

ANURAG ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

II Year B.Tech. I Semester

L	T /P/D	C
0	0/2/-	0

(HS309MC) GENDER SENSITIZATION (Mandatory Course)

Course Objectives:

1. To develop students sensibility with regard to issues of gender in contemporary India.
2. To provide critical perspective or the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender vigilance.

Unit-I:-

UNDERSTANDING GENDER:

Gender: Why should we Study it? (Towards a world of equals: Unit - 1)

Socialization: Making women, Making Men (Towards a world of equals: Unit – 2)

Introduction. Preparing for Womanhood Growing up male. First lessons in Cases. Different masculinities.

Just Relationships: Being Together as Equals (Towards a world of equals: Unit – 12)

Mary Kom and onles love and Acid just do not Mix. Love Letters, Mothers and Fathers.
Furthur Reading: Rose Parks The Brave Heart.

Unit – II:

GENDER AND BIOLOGY:

Missing Women: Sex Selection and its consequences (Towards a world of equals: Unit 4)

Destining Sex Ratio, Demographic Consequences.

Gender Spectrum: Beyond the Binary (Towards a world of Equals unit – 10)

Two or Many? Struggles with Discrimination

Additional reading: Our Bodies, Our Health (Towards a world of equals: Unit – 13)

Unit – III:

GENDER AND LABOUR:

Housework: the Invisible Labour (Towards a world of equals: Unit – 3)

“My Mother doesn’t Work.” “Share the Load.”

Women’s Work: Its Politics and Economics (Towards a world of equals: Unit – 7)

Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

Unit – IV:

ISSUES OF VIOLENCE:

Sexual Harassment: Say Not (Towards a world of equals: Unit – 6)

Sexual Harassment: not Eve teasing Coping with Everyday Harassment Further Reading: “Chupalu”.

Domestic Violence: Speaking Out (Towards a world of equals: Unit – 8)

Is home a safe place? – When women unite [Film]. Rebuilding lives Further Reading New Forums for Justice.

Thinking about Sexual Violence (Towards a world of equals: Unit – 11)

Blaming the Victim-“I fought for my life....” – Further Reading: The Caste Face of Violence

Unit – V:

GENDER STUDIES:

Knowledge: Through the Lens of Gender (Towards a world of equals: Unit – 5)

Point of view Gender and the structure of knowledge. Further Reading: Unacknowledged women Artists of Telangana.

Whose History? Questions for historians and others (Towards a world of equals: Unit – 9)

Reclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.

Essential Reading: All The Units In the Textbook, “ Towards a World of Equals: A Bilingual Textbook on Gender” written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Thanu.

Note: Since it is interdisciplinary course, Resource Persons can be drawn from the fields of English Literature or Sociology or political science or any other qualified faculty who has expertise in this field.

REFERENCE BOOKS:

1. Sen, Amartya. “More than One Million Women are Missing.” New York of books 37.20 (20 December 1990). Print. “we Were Making History...” Life Stories of Women in the Telangana People’s Struggle. New Delhi: Kallfor Women. 1989.
2. Tripti Lahiri. “By the Numbers: Where Indian Women Work.” Women’s Studies Journal (14 November 2012) Available online at : <http://blogs.wsj.com/india-real-time/2012/11/14/by-the-numbers-where-indian-women-work/>
3. K.Satyanaraya and Susie Tharu (Ed.) Steel Nibs Are Sorouting: New Dalit Writing From South India, Dussier 2. Telugu And Kannada
4. Vimala. “Vartillu (the Kitchen)”. Women Writing in India: 600 BC to the Present. Volume II: The 20th Century. Ed. Susie Tharu and K.Lalits. Delhi:Oxford University Press, 1995. 599-601.

5. Shatruguna. VeanaAt . Women's Work and its Impact on Child Health and Nutrition Hyderabad, National Institute of Nutrition . India council of research. 1993.
6. Stree Shakti Sangeetana. "We Were Making History ... 'Life Stories of women in the Telangana People's Struggle. New Delhi: Kai for Women. 1989.
7. Menon. Nivedita. Seeing Like a Feminist New Delhi: Zubaan-Penguin Books, 2012.
8. Yayaprabha, A. "Chupulu (states)". Women Writing in India: 500BC to the Present. Volume II: The 20th Century Ed. Susie Tharu and K.Lalita Delhi: Oxford University Press. 1995.596-597.
9. HaveedShayam and Anupam Maruhaar, "Women and Wage Discrimination in India: A Critical Analysis. " I International journal of Humanities and Social Science Invention 2.4(2013)
10. Gautam. Liela and Gita Ramaswamy. "A Conversation between a Daughter and a Mohter. " Eroadsheet on contemporary Politics. Special Issue on Sexually and Harassment: Gender Politics on Campus Today. Ed. Madhumeeta Sinha and Asma Rasheed. Hyderabad Anveshi Research Center for Women's Studies. 2014
11. Aodulali Sohaila. "I fought for My Life .. and Won. " Available online at <http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohala-abdula/>
12. Jeganathan Pradeep. ParthaChattarjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Parmanert Black and Ravi Dayal Publishers, New Delhi, 2000.
13. Kkapadia. The Violence of Development: The Plitics of Identity, Gender and Social Inequalities in india London: Zed Books. 2002
14. S.benhabib. Situating the Self Gender, Community anaPostmoderism in Contemporary Ethics. London roullege. 1992
15. Virginia Woolf. A Room of One's Own. Oxford Black Swan. 1992
16. T. Banuri and M. Mahmood, Just Development: Beyond Adjustment with a human Face, Karachi Oxford University Press, 1997

Course Outcomes:

CO 1 : Students will have developed a better understanding of important issues related to gender in contemporary India.

CO 2 : Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials from research, facts, everyday life, literature and film.

CO 3 : Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.

CO 4 : Students will acquire insight into the gendered division of labour and its relation to politics and economics.

CO 5 : Men and women students and professions a will be better equipped to work and live together as equals.

GS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1			√			√	√	√	√	√		
CO 2	√		√			√	√	√	√	√		
CO 3			√			√	√	√	√	√		
CO 4			√			√	√	√	√	√		
CO 5			√			√	√	√	√	√		

ANURAG ENGINEERING COLLEGE

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II Year B.Tech. II Semester

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(HS409MC) HUMAN VALUES AND PROFESSIONAL ETHICS

(MANDATORY COURSE)

Objectives:

1. To learn the basic guide lines, content and process for value Education .
2. To understand human being as co-existence of the sentient I and the material body
3. To know the harmony in the family and society will lead affection towards in the family and as well as in the society.
4. Is to get the knowledge about existing nature and their role in protecting of nature.
5. To impart competence in professional ethics.

UNIT - I:

Course Introduction - Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT - II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvridha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT - III:

Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyavastha) - from family to world family!

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UNIT - IV:

Understanding Harmony in the nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature. Inter connected ness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT - V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

- a. Ability to utilize the professional competence for augmenting universal human order,
- b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
- c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order.

- a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
- b. At the level of society: as mutually enriching institutions and organizations.

TEXT BOOKS:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

REFERENCE BOOKS:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumaner, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.N. Tripathy, 2003, Human Values, New Age International Publishers.
6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
8. E G Seebauer & Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.

9. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

RELEVANT CDS, MOVIES, DOCUMENTARIES & OTHER LITERATURE:


1. Value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charle Chaplin, Modern Times, United Artists, USA
5. IT Delhi, Modern Technology - the Untold Story

Course Outcomes:

1. Understood the core values that shape the ethical behavior of an Engineer.
2. Exposed awareness on professional ethics and human values.
3. An ability to communicate effectively.
4. Known their role in technological development.
5. An understanding of professional and ethical responsibility.

CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1							✓	✓	✓	✓		
CO 2							✓	✓	✓	✓		
CO 3							✓	✓	✓	✓		
CO 4							✓	✓	✓	✓		
CO 5							✓	✓	✓	✓		


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ANURAG ENGINEERING COLLEGE

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III Year B.Tech. CE- II Semester

L	T/P/D	C
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(HS508MC) CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. To understand the Indian constitution and its salient features.
2. To understand the fundamental rights and duties of Indian citizen.
3. To understand legal and legislative structure in india
4. To elaborate constitution of India and its amendments
5. To enlighten the scope of local - self government.

UNIT – I:

History of Making of the Indian Constitution:

- History.
- Drafting Committee, (Composition & Working).

Philosophy of the Indian Constitution:

- Preamble
- Salient Features.

UNIT – II:

Contours of Constitutional Rights & Duties:

- Fundamental Rights.
- Right to Equality.
- Right to Freedom.
- Right against Exploitation.
- Right to Freedom of Religion.
- Cultural and Educational Rights.
- Right to Constitutional Remedies.
- Directive Principles of State Policy.
- Fundamental Duties.

UNIT – III:

Organs of Governance:

- Parliament.
- Composition.


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- Qualifications and Disqualifications.
- Powers and Functions.

Executive:

- President.
- Governor.
- Council of Ministers.
- Judiciary, Appointment and Transfer of Judges, Qualifications.
- Powers and Functions.

UNIT – IV:

Local Administration:

- District's Administration head: Role and Importance.
- Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation.
- Pachayati raj: Introduction, PRI: ZilaPachayat.
- Elected officials and their roles, CEO ZilaPachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments).
- Village level: Role of Elected and Appointed officials.
- Importance of grass root democracy.

UNIT – V:

Election Commission:

- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

Text Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution.
4. M. P. Jain, Indian Constitution Law, 7th Ed., Lexis Nexis, 2014.

Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

CO1: Understand the meaning and historical perspective of constitution of India.

CO2: Know fundamental rights of Indian citizen.


CO3: Know structure, rights of federal and legislative bodies.

CO4: president and parliament powers given by constitution.

CO5: Know the local bodies' rights and limitations.


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COI	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1			√			√		√	√	√		
CO 2			√			√		√	√	√		
CO 3			√			√		√	√	√		
CO 4			√			√		√	√	√		
CO 5			√			√		√	√	√		


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ANURAG ENGINEERING COLLEGE

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III Year B.Tech. CE- I Semester

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(CE503PC) GEOTECHNICAL ENGINEERING

Prerequisite: Strength of Materials I & II

Course Objectives:

1. To provide the basic knowledge of soil formation and the properties of various types of soil
2. To provide the knowledge on permeability of various soils and the effective stress of soils.
3. To provide the knowledge on stress distribution and mechanism of compaction in soils.
4. To impart the knowledge on consolidation.
5. To provide the knowledge on failure theories and laboratory shear strength tests.

UNIT I

Introduction: Soil formation–Weathering – Erosion –soil structure and clay mineralogy– Adsorbed water–Three-phase system and phase relationships– Mass-volume relationship – Relative density.

Index Properties of Soils: Grain size analysis–Sieve and Hydrometer methods– consistency limits and indices – Unified soil classification system – I.S. Classification of soils –Characteristics of clays & sand.

UNIT II


Permeability: Soil water–capillary rise–flow of water through soils– Darcy's law– permeability – Factors affecting – laboratory determination of coefficient of permeability – Permeability of layered soils – Insitu permeability tests (Pumping in & pumping out test).

Effective Stress & Seepage through Soils: Total, neutral and effective stresses–principle of effective stress –Seepage force and quick sand condition – Seepage through soils – Flow nets: Uplift pressure – Piping – Characteristics and Uses.

UNIT III

Stress Distribution in Soils: Boussinesq's, Burmisters and Westergard's theories for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and new mark's influence chart for irregular areas.

Compaction: Mechanism of compaction–factors affecting compaction–effects of compaction on soil properties. – Field compaction Equipment – compaction quality control.


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UNIT-IV

Consolidation: Types of compressibility–immediate settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves – normal consolidated soil, over consolidated soil and under consolidated soil – preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation : square root time and logarithm of time fitting methods.

UNIT V

Shear Strength of Soils: Importance of shear strength–Principle stresses and principle planes - Mohr–Coulomb Failure theories–Stress paths –Types of laboratory strength tests – strength tests based on drainage conditions- strength envelopes – Shear strength of sands – dilatancy Critical void ratio – Liquefaction- shear strength of clays

TEXT BOOKS

1. B.C. Punmia, Soil Mechanics and Foundations, (SI Modules), 16/e Laxmi Publications.
2. Gopala Ranjan and A.S.R, Rao, Basic and Applied Soil Mechanics, 2/e, New Age International Publishers.

REFERENCES:

1. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, Newyork
2. Geotechnical Engineering by Purushotham Raj
3. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi
4. C. Venkataramaiah, Geotechnical Engineering, ,New Age International, 2006.

Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

- CO 1: Understand the soil formation and mass volume relationship
- CO 2: Know the effect of permeability and seepage on soils and concept of effective stress in soils.
- CO 3: Understand the concept of stress distribution and mechanism of compaction in soils.
- CO 4: To understand the clear concept of consolidation.
- CO 5: Know the importance of shear strength and understand various theories.

GTE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
CO 3	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
CO4	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓

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III Year B.Tech. CE- I Semester

L	T/P/D	C
3	-/-	3

(CE512PE) GREEN BUILDING MATERIALS AND TECHNOLOGIES

Course Objectives: To enable the student

1. To understand the basic principles of green building technologies and their significance.
2. To understand the judicial use of energy and its management.
3. To know about the Sun-earth relationship and its effect on climate.
4. To enhance awareness of end-use energy requirements in the society.
5. To know about the suitable technologies for energy management and audit procedures.

UNIT- I:

Overview of the significance of energy use and energy processes in building: Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management - Macroaspect of energy use in dwellings and its implications.

UNIT-II:

Indoor environmental requirement and management: Thermal comfort - Ventilation and air quality – Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

UNIT-III:

Climate, solar radiation and their influences: Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

UNIT-IV: End-use, energy utilization and requirements: Lighting and daylighting - End-use energy requirements - Status of energy use in buildings - Estimation of energy use in a building - Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope - Evaluation of the overall thermal transfer

UNIT-V: Energy management options: Energy audit and energy targeting - Technological options for energy management.

Certification - Study of the LEE D and TERI (GRIHA) parameters and certification of Green Buildings



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Text Books:

1. Charles J. Kibert, "Sustainable Construction- Green Building Design and Delivery", John Wiley & Sons, New York, 2008
2. Norbert Lechner, "Heating, Cooling, Lighting - Sustainable Design Methods for Architects", Wiley, New York, 2015.
3. James Kachadorian, "The Passive Solar House: Using Solar Design to Heat and Cool Your Home", Chelsea Green Publishing Co., USA, 1997.

REFERENCES:

1. Michael Bauer, Peter Mosel and Michael Schwarz, "Green Building- Guidebook for Sustainable Architecture", Springer, Heidelberg, Germany, 2010.
2. Mike Montoya, "Green Building Fundamentals", Pearson, USA, 2010.
3. Regina Leffers, "Sustainable Construction and Design", Pearson / Prentice Hall, USA, 2009.

COURSE OUTCOMES:

At the end of the course, the student should

CO 1: Be able to identify the fundamentals of energy use and energy processes in building.

CO 2: Be able to identify the energy requirement and its management.

CO 3: Apply the knowledge about Sun-earth relationship vis-a-vis its effect on climate.

CO 4: Be able to deal with the end-use energy requirements.

CO 5: Be familiar with the audit procedures of energy.

GBMT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	√	√	√	√		√		√	√	√	√	√
CO 2	√	√	√	√		√			√		√	√
CO 3	√	√	√	√		√			√	√	√	√
CO 4	√		√	√		√		√	√	√		√
CO 5	√		√	√		√		√	√			√


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III Year B.Tech. CE- II Semester

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(CE603PC) ENVIRONMENTAL ENGINEERING

Prerequisite: Environmental Studies

Course Objectives:

1. To make students conversant with basic principles of water supply Engineering.
2. To provide the knowledge of source of water and its distribution.
3. To impart the knowledge of various treatment required for potable water
4. To provide the knowledge of characteristics of sewage and its treatment.
5. To make the students in various designing of treatment unit operation system

UNIT I

Introduction: waterborne diseases – protected water supply – populations forecast, design period – water demand – types of demand – factors affecting – fluctuations – fire demand – storage capacity – water quality and testing – drinking water standards.

Sources of water: Selection of water source based on quality, quantity and other considerations – intakes – infiltration galleries, confined and unconfined aquifers distribution system – requirements – methods and layouts.

UNIT II

Layout and general outline of water treatment units – sedimentation, uniform settling velocity – Principles – design factors – surface loading – jar test - optimum dosage of coagulant – coagulation fluctuations clarifier design – coagulants – feeding arrangements


Theory of filtration– working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – types of disinfection theory of chlorination - chlorine demand other disinfection treatment methods.

UNIT III

Distribution systems – types of layouts of distribution systems – design of distribution System – Hardy cross and equivalent pipe methods and service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meter –laying and testing of pipe lines – pump house. Conservancy and water carriage systems – sewage and storm water estimation –time of concentration – storm water over flows combined flow. Layouts and general outline of various units in a waste water treatment plant – primary treatment design of screens – grit chambers – skimming tanks –sedimentation tanks – principles and design of biological treatment – tricking filters –standard and high rate.

UNIT IV

Characteristics of sewage – cycle of decay – decomposition of sewage, examination of sewage – BOD – COD. Equations , design of sewers – shape and materials –sewer appurtenances man holes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses and house drainage – components requirements – sanitary fittings – traps – one pipe and two pipe systems of plumbing ultimate disposal of sewage – sewage farming – dilution.


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UNIT V

Waste water treatment plant- Flow diagram – primary treatment design of screens –grid chambers – skimming tanks –sedimentation tanks – principles of design –biological Treatments – trickling filters – standard and high rate - Construction and design of oxidation ponds. Sludge digestion tanks – factor affecting – design of digestion tanks – sludge disposal by drying – septic tanks working principles and design – soak pits.

TEXT BOOKS:

1. K.N. Duggal, Elements of Public Health Engineering, S Chand, 1988
2. P.N. Modi, Water Supply Engineering - Environmental Engineering (Vol I), Standard Book House, 2006

REFERENCE BOOKS:

1. S.K. Garg, Environmental Engineering Vol I: Water Supply Engineering, Khanna Publishers, 2004.
2. Gurucharan Singh Water Supply and Sanitary Engineering Vol, 1; Standard Publishers, Distributors, 2013.
3. J. Mark Hammer Water and Wastewater Technology; John Wiley and Sons, 2013.
4. Environmental Engineering I and II by BC Punmia, Std. Publications.
5. Manual on Water Supply and Treatment; CPH and EEO, Ministry of Urban Development; Govt, of India, New Delhi.
6. Environmental Pollution and Control Engineering CS Rao,Wiley Publications

COURSE OUTCOMES

At the end of the course students will be able to

CO 1: Apply procedures to forecast population and compute future water demand


CO 2: Develop on Environmental Management Systems for characteristics of water

CO 3: Explain different methodologies for collection and conveyance systems

CO 4: Examine layout and analyze water distribution systems

CO 5: Analysis and Design the various treatment plant units

EE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	√	√			√		√	√	√		√	√
CO 2	√	√			√		√	√	√		√	√
CO 3	√	√			√		√	√	√		√	√
CO 4	√	√			√		√	√	√		√	√
CO 5	√	√			√		√	√	√		√	√


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ANURAG ENGINEERING COLLEGE

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III Year B. Tech. II Semester

L T / P/D C
3 0 3

(EE611OE) SOLAR PHOTOVOLTAIC SYSTEMS

(Open Elective-I)

Course Objectives: Objectives of this course are

1. To introduce solar energy and its geometry.
2. To deal with various technologies of solar PV cells.
3. To know about the protection and measurement of solar photovoltaic system.
4. To understand the design considerations of solar photovoltaic system.
5. To know about the various maximum power point tracking techniques.

Unit I: SOLAR ENERGY

Sun and Earth, Solar Spectrum, Solar Geometry, Solar radiation on horizontal and inclined planes, Instruments for measurement of solar radiation, Solar cell, Equivalent circuit, V-I characteristics, Performance improvement.

Unit II: SOLAR CELLS

Manufacture of Solar Cells-Technologies, Design of Solar cells, Photovoltaic modules, Design requirements, encapsulation systems, manufacture, power rating, hotspot effect, Design qualifications.

Unit III: PROTECTION AND MEASUREMENTS

Flat plate arrays, support structures, module interconnection and cabling, lightning protection, Performance measurement – using natural sun light and simulator, determination of temperature coefficients, internal series resistance, curve correction factor.

Unit IV: PHOTOVOLTAIC SYSTEMS


Photovoltaic systems- types- general design considerations- system sizing-battery sizing-inverter sizing-design examples – Balance of PV systems.

Unit V: MAXIMUM POWER POINT TRACKERS

Maximum power point trackers-algorithms- perturb and observe-incremental conductance method, hill climbing method, , hybrid and complex methods, data based and other approximate methods, instrument design, other MPP techniques-Grid interactive PV system.

TEXT BOOKS:

1. F.C.Treble, "Generating electricity from Sun", Pergamon Press, 1991.
2. A.K.Mukherjee, Nivedita Thakur, "Photovoltaic systems: Analysis and design", PHI, 2011.


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REFERENCE BOOKS:

1. C.S.Solanki, "Solar Photovoltaics: Fundamentals, Technologies and applications", PHI, 3 rd edition ,2015.
2. R.D.Begamudre, "Energy Conversion Systems", New Age International, 1st edition 2014.

Course Outcomes: After completion of this course, the student will be able to

- CO 1: Understand the basics of solar energy and its geometry.
- CO 2: Analyze the various topologies of solar photovoltaic cells.
- CO 3: Understand the protection and measurement of solar photovoltaic system.
- CO 4: Understand the design considerations of solar photovoltaic system.
- CO 5: Analyze the various maximum power point tracking techniques.

SPS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	✓		✓	✓				✓				✓
CO 2	✓		✓	✓	✓			✓	✓		✓	✓
CO 3	✓	✓			✓							✓
CO 4	✓		✓									✓
CO 5	✓			✓	✓			✓		✓	✓	✓


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ANURAG ENGINEERING COLLEGE

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IV Year B.Tech. CE- I Semester

L T/P/D C

3 -/-/ 3

(CE742PE) Solid Waste Management

Prerequisite: Environmental Engineering

Course Objectives:

1. To study about the Sources of solid waste and their properties
2. To provide the knowledge on types of hazardous waste and their disposal
3. To aware the legal aspects of hazardous waste management.
4. To impart the knowledge on environmental audits and pollution prevention
5. To provide the knowledge on site and sub surface characterization and remedial technologies.

UNIT I

Solid Wastes: sources, types, composition, physical, chemical, and biological properties of solid wastes / sources and types of hazardous and infectious wastes in municipal solid wastes.

Solid waste generation and collection: Handling, Storage, Processing, Transportation.

UNIT II

Disposal of Solid waste: materials separation and processing, thermal conversion, biological and chemical conversion, recycling of material in municipal solid wastes, Land-filling, Composting, gas generation, closure of land-fills.

Hazardous Wastes: Fundamentals, fate, and Transport of contaminants, Toxicology origin, quantity and quality parameters.

UNIT III

Biomedical / infectious Waste: Composition, Collection, Handling and Disposal.

Legal aspects of Hazardous Waste Management: Collection, Conveyance, Treatment and Disposal.

UNIT IV

Hazardous Waste Management Practices: Environmental Audits, Pollution Prevention.

Treatment and Disposal Methods: Physicochemical processes, Biological Methods, Stabilization & Solidification, Thermal Methods, Land Disposal.

UNIT V

Site Remediation: Site & Subsurface Characterization, Remedial Technologies.


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TEXT/REFERENCE BOOKS:

1. Integrated Solid Waste Management, Techobanglous, Thiesen and Vigil, McGraw Hill.
2. Hazardous Waste Management, Lagrega, Buckingham and Evans, McGraw Hill, N.Y.
3. Solid Waste Management in Developing Countries, A D Bhide, Nagpur Publications.

Course Outcomes:

On successful completion of this course, it is expected that the students will be able to,

CO 1: Know the various types of solid waste, their properties and treatment

CO 2: Know the various types of solid waste, their properties and treatment

CO 3: Understand the methods of solid and hazardous waste disposal

CO 4: Understand the hazardous waste management practices

CO 5: Aware the site remedial technology.

H&SWM	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	√	√	√	√	√			√	√	√		√
CO 2	√		√	√	√	√		√	√	√		√
CO 3	√		√		√	√		√	√	√	√	√
CO4	√	√			√			√		√	√	
CO5	√	√	√	√	√	√		√		√	√	√


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ANURAG ENGINEERING COLLEGE

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IV Year B.Tech. CE- II Semester

L T/P/D C

3 -/- 3

(CE851PE) Repair and Rehabilitation of Structures

Prerequisite: Design of RC Structures

Course Objectives:

1. The importance of maintenance and to assess the condition of the structure.
2. The repair strategies required for Masonry and Concrete structures.
3. The repair strategies required for Timber and Steel structures.
4. The advanced technologies available in repairing of structures.
5. The seismic retrofitting of structures.

UNIT I

Maintenance and Repair Strategies

Maintenance, Facets of Maintenance, importance of Maintenance, various aspects of Inspection, Condition Assessment of a structure, Various methods of Condition assessment , NDT and NDE ,Repair Strategies , Repairs-Rehabilitation-Retrofitting-Strengthening-Upgradation of a Structure, Selection of Materials and Techniques for Repair

UNIT II


Repairs to Masonry and Concrete Structures

Methods of crack repair in masonry and concrete structures, routing and sealing of cracks, removal and surface preparation in masonry and concrete structures, reinforcement repair, anchorage, placement methods; Shot-creting and guniting, Grouting- Portland cement grouting, chemical grouting, Dry packing, polymer impregnation, Strengthening of structures flexural strengthening, Shear Strengthening, strengthening of columns- jacketing of Columns, strengthening by interior and external reinforcing, External Pre-stressing, Fiber wrapping, Corrosion Protection: surface treatment, joint sealants, cathodic protection

UNIT-III

Repairs to Timber and Steel Structures

Testing of Timber Structures for rots, Creosote retention, Planning for repairs in Timber Structures- Repairs to Timber Structures, Dynamic Loading and Fatigue, welding technology, weldability, Cleaning and surface Preparation of Corroded Structural Steel, replacement and addition of new members, different Types of Steel and Composite Joints.


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UNIT IV

Repairs to Special Structures and Special Repairing Techniques

Repairs to Concrete Structures under water , Repairs to Bridges , Repairs to Water Tanks , Repairs to Tunnels , Repairs to Dams – At least one case study for each of these structures

UNIT V

Seismic Retrofitting of Structures

Retrofit of Reinforced Concrete Buildings - Retrofit of Steel Buildings - Retrofit of Foundations - Base Isolation and Energy Dissipation - Retrofit Case Studies

TEXT BOOKS:

1. Den Campbell, Allen and Harold Roper, "Concrete Structures Materials, Maintenance and Repair", Longman Scientific and Technical, UK, 1991.
2. Allen R.T and Edwards S.C, "Repair of Concrete Structures", Blakie and Sons, UK, 1987
3. Philip H. Perkins"Repair , Protection and Waterproofing of Concrete Structures",Elsevier Applied Science Publisher, London,Newyark, 1986
4. P.C. Guha " Maintenance and Repairs of Buildings " , New Central Book Agency , Kolkata 2006.

REFERENCES:

1. H.W.Kwon " Maintenance and Repair of Concrete under water" , 11th International Conference Proceedings ,Conclinic Co. Ltd., 2013
- 2..CPWD " Handbook on Repair and Rehabilitation of RC buildings " , Director General of CPWD , New Delhi,2002
3. IITM & CPWD " Hand book on Seismic Retrofit of buildings " , Narosa Publishing House
4. American Wood Council " National Design Specification " , 2005

Course Outcomes:


On successful completion of this course, it is expected that the students will be able to,

CO1:Understand the behavior of existing structures.

CO 2:Understand the main causes for structural failure and will be able to give the guidelines to their repairs and retrofitting of masonry and concrete structures.

CO 3:Understand the main causes for structural failure and will be able to give the guidelines to their repairs and retrofitting of steel structures.

CO 4:Understand the repairing of complicated and special structures using the new technologies available.


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CO 5: Give the guidelines and retrofitting procedures required for seismic prone structures.

RRS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	√	√	√	√	√	√			√	√	√	√
CO 2	√	√	√	√	√	√		√	√	√	√	√
CO 3	√	√	√	√	√	√		√	√	√	√	√
CO 4	√	√	√	√	√	√		√	√	√	√	√
CO 5	√	√	√	√	√	√		√	√	√	√	√


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ANURAG ENGINEERING COLLEGE

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IV Year B.Tech. I Semester

L	T/P/D	C
3	-/-	3

(EE722OE/ EE511PE) RENEWABLE ENERGY SOURCES (Open Elective-II)

Prerequisite: Nil

Course Objectives:

1. Ability to learn the principles of solar radiation and collection of solar energy.
2. To introduce the various solar energy storage methods and applications.
3. To introduce the wind energy and biomass energy.
4. To introduce the geothermal energy and ocean energy.
5. To introduce the direct energy conversion devices.

UNIT – I

Principles of Solar Radiation & Solar Energy Collectors

Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

Solar Energy Collectors: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II

Solar Energy Storage & Solar Applications

Solar Energy Storage: Different methods, Sensible, latent heat and stratified storage, solar ponds.

Solar Applications: solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-III

Wind Energy & Bio-Mass


Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT-IV

Geothermal Energy & Ocean Energy

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.


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Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and Wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-V

Direct Energy Conversion

Need for DEC, Carnot cycle, limitations, principles of DEC. Seebeck effect, MHD generators.

TEXT BOOKS:

1. G.D. Rai, "Non-Conventional Energy Sources", Khanna Publishing House, 2011.
2. Ramesh & Kumar, "Renewable Energy Technologies", Narosa Publishing House, 1997.

REFERENCE BOOKS:

1. Tiwari and Ghosal, "Renewable energy resources", Narosa Publishing House, 2007.
2. Ashok V Desai, "Non-Conventional Energy", Wiley Eastern Ltd, New Delhi, 2003.
3. K Mittal, "Non-Conventional Energy Systems", Wheeler Publishing Co., 1999.
4. Sukhame, "Solar Energy", Tata McGraw-Hill Education, 3rd edition, 2008.


Course Outcomes:

The student will be able to

- CO 1:** Learn the principles of solar radiation and collection of solar energy.
CO 2: Understand the various solar energy storage methods and solar applications.
CO 3: Analyze the Wind energy conversion and Biomass energy conversion.
CO 4: Analyze the geothermal energy conversion and ocean energy conversion.
CO 5: Analyze the various direct energy conversion devices.

CO-PO Mapping:

RES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	√	√							√		√	
CO 2	√			√	√			√	√			
CO 3	√			√	√			√	√			
CO 4	√			√	√			√	√			
CO 5	√			√	√				√			


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ANURAG ENGINEERING COLLEGE

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II Year B. Tech. II Semester

L	T / P / D	C
3	0	3

(ES302BS / ES401BS) ENVIRONMENTAL SCIENCE

Prerequisites: Have the basic knowledge of Biology and Chemistry.

Course Objectives:

- To explain the multidisciplinary nature of environment, essence of ecosystem, biodiversity and its conservation.
- To impart knowledge about natural resources and their protection.
- To explain about the causes and effects of environmental pollution as well as environmental issues.
- To discuss about the management of environmental wastes, disasters and rules, regulations, policies for the protection of environment.
- To make the students to understand about sustainable development and the natural functioning of ecosystems.

Unit – I:

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance

A) Ecosystems: Definition, Classification of ecosystems, structure and function of ecosystems (Forest, Pond, Grass Land ecosystems), Energy flow in the ecosystem, Food chains, food webs and ecological pyramids, Ecological succession, Carrying capacity.

B) Biodiversity and its conservation: Introduction & Definition, Genetic, Species and Ecosystem diversities, Bio-geographical classification of India, Value(s) of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. IUCN categories of biodiversity and RED DATA book, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – II:

Natural Resources : Renewable and non-renewable

Forest resources – Use and over – exploitation, deforestation

Water resources – Use and over utilization of surface and ground water, Rainwater Harvesting & watershed management, Floods, drought, Dams – benefits and problems

Mineral resources: Environmental effects of extracting mineral resources, sustainable mining activities


Energy resources: Growing energy needs, renewable (Solar, Wind) and non-renewable (Coal, Petroleum, Natural Gas) energy sources, use of alternate energy sources(waste to energy, Biofuels- Biodiesel and Bioethanol)

Land resources: Land degradation, soil salinity, man induced landslides, soil erosion and desertification. Overuse of fertilizers and pesticides, organic farming.

Unit – III:

(a) Environmental Pollution: Definition, Causes, effects of different kinds of pollution(Air, Water, Soil, Noise, Nuclear, e –Waste, Municipal solid waste, Biomedical waste, Hazardous waste).

(b) Environmental Issues: Bhopal Gas Tragedy, Climate Change(Global Warming), Earth Summit, Kyoto Protocol, Paris Agreement, NAPCC(National Action Plan on Climate Change), Ozone layer depletion- Montreal protocol.


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Unit – IV:

(a) Waste management technology: Solid waste Management, Air pollution control techniques, Waste water treatment techniques: primary, secondary, tertiary treatments. Brief account on Bioremediation and Phyto-remediation of contaminated soils, Noise pollution control techniques. Disaster management: Cyclones, Floods, Earthquakes and Landslides.

Application of GIS and GPS system in environment.

(b) Environmental policy, Rules and regulations: Definition & overview of EIA (Environmental Impact Assessment), Environment Protection Act-1986, Air (Prevention and Control of Pollution) Act-1981, Water (Prevention and control of Pollution) Act-1974. Salient features of Municipal solid waste, Biomedical waste, Hazardous waste & e-waste rules.

Unit – V:

(a) Towards sustainable future: Concept of sustainable development, threats of sustainability, sustainable development goals(United Nations General Assembly-2015), population and its explosion, Environmental education, sustainable cities, Environmental effects of human health, Environmental ethics, concept of green building, Basic principles of Green engineering, Carbon foot print.

(b) Field work: Visit to a local polluted site, visit to water treatment plant/effluent treatment plant/sewage treatment plant, study of simple ecosystems-pond/river/hill slopes etc.

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, University Press.
2. Environmental studies, From Crisis to cure by R.Rajagopalan, third edition.


Reference Books:

1. Environmental Science: towards a sustainable future by Richard T.Wright.2008 PHL Learning Private Ltd .New Delhi
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P.Ela.2008 PHI Learning Pvt. Ltd.

Course Outcomes:


After the completion of the course, the student will be able to understand

1. The multidisciplinary nature of environment, essence of environment, biodiversity and its conservation.
2. About the natural resources and their protection.
3. About the causes and effects of environmental pollution as well as environmental issues.
4. About the management of environmental wastes, disasters and rules, regulations, policies for the protection of environment.
5. About the sustainable development and natural functioning of ecosystems.


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CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			✓				✓	✓	✓	✓		
CO 2			✓				✓	✓	✓	✓		
CO 3			✓				✓	✓	✓	✓		
CO 4			✓				✓	✓	✓	✓		✓
CO 5			✓				✓	✓	✓	✓		✓


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ANURAG ENGINEERING COLLEGE

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II Year B.Tech. EEE I Semester

L T/P/D C

0 -/2/- 0

(ES309MC) ENVIRONMENTAL STUDIES (Mandatory Course)

Prerequisites: Have the basic knowledge of Biology and Chemistry.

Course Objectives:

- To explain the Multidisciplinary nature of environment, essence of ecosystem, biodiversity and its conservation.
- To impart knowledge about the natural resources and their protection.
- To explain about the causes and effects of environmental protection as well as the environmental issues.
- To discuss about rules, regulations for the protection of environment.
- To impart knowledge about steps towards Sustainable Development.

UNIT – I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance

A)Ecosystems: Definition, Classification of ecosystems, structure and function of ecosystems (Forest, Pond, ecosystems), Energy flow in the ecosystem, Food chains, food webs and ecological pyramids.

B)Biodiversity and its conservation: Introduction & Definition, Genetic, Species and Ecosystem diversities, Value(s) of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT - II

Natural Resources: Renewable and non-renewable

Forest resources – Deforestation

Water resources – Use and over utilization of surface and ground water, Rainwater Harvesting & Floods, drought

Mineral resources: Environmental effects of extracting mineral resources

Energy resources: Renewable (Solar, Wind) and non-renewable (Coal, Petroleum, Natural Gas) energy sources, use of alternate energy sources(waste to energy, Biofuels- Biodiesel and Bioethanol)


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UNIT – III

- (c) **Environmental Pollution:** Definition, Causes, effects of different kinds of pollution (Air, Water, Soil, Noise).
- (d) **Environmental Issues:** Bhopal Gas Tragedy, Climate Change(Global Warming), Earth Summit, Paris Agreement, NAPCC(National Action Plan on Climate Change), Ozone layer depletion- Montreal protocol.

UNIT – IV:

Environmental policy, Rules and regulations: Definition & overview of EIA, Environment Protection Act-1986, Air (Prevention and Control of Pollution) Act-1981, Water (Prevention and control of Pollution) Act-1974, Wildlife Protection Act-1972, Salient features of Municipal solid waste, & e-waste rules.

UNIT – V

Towards sustainable future: Concept of sustainable development, threats of sustainability, sustainable development goals(United Nations General Assembly-2015), population and its explosion, Environmental education, sustainable cities, Environmental effects of human health, Environmental ethics, concept of green building, Carrying capacity, Low Carbon Life cycle, Carbon foot print, Polluter Pays Principle.

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, University Press.
2. Environmental studies, From Crisis to cure by R.Rajagopalan, third edition


Reference Books:

1. Environmental Science: towards a sustainable future by Richard T.Wright.2008 PHI Learning Private Ltd .New Delhi
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P.Ela.2008 PHI Learning Pvt. Ltd.

Course Outcomes:

After completion of the course, the student will be able to understand

- CO 1:** The Multidisciplinary nature of environment, essence of ecosystem, biodiversity and its conservation.
- CO 2:** About the natural resources and their protection.
- CO 3:** About the causes and effects of environmental pollution as well the environmental issues.
- CO 4:** About the rules, regulations for the protection of environment.
- CO 5:** About the steps towards Sustainable Development


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CO-PO Mapping:

PO'S CO'S	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO 1			✓	✓		✓	✓		✓	✓	
CO 2			✓	✓		✓	✓	✓	✓	✓	
CO 3			✓	✓		✓	✓	✓	✓	✓	
CO 4			✓	✓		✓	✓	✓	✓	✓	
CO 5			✓	✓		✓	✓	✓	✓	✓	


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ANURAG ENGINEERING COLLEGE

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B.Tech III Year II Semester

L	T	P	C
3	0	0	3

(CE612OE) WASTE MANAGEMENT

(Open Elective –I)

Course Objectives:

The objective of this course is to impart,

- The knowledge about quality standards of feed water and waste management theories.
- The knowledge about the problems that associated with waste water discharging into streams.
- The knowledge about the working processes and liquid waste origin in various industries.
- The knowledge about the manufacturing process and origin of liquid waste from various industries.
- The knowledge regarding waste disposal methods and requirement of treatment plants.

UNIT – I

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and cooling water treatment methods. Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems.

UNIT – II

Industrial waste water discharges into streams. Lakes and oceans and problems. Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries.

UNIT-III

Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods.


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UNIT - VI

Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT – V

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

TEXT BOOK:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.

REFERENCES:

1. Liquid waste of Industry by Newmerow.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

Course Outcomes:

At the end of the course student will be able to,

- CO 1:** Understand the standards for feed water in various industries and different theories in reducing the concentration of waste water.
- CO 2:** Understand the effects of discharging waste water into streams and the direct and indirect impacts on aquatic animals and humans.
- CO 3:** Understand the working procedure in various industries, sources, characteristics and effects of waste, also the treatment methods depending upon the type of waste.
- CO 4:** Know the combined treatment methods of liquid waste, effective methods of waste disposal and their limitations.
- CO 5:** Understand the waste disposal methods and requirement of treatment plants.


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CO-PO Mapping:

PO'S CO'S	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO 1	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
CO 2	✓		✓	✓	✓	✓	✓		✓		
CO 3		✓	✓				✓	✓	✓	✓	✓
CO 4	✓	✓	✓	✓				✓		✓	
CO 5	✓	✓		✓	✓	✓		✓	✓		✓


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