2. Genomes, 2nd ed, Brown, T. A.(2002) John Wiley and sons ,Oxford

REFERENCES:

1. Molecular biology of cell 4thed Alberts, Bruce; Watson, J D(2002) Garland Science Publishing, New York.
2. Molecular cell biology 4th ed Lodish, Harvey and. Baltimore, D(2000) W.H. Freeman and Co., New York
3. Cell and Molecular Biology 8th ed, Robertis, EDP De & Robertis, EMF De(2002) lippincott Williams & Wilkins international student edition, Philadelphia.
4. Essentials of Molecular Biology 4th ed, Malacinski, G. M. (2003) Jones & Bartlet Publishers, Boston
5. Cell and Molecular Biology: concepts and experiments 3rd ed Karp, Gerald(2002) John Wiley and sons, New York.
6. The Cell-a molecular approach, 3rd ed Cooper, G M& Hausman, R E(2004) ASM Press, Washington D C

1. Isolation of bacterial DNA
2. Isolation of plant cell and animal cell genomic DNA
3. Agarose gel electrophoresis
4. Restriction enzyme digestion
5. Competent cells preparation
6. Transformation and screening for recombinants
7. Restriction enzyme digestion
8. Competent cells preparation
9. Blue and white selection for recombinants
10. Plating of ϕ phage
11. ϕ phage lysis of liquid cultures

Total: 60

1. Precision and validity in an experiment using absorption spectroscopy.
2. Validating Lambert-Beer's law using KMnO_4
3. Finding the pKa of 4-nitrophenol using Absorption spectroscopy.
4. UV spectra of nucleic acids.
5. Estimation of SO_4^{2-} by Nephelometry.
6. Estimation of Al^{3+} by Fluorimetry.
7. Chromatography analysis using TLC, paper and column chromatography
8. COD and BOD analysis
9. Flame photometer
10. Analysis of ethanol using Gas chromatography
11. Estimation of Chloride using conductivity meter
12. HPLC-A demonstration
13. AAS - A demonstration

Total: 45