

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	<u>Technical English – II*</u>	3	1	0	4
2.	MA2161	<u>Mathematics – II*</u>	3	1	0	4
3.	PH2161	<u>Engineering Physics – II*</u>	3	0	0	3
4.	CY2161	<u>Engineering Chemistry – II*</u>	3	0	0	3
5. a	ME2151	<u>Engineering Mechanics</u> (For non-circuit branches)	3	1	0	4
5. b	EE2151	<u>Circuit Theory</u> (For branches under Electrical Faculty)	3	1	0	4
5. c	EC2151	<u>Electric Circuits and Electron Devices</u> (For branches under I & C Faculty)	3	1	0	4
6. a	GE2151	<u>Basic Electrical & Electronics Engineering</u> (For non-circuit branches)	4	0	0	4
6. b	GE2152	<u>Basic Civil & Mechanical Engineering</u> (For circuit branches)	4	0	0	4
PRACTICAL						
7.	GE2155	<u>Computer Practice Laboratory-II*</u>	0	1	2	2
8.	GS2165	<u>Physics & Chemistry Laboratory - II*</u>	0	0	3	2
9. a	ME2155	<u>Computer Aided Drafting and Modeling Laboratory</u> (For non-circuits branches)	0	1	2	2

9. b	EE2155	<u>Electrical Circuits Laboratory</u> (For branches under Electrical Faculty)	0	0	3	2
9. c	EC2155	<u>Circuits and Devices Laboratory</u> (For branches under I & C Faculty)	0	0	3	2
TOTAL : 28 CREDITS						
10.	-	<u>English Language Laboratory</u> ⁺	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					
MA3201	<u>Mathematics – III</u>	3	1	0	4
CE3202	<u>Mechanics Of Solids</u>	3	1	0	4
CE3203	<u>Fluid Mechanics</u>	3	0	0	3
CE3206	<u>Surveying</u>	3	0	0	3
EN3205	<u>Environmental Chemistry And Microbiology</u>	3	0	0	3
GE3206	<u>Principles Of Environmental Science And Engineering</u>	3	0	0	3
PRACTICAL					
CE3208	<u>Fluid Mechanics And Strength Of Materials Laboratory</u>	0	0	3	2
CE3209	<u>Surveying Laboratory</u>	0	0	3	2
CE3210	<u>Environmental Engineering Laboratory – I</u>	0	0	3	2
TOTAL		18	2	9	26

SEMESTER IV

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

SEMESTER V

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
EN3301	<u>Solid Waste Management</u>	3	0	0	3
EN3302	<u>Air Pollution And Control</u>	3	0	0	3
EN3303	<u>Wastewater Engineering - I</u>	3	0	0	3
EN3304	<u>Noise Pollution And Control</u>	3	0	0	3
EN3305	<u>Energy Engineering</u>	3	0	0	3
EN3306	<u>Occupational Hazards And Industrial Hygiene</u>	3	0	0	3
PRACTICAL					
EN3307	<u>Air and Noise Pollution Laboratory</u>	0	0	3	2
GE3318	<u>Communication Skills and Soft Skills Lab</u>	0	0	2	1
EN3309	<u>Environmental Engineering Laboratory – III (Plumbing, Piping And House Wiring)</u>	0	0	3	2
TOTAL		18	0	8	23

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	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	8
TOTAL		12	0	12	20

LIST OF ELECTIVE SUBJECTS

COURSE CODE	COURSE TITLE	L	T	P	C
EN3001	Wealth From Waste	3	0	0	3
EN3002	Sustainable Development	3	0	0	3
EN3003	Environmental Policy And Law	3	0	0	3
EN3004	Wind Power Engineering	3	0	0	3
EN3005	Water Power Engineering	3	0	0	3
EN3006	Tidal Engineering	3	0	0	3
EN3007	Geo-Thermal Engineering	3	0	0	3
EN3008	Coastal Zone Management	3	0	0	3
EN3009	Green Building Design	3	0	0	3

GE3403	Total Quality Management	3	0	0	3
CE3011	Hydrology	3	0	0	3
CE3012	Ground Water Contamination	3	0	0	3
EN3013	Process Safety And Loss Prevention	3	0	0	3
EN3014	Space Technology And Waste Disposal	3	0	0	3
EN3015	Climatology And Meteorology	3	0	0	3
EN3016	Epidemiology And Control Of Communicable Diseases	3	0	0	3
EN3017	Low Carbon Economy	3	0	0	3
EN3018	Nuclear Energy	3	0	0	3
EN3019	Solar Energy	3	0	0	3
EN3020	Site Assessment And Remediation	3	0	0	3
EN3021	Urban And Rural Sanitation	3	0	0	3
EN3022	Engineering Economics And Cost Analysis	3	0	0	3
EN3023	Urban And Rural Planning	3	0	0	3
EN3024	Risk Analysis	3	0	0	3

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 parallelepipeds.

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 T_c 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 – Clausius – 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.Owenn, ‘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 conductometric titrations (acid-base – HCl vs, NaOH) titrations,

UNIT II CORROSION AND CORROSION CONTROL 9

Chemical corrosion – Pitting – 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).

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. Hibbeler, 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**
(Common to EEE, EIE and ICE Branches)**L T P C**
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 Edition, (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, Satyabranta 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 & MEASUREMENTS 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

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.**

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 $\text{K}_2\text{Cr}_2\text{O}_7$)
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:

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

5

2. Speaking:

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

5

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.

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. Ramana, B.V. "Higher Engineering Mathematics" Tata McGraw Hill (2007).
3. Bali, N.P. and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

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 Reinhold, 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.

CE3203**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 FLUID 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 (7th 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.

OBJECTIVES

At the end this course the student will possess 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 – Trigonometric 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 Hill 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. Saunders 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 issues, evolution, biodiversity and impacts on human health, 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, University Grants 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.

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	-	1 each
	Rockwell		
	Vicker's (any 2)		
	Brinell		
11.	Beam deflection test apparatus	-	1 No.
12.	Extensometer	-	1 No.
13.	Compressometera	-	1 No.
14.	Dial gauges	-	Few

OBJECTIVES

At the end of this course the student will possess 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	
6.	Leveling staff	
7.	Cross staff	
8.	Chains	1 for a set of 5 students
9.	Tapes	
10.	Arrows	

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. |

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 $C \Phi$ 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, Laximi 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 IV NATURAL ECOSYSTEMS 9

Natural ecosystem – types of natural vegetation – evergreen forest – deciduous forest – tropical grassland – desert vegetation – temperate grassland – broad 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.

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.

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

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

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. Inoculum loops - 5 Nos.
11. Glass slides - 5 Nos.
12. China dish - 10 Nos.
13. Staining Kit - 5 Nos.
14. Refrigerator - 1 No.

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 SOLID 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 REFUSE 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. Hagerly 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.

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
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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 MANAGMENT 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 Employment, 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 ENERGY AUDIT 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.

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.

AIM:

To enhance the overall capability of students and to equip them with the necessary Communication Skills and Soft Skills that would help them excel 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**A. Career Lab (15 periods) Viewing and discussing audio-visual materials**

1. **Resume / Report Preparation / Letter Writing:** (3)
Letter writing – Job application with Resume - Project report - Email etiquette.
2. **Presentation skills:** (3)
Elements of effective presentation – Structure of presentation - Presentation tools – Body language.
3. **Soft Skills:** (3)
Time management – Stress management – Assertiveness – Negotiation strategies, Psychometrics - Analytical and logical reasoning.
4. **Group Discussion:** (3)
Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.
5. **Interview Skills:** (3)
Kinds of interviews – Interview techniques – Corporate culture – Mock interviews.

TOTAL 30 PERIODS**II. Class Room Session**

1. **Resume / Report Preparation / Letter writing:** Students prepare their own resume and report. (9)
2. **Presentation Skills:** Students make presentations on given topics. (12)
3. **Group Discussion:** Students participate in group discussions. (12)
4. **Interview Skills:** Students participate in Mock Interviews (12)

Note: Classroom sessions are practice sessions.

REFERENCES:

1. Prakash P, Verbal and Non-Verbal Reasoning, Macmillan India Ltd., 2nd Edition, New Delhi, 2004.
2. John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi 2004.

3. Paul V Anderson, Technical Communication, Thomson Wadsworth , 6th Edition, New Delhi, 2007.
4. Edgar Thorpe and Showick Thorpe, Objective English, Pearson Education, 2nd Edition, New Delhi 2007.
5. David Evans, Decision maker, CUP, 1997

Lab Requirement:

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

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