AFFILIATED INSTITUTIONS

ANNA UNIVERSITY, CHENNAI

REGULATIONS - 2008

B.E. ENVIRONMENTAL ENGINEERING

II TO VIII SEMESTERS CURRICULUM AND SYLLABI

SEMESTER II

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	HS2161	Technical English – II*	3	1	0	4
2.	MA2161	Mathematics – II*	3	1	0	4
3.	PH2161	Engineering Physics – II*	3	0	0	3
4.	CY2161	Engineering Chemistry – II*	3	0	0	3
5. a	ME2151	Engineering Mechanics **(For non-circuit branches)**	3	1	0	4
5. b	EE2151	Circuit Theory **(For branches under Electrical Faculty)**	3	1	0	4
5. c	EC2151	Electric Circuits and Electron Devices **(For branches under I & C Faculty)**	3	1	0	4
6. a	GE2151	Basic Electrical & Electronics Engineering **(For non-circuit branches)**	4	0	0	4
6. b	GE2152	Basic Civil & Mechanical Engineering **(For circuit branches)**	4	0	0	4
PRACTICAL						
7.	GE2155	Computer Practice Laboratory-II*	0	1	2	2
8.	GS2165	Physics & Chemistry Laboratory - II*	0	0	3	2
9. a	ME2155	Computer Aided Drafting and Modeling Laboratory **(For non-circuits branches)**	0	1	2	2

9. b	EE2155	Electrical Circuits Laboratory **(For branches under Electrical Faculty)**	0	0	3	2
9. c	EC2155	Circuits and Devices Laboratory **(For branches under I & C Faculty)**	0	0	3	2
					TOTAL : 28 CREDITS	
10.	-	English Language Laboratory +	0	0	2	-

*** Common to all B.E. / B.Tech. Programmes**

+ Offering English Language Laboratory as an additional subject (with no marks) during 2nd semester may be decided by the respective Colleges affiliated to Anna University Chennai.

A. CIRCUIT BRANCHES

I Faculty of Electrical Engineering

1. B.E. Electrical and Electronics Engineering
2. B.E. Electronics and Instrumentation Engineering
3. B.E. Instrumentation and Control Engineering

II Faculty of Information and Communication Engineering

1. B.E. Computer Science and Engineering
2. B.E. Electronics and Communication Engineering
3. B.E. Bio Medical Engineering
4. B.Tech. Information Technology

B. NON – CIRCUIT BRANCHES

I Faculty of Civil Engineering

1. B.E. Civil Engineering

II Faculty of Mechanical Engineering

1. B.E. Aeronautical Engineering
2. B.E. Automobile Engineering
3. B.E. Marine Engineering
4. B.E. Mechanical Engineering
5. B.E. Production Engineering

III Faculty of Technology

1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
6. B.Tech. Petroleum Engineering

SEMESTER III

(For the candidates admitted from the academic year 2008 – 2009 onwards)

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
MA2211	Transforms and Partial Differential Equations	3	1	0	4
CE3202	Mechanics Of Solids	3	1	0	4
CE3201	Fluid Mechanics	3	0	0	3
CE3206	Surveying	3	0	0	3
EN3205	Environmental Chemistry And Microbiology	3	0	0	3
GE3206	Principles Of Environmental Science And Engineering	3	0	0	3
PRACTICAL					
CE3208	Fluid Mechanics And Strength Of Materials Laboratory	0	0	3	2
CE3209	Surveying Laboratory	0	0	3	2
CE3210	Environmental Engineering Laboratory – I	0	0	3	2
	TOTAL	**18**	**2**	**9**	**26**

SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
MA3211	Probability And Statistics	3	1	0	4
CE3211	Soil Mechanics And Foundation Engineering	3	0	0	3
CE3212	Applied Hydraulics And Fluid Machines	3	0	0	3
EN3213	Ecology	3	0	0	3
CE3215	Water Supply Engineering	3	0	0	3
CE3216	Industrial Safety	3	0	0	3
Practical					
CE3220	Fluid Machinery Laboratory	0	0	3	2
EN3217	Environmental Engineering Laboratory- II	0	0	3	2
EN3218	Microbiology Laboratory	0	0	3	2
	TOTAL	**18**	**1**	**9**	**25**

SEMESTER V

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
EN3301	Solid Waste Management	3	0	0	3
EN3302	Air Pollution And Control	3	0	0	3
EN3303	Wastewater Engineering - I	3	0	0	3
EN3304	Noise Pollution And Control	3	0	0	3
EN3305	Energy Engineering	3	0	0	3
EN3306	Occupational Hazards And Industrial Hygiene	3	0	0	3
PRACTICAL					
EN3307	Air and Noise Pollution Laboratory	0	0	3	2
GE3318	Communication Skills Laboratory	0	0	4	2
EN3309	Environmental Engineering Laboratory – III (Plumbing, Piping And House Wiring)	0	0	3	2
	TOTAL	**18**	**0**	**10**	**24**

SEMESTER VI

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
EN3310	Wastewater Engineering - II	3	0	0	3
EN3311	Environmental Instrumentation	3	0	0	3
EN3312	GIS For Environmental Engineers	3	0	0	3
MG3313	Principles Of Management	3	0	0	3
EN3314	Cleaner Production	3	0	0	3
	Elective – I	3	0	0	3
PRACTICAL					
EN3315	Environmental Instrumentation Laboratory	0	0	3	2
EN3316	Environmental Engineering Design And Drawing	0	0	3	2
EN3317	G I S Laboratory	0	0	3	2
	TOTAL	**18**	**0**	**9**	**24**

SEMESTER VII

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
EN3401	Disaster Management	3	0	0	3
EN3402	Transport Of Water And Wastewater	3	0	0	3
EN3403	Hazardous Waste Management	3	0	0	3
EN3404	Industrial Waste Management	3	0	0	3
	Elective - II	3	0	0	3
	Elective - III	3	0	0	3
PRACTICAL					
EN3405	Plant Lay out Design	0	0	3	2
EN3406	Industrial Safety Laboratory	0	0	3	2
EN3407	Project Management Software Laboratory	0	0	3	2
	TOTAL	**18**	**0**	**9**	**24**

SEMESTER VIII

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
EN3408	Environmental Impact Assessment	3	0	0	3
	Elective – IV	3	0	0	3
	Elective – V	3	0	0	3
	Elective – VI	3	0	0	3
PRACTICAL					
EN3409	Project Work	0	0	12	6
	TOTAL	**12**	**0**	**12**	**18**

SEMESTER - VI

Elective – I

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	EN3001	Wealth From Waste	3	0	0	3
2.	EN3002	Sustainable Development	3	0	0	3
3.	EN3003	Environmental Policies and Law	3	0	0	3
4.	EN3004	Wind Power Engineering	3	0	0	3

SEMESTER – VII

Elective – II

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
5.	EN3005	Water Power Engineering	3	0	0	3
6.	EN3006	Tidal Engineering	3	0	0	3
7.	EN3007	Geo-Thermal Engineering	3	0	0	3
8.	EN3008	Coastal Zone Management	3	0	0	3

Elective – III

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
9.	EN3009	Green Building Design	3	0	0	3
10.	GE2022	Total Quality Management	3	0	0	3
11.	CE3011	Hydrology	3	0	0	3
12.	CE3012	Ground Water Contamination	3	0	0	3

SEMESTER –VIII

Elective – IV

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
13.	EN3013	Process Safety And Loss Prevention	3	0	0	3
14.	EN3015	Climatology And Meteorology	3	0	0	3
15.	EN3016	Epidemiology And Control Of Communicable Diseases	3	0	0	3

Elective – V

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
16.	EN3017	Low Carbon Economy	3	0	0	3
17.	EN3018	Nuclear Energy	3	0	0	3
18.	EN3019	Solar Energy	3	0	0	3
19.	EN3020	Site Assessment And Remediation	3	0	0	3

Elective – VI

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
20.	EN3021	Urban And Rural Sanitation	3	0	0	3
21.	EN3022	Engineering Economics And Cost Analysis	3	0	0	3
22.	EN3023	Urban And Rural Planning	3	0	0	3
23.	EN3024	Risk Analysis	3	0	0	3

HS2161	TECHNICAL ENGLISH II	L T P C 3 1 0 4

AIM:

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:

- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To help students improve their active and passive vocabulary.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations.

UNIT I **12**

Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading& predicting content, Reading and interpretation, extended definitions, Process description

Suggested activities:

1. Exercises on word formation using the prefix 'self' - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

UNIT II **12**

Phrases / Structures indicating use / purpose – Adverbs-Skimming – Non-verbal communication - Listening – correlating verbal and non-verbal communication -Speaking in group discussions – Formal Letter writing – Writing analytical paragraphs.

Suggested activities:

1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

UNIT III **12**

Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

Suggested activities:

1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object –verb / object – noun)
2. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, Multiple choice question.
4. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

UNIT IV **12**

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

Suggested Activities:

1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – Writing argumentative paragraphs – Writing formal letters – Writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages.

UNIT V **9**

Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

Suggested Activities:

1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

TOTAL: 60 PERIODS

TEXT BOOK:

1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

REFERENCES:

1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).
3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.

EXTENSIVE READING:

1. Robin Sharma**, '**The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

NOTE:

The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

MA2161 MATHEMATICS – II L T P C
3 1 0 4

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS 12

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelpipeds.

UNIT III ANALYTIC FUNCTIONS 12

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM 12

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3rd Edition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40th Edition, Khanna Publications, Delhi, (2007).

REFERENCES:

1. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 3rd Edition, Pearson Education, (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7th Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).

PH2161 ENGINEERING PHYSICS – II L T P C
3 0 0 3

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives.

Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V MODERN ENGINEERING MATERIALS 9

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA

Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.

Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Charles Kittel ' Introduction to Solid State Physics', John Wiley & sons, 7th edition, Singapore (2007)
2. Charles P. Poole and Frank J.Ownen, 'Introduction to Nanotechnology', Wiley India(2007) (for Unit V)

REFERENCES:

1. Rajendran, V, and Marikani A, 'Materials science'Tata McGraw Hill publications, (2004) New delhi.
2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, 'Materials Science' Anuradha publications, Kumbakonam, (2006).

CY2161 ENGINEERING CHEMISTRY – II L T P C
3 0 0 3

AIM

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

OBJECTIVES

- The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
- Principles of corrosion control
- Chemistry of Fuels and combustion
- Industrial importance of Phase rule and alloys
- Analytical techniques and their importance.

UNIT I ELECTROCHEMISTRY 9

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe^{2+} vs dichromate and precipitation – Ag^{+} vs Cl^{-} titrations) and conduct metric titrations (acid-base – HCI vs, NaOH) titrations,

UNIT II CORROSION AND CORROSION CONTROL 9

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

UNIT III FUELS AND COMBUSTION 9

Calorific value – classification – Coal – proximate and ultimate analysis metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels-water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

UNIT IV PHASE RULE AND ALLOYS 9

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT V ANALYTICAL TECHNIQUES 9

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006).

REFERENCES:

1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

ME2151 ENGINEERING MECHANICS L T P C
3 1 0 4

OBJECTIVE

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT I BASICS & STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS 12

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12

Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction.

Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

TEXT BOOK:

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, (1997).

REFERENCES:

1. Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., (2000).
2. Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2000).
3. Palanichamy, M.S., Nagam, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill, (2001).
4. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
5. Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., (2002).

EE2151	CIRCUIT THEORY	L	T	P	C
	(Common to EEE, EIE and ICE Branches)	3	1	0	4

UNIT I BASIC CIRCUITS ANALYSIS 12

Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS: 12

Network reduction: voltage and current division, source transformation – star delta conversion.

Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSING THREE PHASE CIRCUITS 12

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis",Tata McGraw Hill publishers, 6th edition, New Delhi, (2002).
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw Hill, (2007).

REFERENCES:

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996).
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2001).
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999).
4. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003).

EC2151 ELECTRIC CIRCUITS AND ELECTRON DEVICES L T P C
(For ECE, CSE, IT and Biomedical Engg. Branches) **3 1 0 4**

UNIT I CIRCUIT ANALYSIS TECHNIQUES 12

Kirchoff's current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS 12

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

UNIT III SEMICONDUCTOR DIODES 12

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

UNIT IV TRANSISTORS 12

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only) 12

Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series,Tata McGraw Hill, (2001)
2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill, 2nd Edition, (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, (2008).

REFERENCES:

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education, (2006).
2. William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6th Edition, 2002.
3. J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits",Tata McGraw Hill, 2nd Edition, 2008.

GE2151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
(Common to branches under Civil, Mechanical and Technology faculty) 4 **0 0 4**

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS 12

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS 12

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL: 60 PERIODS

TEXT BOOKS:

1. V.N. Mittle "Basic Electrical Engineering",Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, "Applied Electronics" S. Chand & Co., 2006.

REFERENCES:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering",Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
3. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2002).
5. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers, (2003).

GE2152 BASIC CIVIL & MECHANICAL ENGINEERING L T P C
(Common to branches under Electrical and I & C Faculty) **4 0 0 4**

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES 15
Foundations: Types, Bearing capacity – Requirement of good foundations.

Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

TOTAL: 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10
Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV IC ENGINES 10
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10
Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 30 PERIODS

REFERENCES:

1. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”,Tata McGraw Hill Publishing Co., New Delhi, (1996).
2. Ramamrutham. S, “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. (1999).
3. Seetharaman S. “Basic Civil Engineering”, Anuradha Agencies, (2005).
4. Venugopal K and Prahu Raja V, “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, (2000).
5. Shantha Kumar S R J., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, (2000).

GE2155	COMPUTER PRACTICE LABORATORY – II	L	T	P	C
		0	1	2	2

LIST OF EXPERIMENTS

1. UNIX COMMANDS **15**

Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING **15**

Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX **15**

Dynamic Storage Allocation-Pointers-Functions-File Handling

TOTAL: 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Hardware

- 1 UNIX Clone Server
- 33 Nodes (thin client or PCs)
- Printer – 3 Nos.

Software

. OS – UNIX Clone (33 user license or License free Linux)
- Compiler - C

GS2165	PHYSICS LABORATORY – II	L	T	P	C
		0	0	3	2

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

GS2165 CHEMISTRY LABORATORY – II L T P C
0 0 3 2

LIST OF EXPERIMENTS

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using $BaCl_2$ vs Na_2SO_4
4. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

ME2155 COMPUTER AIDED DRAFTING AND MODELING LABORATORY L T P C
0 1 2 2

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

TOTAL: 45 PERIODS

EE2155	ELECTRICAL CIRCUIT LABORATORY (Common to EEE, EIE and ICE)	L T P C 0 0 3 2

LIST OF EXPERIMENTS

1. Verification of ohm's laws and kirchoff's laws.
2. Verification of Thevemin's and Norton's Theorem
3. Verification of superposition Theorem
4. Verification of maximum power transfer theorem.
5. Verification of reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits.
10. Frequency response of single tuned coupled circuits.

TOTAL: 45 PERIODS

EC2155	CIRCUITS AND DEVICES LABORATORY	L T P C 0 0 3 2

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET

11. Characteristics of Diac and Triac.

12. Characteristics of Photodiode and Phototransistor.

TOTAL: 45 PERIODS

ENGLISH LANGUAGE LABORATORY (Optional) **L T P C**
0 0 2 -

1. Listening: **5**

Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

2. Speaking: **5**

Pronouncing words & sentences correctly – word stress – Conversation practice.

Classroom Session **20**

1. Speaking: Introducing oneself, Introducing others, Role play, Debate- Presentations: Body language, gestures, postures.
   Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

Evaluation

(1) Lab Session – 40 marks
- Listening – 10 marks
- Speaking – 10 marks
- Reading – 10 marks
- Writing – 10 marks

(2) Classroom Session – 60 marks
- Role play activities giving real life context – 30 marks
- Presentation – 30 marks

Note on Evaluation

1. Examples for role play situations:
   a. Marketing engineer convincing a customer to buy his product.
   b. Telephone conversation – Fixing an official appointment / Enquiry on availability of flight or train tickets / placing an order. etc.
2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

REFERENCES:

1. Hartley, Peter, Group Communication, London: Routledge, (2004).
2. Doff, Adrian and Christopher Jones, Language in Use – (Intermediate level), Cambridge University Press, (1994).
3. Gammidge, Mick, Speaking Extra – A resource book of multi-level skills activities , Cambridge University Press, (2004).
4. Craven, Miles, Listening Extra - A resource book of multi-level skills activities, Cambridge, Cambridge University Press, (2004).

5. Naterop, Jean & Rod Revell, Telephoning in English, Cambridge University Press, (1987).

LAB REQUIREMENTS

1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.

MA2211 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
3 1 0 4

(Common to all B.E. / B.Tech. Degree Programmes)

OBJECTIVES

The course objective is to develop the skills of the students in the areas of Transforms and Partial Differtial Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I FOURIER SERIES 9 + 3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT II FOURIER TRANSFORMS 9 + 3

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9 +3

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS 9 + 3

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z-transform.

TOTAL (L:45+T:15): 60 PERIODS

TEXT BOOK:

1. Grewal, B.S, "Higher Engineering Mathematic", 40th Edition, Khanna publishers, Delhi, (2007)

REFERENCES:

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematic", 7th Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2007).
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2007).
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, Wiley India (2007).

CE3202	MECHANICS OF SOLIDS	L	T	P	C
		3	1	0	4

OBJECTIVES

The objective of the course is to understand the various materials strength in the form of Stresses, strains, shear force and bending moment. The course will also used to study the loads in columns, torsion and complex Stresses.

UNIT I STRESS AND STRAIN 9

Stress and strain at a point – Tension, Compression, Shear Stress – Hooke's Law – Relationship among elastic constants – Stress Strain Diagram for Mild Steel, TOR steel, Concrete – Ultimate Stress – Yield Stress – Factor of Safety – Thermal Stresses – Thin Cylinders and Shells – Strain Energy due to Axial Force – Resilience – Stresses due to impact and Suddenly Applied Load – Compound Bars.

UNIT II SHEAR FORCE AND BENDING MOMENT DIAGRAMS AND STRESS IN BEAMS 9

Beams and Bending- Types of loads, supports – Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load. Theory of Simple Bending – Analysis of Beams for Stresses – Stress Distribution at a cross Section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions.

UNIT III COLUMNS 9

Eccentrically loaded short columns – middle third rule – core section – columns of unsymmetrical sections – (angle, channel sections) – Euler's theory of long columns – critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns

UNIT IV TORSION 9

Torsion of Circular and Hollow Shafts – Elastic Theory of Torsion – Stresses and Deflection in Circular Solid and Hollow Shafts – Stepped Composite Shafts – Combined Bending Moment and Torsion of Shafts – Strain Energy due to Torsion – Modulus of Rupture – Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – Flitched Beams – Leaf Springs – Springs in series and parallel – Design of buffer springs.

UNIT V COMPLEX STRESSES 9

2 D State of Stress – 2 D Normal and Shear Stresses on any plane – Principal Stresses and Principal Planes – Graphical Method

PLANE TRUSSES: Analysis of Plane Trusses – Method of Joints – Method of Sections

LECTURES: 45 TUTORIALS : 15 TOTAL : 60 PERIODS

TEXT BOOKS

1. Sadhu Singh, “Strength of Materials”, Khanna Publishers, New Delhi, 2000
2. Vaidyanathan.R, Perumal.P and Lingeswari.S, “Mechanics of Solids and Structures”, Volume 1, Scitech Publication Private Ltd, Chennai, 2006.
3. Rajput.R.K. “Strength of Materials”, S.Chand and Co, New Delhi, 2007.

REFERENCES :

1. Prasad.I.B, “Strength of Materials”, Khanna Publishers, New Delhi,1998.
2. Timoshenko.S.B. and Gere.J.M, “ Mechanics of Materials”, Van Nos Reinbhold, New Delhi 1995.
3. Vazirani.V.N and Ratwani.M.M, “Analysis of Structures”, Vol I Khanna Publishers, New Delhi,1995.
4. Jhunarkar.S.B. and Shah.H.J, “Mechanics of Structures”, Vol I, Charotar Publishing House, New Delhi 1997.
5. Kazimi, “Solid Mechanics”, Tata McGraw-Hill Publishing Co., New Delhi, 1998.

CE3201	FLUID MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES

To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyse and appreciate the complexities involved in solving the fluid flow problems.

UNIT I FLUID PROPERTIES AND FLUID STATICS 9

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

UNIT II FLIUD KINEMATICS 9

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net.

UNIT III FLUID DYNAMICS 9

Fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube – flow through weirs and notches.

UNIT IV FLOW THROUGH PIPES 9

Viscous flow - Navier-Stoke's equation (Statement only) - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - Hydraulic and energy gradient - flow through pipes - Darcy -weisbach's equation - pipe roughness -friction factor- Moody's diagram.

UNIT V BOUNDARY LAYER 9

Boundary layer – definition- boundary layer on a flat plate – Thickness and classification – displacement , energy and momentum thickness – Boundary layer separation and control – drag in flat plate, cylinders and spheres – drag and lift coefficients.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Bansal, R.K., “Fluid Mechanics and Hydraulics Machines”, (5th edition), Laxmi publications (P) Ltd, New Delhi, 2008.
2. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 2001.
3. Kumar, K.L., “Engineering Fluid Mechanics”, Eurasia Publishing House (P) Ltd, New Delhi (7^{th} edition), 2004.

REFERENCES :

1. Streeter, V.L., and Wylie, E.B., “Fluid Mechanics”, McGraw-Hill, 2000.
2. Vasandani, V.P., “Hydraulic Machines - Theory and Design”, Khanna Publishers.2001.
3. White, F.M., “Fluid Mechanics”, Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
4. Som, S.K., and Biswas, G., “Introduction to Fluid Mechanics and Fluid Machines”, Tata McGraw-Hill, 2nd Edition, 2004.

CE3206	SURVEYING	L	T	P	C
		3	0	0	3

OBJECTIVES

At the end this course the student will posses the basic knowledge about the various surveying instruments and various surveying techniques.

UNIT I INTRODUCTION AND CHAIN SURVEYING 9

Definition – Principles of Surveying - Classification - Field and office work - Scales - Conventional signs – Chain Survey - instruments - Ranging and chaining - Reciprocal ranging – Obstacles in Chaining - Setting perpendiculars - Well conditioned triangles - Traversing - Plotting - Enlarging and reducing Maps.

UNIT II COMPASS AND PLANE TABLE SURVEYING 9

Prismatic compass - Surveyor’s compass - Bearing - Systems and conversions - Local attraction - Magnetic declination - Dip - Traversing - Plotting - Adjustment of errors by graphical methods - Instruments and accessories - Merits and demerits - Methods - Radiation - Intersection – Resection.

UNIT III LEVELLING AND APPLICATIONS 9

Levelling Instruments - Spirit level - Sensitiveness - Bench marks - Temporary and permanent adjustments – Fly, Check, Profile and block levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Longitudinal and cross sections - Plotting - Calculation of areas and volumes - Contouring - Methods - Characteristics and uses of contours.

UNIT IV TACHEOMETRIC SURVEYING 9

Theodolite, Tachometer - Temporary adjustments of Vernier Transit - Tachometric systems – Tangential, Stadia and Subtense methods – Stadia systems- Horizontal and inclined sights – Vertical and normal staffing – Fixed and Movable hair – stadia constants – Anallactic lens – Subtense bar – Total Station.

UNIT V CONTROL SURVEYING 9

Vertical and horizontal control – triangulation – Networks, Orders and Accuracies, Signals and Towers – trilateration, Base line – Instruments and Accessories – Corrections – Satellite stations – Reduction to centre – Trignometric levelling – Single and reciprocal observations – Introduction of Global Positioning system**.**

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Punmia B.C. Surveying, Vols. I, II and III, Laxmi Publications, 2005.
2. Kanetkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 2001.

REFERENCES :

1. Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1999.
2. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and
3. Distributors, Sixth Edition, Delhi, 1983.

EN3205	ENVIRONMENTAL CHEMISTRY AND MICROBIOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES

The objectives of the course are to study the basics of environmental chemistry, chemical reactions involved in water and electrokinetic properties. Also the students are able to understand the basic microbiological concepts related to Environmental Engineering.

UNIT I ENVIRONMENTAL CHEMISTRY: INTRODUCTION 9

Oxidation state, redox potential – chemical equilibrium, Le-Chatlier Principle - heterogeneous equilibria - solubility product - common ion effect, diversion effect - application in water treatment.

Chemical kinetics - factors influencing the rate – order and molecularity (examples) – derivation of rate constant for first order reaction - time for half - change - nature of BOD reactions – consecutive reactions in water treatment – Enzyme reactions, temperature dependence, catalyst.

UNIT II CHEMICAL REACTIONS OF WATER 9

Colloids, Classification – solids in liquids - hydrophilic and hydrophobic colloids – electrokinetic properties - chemical coagulation of water - Schulz Hardy rule - mechanism of coagulation electrodialysis - water purification – electro-osmosis - dewatering of sludges – electrophoresis – adsorption, Freundlich and Langmuir isotherms – Applications in pollution control.

UNIT III ORGANIC COMPOUNDS AND STRUCTURES 9

Functional groups in organic compounds and their structures (Preparation & Properties not required) - carbohydrates - classification – monosaccharides, pentoses (Xylose and arabinose) Hexoses (Glucose, galactose, mannose and fructose) – disaccharides (Sucrose, maltose and lactose) – Polysaccharides (Starch, cellulose and hemicellulose) - Structural formulae - ring structure and hydrolysis reaction only.

UNIT IV MICROBIOLOGY: GENERAL 9

Classification of living organisms with special emphasis on micro-organisms - characteristics - application in environmental engineering - DNA & RNA.

METHODS OF STUDY

Culture of micro-organisms - media preparation - sterilization, pure culture - maintenance of cultures – stains and staining - estimation of bacterial numbers.

UNIT V GROWTH AND METABOLISM OF MICRO-ORGANISMS 9

Growth curves - factors affecting growth - nutritional requirements of micro-organisms - metabolism of micro-organisms - carbohydrates, proteins, fat metabolisms and the role of enzymes.

RESPIRATIONS

Aerobic and anaerobic - role of enzymes - bacterial respiration - fermentation and saprogenic action - basic concepts of molecular biology.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Stanley E.Manohar, Environmental Chemistry, Williard Grant, 1975.
2. McKinney R.E. and Gall M. Microbiology for Sanitary Engineers, Mc Graw Hil Book Co.Inc. New York (Latest Edition).
3. Gainey and Lord, Microbiology of Water and Sewage, Printice Hall Inc., New York, (Latest Edition).
4. De.A.K. “Environmental Chemistry ", New Age International Ltd., New Delhi, 1996.

REFERENCES :

1. Sawyer, C.N. and McCarty, P.L., and Parkin, G.F. “Chemistry for Environmental Engineers ",3rd Edn. Tata McGraw Hill, New Delhi, 1985.
2. Glasstone and Ceuris.D, Elements of Physical Chemistry , 1997.
3. Albaigo J., Analytical Techniques in Enviromental Chemistry, Pergamon Press, New York, 1980.
4. " Standard Methods for the Examination of Water and Wastewater ", 20th Edn., WPCF, APHA and AWWA, USA, 1993
5. Frobisher M. Hinsdill R.D. Goodheart.C.R., Fundamentals of Microbiology, W.B. Saundars company, USA, 1974.
6. Mitchell R., Water Pollution Microbiology, Wiley Eastern (Latest Edition), 1978.

GE3206	PRINCIPLES OF ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES

To understand the basic concepts of environmental issuses, evolution, biodiversity and impacts on human heath, internal and external earth structures and climate changes.

UNIT I ENVIRONMENTAL ISSUES 9

Environmental issues - Population growth, resource use, climate change, biodiversity crisis, pollution and poverty – economic development – indicators, resources and systems- cultural change and sustainability – agricultural, industrial, information and globalization revolution – use of economics to improve environmental quality and reduction poverty – environmental revolution.

UNIT II EVOLUTION 9

Evolution and adaption – ecological niches, speciation, extinction and biodiversity – biomes – aquatic environment – community structure and species diversity – types, competition and predation, parasitism, mutualism and commensalism – ecological succession, stability and sustainability.

UNIT III BIODIVERSITY 9

Human impacts on biodiversity – protection of biodiversity – forests – types, management, tree harvesting – tropical deforestation – national reserves – biosphere reserves – wilderness – preservation, protection and management – ecological restoration – species extinction – types – endangered and threatened species – extinction rates – effect of human activities – preservation – habitat loss and degradation – habitat fragmentations, non native species – role effect and solutions – shunting and poaching – wild life management.

UNIT IV EARTH STRUCTURE 9

Earth structure – internal and external earth processes – minerals, rocks and rock cycle – mineral resources – processing, impacts, limits, economics – earthquakes and volcanic eruptions – soil resources – formation and types, erosion, and conservation-human population – size, fertility, death and distribution – risks and hazards – toxicity – dose, frequency of exposure, detoxification systems, solubility, persistence – bio accumulation, biomagnifications, response – risk analysis – assessment and management.

UNIT V CLIMATE CHANGE AND WATER RESOURCES MANAGEMENT 9

Climate – global air circulation, ocean currents, upwellings, El-Nina, La-Nina – natural green house effect, climate change and human activities protection – green house gases, ozone layer – ozone depletion – solution – water resources – water conflicts, importance, properties, uses, shortages and solution – large dams and reservoirs – advantages and disadvantages – water transfers – wastages of water, floods desalination – ground water – problems and solutions – water pollution – types, effects, sources and solution.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. G. Tyler Miller, Jr, Environmental Sciences, Brooks/Cole- Thomson Learning, USA, 2004.
2. Erach Bharucha, Textbook of Environmental Studies for undergraduate courses, UniversityGrants Commission, University Press, Hyderabad, 2006.

REFERENCES :

1. R.Rajagopalan, Environmental Studies from crisis to cure, Oxford university press, New Delhi, 2006.
2. T.Meenambal, R.N.Uma and K.Murali, Principles of Environmental science and Engineering, S.Chand & Company Ltd, New Delhi, 2005.

CE3208	FLUID MECHANICS AND STRENGTH OF MATERIALS LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES

The experimental work involved in this laboratory shall make the student understand the basic concepts of fluid mechanics, mainly flow through pipes and the structural properties of the materials used for construction.

LIST OF EXPERIMENTS

Fluid Mechanics Laboratory

1. Determination of co-efficient of discharge for orifice
2. Determination of co-efficient of discharge for notches
3. Determination of co-efficient of discharge for venturimeter
4. Determination of co-efficient of discharge for orifice meter
5. Study of friction losses and minor losses in pipes
6. Determination of co-efficient of discharge for weirs
7. Verification of Bernoulli's theorem
8. Measurement of velocity of flow by Pitot tube.

Strength of Materials Laboratory

1. Test involving axial compression
2. Test involving axial tension
3. Test involving torsion
4. Deflection test
5. Tests on springs
6. Hardness tests
7. Tests on wood

The student should learn the use of deflectometer, extensometer, compressometer and strain gauges, weirs and notches, orifice meter, venturimeter etc.

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS

(For a batch of 30 students)

1.	Bernoulli's theorem – Verification Apparatus	-	1 No.
2.	Calculation of Metacentric height water tank	-	1 No.
	Ship model with accessories	-	1 No.
3.	Measurement of velocity Pitot tube assembly	-	1 No.
4.	Flow measurement open channel flow		
	(i) Channel with provision for fixing notches (rectangular, triangular & trapezoidal forms)	-	1 Unit
	(ii) Flume assembly with provisions for conducting experiments on Hydraulic jumps, generation of surges etc.	-	1 Unit
5.	Flow measurement in pipes		
	(i) Venturimeter, U tube manometer fixtures like Valves, collecting tank	-	1 Unit
	(ii) Orifice meter, with all necessary fittings in pipe lines of different diameters	-	1 Unit
	(iii) Calibration of flow through orifice tank with Provisions for fixing orifices of different shapes, collecting tank	-	1 Unit
	(iv) Calibration of flow through mouth piece Tank with provisions for fixing mouth pieces Viz. external mouth pieces & internal mouth piece, Borda's mouth piece	-	1 Unit
6.	Losses in Pipes Major loss – Friction loss Pipe lengths (min. 3m) of different diameters with Valves and pressure tapping & collecting tank	-	1 Unit
	Minor Losses Pipe line assembly with provisions for having Sudden contractions in diameter, expansions, bends, elbow etc.- 1 unit		
7.	U T M of minimum 400 kN capacity	-	1 No.
8.	Torsion testing machine for steel rods	-	1 No.
9.	Izod impact testing machine	-	1 No.
10.	Hardness testing machine Rockwell Vicker's (any 2) Brinnel	-	1 each
11.	Beam deflection test apparatus	-	1 No.
12.	Extensometer	-	1 No.
13.	Compressometera	-	1 No.
14.	Dial gauges	-	Few

CE3209	SURVEYING LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES

At the end of this course the student will posses knowledge about various Survey field techniques and shall know about the basic surveying instruments.

LIST OF EXPERIMENTS

1. Study of chains and its accessories
2. Aligning, Ranging and Chaining
3. Chain Traversing
4. Compass Traversing
5. Plane table surveying: Radiation, Intersection and Traversing.
6. Plane table surveying: Resection – Two point problem and Three point problem.
7. Study of levels and levelling staff
8. Fly levelling using Dumpy level
9. Fly levelling using tilting level
10. Check levelling
11. LS and CS
12. Contouring

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS

(For a batch of 30 students)

SL. NO.	DESCRIPTION OF EQUIPMENTS	QUANTITY
1.	Theodolites	Atleast 1 for every 10 students
2.	Dumpy level	Atleast 1 for every 10 students
3.	Plain table	Atleast 1 for every 10 students
4.	Pocket stereoscope	1 no.
5.	Ranging rods	1 for a set of 5 students
6.	Leveling staff	
7.	Cross staff	
8.	Chains	
9.	Tapes	
10.	Arrows	

CE3210	ENVIRONMENTAL ENGINEERING LABORATORY – I	L	T	P	C
		0	0	3	2

OBJECTIVES

To understand the sampling and preservation methods and to understand the analysis of water.

LIST OF EXPERIMENTS

1. Determination of pH and turbidity
2. Determination of Hardness
3. Determination of iron & fluoride in water
4. Determination of residual chlorine in water
5. Determination of Chlorides
6. Determination of Alkalinity/Acidity
7. Determination of Sulphate
8. Determination of Optimum Coagulant Dosage
9. Determination of available Chlorine in Bleaching powder
10. Determination of dissolved oxygen in water
11. Determination of suspended, volatile and fixed solids

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS

(For a batch of 30 students)

1.	pH meter	-	1 No.
2.	Turbidity meter	-	1 No.
3.	Conductivity meter	-	1 No.
4.	Refrigerator	-	1 No.
5.	BOD incubator	-	1 No.
6.	Muffle furnace	-	1 No.
7.	Hot air oven	-	1 No.
8.	Magnetic stirrer with hot plates	-	5 Nos.
9.	Dessicator	-	2 Nos.
10.	Jar test apparatus	-	1 No.
11.	Water bath	-	1 No.
12.	Furniture	-	1 lot
13.	Glass wares / Crucibles	-	1 lot
14.	Chemicals	-	1 lot
15.	COD apparatus	-	1 No.
16.	Kjheldal apparatus	-	1 No.
17.	Calorimeter	-	1 No.
18.	Colour comparator	-	1 No.
19.	Furniture: Work tables	-	10 Nos.
20.	Beaker	-	30 Nos.
21.	Standard flask	-	30 Nos.
22.	Burette with stand	-	15 Nos.
23.	Pipette	-	15 Nos.
24.	Crucible	-	15 Nos.
25.	Filtration assembly	-	1 No.

MA3211 PROBABILITY AND STATISTICS LT P C
3 1 0 4

AIM:

This course aims at providing the required skill to apply the statistical tools in engineering problems.

OBJECTIVES:

- The students will have a fundamental knowledge of the concepts of probability.
- Have knowledge of standard distributions which can describe real life phenomenon.
- Have the notion of sampling distributions and statistical techniques used in management problems.

UNIT I RANDOM VARIABLES 9 + 3

Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 9 + 3

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS 9 + 3

Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – χ^2-test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank-sum test (Wilcoxon test).

UNIT IV DESIGN OF EXPERIMENTS 9 + 3

Completely randomized design – Randomized block design – Latin square design - 22 - factorial design.

UNIT V STATISTICAL QUALITY CONTROL 9 + 3

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

T : 45 + 15 ,TOTAL : 60 PERIODS

TEXT BOOKS

1. Milton, J. S. and Arnold, J.C., “Introduction to Probability and Statistics”, Tata McGraw Hill, 4th edition, (2007).
2. Johnson, R.A. and Gupta, C.B., “Miller and Freund’s Probability and Statistics for Engineers”, Pearson Education, Asia, 7th edition, (2007).

REFERENCES

1. Devore, J.L., “Probability and Statistics for Engineering and the Sciences”, Thomson Brooks/Cole, International Student Edition, 7th edition, (2008).
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., “Probability and Statistics for Engineers and Scientists”, Pearson Education, Asia , 8th edition, (2007).
3. Ross, S.M., “Introduction to Probability and Statistics for Engineers and Scientists, 3rd edition, Elsevier, (2004).
4. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., “Schaum’s Outline of Theory and Problems of Probability and Statistics”, Tata McGraw Hill edition, (2004).

CE3211	SOIL MECHANICS AND FOUNDATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES

To understand the basic properties and strength nature of various soils and their settlement behaviour in foundations.

UNIT I SOIL PROPERTIES AND COMPACTION OF SOIL 9

Nature of Soil - Problems with soil - phase relation – particle size distribution – Atterberg limits - classification for engineering purposes - BIS Classification system – Soil compaction - factors affecting compaction – laboratory and field compaction methods and monitoring.

UNIT II SOIL MOISTURE – PERMEABILITY, STRESSES IN SOILS 9

Soil water – Various forms –Capillary rise – Suction - Effective stress concepts in soil – Total, neutral and effective stress distribution in soil - Permeability – Darcy's Law- Permeability measurement in the laboratory – quick sand condition - Stress distribution in soil media – Boussinesq's formula – stress due to line load, Circular and rectangular loaded area - approximate methods - Use of influence charts – Westerguard equation for point load.

UNIT III SHEAR STRENGTH AND SLOPE STABILITY 9

Shear strength of cohesive and cohesionless soil – Mohr, Coulomb failure theory – Measurement of shear strength - direct shear, Triaxial compression, UCC and Vane shear tests –Types of shear tests based on drainage and their applicability - Drained and undrained behaviour of clay and sand. Slope failure mechanisms - Modes - Infinite slopes - Finite slopes – Total and effective stress analysis - Stability analysis for purely cohesive and C Φ soils - Method of slices – Modified Bishop's method - Friction circle method - stability number.

UNIT IV SOIL EXPLORATION 9

Scope and objectives – Methods of exploration - averaging and boring – Wash boring and rotary drilling – Depth of boring – Spacing of bore hole - Sampling – Representative and undisturbed sampling – sampling techniques – Split spoon sampler, Thin tube sampler, Stationary piston sampler – Bore log report – Penetration tests (SPT and SCPT) – Data interpretation (Strength parameters and Liquefaction potential).

UNIT V FOUNDATION – BEARING CAPACITY AND SETTLEMENT 9

Introduction – Location and depth of foundation – Selection of foundation based on soil condition - codal provisions – bearing capacity of shallow foundation on homogeneous deposits –Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems - Bearing Capacity from insitu tests (SPT, SCPT and plate load) – Allowable bearing pressure, Settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits - Allowable settlements – Codal provision – Methods of minimising settlement, differential settlement.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Punmia P.C, Soil Mechanics and Foundations, Laxmi Publications Pvt. Ltd, New Delhi, 1995.
2. Murthy, V.N.S, "Soil Mechanics and Foundation Engineering", UBS Publishers Distribution Ltd, New Delhi, 1999.

REFERENCES :

1. Coduto, D.P, Geotechnical Engineering Principles and Practices, Prentice Hall of India Private Limited, New Delhi, 2002.
2. McCarthy D.F, Essentials of Soil Mechanics and Foundations Basic Geotechniques, Sixth Edition, Prentice-Hall, New Jersey, 2002.
3. Bowles J.E, "Foundation analysis and design", McGraw-Hill, 1996.

CE3212	APPLIED HYDRAULICS AND FLUID MACHINES	L	T	P	C
		3	0	0	3

OBJECTIVES

The objective of the course is to understand the types of flow in open channel, dimensional analysis, momentum principle and application of various turbines and pumps in fluid problems.

UNIT I OPEN CHANNEL FLOW 9

Uniform flow – Chezy's and Manning's equations – Determination of roughness coefficients – hydraulically best sections – venturi flume – specific energy – critical flow – mild and steep slopes- critical depth – hydraulic jump – Gradually varied flow.

UNIT II DIMENSIONAL ANALYSIS 9

Dimensional Homogeneity – Rayleigh's and Buckingham methods – model study and similitude – Non- dimensional numbers and its significance – scale effect and distorted model.

UNIT III MOMENTUM PRINCIPLE 9

Impulse momentum equation – Application of linear momentum principle – Impact of Jet- Force exerted by a jet on normal, inclined and curved surfaces for stationary and moving cases – Angular momentum principle – construction of velocity vector diagrams – forces on pipe bends.

UNIT IV HYDRAULIC TURBINES 9

Classification – working principles - design of Pelton wheel, Francis and Kaplan Turbines – Head, losses, work done and efficiency – Draft tube – theory and types – similarity laws – specific speed – operating characteristics – Governing of turbines - Selection of turbines.

UNIT V HYDRAULIC PUMPS 9

Classification – centrifugal pump - working principle – head, discharge and efficiencies – minimum starting speed – Net positive suction head – performance curves - specific speed – Reciprocating pump – components and working - slip – indicator diagram – air vessel – selection of pumps.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Rajput R. K., A text book of Fluid Mechanics, S.Chand and Company, New Delhi, 2006.
2. Bansal R. K.,Fluid Mechanics and Hydraulic Machines, Lakshmi Publications, New Delhi, 2002.

REFERENCES :

1. Natarajan M.K, Principles of Fluid Mechanics, Oxford & IBH publications Co.Pvt.Ltd, 1995.
2. Subramanya K, Flow in Open channels, Tata Mc Graw Hill Publishing Company, 2000.
3. Ramamurtham. S and Narayanan.R, Hydraulics Fluid Mechanics and Fluid Machines, Dhanpat rai Publishing Co (P) Ltd, New Delhi, 2000.

EN3213	ECOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES

At the end of this course the student will posses knowledge about ecology, ecosystems and its types and about the various biogeochemical cycles.

UNIT I INTRODUCTION 9

Ecology – its relevance to civilization – levels of organization hierarchy – concept of ecosystem – structure of ecosystem – study of ecosystems – communities in ecosystem – energy flow and material cycling – productivity in ecosystems - examples of ecosystems.

UNIT II ECOSYSTEMS 9

Classification of ecosystems - Principles and components of Systems - Structural and functional interactions in environmental systems - Human modifications of environmental systems.

UNIT III BIOGEOCHEMICAL CYCLES 9

Biogeochemical cycles – patterns and basic types – the nitrogen cycle - the phosphorus cycle – the sulphur cycle – the global cycling of carbon and water – nutrient cycling.

UNIT IV NATURAL ECOSYSTEMS 9

Natural ecosystem – types of natural vegetation – evergreen forest – deciduous forest – tropical grassland – desert vegetation – temperate grassland – board leaved forest – coniferous forest – Tundra vegetation – location – importance – identifying life forms – special features.

UNIT V FRESH WATER ECOSYSTEMS 9

Fresh water ecosystems – Lentic ecosystems – Lotic ecosystems – marshes and swamps location – importance – identifying life form – special features – marine ecosystems.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Eugene P. Odum, Basic Ecology , CBS College publishing , Saunders college publishing, Holt – sounders, Japan, 1983.
2. Erach Bharucha, Textbook of Environmental Studies for undergraduate courses, University Grants Commission, University Press, Hyderabad, 2006.

REFERENCES :

1. Mitsch, J.W. & Jorgensen, S.E., Ecological Engineering - An Introduction to Ecotechnology, John Wiley & Sons, New York, 1989.
2. Santhosh kumar Garg, Rajeswari Garg and Ranjni Garg, Ecological and Environmental studies, Khanna publishers, New Delhi, 2007.
3. Dash M.C., Fundamentals of Ecology, Mc Graw Hill Publishing company Ltd., New Delhi 1993.
4. White, I.D, Mottershed, D.N and Harrison, S.J., Environmental Systems – An Introductory text, Chapman Hall, London, 1994.

CE3215	WATER SUPPLY ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES

The course objective is to identify the sources and quantity of surface and ground water bodies and their demand for the public and also to study the quality of water and their treatment techniques.

UNIT I PUBLIC WATER SUPPLY SCHEMES AND QUANTITY OF WATER 9

Necessary and objectives of public water supply schemes – planning and financing – Quantity of water – water requirements – continuous and intermittent supply – rate of demand – variations in rate of demand- its effect on design – design periods and capacities of different components – population growth and forecast – estimating the quantity of water required.

UNIT II HYDROLOGICAL CONCEPTS AND SOURCES OF WATER 9

Hydrological concepts – hydrological cycle – precipitation – types of precipitation – rainfall measurements – estimation of surface runoff. Sources of water – types of sources – lakes, ponds, rivers – infiltration galleries – storage reservoirs – storage capacity by analytical method and mass curve method – types of wells – sanitary protection of wells – tests for yield of a well – Estimating yield of wells under steady state condition (No derivation).

UNIT III QUALITY OF WATER AND TRANSPORTATION OF WATER 9

Quality of water – portable water, pure water, mineral water, etc. – impurities in water – sampling – analysis of water – water borne diseases – quality standards of water. Transportation of water – Hydraulics of pipe flow – design of pipes – pumps – types of pumps – selection of pumps.

UNIT IV PURIFICATION OF WATER 9

Treatment of water- working principles, Purpose and design of all the unit process of water treatment – screening – plain sedimentation – coagulation sedimentation – filtration – disinfection – water softening.

UNIT V OTHER TREATMENTS AND DISTRIBUTION OF WATER 9

Removal of colour, odour and tastes – Removal of Iron and Manganese – Fluoridation and Defluoridation Intakes – types – Intake Tower – Distribution of water – Planning – Methods of Distribution – Distribution (Service) Reservoirs – purpose – types – locations and height – Design aspects – requirements of good distribution system – methods of layout of distribution pipes – preventive methods to reduce wastage of water – Pipe appurtenances - Impact of water supply schemes.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Garg. S.K., Water Supply Engineering, Khanna Publishers, Delhi, September 2001.
2. Mark J. Hammer & Mark J. Hammer Jr., Water and Waste Water Technology, Prentice Hall of India Pvt. Ltd., New Delhi, 2008.

REFERENCES :

1. Birdie.G.S., Water Supply and Sanitary Engineering, Dhanpat Rai and sons, 1991.
2. Fair. G.M., Geyer.J.C., Water Supply and Wastewater Disposal, John Wiley and Sons, 1954.
3. Babbit.H.E, and Donald.J.J, Water Supply Engineering , Mc Graw Hill book Co, 1984.
4. Steel. E.W.et al., Water Supply Engineering , Mc Graw Hill International book Co, 1984.
5. Duggal.K.N., Elements of Public Health Engineering , S.Chand and Co, 1985.
6. Jain Publishers, CPHEECO Manual.

CE3216	INDUSTRIAL SAFETY	L	T	P	C
		3	0	0	3

OBJECTIVES

To understand the basic needs of safety in human health, environmental safety, electrical safety, safety against accidents and fire safety.

UNIT I INTRODUCTION 9

Introduction to Safety - Goals, Need - History of Safety - Importance of Industrial Safety - Influence of Environmental Safety - Accident Causes, Effects - Safety Culture and behavioral safety – Safety policy – case study.

UNIT II SAFETY ON HEALTH 9

Occupational Health Hazards - Promoting Safety - Safety and Health training - Stress and Safety -Ergonomics - Introduction, Definition, Objectives, Advantages - Ergonomics Hazards - Musculoskeletal Disorders and Cumulative Trauma Disorders - Importance of Industrial safety -Role of safety department, Safety committee and Function – Role of government agencies in safety training – safety campaign.

UNIT III ELECTRICAL SAFETY 9

Safe limits of amperages, voltages, distance from lines, etc. - Joints and connections - Overload and Short circuit protection - Earthing standards and earth fault protection - Protection against voltage fluctuations - Effects of shock on human body - Hazards from Borrowed neutrals - Electrical equipment in hazardous atmosphere - Criteria in their selection, installation, maintenance and use - Control of hazards due to static electricity.

UNIT IV SAFETY AGAINST ACCIDENTS 9

Theories and principles of accident Causation - The effects of accident - Unsafe Act - Unsafe condition - Unpredictable performance - Consequences of accident - Accident prevention programs – Accident investigation and analysis – OSHA principle and concept – safety measures in factory act.

UNIT V FIRE PROTECTION 9

General causes and classification of fire - Detection of fire - extinguishing methods - fire fighting installations with and without water - Machine guards and its types – automation - High pressure hazards, safety, emptying, inspecting, repairing - hydraulic and nondestructive testing - hazards and control in mines.

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Jain.R.K and Sunil S.Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi , 2006.
2. Roland. P. Blake, Industrial safety, Prentice hall publications, New Delhi, 2005.

REFERENCES :

1. Slote. L, Handbook of Occupational Safety and Health, John Willey and Sons, NewYork .
2. Heinrich H.W, Industrial Accident Prevention, Mc Graw Hill Company, New York, 1980.

CE3220	FLUID MACHINERY LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES

The experimental work involved in this laboratory should make the student to study the performances of Rotodynamic and positive displacement pumps and load tests on impulse and reaction turbines.

LIST OF EXPERIMENTS

1. Conducting experiments and drawing the characteristic curves of Monoblock Centrifugal pump
2. Conducting experiments and drawing the characteristic curves of Coupled Centrifugal pump
3. Conducting experiments and drawing the characteristic curves of Submersible pump
4. Conducting experiments and drawing the characteristic curves of Jet pump.

5. Conducting experiments and drawing the characteristic curves of Reciprocating pump.
6. Conducting experiments and drawing the characteristic curves of Gear pump.
7. Conducting experiments and drawing the characteristic curves of Pelton wheel.
8. Conducting experiments and drawing the characteristics curves of Francis turbine.
9. Conducting experiments and drawing the characteristic curves of Kaplan turbine.
10. Impact of jet on flat plate (Normal / Inclined)

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS

(For a batch of 30 students)

1. Monoblock Centrifugal pump setup
2. Coupled Centrifugal pump setup
3. Submersible pump setup
4. Jet pump setup
5. Reciprocating pump setup
6. Gear pump setup
7. Pelton wheel turbine setup
8. Francis turbine setup
9. Kaplan turbine setup
10. Impact of Jet on vane setup

Quantity: one each

EN3217	ENVIRONMENTAL ENGINEERING LABORATORY – II	L	T	P	C
		0	0	3	2

OBJECTIVES

To understand the sampling and preservation methods and significance of characterization of wastewater.

LIST OF EXPERIMENTS

1. Determination of Chlorides in wastewater.
2. Determination of Ammonia Nitrogen in wastewater.
3. Determination of Sulphate in wastewater.
4. Precipitation process for treating waste water
5. Determination of suspended, volatile, fixed and settleable solids in wastewater.
6. B.O.D. test
7. C.O.D. test
8. Nitrite in wastewater.
9. Nitrate in wastewater.
10. Phosphate in wastewater.
11. Determination of Acidity of wastewater.
12. Determination of Alkalinity of wastewater.
13. Determination of Calcium, Potassium and Sodium.
14. Heavy metals determination - Chromium, Lead and Zinc.
    (Demonstration only)

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS

(For a batch of 30 students)

1. Oxygen analyzer
2. Spectrophotometer
3. Ion – selective electrode
4. Sodium Potassium Analyzer – Flame Photometer
5. Gas Chromatography
6. Atomic absorption spectroscopy (Ni, Zn, Pb)
7. Nephlo - turbiditymeter
8. BOD Analyser
9. COD Analyser

Quantity: one each

EN3218	MICROBIOLOGY LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES

To understand the experimental procedures involved in the study of micro-organisms and the method of testing their presence.

1. Sampling Techniques
2. Sterilization Techniques
3. Preparation of culture media
4. Isolation of micro-organisms (Air, water, soil, sediment)
5. Isolation of anaerobic sediments (Sewage sediments)
6. Isolation of yeast (Sediment)
7. Purification of micro-organisms
8. Cultural characteristics of bacteria
9. Simple staining
10. Negative staining
11. Differential staining
12. Acid-fast staining
13. Coliform test
14. MPN test

TOTAL: 45 PERIODS

LIST OF EQUIPMENTS

(For a batch of 30 students)

1. Incubator - 1 No.
2. Incubator Shaker - 3 Nos.
3. Microscopes - 5 Nos.

4. Micropipettes - 3 in each volume
5. Colony counter - 1 No.
6. Anaerobic jar - 2 Nos.
7. Laminar hood - 1 No.
8. Chemicals - 1 lot
9. Petty dishes - 5 Nos.
10. Innoculum loops - 5 Nos.
11. Glass slides - 5 Nos.
12. China dish - 10 Nos.
13. Staining Kit - 5 Nos.
14. Refrigerator - 1 No.

EN3301 SOLID WASTE MANAGEMENT

L	T	P	C
3	0	0	3

UNIT I MANAGEMENT SYSTEM, GENERATION AND ONSITE PROCESSING 9

Solid Waste Management - Goals and objectives – Functional elements in a solid waste management system – Interrelationships - public awareness. Generation of solid waste - Sources and types of solid wastes – sampling - Composition – Generation rates – Factors affecting generation rates. Onsite handling, Storage and Processing of solid wastes - necessary equipments.

UNIT II COLLECTION AND TRANSFER OF SOILD WASTES 9

Collection of solid waste - Collection services - collection system, equipments – Time and frequency of collection - labour requirements – Factors affecting collection – Analysis of collection systems – collection routes – Preparation of Master schedules. Transfer and Transport – Need for transfer operations - Transfer stations – types - Transport means and methods - location of transfer stations.

UNIT III PROCESSING TECHNIQUES AND RECOVERY OF ENERGY 9

Processing Techniques – purposes – Mechanical volume reduction – necessary equipments – Chemical volume reduction – incinerators – Mechanical size reduction – Selection of equipments - Component separation – Methods – Drying and Dewatering. Recovery of resources, conversion products and energy recovery – recoverable materials – processing and recovery systems.

UNIT IV REFUGE DISPOSAL 9

Refuse disposal – Various methods - Incineration – principal features of an incinerator – site selection and plant layout of an incinerator – Sanitary landfill – methods of operation – Advantages and disadvantages of a sanitary landfill – site selection –– Gas and leachate Movement and control.

UNIT V COMPOSTING 9

Composting – anaerobic and aerobic composting – Vermicomposting – unit operations associated with composting anaerobic digestion of municipal solid waste – Pyrolysis – reduction methods.

TOTAL: 45 PERIODS

REFERENCES

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. Solid. Wastes: Engineering Principles and Management Issues. New York: McGraw-Hill, 1977.
2. Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, "Environmental Engineering", McGraw - Hill Co., 1988.
3. Hagerty D.J., Pevani J. L., and Heer J. E., Solid Waste Management , Van Nostrand Reinhold, 1979.
4. Vesilind, P.A. and Rimer, A.E., "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981
5. Shukla S. K. & Srivastava P. R. In: Waste Management and Control. Commonwealth Publishers, New Delhi 1992.
6. Bhide A.D and Sundaresan B.B , " Solid waste management – collection, processing and Disposal", Mudrashilpa Offset Printers 2001**.**
7. Manual on Solid Waste Management, CPHEEO, Ministry of Urban Development, GOI, New Delhi, 2000.

EN3302	AIR POLLUTION AND CONTROL	L	T	P	C
		3	0	0	3

UNIT I GENERAL 9

Atmosphere as a place of disposal of pollutants – Air Pollution – Definition - Air Pollution and Global Climate - Units of measurements of pollutants - Air quality criteria - emission standards - National ambient air quality standards - Air pollution indices - Air quality management in India.

UNIT II SOURCES, CLASSIFICATION AND EFFECTS 9

Sources and classification of air pollutants - Man made - Natural sources - Type of air pollutants - Pollution due to automobiles - Analysis of air pollutants - Chemical, Instrumental and biological methods.

Air pollution and its effects on human beings, plants and animals - Economic effects of air pollution - Effect of air pollution on meteorological conditions - Changes on the Meso scale, Micro scale and Macro scale.

UNIT III SAMPLING, METEOROLOGY AND AIR QUALITY MODELLING 9

Sampling and measurement of particulate and gaseous pollutants - Ambient air sampling - Stack sampling. Environmental factors - Meteorology - temperature lapse rate and stability – Adiabatic lapse rate - Wind Rose - Inversion – Wind velocity and turbulence - Plume behaviour - Dispersion of air pollutants.

UNIT IV AIR POLLUTION CONTROL MEASURES 9

Control - Source correction methods - Control equipments - Particulate control methods – Bag house filter - Settling chamber - cyclone separators - inertial devices - Electrostatic precipitator - scrubbers - Control of gaseous emissions - Absorption - Absorption equipments - adsorption and combustion devices (Theory and working of equipments only).

UNIT V AIR POLLUTION SURVEY, LEGISLATIONS AND CASE STUDIES 9

Air pollution survey - Air pollution legislation and regulations – Environmental criteria for siting industries and green belts - Air pollution in Indian Metropolitan cities. Case studies - some specific industries - cement industry - refineries - fertilizer – Thermal power plants - Sources of pollutants and its controls.

TOTAL: 45 PERIODS

REFERENCES

1. C. S. Rao, "Environmental Pollution Control Engineering", Wiley Eastern Limited, 2000.
2. M. N. Rao, H. V. N. Rao, Air pollution, Tata Mc Graw Hill Pvt Ltd, NewDelhi, 1993
3. Stern A. C., "Air Pollution" (vol. I), "Air Pollution and its effects" (vol. II), "Analysis, Monitoring and Surveying" (vol. III), "Sources of Air Pollution and their control", Academic press, New York, 1968.
4. Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, "Environmental Engineering", McGraw - Hill Co., 1988.
5. Kenneth wark, Cecil F.Warner, "Air Pollution its Origin and Control", Harper and Row Publishers, New York, 1981.
6. Dr. Y. Anjaneyulu, "Air Pollution and Control Technologies", Allied publishers (P) Ltd., 2002.
7. Henry C Perkins, Air pollution, Mc Graw Hill Pvt Ltd, NewDelhi, 1974.
8. Noel De Nevers, Air pollution control Engineering, Mc Graw Hill International Edition, Mc Graw Hill Inc, New Delhi, 2000.
9. Air Pollution act, 1981 (India).

EN3303 WASTEWATER ENGINEERING – I

L	T	P	C
3	0	0	3

UNIT I QUANTITY, COLLECTIONS AND CONVEYANCE 9

Necessity and objectives of sanitary engineering projects - Definitions - systems of sewerage - quantity of sewage - Fluctuations in flow pattern - Estimation of storm runoff - DWF and WWF - Design flow for separate and combined systems - Hydraulics of sewers - Self cleansing velocities - full flow / partial flow conditions - sewer sections - sewer appurtenances - Design principles and procedures - materials for sewers - sewer joints - sewer laying - sewer cleaning and maintenance - sewage pumping - types of pumps.

UNIT II QUALITY OF SEWAGE AND PRIMARY TREATMENT 9

Characteristics and composition of sewage - physical and chemical analysis - DO, BOD,COD and their significance - cycles of decomposition - Objectives and basic principles of sewage treatment - primary treatment - screens - Grit chamber - settling tank - principles of sedimentations - Design of settling tanks.

UNIT III BIOLOGICAL TREATMENT OF SEWAGE 9

Basic principles of biological treatment - Filtration - contact beds - Sand Filters - trickling filters - Description and principles of operation of standards / high rate filters - recirculation - activated sludge process - diffuser / Mechanical aeration - Conventional, high rate and extended aeration process - oxidation pond - stabilization ponds - aerated lagoons.

UNIT IV SLUDGE MANAGAMENT 9

Objectives of sludge treatment - properties and characteristics of sludge - Thickening - sludge digestion - drying beds - conditioning and dewatering - sludge disposal - Eutrophication - recycle & reuse of waste effluents - elutriation

UNIT V SEWAGE DISPOSAL AND HOUSE DRAINAGE 9

Methods - dilution method - self purification of streams - oxygen sag curve - land disposal - sewage farming.

House drainage - Sanitary fixtures / fittings - one pipe system, two pipe system, etc. - General layout of house drainage - street connections. Septic tanks and effluent disposal system

TOTAL: 45 PERIODS

TEXT BOOKS

1. Garg. S. K., "Environmental Engineering", Vol I & Vol II, Khannah Publishers, New Delhi, 1994.
2. Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prentice hall of India, 2008.
3. Hussain. S. K., "Text Book of Water Supply and Sanitary Engineering", Oxford and IBH Publishing, 1984.
4. Duggal. K.N., "Elememts of public Health Engineering", S.Chand and CompanyLtd, New Delhi. 1998.

REFERENCES

1. Mannual on wastewater and treatment CPHEEC, Ministry of Urban Affairs and Eemployment, Govt. of India, New Delhi, 1990.
2. Shah.C. S., "Water supply and Sanitation", Galgotia publishing company, New Delhi, 1994.

EN3304 NOISE POLLUTION AND CONTROL L T P C
3 0 0 3

UNIT I NOISE POLLUTION AND ITS MEASUREMENT 9

Sources of noise – Units and Measurements of Noise – Noise Power level, Intensity level, Pressure level – Relationship, Noise level meter – Weighted networks – Decibel addition – Octave Band – Noise spectrum – Equivalent Noise – Day and night time – Standards, Equations and Application.

UNIT II CHARACTERIZATION OF NOISE AND ITS EFFECTS 9

Characterization of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise – General Control Measures – Effects of noise pollution – auditory effects, non-auditory effects.

UNIT III CONTROL OF NOISE 9

Noise Menace – Noise and the Foetus – Prevention and Control of Noise Pollution – Control of noise at source, control of transmission, protection of exposed person - Control of other types of Noise Sound Absorbent – Noise Pollution Analyzer – Auditorium Designing – Anti Noise Device.

UNIT IV THE PHYSICAL CONTROL OF NOISE 9

Designing out Noise – Industrial Noise Control – effects of noise on workers efficiency - Acoustic quieting - mechanical isolation technique, acoustical absorption, constrained-layer damping – OSHA Noise standards – public education – other non-legislative measures.

UNIT V NOISE AND THE AUTHORITIES 9

Legislation Noise and the Administrative Function – Planning against Noise – Noise and the Law – The Rajasthan noise control Act 1963, Railway Act 1890 (Related to noise only), The Aircraft Act 1934 (Related to noise only), Factories Act 1948 (Related to noise only), The Environmental Protection Act 1986 – Noise pollution remedies.

TOTAL: 45 PERIODS

REFERENCES

1. Peterson and E.Gross Jr., “Hand Book of Noise Measurement” (5th Edn 1963).
2. Mukergee, Environmental Pollution and Health Hazards, causes and effects (1986).
3. Antony Milne, “Noise Pollution: Impact and Counter Measures”, David & Charles PLC, 1979.

EN3305	ENERGY ENGINEERING	L	T	P	C
		3	0	0	3

UNIT I INTRODUCTION 9

Sources of energy, types of fuels- energy and relative forms. Calorific value - gross and net value, calculation of calorific value from fuel analysis - experimental determination of energy resources present - future energy demands with reference to India.

UNIT II CONVENTIONAL SOURCES OF ENERGY 9

Coal carbonization and byproduct recovery, liquefaction of coal, gasification of coal, burning of coal and firing mechanism, burning of pulverized coal - Liquid fuels: petroleum: composition, classification, characteristics, fractionation, reforming, cracking, petroleum products, burning of liquid fuels – Environmental issues.

UNIT III NON-CONVENTIONAL SOURCES OF ENERGY 9

Energy resources and their utilization – Introduction to various sources of energy – Solar energy, Water power, Wind energy, Biomass, Tidal and wave energy – Theory – Methodology – usefulness – Comparison.

UNIT IV GASEOUS FUELS 9

Natural gas, coke oven gas, producer gas, water gas, LPG – burning of gaseous fuels – hydrogen (from water) as future fuel – Theory – Methodology – usefulness – Comparison. Analysis of gas: ORSAT apparatus.

UNIT V ENERGYAUDIT 9

Energy auditing purpose – methods – short term, medium term, long term schemes – energy conversion – energy index – energy cost – representation of energy consumption – energy auditing.

TOTAL: 45 PERIODS

TEXT BOOKS

1. O.P. Gupta, “Elements of Fuels, Furnaces and Refractories”, Fifth Edition, Khanna publication.
2. Sami Sarkar, “Fuels and combustion by 3rd edition”, Orient, CRC Press.

REFERENCES

1. Fuel and energy by harker and Backhurst Academic press London 1981.
2. Harker and Allen Oliver and Boyd, “Fuel science”, 1972.
3. W.R.Murphy, G.Mc.Kay- “Energy Management”, 1st edition – Butterwolfer & Co.Ltd.2001.
4. Bansal Keemann, Meliss, “Renewable energy sources and conversion technology”, Tata Mc Graw Hill.

EN3306 OCCUPATIONAL HAZARDS AND INDUSTRIAL HYGIENE L T P C
3 0 0 3

UNIT I INDUSTRIAL ATMOSPHERIC CONTAMINANTS AND HEALTH HAZARDS 9

Industrial atmospheric contaminants – types. Industrial Health Hazards - effects of pressure, humidity, temperature - radiation, light, noise, electricity - accidents, occupational diseases, infections.

UNIT II INDUSTRIAL TOXICOLOGY AND INDUSTRIAL HYGIENE SURVEY 9

Modes of entry of toxic substances into the human body - long term and short term effects - industrial toxicology. Threshold Limit Values, kinds of exposure standards, pollutant concentrations, Industrial Hygiene Survey – Diagnosis – Remedial measures – Occupational Health and Safety Management System (OHSMS) - BS OSHAS 18001.

UNIT III INDUSTRIAL VENTILATION 9

Industrial Ventilation - general principles of air flow - general dilution ventilation - comfort ventilation. Local exhaust ventilation - principles of hood and duct design - duct system design - fans.

UNIT IV CONTROL MEASURES 9

Air cleaning Devices - relative efficiencies - Testing of local exhaust ventilation systems..25 Industrial Noise Control - general engineering principles of control - standards.

UNIT V INDUSTRIAL ILLUMINATION AND INDUSTRIAL PLANT SANITATION 9

Industrial illumination - glare – types & levels of illumination. Industrial plant sanitation - housekeeping - worker facilities.

TOTAL: 45 PERIODS

REFERENCES

1. Patty, “Industrial Hygiene and Toxicology”, Wiley Inter science, 1979.
2. Industrial Ventilation Manual, American Conference of Government Industrial Hygienists, 1993

EN3307	AIR AND NOISE POLLUTION LABORATORY	L	T	P	C
		0	0	3	2

INTRODUCTION TO ATMOSPHERIC MONITORING:

1. Particulate Sampling – Dust Fall, Pollution Suspended Particulates and Total Particulate Matters using High Volume Sampler / Respirable Dust Sampler.
2. Experiment on Respirable Dust – Estimating RPM.
3. Estimating Sulphur Dioxide in Ambient Air Using High Volume Air Sampler.
4. Stack Sampling Techniques and Demonstration of Stack Monitoring.
5. Exercises on Ambient Gas Monitoring using GASTEC Device.
6. Demonstration / Exercises on Air Pollution Control Devices – Bag Filter, Scrubber, Cyclone and ESP.
7. Exercises on Auto Exhaust Analyser for Petrol Vehicle and Diesel Vehicle Smoke test for Diesel Vehicle.
8. Exercises on Noise Measuring Instruments.
9. Exercises on Luxmeter (Light Intensity measuring Instrument)
10. Demonstration on Wind Monitoring and Analysis of Data for Windrose Diagrams.
11. Demonstration of Rain Gauges.

Note: Experiments to be conducted for 8-hr and 24-hr cycles.

TOTAL: 45 PERIODS

REFERENCES:

1. Henry C Perkins, Air pollution and Control, Mc Graw Hill Pvt Ltd, NewDelhi, 1974.
2. Stern A. C., “Air Pollution” (vol. I), “Air Pollution and its effects” (vol. II), “Analysis, Monitoring and Surveying” (vol. III), “Sources of Air Pollution and their control”, Academic press, New York, 1968.
3. Relevant IS Codes.

GE3318	COMMUNICATION SKILLS LABORATORY	L T P C 0 0 4 2

Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

I. PC based session	(Weightage 40%)	24 periods

A. ENGLISH LANGUAGE LAB (18 Periods)

1. LISTENING COMPREHENSION: (6)

Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

2. READING COMPREHENSION: (6)

Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. SPEAKING: (6)

Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

B. DISCUSSION OF AUDIO-VISUAL MATERIALS (6 PERIODS)

(Samples are available to learn and practice)

1. RESUME / REPORT PREPARATION / LETTER WRITING (1)

Structuring the resume / report - Letter writing / Email Communication - Samples.

2. PRESENTATION SKILLS: (1)

Elements of effective presentation – Structure of presentation – Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. SOFT SKILLS: (2)

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

4. GROUP DISCUSSION: (1)

Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples

5. INTERVIEW SKILLS: (1)

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews- Video samples.

II. Practice Session	**(Weightage – 60%)**	**24 periods**

1. **Resume / Report Preparation / Letter writing**: Students prepare their own resume and report. **(2)**
2. **Presentation Skills:** Students make presentations on given topics. **(8)**
3. **Group Discussion**: Students participate in group discussions**.** **(6)**
4. **Interview Skills**: Students participate in Mock Interviews **(8)**

TEXT BOOKS

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second Edition, New Delhi, 2004.

REFERENCES

1. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi, 2004.
2. Evans, D, **Decisionmaker**, Cambridge University Press, 1997.
3. Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education, Second Edition, New Delhi, 2007.
4. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addison Wesley Longman Ltd., Indian reprint 1998.

LAB REQUIREMENT

1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

Requirement for a batch of 60 students

Sl.No.	Description of Equipment	Quantity required
1.	**Server**	1 No.
	o PIV system	
	o 1 GB RAM / 40 GB HDD	
	o OS: Win 2000 server	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
2.	Client Systems	60 No.
	o **PIII or above**	
	o **256 or 512 MB RAM / 40 GB HDD**	
	o **OS: Win 2000**	
	o Audio card with headphones (with mike)	
	o JRE 1.3	
3.	**Handicam Video Camera (with video lights and mic input)**	1 No.
4.	Television - 29”	1 No.
5.	Collar mike	1 No.
6.	Cordless mikes	1 No.
7.	Audio Mixer	1 No.
8.	DVD Recorder / Player	1 No.
9.	LCD Projector with MP3 /CD /DVD provision for audio / video facility - **Desirable**	1 No.

EN3309 ENVIRONMENTAL ENGINEERING LABORATORY – III (PLUMBING, PIPING AND HOUSE WIRING) **L T P C 0 0 3 2**

AIM

To provide an exposure of basic engineering practices to the student.

PLUMBING WORKS:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
2. Study of pipe connections requirements for pumps – Connections.
3. Preparation of plumbing line sketches for water supply and sewage works.

4. Hands- on - Exercise:. Basic pipe connections - Mixed pipe material connection - pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

PIPING:

1. Practical of making plain surface with file over metal surface
2. Practice of pipe cutting and remaking
3. Practice of thread cutting of pipe, socket, nipple & Tee
4. Practice of bending G.I. pipe
5. Practice rectangular pipe services connection with different fittings in different way and disconnect the same.

HOUSE WIRING:

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring
3. Stair-case wiring
4. Measurement of electrical quantities - voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

TOTAL: 45 PERIODS

EN3310 WASTEWATER ENGINEERING - II LT P C
3 0 0 3

UNIT I INTRODUCTION, PROCESS ANALYSIS AND SELECTION 9

Biological treatment processes – objectives - Choice of treatment method – Environmental impact and other considerations in planning the treatment – Cost of Wastewater treatment – Reactors used for the treatment – mass balance analysis – Reactions, Reaction rates – Enzyme reaction. Modeling of ideal flow and non ideal flow reactors – Reactors in parallel – Reactors in series – Tracer tests – Estimation of dispersion coefficient.

UNIT II FUNDAMENTALS OF PROCESS KINETICS 9

Role of microorganisms – Microbial growth kinetics - Biological oxidation process - loading – MCRT - F/ M ratio - Determination of biokinetic coefficients – Modelling of suspended growth treatment process – Description, Design and operating parameters – Applications to the design of Activated sludge process using CFSTR.

UNIT III PARTICLE SETTLING THEORY 9

Types of settling - Discrete, Flocculant, Zone and Compression settling - Applications to design of settling tanks – Talmage & Fitch analysis and solids flux analysis for secondary settling tank design (SST) – inclined plate and tube settling, Flotation - description – Design considerations – dissolved air floatation system.

UNIT IV OXYGEN TRANSFER AND AERATION SYSTEMS 9

Description – Evaluation of oxygen transfer coefficient – aeration system – types – Diffused air aeration – Mechanical aerators – Energy requirements for mixing – Generation and dissolution of high purity oxygen – Applications of various aeration systems to water and wastewater treatments.

UNIT V ADVANCED WASTEWATER TREATMENT 9

Need for advanced wastewater treatment – advanced technologies – Classification – Residual constituents in treated wastewater and its impact – Removal of dissolved organics – Removal of biological constituents.

Adsorption – Types – Fundamentals of adsorption – Activated carbon adsorption kinetics – Activated carbon treatment.

TOTAL : 45 PERIODS

REFERENCES

1. Metcalf and Eddy, "Waste Water Engineering – Treatment and reuse", Tata McGraw-Hill, New Delhi, 2003.
2. Arceivala S. J., "Waste Water Treatment and disposal, Marceldekker publishers,1981.
3. Larry D. Benefield and Clifford W. Randall, "Biological process design for Wastewater Treatment", 1980.
4. Howard S. Peavy, Donald R. Rowe and George Techobanoglous, "Environmental Engineering", McGraw – Hill co., 1987.
5. Arceivala S. J., "Wastewater Treatment and Pollution control", Tata McGraw-Hill Co., New Delhi, 1998.
6. Linvil G. Rich., "Low-Maintenance, Mechanically simple wastewater treatment Systems" , McGraw-Hill Co., 1980.
7. Donald W. Sundstrom and Herbert E. Klei, "Wastewater treatment" Prentice – Hall Inc – Englewood Cliffs N. J. 07632 -1979

EN3311 ENVIRONMENTAL INSTRUMENTATION L T P C
3 0 0 3

UNIT I GENERAL 9

Study of machinery, electric motors types and characteristics, other prime covers, pumps, capacity, operation and maintenance of pumping machinery, air compressors preventive maintenance, break-down maintenance, schedules – Factors to be considered in the selection of the equipments.

UNITII INSTRUMENTATION 9

pH meter - Flame Emission Spectrometry. Absorption spectrometry - Nephelometry - Atomic Absorption Spectrometry - Gas chromatography – working principle and components.Total carbon analyser – Mercury Analyser polar graph for metal estimation and organic compounds - Ion selective Electrode -SO_2 and CO analyser – Instrument components and its working principle.

UNIT III WATER SUPPLY MACHINERY AND WASTEWATER MACHINERY 9

Drilling equipment, pumping equipment for wells. Machinery required for primary and secondary treatment, sewage pumps , sludge pumps, vaccum filtration equipment.

UNIT IV EQUIPMENTS FOR TREATMENT UNITS 9

Equipment for treatment unit - electrically and mechanically operated agitators, mixers, aerators, chlorinators, Surface aerators. Meters for measurement of flow, head, electricity.

UNIT V AIR POLLUTION CONTROL EQUIPMENTS 9

Working principles of electrostatic precipitator – cyclone separators – settling chamber – operation and Maintenance. Machinery for solid waste collection and disposal incineration – compactors – magnetic separators- incinerators.

TOTAL : 45 PERIODS

REFERENCES

1. Operation and Control of Water Treatment Processes COX CR WHO 1964.
2. Course Manual on Preventive Maintenance of Water Distribution System, NEERI, 1973.
3. Trivedy R. K. & Goel P.K., Chemical and Biological methods for water pollution studies, Environmental publication, Karat, 1986.
4. Standards Methods for the Examination of Water and Waste Water, 17th Edition, WPCF, APHA and AWWA, USA, 1989.

EN3312 G I S FOR ENVIRONMENTAL ENGINEERING L T P C
3 0 0 3

UNIT I FUNDAMENTALS OF REMOTE SENSING 9

Introduction to remote sensing – Principles of Electro – Magnetic Radiation – Energy /Matter interaction with Atmosphere and land surface – spectral reflectance of earth materials and vegetation – Data products.

UNIT II AERIAL PHOTOGRAPHY AND SATELLITE REMOTE SENSING 9

Aerial Photography – Photogrammetry And Visual Image Interpretation. Various satellites in orbit and their sensors – Resolutions – Multispectral Remote Sensing system (MSS) and design – VISIBLE - NIR remote sensing - Thermal IR Radiation properties, systems and application – Microwave and LIDAR remote sensing – Principles and applications.

UNIT III DATA ANALYSIS AND GIS 9

Data Analysis – Visual interpretation and digital image processing – Classification. Introduction to GIS, concepts and data base structure, various GIS software.

UNIT IV REMOTE SENSING AND GIS APPLICATIONS 9

Applications of Remote sensing and GIS – Management and Monitoring of Land, air, water and pollution studies – conservation of resources – coastal zone management – Limitations.

UNIT V LABORATORY PRACTICES 9

Data sources – Visual interpretation - digital image processing – Introduction to ENVI image processing software – GIS / Data Analysis in ARC GIS.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Anji Reddy, “Remote Sensing and Geographical Information system”, B S publications 2001.
2. M.G. Srinivas (Edited by) “Remote sensing applications”, Narosa publishing house, 2001.
3. A M. Chandra and S.K .Ghosh, “Remote Sensing and Geographical Information System”, Narosa Publishing House, 2006.

REFERENCES

1. Lintz, J. and Simonet, Remote Sensing of Environment, Addison Wesley Publishing Company, 1994.
2. Burroughs P.A, Principles of Geographical Information System, Oxford University Press, 1998.
3. Thomas M Lille sand ,Rupiah W. Kiefer & Jonathan W. Chip man “Remote sensing and Image Interpretation” John Wiley Sons, 2004.

MG3313 PRINCIPLES OF MANAGEMENT L T P C
3 0 0 3

UNIT I HISTORICAL DEVELOPMENT 9

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

UNIT II PLANNING 9

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

UNIT III ORGANISING 9

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV DIRECTING 9

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

UNIT V CONTROLLING 9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Harold Kooritz & Heinz Weihrich “Essentials of Management”, Tata McGraw-Hill, 1998
2. Joseph L Massie “Essentials of Management”, Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCES:

1 Tripathy PC And Reddy PN, “Principles of Management”, Tata McGraw-Hill, 1999.
2. Decenzo David, Robbin Stephen A, “Personnel and Human Reasons Management”, Prentice Hall of India, 1996.
3. JAF Stomer, Freeman R. E and Daniel R Gilbert, “Management”, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, “Engineering Management”, Addison Wesley, 2000.

EN3314 CLEANER PRODUCTION L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Sustainable development – Indicators of Sustainability – Sustainability Strategies - Barriers to Sustainability – Industrial activities and Environment – Industrialization and sustainable development – Industrial Ecology – Cleaner Production (CP) in Achieving Sustainability – Prevention versus Control of Industrial Pollution – Environmental Policies and Legislations – Regulation to Encourage Pollution Prevention and Cleaner Production – Regulatory versus Market Based Approaches.

UNIT II CLEANER PRODUCTION 9

Definition – methodology – Historical evolution – Benefits – Promotion – Barriers – Role of Industry, Government and Institutions – Environmental Management Hierarchy – Relation of CP and EMS – Integrated prevention and pollution limitation – Best Available Technology concept (BAT) – Internet information & Other CP Resources.

UNIT III CLEANER PRODUCTION PROJECT DEVELOPMENT & IMPLEMENTATION 9

Overview of CP - Assessment Steps and Skills - Preparing for the Site, Visit, Information gathering, and Process Flow Diagram - Material Balance - CP Option Generation – Technical and Environmental Feasibility analysis – Economic valuation of alternatives – Total Cost Analysis – CP Financing – Establishing a Program – Organizing a Program – Preparing a Program Plan – Measuring Progress – Pollution Prevention and Cleaner Production Awareness Plan.

UNIT IV SUPPORT INSTURMENTS OF PREVENTION METHODS 9

Life cycle analysis - Elements of LCA – Life Cycle Costing – Eco Labelling – Design for the Environment – International Environmental Standards – ISO 14001 – Environmental audit – Environmental statement.

UNIT V CASE STUDIES 9

Industrial Applications of CP, LCA, EMS and Environmental Audits.

TOTAL : 45 PERIODS

REFERENCES

1. Paul L. Bishop, 'Pollution Prevention : Fundamentals and Practice', McGraw-Hill International, 2000.
2. World Bank Group 'Pollution Prevention and Abatement Handbook – Towards Cleaner Production', World Bank and UNEP, Washington D. C., 1998.
3. Prasad modak C. Visvanathan and Mandar parasnis , 'Cleaner Production Audit', Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok, 1995.
4. www.environmentalexpert.com.
5. www.Cleaner production.com.

EN3315 ENVIRONMENTAL INSTRUMENTATION LABORATORY

L	T	P	C
0	0	3	2

A. Sample Collection, Handling and Preservation

1. Sampling Protocol: Planning a Sampling Strategy
2. The Representative Sample: Random vs. Judgmental Sampling
3. Sampling Equipment: Devices and Containers for soil, air and water.
4. Sampling Techniques: soil and water
5. Sampling Techniques: gases and vapors
6. Sample Documentation and Preservation, Chain of Custody (COC)

B. Methods of Analysis

1. Sample Preparation: Interferences and Detection Limits
2. Quality Control
3. Field Quality Control: Duplicate Samples
4. Quality Control in the Laboratory: Equipment Calibration, Matrix spike and Blank samples.

C. Electrode (potentiometric) Methods:

1. Use of bench top and field model pH meters
2. Use of Dissolved Oxygen Meters.
3. Use of TDS Meters.

D. Spectrophotometry

1. Estimation of Phosphate.
2. Estimation of Hydrocarbon.
3. Estimation of Nitrogen.
4. Estimation of Heavy Metals.

E. Chromatography

1. Liquid/Gas Chromatography.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Douglas A. Skoog and Donald M. West, Analytical chemistry: An introduction, CBS publishing Japan Ltd. New york, 1986.
2. Sawyer .C.N. and Mc Carty P. L. Chemistry for environmental engineering, McGraw Hill Publications, 4th edition, 1994.
3. Standards Methods for the Examination of Water and Waste Water, 17th Edition, WPCF, APHA and AWWA, USA, 1989.

EN3316 ENVIRONMENTAL ENGINEERING DESIGN AND DRAWING L T P C
0 0 3 2

ENVIRONMENTAL ENGINEERING

1. Layout of Water treatment plant
2. Sedimentation tank
3. Clariflocculator
4. Slow and rapid sand filters
5. Primary and secondary settling tanks
6. Trickling filter
7. Activated sludge process
8. Sludge digestion tank
9. Septic tank with dispersion trench and soak pit.
10. Infiltration gallery and pumping station.
11. Flow chart of ETP for selected Industries.
12. Flow Chart for CETP.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Sathya Narayana Murthy Challa , "Water Resources Engineering " Principles and Practice New Age
   International (P) Ltd., New Delhi – 2002.
2. Rangwala.S.C, "Fundamentals of water supply and sewerage engineering", Charotar Publishing 2000.

REFERENCE BOOKS

1. Santosh Kumar Garg, Irrigation Engineering and Hydraulics Structures, Khanna Publications Pvt.Ltd, New Delhi, 2002.
2. Birde.G.S and Birde.J.S, "Water supply and sanitary Engineering", Dhanpat Rai Publications Pvt.Ltd New Delhi, 2001.

EN3317 **G I S LABORATORY** **L T P C**
0 0 3 2

GIS SOFTWARES :

1. Arc GIS 9.02.
2. ERDAS 8.73.
3. Mapinfo 6.5
4. Any one or Equivalent.

EXCERCISES:

1. Digitization of Map/Toposheet
2. Creation of thematic maps.
3. Study of features estimation
4. Developing Digital Elevation model
5. Simple applications of GIS in Environmental Engineering.
6. Simple applications of GIS in water Resources Engineering.
7. Simple applications of GIS in Ground water Engineering.
8. Simple applications of GIS in Air Pollution.
9. Simple applications of GIS in water Quality Management.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Concept and Techniques of GIS by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers

EN3401 **DISASTER MANAGEMENT** **L T P C**
3 0 0 3

UNIT I NATURAL DISASTERS **6**

Earthquake - Tsunami - Landslides and Avalanche – Cyclones - Floods - Drought and Desertification – impacts.

UNIT II MAN INFLUENCED DISASTERS **6**

Chemical industrial hazards - major power breakdowns - traffic accidents - Fire, War, Nuclear radiation, Nuclear disaster - Forest Fire - Oil fire – accident in Mines.

UNIT III VULNERABILITY ANALYSIS AND MITIGATION **13**

Hazards - Risks and Vulnerabilities - Disasters in and India - Assessment of Disaster Vulnerability of a location and vulnerable groups - Preparedness and Mitigation measures for various Disasters - Mitigation through capacity building - partnership actions - Preparation of Disaster Management Plans - warning - precautionary and post measures.

UNIT IV DISASTER MANAGEMENT **12**

Disaster Management Systems - Legislative responsibilities of disaster management- Disaster management act 2005 - post disaster recovery & rehabilitation - Relief &

Logistics Management; disaster related infrastructure development - Post Disaster - Emergency Support Functions and their coordination mechanism – challenges.

UNIT V DISASTER MANAGEMENT WITH INFORMATION AND COMMUNICATION TECNOLOGY 8

Facilities for Disaster Management information and communication – Mobile, satellite, Remote sensing - GIS and GPS applications in real time disaster monitoring - Prevention and rehabilitation - Disaster mapping.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Khanna B K, "All You Wanted To Know About Disasters", New India Publishing Agency, New Delhi, 2005.
2. Ramana Murthy, "Disaster Management", Dominant, New Delhi, 2004.
3. Rajdeep Dasgupta, Disaster Management and Rehabilitation, Mittal Publishers, New Delhi, 2007.
4. Jagbir Singh, "Disaster Management Future Challenges and Opportunities", I.K. International Publishing House Limited, New Delhi, 2007.

EN3402 TRANSPORT OF WATER AND WASTEWATER L T P C
3 0 0 3

AIM: To impart knowledge on basic hydraulics, water and waste water transport processes.

UNIT I FUNDAMENTAL HYDRAULICS 10

Fluid properties - fluid flow - continuity principle - energy principle and momentum principle - frictional head loss in free and pressure flow - major and minor head loss - formula for estimation of head loss – pumping of fluids – selection of pumps – Flow measurement.

UNIT II WATER TRANSMISSION AND DISTRIBUTION 10

Planning factors – Water transmission main design – Pipe material – Economics water distribution pipe networks – Methods for analysis and optimization – Laying and maintenance – in-situ lining – Appurtenances – Corrosion prevention.

UNIT III WASTEWATER COLLECTION AND CONVEYANCE 9

Planning factors – Design of sanitary sewer- Partial flow in sewers - Economics of sewer design - Sewer appurtenances - Material, construction, inspection and maintenance of sewers - Design of sewer outfalls - Mixing conditions - Conveyance of corrosive wastewaters.

UNIT IV STORM WATER DRAINAGE 8

Planning – Run-off estimation - Rainfall data analysis - Storm water drain design – Rainwater harvesting.

UNIT V SOFTWARE APPLICATIONS 8

Use of computer software in water transmission - Water distribution and sewer design – LOOP version 4.0 sewer branch.

TOTAL : 45 PERIODS

REFERENCES:

1. " Manual on water supply and Treatment ", CPHEEO, Ministry of Urban Development, GOI, New Delhi, 1999.
2. " Manual on Sewerage and Sewage Development ", CPHEEO, Ministry of Urban Development, GOI, New Delhi, 1993.
3. B.A. Hauser, " Practical Hydraulics Hand Book ", Lewis Publishers, New York, 1991.
4. M.J. Hammer, " Water and Wastewater Technology ", Regents/Prentice Hall, New Jersey, 1991.

EN3403 HAZARDOUS WASTE MANAGEMENT L T P C
3 0 0 3

AIM:

At the end of the course the student shall be able to understand the type, nature and treatment of hazardous wastes.

UNIT I INTRODUCTION 10

Hazardous waste definition - Physical and biological routes of transport of hazardous substances - Sources and characterization categories and control - Sampling and analysis of hazardous wastes - Analytical approach for hazardous waste characterization - Proximate analysis - Survey analysis - Directed analysis – Analytical methods.

UNIT II HAZARDOUS WASTES MANAGEMENT 10

Sources and characteristics - Handling, collection, storage and transport - TSDF concept - Hazardous waste treatment technologies - Physical, chemical and thermal treatment of hazardous waste – Solidification - Chemical fixation – Encapsulation - Pyrolysis and Incineration - Hazardous waste landfills - Site selections - design and operation - HW reduction - Recycling and reuse - Regulatory aspects of HWM.

UNIT III BIOMEDICAL WASTE MANAGEMENT 9

Biomedical waste – Definition – Sources – Classification – Collection - Segregation Treatment and disposal.

UNIT IV RADIOACTIVE WASTE MANAGEMENT 8

Radioactive waste: Definition – Sources - Low level and high level radioactive wastes and their management - Radiation standard by ICRP and AERB.

UNIT V E-WASTE MANAGEMENT 8

Waste characteristics - Generation - Collection - Transport and disposal.

TOTAL : 45 PERIODS

REFERENCES

1. Hazardous waste management Charles A. Wentz. Second edition 1995. McGraw Hill International.
2. Integrated solid waste management George Techobanoglous, Hilary Theisen & Sammuel A. Vigil.
3. Criteria for hazardous waste landfills – CPCB guidelines 2000.
4. Hazardous waste management by Prof. Anjaneyulu.

5. Environmental Sciences by Daniel B. Botkin and Edward A. Keller, Wiley student, 6th edition- 2009.
6. Standard handbook of Hazardous waste treatment and disposal by Harry M. Freeman, McGraw Hill 1997.
7. Management of Solid waste in developing countries by FrankFlintoff , WHO regional publication.

EN3404 INDUSTRIAL WASTE MANAGEMENT L T P C
3 0 0 3

AIM:
To impart knowledge on different industrial processes, waste generation, nature and treatment.

UNIT I INTRODUCTION 8
General characteristics of industrial wastes and sewage – Population equivalent –Effects of industrial effluents on streams, sewer, land, sewage treatment plants and on human health – Environmental legislations related to prevention and control of industrial pollution and hazardous wastes.

UNIT II CLEANER PRODUCTION 8
Volume reduction - Strength reduction - Material and process modifications - Recycle, reuse and byproduct recovery - Applications.

UNIT III TREATMENT TECHNOLOGIES 11
Equalisation - Neutralisation - Removal of suspended and dissolved organic solids - Chemical oxidation - Adsorption - Removal of dissolved inorganic - Combined treatment of industrial and municipal wastes - Residue management - Dewatering – Disposal.

UNIT IV POLLUTION FROM MAJOR INDUSTRIES 9
Sources - Characteristics - Waste treatment flow charts for selected industries such as Textiles - Tanneries - Pharmaceuticals - Electroplating industries - Dairy - Sugar - Paper - distilleries - Steel plants – Refineries – Fertilizer - thermal power plants - Wastewater reclamation concepts.

UNIT V HAZARDOUS WASTE MANAGEMENT 9
Hazardous wastes – Types – Sources - Collection - Physico chemical treatment – Solidification – Incineration – Secured landfills.

TOTAL : 45 PERIODS

TEXT BOOKS
1. M.N.Rao & A.K.Dutta, “Wastewater Treatment”, Oxford - IBH Publication, 1995.
2. W .W. Eckenfelder Jr., “Industrial Water Pollution Control”, McGraw-Hill Book Company, New Delhi, 2000.

REFERENCES
1. T.T.Shen, “Industrial Pollution Prevention”, Springer, 1999.
2. R.L.Stephenson and J.B.Blackburn, Jr., “Industrial Wastewater Systems Hand book”, Lewis Publisher, New Yark, 1998
3. H.M.Freeman, “Industrial Pollution Prevention Hand Book”, McGraw-Hill Inc., New Delhi, 1995.
4. Bishop, P.L., “Pollution Prevention: Fundamental & Practice”, McGraw-Hill, 2000.

EN3405 PLANT LAY OUT DESIGN L T P C
0 0 3 2

1. Layout design for water treatment plant with all specifications
2. Layout design for sewage treatment plant with all specifications
3. Layout of effluent treatment plant for Textile industry water
4. Layout of effluent treatment plant for Sugar mill waste
5. Layout of effluent treatment plant for distilleries industry waste
6. Layout of effluent treatment plant for Dairy industry waste
7. Layout of effluent treatment plant for Tanning industry waste
8. Layout of effluent treatment plant for Pulp and paper mill waste
9. Layout of effluent treatment plant for Chemical industry waste
10. Layout of effluent treatment plant for Metal finishing industry waste

TOTAL : 45 PERIODS

REFERENCES

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi,1999.
2. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 1993 Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987

EN3406 INDUSTRIAL SAFETY LABORATORY L T P C
0 0 3 2

UNIT I NOISE LEVEL MEASUREMENT AND ANALYSIS 9

Measurement of noise level - Instrument – Precision type of Noise level meter with frequency and spectrum analyzer - Various sources – Continuous and intermittent noises – Impact identification - Frequency and spectrum analysis of noise - Measurement of whole body vibration for various acceleration- Instrument – vibration simulator and vibration analyzer.

UNIT II AMBIENT AIR POLLUTION AND EXHAUST GAS MEASUREMENT AND ANALYSIS 10

Measurement of Exhaust gas measurement of IC engines: Instrument – Gas analyzer Measurement of breathing zone concentration of dust and fumes: Instrument – Personal air sampler Measurement of respirable and non-respirable dust in ambient air - Measurement of gaseous pollutants in ambient air: Instrument – High volume sampler - Soft computing skills on developing effects of fire & explosion and dispersion: Software – PHAST 1 and ALOHA.

UNIT III STUDY ON PERFORMANCE MONITORING OF WATER AND WASTEWATER TREATMENT PLANTS 9

Study of performance monitoring in wastewater treatment plants – CETPs of industrial units – domestic wastewater treatment plant.

UNIT IV STUDY OF PERSONAL PROTECTIVE EQUIPMENT 8

Safety helmet – Belt - hand gloves – Goggles - Safety shoe - Gum boots - Ankle shoes - Face shield - Nose mask - Ear plug - ear muff - Apron and leg guard.

UNIT V STUDY OF FIRE EXTINGUISHERS 9

Selection and demonstration of first-aid fire extinguishers: soda acid, foam, carbon dioxide (CO_2), dry chemical powder, halon.

TOTAL : 45 PERIODS

REFERENCES

1. "Accident Prevention Manual for Industrial Operations" NSC, Chicago, 1982.4. GREEN, A.E., "High Risk Safety Technology", John Wiley and Sons,. 1984.
2. Petroleum Act and Rules, Government of India.
3. Carbide of Calcium Rules, Government of India.

EN3407 PROJECT MANAGEMENT SOFTWARE LABORATORY L T P C
0 0 3 2

UNIT I PROJECT ORGANIZATION 9

Project organization involves selecting an appropriate project organization, structure and establishing the Organizational Breakdown Structure (OBS) for the project - Through an analysis of the project information - Transfer needs (i.e., who needs information from whom) - Project teams and a reporting structure may be determined - Specifically, several product development processes and the Design Structure Matrix are studied.

UNIT II PROJECT PLANNING 10

Project planning involves establishing the Work Breakdown Structure and mapping this structure to the established OBS. Specific methodologies for planning include:

- The Critical Path Method (CPM)
- The Precedence Diagramming Method (PDM)
- The Program Evaluation and Review Technique (PERT)
- The Graphical Evaluation and Review Technique (GERT)
- Queue - Graphical Evaluation and Review Technique (GERT)
- Simulation Language for Alternative Modelling (SLAM)
- Dynamic Planning and Control Methodology (DPM)
- Critical Chain Planning
- Resource Loading

Many software tools, such as Microsoft® Project, Primavera Project Planner®, Primavera® Monte Carlo, Crystal Ball® and ProChain® are available to the project manager for deterministic and probabilistic planning. In this course we will use the following:

- Primavera® P3 — for deterministic time and resource scheduling
- Primavera® Monte Carlo — for probabilistic time and resource scheduling
- Primavera® Expedition — for documenting multiple and complex projects
- Pro Chain® — for scheduling with the critical chain method
- Crystal Ball® — for risk analysis
- Vensim® — for system dynamics analysis

UNIT III PROJECT MONITORING 8

Project Monitoring refers to the configuration and metrics used to monitor the progress of a project throughout its life.

UNIT IV PROJECT CONTROL 10

Based on the information gathered through the Project Monitoring system, corrective action may be required to keep a project on track - The Project Control section of the course describes techniques to help realign projects that have gone away - Corrective action may be needed in many areas such as project scope, product performance, project schedule, and project budget - Project Control also requires a clear trace as to when and how changes are made to baselines as well as a clear understanding and documentation of project configurations.

UNIT V PROJECT LEARNING 8

Project Learning is recognized by organizations as one of the most important factors for success in current and future projects.

TOTAL : 45 PERIODS

REFERENCES

1. "Construction project management: planning and scheduling" – by Henry F. W. Naylor, Delmar Publishers, 1995 - Technology & Engineering
2. Baker, S. and Baker, K., The Complete Idiot 's Guide to *Project Management*, New York: Alpha *Books*, 1998.
3. Planning Using Primavera Project Planner P3 Version 3. 1 Revised 2006 By Paul Eastwood. Harris, Eastwood Harris Pty Ltd.

EN3408 ENVIRONMENTAL IMPACT ASSESSMENT L T P C
3 0 0 3

AIM:

To impart knowledge on Environmental management and Environmental Impact Assessment.

UNIT I INTRODUCTION 8

Impact of development projects – Urbanisation – Meaning – Activities involved – Effects on environment - Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA

UNIT II METHODOLOGIES 9

Methods of EIA – Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives

UNIT III PREDICTION AND ASSESSMENT 9

Assessment of Impact on land, water, air, social & cultural activities and on flora & fauna- Mathematical models- Public participation – Rapid EIA

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora & fauna - Addressing the issues related to the Project Affected People.

UNIT V CASE STUDIES 10

EIA for infrastructure projects – Dams – Highways – Multi-storey Buildings – Water Supply and Drainage Projects – Waste water treatment plants, STP.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Canter, R.L., “Environmental Impact Assessment”, McGraw-Hill Inc., New Delhi, 1996.
2. Shukla, S.K. and Srivastava, P.R., “Concepts in Environmental Impact Analysis”, Common Wealth Publishers, New Delhi, 1992.

REFERENCES

1. John G. Rau and David C Hooten (Ed)., “Environmental Impact Analysis Handbook”, McGraw-Hill Book Company, 1990.
2. “Environmental Assessment Source book”, Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, “Handbook of Environmental Impact Assessment Vol. I & II”, Blackwell Science, 1999.

EN3001 **WEALTH FROM WASTE** **L T P C**
3 0 0 3

UNIT I INTRODUCTION 9

Solid waste – Sources – Domestic, industrial and agriculture sources- Industrial wastes- Mineral wastes - Indentification waste - Minimizing options -Recovery and Recycle- Composting- Vermi composting - Incineration - Energy from waste- Pyrolysis, chemical processing- Legislative measures for garbage disposal.

UNIT II FLY ASH 9

Introduction- Nature- Direct Replacement of Cement- Waste Land Development- Soil Amendment to grow Crops- Utilization of Flyash In Afforestation, Limitation of Land Application of Fly Ash.

UNIT III PLASTIC WASTE, INDUSTRIAL WASTE 9

Introduction – Amount and types of plastic waste – Recycling of plastic waste-cement manufacture from industrial solid waste - Paper industry waste - Calcium carbide industry waste.

UNIT IV BIO FUELS & BIO ETHANOL 9

Bio ethanol production technologies- Bio hydrogen- its application - Methanogenesis from agro- industrial residues- Bio mass – Gasifier based power plants.

UNIT V WASTE WATER 9

Introduction reuse- Quality, the basic treatment processes - Benefits of reuse in agriculture - The costs of reuse projects and economic justification - Factors essential for the success of reuse projects- Case study.

TOTAL : 45 PERIODS

REFERENCES

1. Nemerow N.L., “Industrial Water Pollution”, Addison – Wesley Publishing Company inc., USA, 1978
2. Wesley Eckenfelder Jr. W, Industrial water poolution control, McGraw Hill book Co, New Delhi, 1989.
3. Mahajan S.P. “Pollution Control in process industries”, Tata McGraw Hill Publishing Co Ltd., New Delhi, 1989.

EN3002 SUSTAINABLE DEVELOPMENT L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Definition – Why sustainability? – Nine ways to achieve sustainability – population, resources, environment and sustainability- Sustainability on the highway produced by three key sources of energy.

UNIT II CHALLENGES OF SUSTAINABLE DEVELOPMENT AND GLOBAL ENVIRONMENTAL ISSUES 9

Concept of sustainability – Factors governing sustainable development – Linkages among sustainable development- Environment and poverty – Determinants of sustainable development – Case studies on sustainable development - Population, income and urbanization – Health care – Food, fisheries and agriculture – Materials and energy flows.

UNIT III SUSTAINABLE DEVELOPMENT INDICATORS 9

Need for indicators – Statistical procedures – Aggregating indicators – Use of principal component analysis – Three environmental quality indices.

UNIT IV ENVIRONMENTAL ASSESSMENT 9

National environmental policy act of 1969 – Environmental Impact Assessment – Project categories based on environmental impacts – Impact identification methods – Environmental impact assessment process.

UNIT V ENVIRONMENTAL MANAGEMENT AND SOCIAL DIMENSIONS 9

Revisiting complex issues – Sector policies concerning the environment – Institutional framework for environmental management - Achievements in environmental management - People's perception of the environment – Participatory development – NGOs – Gender and development – Indigenous peoples – Social exclusion and analysis.

TOTAL : 45 PERIODS

REFERENCES

1. Peter P. Rogers, Kazi F. Jalal, John A. Boyd, An introduction to sustainable development, Glen Educational Foundation, 2008.
2. Jennifer A. Elliott, An introduction to sustainable development. London: Routledge: Taylor and Francis group, 2001.
3. Low, N. Global ethics and environment. London: Routledge. 1999.
4. F. Douglas Muschett, Principles of Sustainable Development, St. Lucie Press, 1997.

EN3003 ENVIRONMENTAL POLICIES AND LAW L T P C
3 0 0 3

OBJECTIVE:
To impart knowledge on the policies, legislations, institutional frame work and enforcement mechanisms for environmental management in India.

UNIT I INTRODUCTION 9
Indian Constitution and Environmental Protection – National Environmental policies – Precautionary Principle and Polluter Pays Principle – Concept of absolute liability – multilateral environmental agreements and Protocols – Montreal Protocol, Kyoto agreement, Rio declaration – Environmental Protection Act, Water (P&CP) Act, Air (P&CP) Act – Institutional framework (SPCB/CPCB/MoEF)

UNIT II WATER (P&CP) ACT, 1974 8
Power & functions of regulatory agencies - responsibilities of Occupier Provision relating to prevention and control Scheme of Consent to establish, Consent to operate – Conditions of the consents – Outlet – Legal sampling procedures, State Water Laboratory – Appellate Authority – Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.

UNIT III AIR (P&CP) ACT, 1981 8
Power & functions of regulatory agencies - responsibilities of Occupier Provision relating to prevention and control Scheme of Consent to establish, Consent to operate – Conditions of the consents – Outlet – Legal sampling procedures, State Air Laboratory – Appellate Authority – Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.

UNIT IV ENVIRONMENT (PROTECTION) ACT 1986 13
Genesis of the Act – delegation of powers – Role of Central Government - EIA Notification – Sitting of Industries – Coastal Zone Regulation - Responsibilities of local bodies mitigation scheme etc., for Municipal Solid Waste Management - Responsibilities of Pollution Control Boards under Hazardous Waste rules and that of occupier, authorisation – Biomedical waste rules – responsibilities of generators and role of Pollution Control Boards

UNIT V OTHER TOPICS 7
Relevant Provisions of Indian Forest Act, Public Liability Insurance Act, CrPC, IPC - Public Interest Litigation - Writ petitions - Supreme Court Judgments in Landmark cases.

TOTAL : 45 PERIODS

REFERENCES

1. CPCB, “Pollution Control acts, Rules and Notifications issued there under “Pollution Control Series – PCL/2/1992, Central Pollution Control Board, Delhi, 1997.
2. Shyam Divan and Armin Roseneranz “Environmental law and policy in India “Oxford University Press, New Delhi, 2001.
3. Greger I.Megregor, “Environmental law and enforcement”, Lewis Publishers, London. 1994.

EN3004 WIND POWER ENGINEERING L T P C
3 0 0 3

AIM

To understand the fundamentals of wind energy and its conversion techniques for electrical energy applications.

UNIT I INTRODUCTION 9

Forces influencing Wind - Wind Speeds and scales - Wind Mechanics - Pressure gradient force and Coriolis force - Atmospheric Boundary Layer - Atmospheric Stability - Turbulence - Surface Wind-Potential of wind electricity generation in India and its current growth rate.

UNIT II MEASUREMENTS AND ANALYSIS 10

Instrumentation for wind measurements-Wind data analysis-Wind resource estimation-Wind sensing systems-Recording systems-Power extracted from wind -Power curve - Velocity duration curve-wind characteristics and site selection -linear momentum theory-power coefficient- Betz limit.

UNIT III AERODYNAMICS AND COMPONENTS 10

Aerofoil-Lift and drag curves Asymmetrical-Symmetrical foil-Pitch angle-Pitch control-Tip speed ratio Balancing technique (Rotor & Blade)-Solidity-Hub-Nacelle-Yaw control-Layout and operation of wind turbine-Wind turbine specifications.

UNIT IV WIND TURBINES AND GENERATING SYSTEM 9

HAWT-VAWT-Savonius turbines-Darrieus turbines-Off shores turbines-Merits and demerits of wind power generation-CSCF-VSCF-VSVF-Combined wind and solar plant-Combined wind and diesel plant.

UNIT V ECONOMIC ANALSIS 7

Wind resource assessment and R & D costs- Fixed and variable costs- Value of wind Energy -Life cycle costing and cash flow of wind power projects-Wind energy market - General Principles, guidelines and acceptable limits-Noise and Electro Magnetic Interference due to wind mills.

TOTAL : 45 PERIODS

REFERENCES

1. L.L.Freris, Wind Energy Conversion Systems, Prentice Hall, 1990.
2. E Hau, Wind Turbines- Fundamentals: Technologies, Application, Economics, Springer -Verlag Berlin -Heidelbeg, 2000
3. GL Johnson, Wind Energy Systems, Printice Hall Inc, New Jersy, 1985
4. Hansen, Martin, O, L, Aerodynamics of Wind Turbine, James and James (Science Publishers) Ltd, London 2000

EN3005 WATER POWER ENGINEERING L T P C
3 0 0 3

UNIT I BASIC HYDRO POWER CONCEPTS 9

Hydrological cycle - Selection of site-Run off - Factors affecting runoff - Hydrograph and flow duration curve - Mass curve - Storage and pondage - Advantages and disadvantages of water power - Potential of hydropower in India- Its development and future prospect.

UNIT II LAYOUT 9

Operation and selection of hydro plant – Layout - Essential elements - Catchment area-Reservoir – Dams -Selection of site - Gravity dams - Earth dams - Rock fill dams – Spillways –Types –Conduits - Surge tanks –Types -Water hammer - Draft tubes.

UNIT III HYDRAULIC TURBINES 9

Types - Selection factors -Turbine size - Pelton wheel - Francis turbine - Propeller turbine-Kaplan turbine - Bulb turbine - Scale ratio - Comparison of turbines - Governing of hydraulic turbines.

UNIT IV TYPES OF HYDRO POWER PLANTS 9

Classification of hydro plants - Run-of - River plants -Valley dam plants - High head diversion plants - Diversion Canal Plants - Pumped storage plants -Tidal power plants - Small and Mini hydro power system: Introduction - Site development - Generation and electrical equipment-System of regulation of hydroelectric power in India.

UNIT V ECONOMIC ANALYSIS 9

Cost of hydro plants - Combined hydro and steam plant - Plant selection-Equipment selection -Economic factors -National water grid - Case studies - Potential of small hydro power in North East India -Hydro power projects in Western Himalayas.

TOTAL : 45 PERIODS

REFERENCES:

1. Power Plant Engineering by P.K. Nag, Tata McGraw Hill, Second Edition , Fourth reprint 2003.
2. An introduction to power plant technology by G.D. Rai-Khanna Publishers, Delhi-110005.
3. Power Plant Engineering by Dr.P.C. Sharma, S. K. Kataria & Sons, 2009
4. Small and mini Hydropower system by Tata Mc Graw Hill.

EN3006 **TIDAL ENGINEERING** **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Energy from the ocean - Tidal power - Origin of the tides - Cause of tides – Enhancement of tides - Diurnal tide - Coriolis force -Tidal range -Variation of tidal range - Tidal constituents-Effects of individual tides - Surge tides -Tides schedule -Tidal cycle.

UNIT II COMPONENTS **10**

Tidal barrage function -Tidal Turbines - Bulb turbine - Rim turbine - Tubular turbine - Sluices-Venturi effect – Locks – Embankments - Ebb and flood generation - Cross sectional view of power module at Vizhinjam.

UNIT III TIDAL POWER PLANTS **10**

Tidal force-Spring tide-Neap tide-Types of tidal power plants-Single basin, single effect scheme-
Single basin, double effect scheme-Linked basin scheme-Layout of tidal power house

UNIT IV CAISSONS **9**

Caissons for tidal power-Steel caissons-Towing and placing caissons-Long period waves-Flap gate-Radial gate-Rising sector gate-Vertical lifted gate-Effects of barrage on tidal level-Advantages and limitations of tidal power-

UNIT V ECONOMIC ANALYSIS **7**

Cost-Value of electricity- Environmental aspects-Water quality-Effects of nature - Tidal power resources around the world-Case study-La Rance tidal power station - Long Island Sound Barrage Case Study for the Future

TOTAL : 45 PERIODS

REFERENCES

1. Tidal power by A.C.Baker, peter peregrines ltd, London, united kingdom
2. Ocean energy tide and tidal power by R.H.Charlier,C.W.Finkl by Springer publications
3. Power Plant Engineering by P.K. Nag, Tata McGraw Hill, Second Edition, Fourth reprint 2003.

EN3007 GEO-THERMAL ENGINEERING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Thermal structure of earth-Heat flow and temperature distribution-heat and storage-Heat conduction, radiation and convection –Geo thermal gradient-Thermal conductivity-Potential Sites-Estimations of Geothermal Power-Nature of Geothermal Sites-Basic geo thermal power plant

UNIT II RESOURCES 9

Hydro geothermal-Dry steam fields-Wet steam fields-Hot water fields-Geo pressure resources-Hot dry rocks-Magma resources-Volcanoes- Prospects of geothermal energy in India -Total flow power unit

UNIT III HOT SPRINGS 9

Hot spring system structure-Warm spring-Flow rates-High flow hot springs-Therapeutic uses-Infections-Hot springs around the world- Merits and demerits of geothermal energy- Applications of geothermal energy

UNIT IV POWER GENERATING SYSTEMS 9

Single flash steam plant-Double flash steam plant-Dry steam plants-Binary cycle power plants-Advanced geothermal energy conversion systems-Environmental effects

UNIT V ADVANCEMENTS 9

Advanced concepts-R&D challenges and activities-Recent progress-Commercialization and deployment activities-Market context-Case study-Larderello dry steam power plant, Italy-Mutnovsky flash steam power plant, Russia

TOTAL : 45 PERIODS

REFERENCES

1. Geothermal Energy: An Alternative Resource for the 21st Century by Harsh K. Gupta, Sukanta Roy, Elsevier, first edition
2. Geothermal Power Plants Principles, Applications and Case Studies by Ronald Dipippo, Elsevier, second edition
3. Non Conventional Energy Sources, by G.D. Rai, Khanna Publishers, New Delhi,

EN3008 COASTAL ZONE MANAGEMENT L T P C
3 0 0 3

AIM

At the end of the semester, the student shall be able to understand the coastal processes, coastal dynamics, impacts of structures like docks, harbours and quays,leading to simple management perspectives along the coastal zone.

UNIT I COASTAL ZONE 9

Coastal zone- Coastal zone regulations- Beach profile- Surf zone- Off shore- Coastal waters- Estuaries- Wet lands and Lagoons- Living resources- Non living resources.

UNIT II WAVE DYNAMICS 10

Wave classification- Airy's Linear Wave theory- Deep water waves- Shallow water waves- Wave pressure- Wave energy- Wave Decay- Reflection, Refraction and Diffraction of waves- Breaking of waves- Wave force on structures- Vertical- Sloping and stepped barriers- Force On piles.

UNIT III WAVE FORECASTING AND TIDES 9

Need for forecasting- SMB and PNJ methods of wave forecasting- Classification of tides- Darwin's equilibrium theory of tides- Effects on structures- Seiches, Surges and Tsunamis.

UNIT IV COASTAL PROCESSES 8

Erosion and depositional shore features- Methods of protection- Littoral currents- Coastal aquifers- Sea water intrusion- Impact of sewage disposal in seas.

UNIT V HARBOURS 9

Structures near coast - Selection of site - Types and selection of break waters - Need and mode of dredging - Selection of dredgers - Effect of Mangalore forest.

TOTAL : 45 PERIODS

TEXTBOOKS

1. Richard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Scientific Publishing Co.,1999
2. Quinn, A.D., "Design & Construction of Ports and Marine Structures", McGraw-Hill Book Co.,1999

REFERENCES

1. Ed. A.T. Ippen, "Coastline Hydrodynamics", McGraw-Hill Inc., New York, 1993
2. Dwivedi, S.N., Natarajan, R and Ramachandran, S., "Coastal Zone Management in Tamilnadu".

EN3009 GREEN BUILDINGS DESIGN L T P C
3 0 0 3

UNIT I INTRODUCTION 12

The sun-earth relationship and the energy balance on the earth's surface, climate, wind - Solar radiation and solar temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings - Thermal properties of building materials.

Estimation of Building Loads

Steady state method - Network method - Numerical method – Correlations- Computer packages for carrying out thermal design of buildings and predicting performance.

UNIT II ENERGY EFFICIENT TECHNOLOGIES FOR BUILDINGS 8

Passive cooling and day lighting - Active solar and photovoltaic- Building energy analysis methods- Building energy simulation- Building energy efficiency standards- Lighting system design- Lighting economics and aesthetics- Impacts of lighting efficiency.

UNIT III INDOOR ENVIRONMENTAL QUALITY REQUIREMENT AND MANAGEMENT 8

Psychrometry- Comfort conditions- Thermal comfort- Ventilation and air quality-Air conditioning requirement- Visual perception- Illumination requirement- Auditory requirement- Energy management options- Energy audit and energy targeting- Technological options for energy management.

UNIT IV ENERGY CONSERVATION IN AIR CONDITIONING SYSTEMS 8

Cycles- Air conditioning systems- Energy conservation in pumps- Fans and blowers- Refrigerating machines- Heat rejection equipment- Energy efficient motors- Insulation.

UNIT V GREEN BUILDINGS 9

Ecological sustainable design- Life cycle analysis- Barriers to green buildings- Green building rating tools- Material selection- Embodied energy- Operating energy- Façade systems- Ventilation systems- Transportation- Water treatment systems- Water efficiency- Building economics- Leeds and IGBC codes.

TOTAL : 45 PERIODS

REFERENCES

1. Edward G Pita, “An Energy Approach- Air-conditioning Principles and Systems”, Pearson Education, 2003.
2. Colin Porteous, “The New Eco-Architecture”, Spon Press, 2002.
3. Lever More G J, “Building Energy Management Systems”, E and FN Spon, London, 2000.
4. Ganesan T P, “Energy Conservation in Buildings”, ISTE Professional Center, Chennai, 1999.
5. John Littler and Randall Thomas, “Design with Energy: The Conservation and Use of Energy in Buildings”, Cambridge University Press, 1984.
6. Energy Conservation Building Codes: www.bee-india.nic.in

GE2022 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Dale H.Besterfiled, et at., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint (2006).

REFERENCES:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd., 2006.

CE3011 **HYDROLOGY** **L T P C**
3 0 0 3

UNIT I PRECIPITATION 9

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall –Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

UNIT II ABSTRACTION FROM PRECIPITATION 9

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process –Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT III HYDROGRAPHS 9

Factors affecting Hydrograph – Baseflow separation – Unit hydrograph – Derivation of unit
hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

UNIT IV FLOODS AND FLOOD ROUTING 9

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control

UNIT V GROUND WATER HYDROLOGY 9

Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2000
2. SRaghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000

REFERENCES

1. Chow, V.T. and Maidment, "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000
2. Singh, V.P., "Hydrology", McGraw-Hill Inc., Ltd., 2000.

CE3012 GROUND WATER CONTAMINATION L T P C
3 0 0 3

UNIT I INTRODUCTION 8

Ground water and the hydrologic cycles- Ground water as a resource- Ground water contamination- Ground water as a geotechnical problem- Ground water and geologic processes- Physical properties and principles- Darcy's law- Hydraulic head and fluid potential- Piezometers and nests.

UNIT II OCCURANCE AND MOVEMENT OF GROUND WATER 9

Hydraulic conductivity and permeability- Homogenicity and anisotropy- Porosity and voids ratio- Unsaturated flow and the water table- Steady state flow and transient flow- Compressibility and effective stress- Transmissivity and storativity- Equations of ground water flow - Limitations of Darcian Approach- Hydro dynamic dispersion.

UNIT III RESOURCE EVALUATION 9

Development of ground water resources- Exploration of Aquifers- The response of ideal aquifers to pumping- Measurement of parameters- Laboratory tests- Numerical simulation for aquifer yield prediction- Artificial recharge and induced infiltration- Land subsidence- Sea water intrusion.

UNIT IV CHEMICAL PROPERTIES AND PRINCIPLES 10

Constituents- Chemical equilibrium- Association and dissociation of dissolved species- Effects of concentration gradients- Mineral dissolution and solubility- Oxidation and reduction process-Ion exchange and adsorption- Environmental isotopes- Field measurement of index parameters- Chemical evolution- Ground water in carbonate terrain- Ground water in crystalline rocks- Ground water in complex sedimentary systems- Geotechnical interpretation of 14C dates- Process rates and molecular diffusion.

UNIT V SOLUTE TRANSPORT 9

Water quality standards- Transport process- Non reactive constituents in homogeneous media- Transport in fracture media- Hydrochemical behaviour of contaminants- Trace metals- Nitrogen- Trace non metals- Organic substances- Measurement of parameters– Velocity- Dispersivity- Chemical partitioning- Sources of contamination- Land disposal of solid waste- Sewage disposal on land. USGS- Moc model: Modeling principles- MOC modeling.

TOTAL : 45 PERIODS

REFERENCES

1. Randall J. Charbeneau-Ground water Hydraulics and Pollutant Transport Allen Freeze R. and John A. Cherry -Ground water. Prentice Hall.Inc
2. Raghunath, H.M., Ground Water, 2nd edition, Wiley Eastern Ltd., New Delhi, 1987.
3. Rushton K.R., Groundwater Hydrology : Conceptual and Computational Models,Wiley, 2003
4. Elango L. and Jayakumar, R. Modelling in Hydrology, Allied Publishers Ltd., 2001
5. Remson I., Hornberger G.M. and Moltz F.J., Numerical Methods in Subsurface Hydrology, Wiley, New York, 1971

EN3013 PROCESS SAFETY AND LOSS PREVENTION L T P C
3 0 0 3

UNIT I **9**

Occupation, Health and Hazards- Safety Health and Management- Occupational Health Hazards- Ergonomics- Importance of Industrial Safety- Radiation and Industrial Hazards- Types and effects- Vibration- Industrial Hygiene- Different air pollutants in industries and their effects- Electrical, fire and Other Hazards- General causes- Machine Guards and its types- Automation.

UNIT II **9**

Safety at Workplace- Safe use of Machines and Tools- Safety in use of different types of unit operations- Ergonomics of Machine guarding- Working in different workplaces- Operation- Inspection and maintenance- Plant Design and Housekeeping- Industrial lighting- Vibration and Noise.

UNIT III **9**

Accident Prevention Techniques- Principles of accident prevention- Definitions, Theories, Principles- Hazard identification and analysis- Event tree analysis- Hazop studies- Job safety analysis- Theories and Principles of Accident causation- First Aid- Body structure and functions- Fracture and Dislocation- Injuries to various body parts.

UNIT IV **9**

Safety Management System and Law- Legislative measures in Industrial Safety- Various acts involved in Detail- Occupational safety- Health and Environment Management- Bureau of Indian Standards on Health and Safety, 14489, 15001-OSHA- Process safety management (PSM) and its principles- EPA standards- Safety Management- Organisational & Safety Committee- Its structure and functions

UNIT V **9**

Plant Layout for Safety- Design and location- Distance between hazardous units- Lighting- colour coding- Pilot plant studies- Housekeeping- Accidents Related with Maintenance of Machines- Work Permit System- Significance of Documentation Directing Safety- Definition- Process- Principles and Techniques Leadership- Role, function and attribution of a leader Case studies- Involving implementation of health and safety measures in Industries.

TOTAL : 45 PERIODS

REFERENCES

1. R.K. Jain and Sunil S. Rao, Industrial safety, Health and Environment Management, Khanna publishers, New Delhi (2006).
2. Frank P. Lees - Loss of Prevention in Process Industries, Vol 1 and 2, Butterworth - Heinamann Ltd., London (1991)
3. Industrial Safety - National Council of India
4. Factories Act with Amendments 1987, Govt. of India Publications DGFASLI, Mumbai

EN3015 CLIMATALOGY AND METEOROLOGY L T P C
3 0 0 3

UNIT I EARTH'S CLIMATE SYSTEM 9

Introduction- Climate in the spotlight- The Earth's Climate Machine- Climate Classification- Global Wind Systems- Trade Winds and the Hadley Cell- The Westerlies- Cloud Formation and Monsoon Rains- Storms and Hurricanes- The Hydrological Cycle- Global Ocean Circulation- EI Nino and its Effect- Solar Radiation- The Earth's Natural Green House Effect- Green House Gases and Global Warming- Carbon Cycle.

UNIT II OBSERED CHANGES AND ITS CAUSES 9

Observation of Climate Change- Changes in patterns of temperature- Precipitation and sea level rise- Observed effects of Climate Changes- Patterns of Large scale Variability- Drivers of Climate change- Climate Sensitivity and Feedbacks- The Montreal Protocol- UNFCCC- IPCC- Evidences of changes in Climate and Environment- On a Global Scale and in Indian.

UNIT III IMPACTS OF CLIMATE CHANGE 9

Impacts of Climate Change on Various sectors- Agriculture, Forestry and Ecosystem- Water Resources- Human Health- Industry, Settlement and Society- Methods and Scenarios- Projected Impacts for Different Regions- Uncertainties in the Projected Impacts of Climate change- Risk of Irreversible Changes.

UNIT IV METEOROLOGY 9

Importance of the atmosphere- composition of atmosphere Regions and Stratification of atmosphere- Energy transfer in the atmosphere- Atmosphere mass transfer- Meteorology and weather meteorological parameters- Inversion and air pollution- Microclimate- Global aspect of Weather and Climate.

UNIT V PLUME BEHAVIOR AND POLLUTANT DISPERSION 9

Temperature Lapse rate- Atmospheric stability- Maximum Mixing Depth- Ventilation Coefficient- Meteorology influence on Plume Behavior- Effect of topography on Pollutant dispersion- Effect of air pollutants on meteorology- Effective stack height- Gaussian plume model.

TOTAL: 45 PERIODS

REFERENCES

1. Jan C. van Dam, Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press 2003
2. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press Indian Pvt.Ltd, 2007
3. Stanley E.Manahan, "Environmental Science and Technology", Lewis Publisher, 1997
4. KVSA , Muralikrihna , "Air Pollution and central", published by Kanshal and co – Kakinada, 1997
5. IPCC, Fourth Assessment Report- the AR4 synthesis report.
6. Anjaneyulu.Y, 'Air pollution and Control Technology' Allied Publishers (P)Ltd, India 2002.

EN3016 EPIDEMIOLOGY AND CONTROL OF COMMUNICABLE DISEASES **L T P C 3 0 0 3**

9

UNIT I GENERAL

Definitions - Dynamics of disease Transmission - Investigation of disasters - Survey - Chain of transmission of diseases - disease control - control of source - control of mode of transmission - susceptible host - typical epidemic control - Investigations.

UNIT II RESPIRATORY, WATER, AND FOOD BORNE DISEASES 9

Respiratory diseases - Definition - Group - control of source.Water and Food borne diseases - General reservoir of infection – agents - food decomposition - vehicle or transmission of diseases - control of water and food-borne diseases.

UNIT III INSECT BORNE DISEASES 9

Insect borne diseases and Zoo noses – Infections from mosquitoes, house flies, rats, louse, pubic louse and other insects - General, insect borne diseases, zoo noses and their spread - control at source - control of mode of transmission.

UNIT IV MISCELLANEOUS DISEASES AND ILLNESSES 9

Miscellaneous diseases and illnesses - Ringworm, hookworm infections, ancylostomiasiz, tetanus, amoebiasis.

Other illnesses associated with environment and food - Lead poisoning, carbon monoxide poisoning - mercury poisoning - illnesses associated with air pollution - nutritional deficiency diseases – Illness associated with building materials.

UNIT V ASPECTS OF HEALTH SERVICES 9

The Organization of Health services – Tasks for the health services - the major components of health services (curative, preventive, special services, statistics and health education) - resources for the health services – community participation in health services.Declaration of ALMA-ATA.

TOTAL : 45 PERIODS

REFERENCES

1. J. E .Park and K.Park, " Text Book of Preventive and Social Medicine ", X Edition.
2. Rieman Hans, “Food borne infections and intoxications”, Academic Press, NY, 1969.

EN3017 LOW-CORBON ECONOMY L T P C
3 0 0 3

UNIT I RATIONALE AND AIMS 9

Energy policy- Renewable energy and energy efficiency- Energy storage- Smart grid- Methane cycle- Nuclear power and Carbon Capture and Storage- green house gas balances and mitigation costs.

UNIT II PRIMARY SECTORS 9

Agriculture – Crops – Livestock - Hunting and Fishing – Forestry - Mining.

UNIT III SECONDARY SECTORS 9

Basic metals processing- Nonmetallic product Processing- Wood Processing- Paper and Pulp Making- Food Processing.

UNIT IV TERTIARY SECTORS 9

Retail- Transportation Services- Health Services.

UNIT V INITIAL STEPS 9

Countries- Costa Rica- Iceland- Australia- New Zealand- China- United Kingdom- India- Low carbon strategies for inclusive growth - Cities.

TOTAL: 45 PERIODS

REFERENCES:

1. http://en.wikipedia.org/wiki/low carbon economy
2. website: Bioenergy and renewable power methane in integrated 100% renewable energy system
3. website: Global, Regional, and National CO_2 Emissions
4. website: Renewable Revolution:Low-Carbon Energy by 2030

EN3018 NUCLEAR ENERGY L T P C
3 0 0 3

UNIT I NUCLEAR REACTIONS 9

Mechanism of Nuclear Fission- Nuclides- Radioactivity- Decay Chains- Neutron Reactions- The Fission Process- Reactors- Types of Fast Breeding- Reactor- Design and Construction of Nuclear reactors- Heat Transfer Techniques in Nuclear Reactors- Reactor Shielding.

UNIT II REACTOR MATERIALS 9

Nuclear Fuel Cycles- Characteristics of Nuclear Fuels- Uranium- Production and Purification of Uranium- Conversion to UF4 and UF6- Other Fuels like Zirconium, Thorium and Berylium.

UNIT III REPROCESSING 9

Nuclear Fuel Cycles- Spent Fuel Characteristics- Role of Solvent Extraction in Reprocessing- Solvent Extraction Equipment.

UNIT IV SEPARTION OF REACTOR PRODUCTS 9

Processes to be Considered - 'Fuel Element' Dissolution - Precipitation Process - Ion Exchange-Redox - Purex - TTA- Chelation - U235- Hexone - TBP and Thorax Processes - Oxidative Slaging and Electro – Refining – Isotopes - Principles of Isotope Separation.

UNIT V WASTE DISPOSAL AND RADIATION PROTECTION 9

Types of Nuclear Wastes - Safety Control and Pollution Control and Abatement - International Convention on Safety Aspects - Radiation Hazards Prevention.

TOTAL: 45 PERIODS

REFERENCES

1. J.R.Lamarsh, Introduction to Nuclear Reactor Theroy, Wesley, 1966
2. J.J.Duderstadt and L.J.Hamiition, Nuclear Reactor Analysis - John Wiley 1976
3. A.E.Walter and A.B.Reynolds Fast Breeder Reactor, Pergamon Press - 1981
4. S.Glasstone and A.Sesonske, Nuclear Reactor Engineering (3 rd Edition), Von Nostrand, 1981.
5. R.H.S.Winterton, Thermal Design of Nuclear Reactors - Pergamon Press - 1981.
6. Thomas J.Cannoly,"Fundamentals of nuclear Engineering"John Wiley 1978.
7. Collier J.G., and Hewitt G.F,"introduction to Nuclear power", Hemisphere publishing, New York.1987.
8. Wakil M.M.El., "Power Plant Technology" – McGraw-Hill International, 1984.

EN3019 SOLAR ENERGY L T P C

3 0 0 3

UNIT-I INTRODUCTION 9

Basic Heat Transfer Principles- Availability of Solar Energy- Nature of Solar Energy- Solar Energy & Environment- Sun as the source of radiation- Solar radiation- Measurement of solar radiation- Irradiance- Solar constant- Insolation- Radiosity- Emissive power- Earth's equator- Meridian- Longitude- Sun earth angles- Sunrise, sun set and day length- Solar time- Equation of time- Various Methods of using solar energy- Photo thermal, Photovoltaic, Photosynthesis, Present & Future Scope of Solar energy.

UNIT-II SOLAR CELLS 10

Various generations- Semiconductor materials- Doping- Fermi level- PN junction and characteristics- Photovoltaic effect- Photovoltaic material- Parameters of solar cells- Effects of cell temperature on cell efficiency- Types of solar cells- Solar modules and arrays- Advantages and limitations of solar energy system- Solar cell power plant- Silicon, thin film and polymer processing- Silicon wafer based solar cells.

UNIT-III SOLAR THERMAL ENERGY 10

Stationary collectors- FPC- CPC- ETC- Sun tracking concentrating collectors- PTC- PDR- HFC- Fresnel collectors- Solar thermal power plants- Solar chimney power plant- Solar pond- Solar water heater- Solar cooker- Types- SODIS- Thermal energy storage- Solar cooling- Limitations of solar thermal energy.

UNIT-IV SOLAR PHOTOVOLTAICS 9

Photovoltaic cell function- Types of PV system- Design of PV system- Grid connected PV system- Stand alone PV system- Efficiency of PV module- MPPT- Applications of PV system- SPV lighting system- Solar water pumping system- Solar vehicles- Solar dryer- BIPV- Features of SPV system- Case study- Solar water pumping system in Punjab- Performance study on solar drying system in Nepal.

UNIT-V ECONOMIC ANALSIS 7

Life cycle analysis of Solar Energy Systems - Time Value of Money - Evaluation of Carbon Credit of Solar Energy Systems.

TOTAL: 45 PERIODS

REFERENCES:

1. Solar Energy Handbook: Kreith and Kreider McGrawHill
2. John W. Twidell & Anthony D.Weir, 'Renewable Energy Resources
3. S.A.Kalogirou: Solar Energy Engineering
4. Solar Energy: Thermal Processes, by Duffie John A, and Beckman W.A, john Wiley and Sons.
5. S.P. Sukhatme, Solar Energy, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
6. G.N. Tiwari, Solar Energy – Fundamentals Design, Modelling and applications, Narosa Publishing House, New Delhi, 2002.

EN3020 SITE ASSESSMENT AND REMEDIATION L T P C
3 0 0 3

UNIT I FUNDAMENTALS OF GEO- ENVIRONMENTAL ENGINEERING 9

Scope of Geoenvironmental engineering- Multiphase behavior of soil- Role of soil in geoenvironmental applications- Importance of soil physics, soil chemistry, hydrogeology- Biological process- Sources and type of ground contamination- Impact of ground contamination on geo-environment- Case histories on geoenvironmental problems.

UNIT II SOIL-WATER-CONTAMINANT INTERACTION 9

Soil mineralogy characterization and its significance in determining soil behavior- Soil-water interaction and concepts of double layer- Forces of interaction between soil particles- Concepts of unsaturated soil- Importance of unsaturated soil in geoenvironmental problems- Measurement of soil suction- Water retention curves- Water flow in saturated and unsaturated zone- Soil-water contaminant interactions and its implications- Characterization of retention and transport.

UNIT III WASTE CONTAINMENT SYSTEM 9

Site selection based on environmental impact assessment- Evolution of waste containment facilities and disposal practices- Different role of soil in waste containment- Different components of waste containment system and its stability issues- Property evaluation for checking soil suitability for waste containment- Design of waste containment facilities.

UNIT IV CONTAMINANT SITE REMEDIATION 9

Site characterization - Risk assessment of contaminated site - Remediation methods for soil and groundwater - Selection and planning of remediation methods - Some examples of in-situ remediation.

UNIT V ADVANCED SOIL CHARACTERIZATION 9

Contaminant analysis- Water content and permeability measurements- Electrical and thermal property evaluation- Use of GPR for site evaluation- Introduction to geotechnical centrifuge modeling.

TOTAL: 45 PERIODS

REFERENCES

1. Martin N. Sara., Site Assessment and Remediation Handbook, Second Edition, Lewis Publishers, 27-Jun-2003.
2. Edward J. Calabrese, Paul T. Kostecki, James Dragun., Contaminated Soils, Sediments and Water: Successes and Challenges, published by Birkhäuser.
3. K. G. Hiremath., Recent Advances in Environmental Science, Published by Discovery Publishing House.

EN3021 URBAN AND RURAL SANITATION L T P C
3 0 0 3

UNIT I GENERAL AND BASIC PRINCIPLES OF HEALTHFUL HOUSING 9

Control of environment – Engineering methods - Modes of transmission of diseases – Mosquitoes and Flies - Life cycle, important characteristics and control measures of carriers. Basic principles of healthful housing - heating - ventilation - lighting - air conditioning – noise control in residential buildings.

UNIT II PLUMBING AND SWIMMING POOL SANITATION 9

Scope of plumbing - definition of plumbing terms - general principles of good plumbing system – water seal - types of traps, siphonage – design of plumbing system for multistory buildings - plumbing codes and standards.

Transmission of diseases in swimming pools - quality standards of pool water - design features of pools and their appurtenances.

UNIT III REFUSE AND FOOD SANITATION 9

Refuse characteristics in urban and rural areas - conditions and factors affecting collection, quantity and conveyance of solid waste - disposal methods - incineration - design of incinerators sanitary landfill - composting - waste recycling - biogas and gobar gas plants.

Food borne and food caused diseases – food poisoning - food preservation – precautions in the design of kitchen - bactericidal treatment of kitchen utensils - Bacteriological contents of milk borne diseases - essential of milk sanitation - dairy barn sanitation - pasteurization methods - milk tests.

UNIT IV URBAN AND RURAL WATER SUPPLY SYSTEM 9

Water supply arrangements in urban buildings - design of water supply systems for multistoried buildings - consideration in the development of water supply programmes for rural areas - health and economical aspects in the design and

installation of rural water supply systems - methods of construction and development of different types of wells - sanitation of rural wells - pumps for rural wells - treatment methods for rural water supply.

UNIT V RURAL SANITATION **9**

Layout of drainage systems in urban domestic areas - methods of disposal of night soil in rural areas - different privies - Twinpit pourflush toilets, VIP latrines - water carriage method of sewage disposal - cesspools and seepage pits - septic tank systems - oxidation ponds - aerated lagoons.

Total : 45 PERIODS

REFERENCES

1. Salvato, Environmental Sanitation, John Wiley & Sons, NewYork, 1982.
2. Ehler and Steel, Municipal Rural Sanitation, Mc - Graw Hill Book Co., New York, 1964.
3. E.G. Wagner and J.N. Lanoix, Excreta Disposal for Rural areas and small communities, W.H.O. Publication, Geneva, 1958.
4. E.G. Wagner and J.N.Lanoix, Water supply for rural areas and small communities, W.H.O. Publication, Geneva, 1958.
5. Babbit H.E and Donald J.J., Water supply Engineering, Mc - Graw Hill Book Co., New York, 1962.

EN3022 ENGINEERING ECONOMICS AND COST ANALYSIS **L T P C**
3 0 0 3

UNIT I BASIC ECONOMICS **9**

Definition of Economics- Nature and scope of economic science- Nature and scope of managerial economics- Basic terms and concepts- Goods- Utility- Value- Wealth- Factors of production- Land- Its peculiarities- Labour- Economics of large and small scale- Consumption wants- Its characteristics and classification- Law of diminishing marginal utility- Relation between economic decision and technical decision.

UNIT II DEMAND AND SCHEDULE **9**

Demand- Demand schedule- Demand curve- Law of demand- Elasticity of demand- Types of elasticity- Factors determining elasticity- Measurement- Its significance- Supply- Supply schedule- Supply curve- Law of supply- Elasticity of supply- Time element in determination of value- Market price and normal price- perfect competition- Monopoly- Monopolistic competition.

UNIT III ORGANISATION **9**

Forms of business- Proprietorship- Partnership- Joint stock company- Cooperative organization- State enterprise- Mixed economy- Money and banking- Banking- kinds- Commercial banks- Central banking functions- Control of credit- Monetary policy- Credit instrument.

UNIT IV FINANCING 9

Types of financing- Short term borrowing- Long term borrowing- Internal generation of funds- External commercial borrowings- Assistance from government budgeting support and international finance corporations- Analysis of financial statement- Balance sheet- Profit and loss account- Funds flow statement.

UNIT V COST AND BREAK EVEN ANALYSES 9

Types of costing- Traditional costing approach- Activity based costing- Fixed cost- Variable cost- Marginal cost- Cost output relationship in the short run and in long run- Pricing practice- Full cost pricing- Marginal cost pricing- Going rate pricing- Bid pricing- picking for a rate of return- Appraising project profitability- Internal rate of return- Payback period- Net present value- Cost benefit analysis- Feasibility reports- Appraisal process- Technical feasibility- Economic feasibility- Financial feasibility- Break even analysis- Basic assumptions- Break even chart- Managerial uses of break even analysis.

TOTAL: 45 PERIODS

TEXT BOOK

1. 'Elementary Economic Theory' by Dewett K K and Varma J D, S Chand & Co. Publications, 2006.

REFERENCE BOOKS

1. 'Construction Management and Accounts' by Sharma JC, Published by Satya Prakashan New Delhi, 2004.
2. 'Solid Waste Management in developing countries' by Bhide A D and Sunderaeson B B, published by INSDOC, 2001.
3. 'Industrial Economics – An Introductory Textbook' by Barthwal R R, New Age Publications, 2000.
4. 'Economics – An Introductory Analysis' by Samuelson P A, McGraw – Hill Publications, 2000.
5. 'Financial Management' by Khan MY and Jain PK, McGraw – Hill Publishing Co Ltd., 2006.
6. 'Managerial Economics' by Varshney RL and Maheshwary KL S, Chand and Co Publications, 2001.

EN3023 URBAN AND RURAL PLANNING L T P C
3 0 0 3

UNIT I BASIC ISSUE IN URBAN PLANNING 8

Urban plann ing and development- Definition of terms- Explanation of concepts- National Policies and strategies on issues related to urban planning- Trends of Urbanization- International, National and Regional level- Positive and Negative impacts of Urban development.

UNIT II PLANNING PROCESS 7

Principles of planning- Types and levels of Urban plans- Stages in planning Process- Goals- Objective- delineation of planning areas- Surveys and Analysis.

UNIT III DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUTION 10

Scopes and content of regional plan- Master plan- Detailed development plans- Structure plans- Sub regional Plan- Planning of Industrial Estates Development strategies- Formulation and Evaluation.

UNIT IV INTRODUCTION TO RURAL PLANNING 10

The basic concept of rural development- History of Rural Development in India- Current issues in development- Different perspectives on Planning & Development- Different approaches to planning- Rural Development Policy.

UNIT V SOCIO ECONOMIC ASPECTS OF RURAL PLANNING 10

The nature of rural economy- Agricultural change and restructuring- The role of agriculture in the rural economy- Rural households- Resources- Activities and Income- Services- Infrastructure and investments in rural areas- Water and Sanitation facilities- Planning and Financial analysis.

TOTAL: 45 PERIODS

REFERENCES:

1. Edvin S.Mills and Chares M. Becker, “Studies in Urban development”, A world Bank puplication,1986.
2. Singh.V.B. Revitalized, “Urban administration in India”, Kalpaz publication, Delhi-2001
3. George Chanwick, “A system view planning”, Pergamon Press,Oxford1978
4. Karat Singh, “Rural development, principles, Policies and Management stages”, Sage publication India Pvt.Ltd, 2009
5. Participatory Rural Appraisal: “Principle, Methods and applications”, Sage publication India Pvt Ltd, 2009
6. Verant derai, Rural development (Vol. I to VI) in the seventh plan, Himalaya Publishing Co.
7. Goel.S.L ‘ Urban Development and Management’, Deep and Deep Publications, New Delhi, 2002.
8. B.S.Khanna, Rural Development in South Asia Volume, India. Deep and Deep Publishers.

EN3024 RISK ANALYSIS L T P C

3 0 0 3

UNIT I INTRODUCTION 6

Sources of Environmental hazards- Environmental and ecological risks- Environmental risk assessment framework- Regulatory perspectives and requirements- Risk Analysis and Management and historical perspective- Social benefit Vs technological risks- Path to risk analysis- Perception of risk- Risk assessment in different disciplines.

UNIT II ELEMENTS OF ENVIRONMENTAL RISK ASSESSMENT 10

Hazard identification and accounting - Fate and behaviour of toxics and persistent substances in the environment - Properties, processes and parameters that control fate and transport of contaminants - Receptor exposure to Environmental Contaminants - Dose Response Evaluation- Exposure Assessment - Exposure Factors- Slope Factors-

Dose Response calculations and Dose Conversion Factors - Risk Characterization and consequence determination- Vulnerability assessment- Uncertainty analysis.

UNIT III TOOLS AND METHODS FOR RISK ASSESSMENT 12

HAZOP and FEMA methods- Cause failure analysis- Event tree and fault tree modeling and analysis- Multimedia and multipathway exposure modeling of contaminant migration for estimation of contaminant concentrations in air, water, soils, vegetation and animal products- Estimation of carcinogenic and non carcinogenic risks to human health- Methods in Ecological risk assessment- Probabilistic risk assessments- Radiation risk assessment- Data sources and evaluation.

UNIT IV RISK MANAGEMENT 8

Risk communication and Risk Perception- Comparative risks- Risk based decision making- Risk based environmental standard setting- Risk Cost Benefit optimization and tradeoffs- Emergency Preparedness Plans- Emergency planning for chemical agent release- Design of risk management programs- Risk based remediation- Risk communication- Adaptive management- Precaution and stake holder involvement.

UNIT V APPLICATIONS 9

Case studies on risk assessment and management for hazardous chemical storage- Chemical industries- Tanneries- Textile industries- Mineral processing and Petrochemical plants- Hazardous waste disposal facilities- Nuclear power plants- contaminated site remediation- Case histories on Bhopal, Chernobyl, Seveso and Three Mile Island.

TOTAL: 45 PERIODS

REFERENCES

1. Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
2. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff, “Risk Assessment and Management Handbook”, McGraw Hill Inc., New York, 1996.
3. Kofi Asante Duah, “Risk Assessment in Environmental management”, John Wiley and sons, Singapore, 1998.
4. Kasperson, J.X. and Kasperson, R.E. and Kasperson,R.E., Global Environmental Risks, V.N.University Press, New York, 2003.
5. Risks and Decisions for Conservation and environmental management, Mark Burman, Cambridge University Press.
6. Susan L |Cutter, “Environmental Risks and Hazards” Prentice Hall of India, New Delhi, 1999.
7. Joseph F Louvar and B Diane Louver, Health and Environmental Risk Analysis fundamentals with applications, Prentice Hall, New Jersey, 1997