

E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University,
Chennai Accredited by NAAC with 'A' Grade | Accredited by NBA

NAGAPATTINAM – 611002



M.E. ENVIRONMENTAL ENGINEERING

REGULATION -2021

Second Year – Third Semester

| Course Category | Course Code | Course Name | L | T | P | C | Maximum Marks | | |
|--------------------------|-------------|------------------------|----------|----------|-----------|-----------|---------------|------------|------------|
| | | | | | | | CA | ES | Total |
| Theory Course | | | | | | | | | |
| PEC | | Program Elective - IV | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| PEC | | Program Elective - V | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| OEC | | Open Elective | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| Laboratory Course | | | | | | | | | |
| EEC | 2104EV301 | Project Work - Phase I | 0 | 0 | 20 | 10 | 50 | 50 | 100 |
| Total | | | 9 | 0 | 20 | 19 | 170 | 230 | 400 |

| 2103EV010 | ENVIRONMENTAL IMPACT ASSESSMENT | L | T | P | C |
|---|---|-----------------|---|---|-----------------|
| | | 3 | 0 | 0 | 3 |
| COURSE OBJECTIVES: | | | | | |
| | 1. To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment and to develop the skill to prepare environmental management plan. | | | | |
| | 2. To provide knowledge related to the broad field of environmental risk assessment, important processes that control contaminant transport and tools that can be used in predicting and managing human health risks. | | | | |
| Module I | Introduction | 8 Hours | | | |
| Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA –EIA process- screening – scoping - setting – analysis – mitigation. Cross sectoral issues and terms of reference in EIA – Public Participation in EIA. | | | | | |
| Module II | Impact Identification and Prediction | 10 Hours | | | |
| Matrices – Networks – Checklists –Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modeling for impact prediction – Assessment of impacts – air – water – soil – noise – biological – Cumulative Impact Assessment. | | | | | |
| Module III | Social Impact Assessment and EIA Documentation | 8 Hours | | | |
| Social impact assessment - Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Community level impacts in transition Documentation of EIA findings – planning – organization of information and visual display materials – Report preparation. | | | | | |
| Module IV | Environmental Management Plan | 7 Hours | | | |
| Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment- Case Studies. | | | | | |
| Module V | Environmental Risk Assessment and Management | 12 Hours | | | |
| Environmental risk assessment framework-Hazard identification -Dose Response Evaluation – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment– HAZOP and FEMA methods – Event tree and fault tree analysis – Multimedia and multipathway exposure modeling of contaminant- Risk Characterization Risk communication - Emergency Preparedness Plans –Design of risk management programs. | | | | | |
| Total: | | | | | 45 Hours |
| COURSE OUTCOMES: | | | | | |
| After completion of the course, Student will be able to | | | | | |
| 1. Understand the necessity to study the impacts and risks that will be caused by projects or industries and the methods to overcome these impacts. | | | | | |
| 2. Know about the legal requirements of Environmental and Risk Assessment for projects. | | | | | |
| REFERENCES: | | | | | |
| 1. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996 | | | | | |
| 2. Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey. 2003 World Bank –Source book on EIA | | | | | |
| 3. Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999. | | | | | |
| 4. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff “Risk Assessment and Management Handbook”, McGraw Hill Inc., New York,1996. | | | | | |
| 5. K. V. Raghavan and A A. Khan, Methodologies in Hazard Identification and Risk Assessment, Manual by CLRI, 1990. | | | | | |
| 6. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012. | | | | | |

| 2103EV013 | RESOURCE AND ENERGY RECOVERY FROM WASTE | L | T | P | C |
|---|---|-----------------|---|---|-----------------|
| | | 3 | 0 | 0 | 3 |
| COURSE OBJECTIVES: | | | | | |
| | 1. To understand the principles and design of recovering materials and energy from wastes through mechanical, biological and thermal methods and manage the undesirable by-products | | | | |
| Module I | Mechanical Processing for Material Recycling | 10 Hours | | | |
| Resource recovery for a sustainable development- Material and energy flow management and analysis - Systems and processes for reduction, reuse and recycling -Objectives of Waste Processing-Source Segregation and Hand Sorting-Waste Storage and Conveyance – Shredding – Pulping - Size Separation by Screens- Density Separation by Air Classification –magnetic and electromechanical separation processes- Design Criteria and Equipment selection | | | | | |
| Module II | Biological Processing for Resource Recovery | 10 Hours | | | |
| Mechanisms of Biological Processing – Aerobic Processing of Organic fraction - Composting methods and processes- factors affecting- Design of Windrow Composting Systems- In Vessel Composting- Compost Quality Control- Vermiculture: definition, scope and importance - common species for culture - Environmental requirements - culture methods- Applications of vermiculture- Potentials and constraints for composting in India- Largescale and decentralized plants. | | | | | |
| Module III | Bio-Chemical Conversion of Waste to Energy | 9 Hours | | | |
| Principles and Design of Anaerobic Digesters – Process characterization and control- The biochemistry and microbiology of anaerobic treatment - Toxic substances in anaerobic treatment - Methane generation by Anaerobic Digestion- Anaerobic reactor technologies - Commercialanaerobic Technologies- Single stage and multistage digesters- Digester design and performance-Gas collection systems-Methane Generation and Recovery in Landfills – Biofuels from Biomass | | | | | |
| Module IV | Thermo-Chemical Conversion of Waste To Energy | 8 Hours | | | |
| Principles and Design of Energy Recovery Facilities -Types and principles of energy conversion processes - Incinerator design - Mass Burn and RDF Systems- Composition and calorific value of fuels and waste, Determination of the stoichiometric air consumption, Calculation of the flue gas composition - grate firing designs, boiler design, removal of bottom ash, heat recovery- Emission Controls – flue gas cleaning, de-dusting, flue gas scrubbers, DeNOx processes, dioxins and furans- Alternative thermal processes: co-incineration, pyrolysis, gasification, plasma arc - Process characterization and control- waste heat recovery- Bottom ash: Quantity, quality, treatment, utilization, disposal- Facility design- decentralized mobile plants- Planning and construction of incineration plants | | | | | |
| Module V | Case Studies on Waste Recycling | 8 Hours | | | |
| Recycling technologies for paper, glass, metal, plastic – Used Lead Acid Battery Recycling –End of Life Vehicle Recycling – Electronic Waste Recycling – Waste Oil Recycling – Solvent Recovery - Drivers and barriers for material recycling: social, legal and economic factors - Environmental impacts of waste recycling - Design for the environment: the life cycle approach | | | | | |
| Total: | | | | | 45 Hours |
| COURSE OUTCOMES: | | | | | |
| After completion of the course, Student will be able to | | | | | |
| 1. Understand the fundamental principles of existing and emerging technologies for the treatment of waste and recovery of materials and energy from waste; | | | | | |
| 2. Appreciate the increasing importance of waste and resource management in achieving environmental sustainability. | | | | | |
| 3. Analyze and describe the potential of solid waste as a secondary raw material, | | | | | |
| REFERENCES: | | | | | |
| 1. Aarne Vesilind and Alan E Rimer (1981), “ Module operations in Resource Recovery Engineering“, Prentice Hall Inc., London | | | | | |
| 2. Manser A G R, Keeling A A (1996). Practical handbook of processing and recycling on municipal waste. Pub CRC Lewis London, ISBN 1-56670-164 | | | | | |
| 3. Chiumenti, Chiumenti, Diaz, Savage, Eggerth, and Goldstein , Modern CompostingTechnologies , JG Press October 2005 | | | | | |
| 4. Charles R Rhyner (1995),Waste Management and Resource Recovery, Lewis Publishers | | | | | |
| 5. Gary C. Young (2010)Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons , John Wiley & Sons | | | | | |

| 2103EV020 | ENVIRONMENTAL POLICIES AND LEGISLATION | L | T | P | C |
|---|--|-----------------|---|---|-----------------|
| | | 3 | 0 | 0 | 3 |
| COURSE OBJECTIVES: | | | | | |
| To impart knowledge on the policies, legislations, institutional frame work and enforcement mechanisms for environmental management in India. | | | | | |
| Module I | Introduction | 9 Hours | | | |
| Indian Constitution and Environmental Protection – National Environmental policies – Precautionary Principle and Polluter Pays Principle – Concept of absolute liability – multilateral environmental agreements and Protocols – Montreal Protocol, Kyoto agreement, Rio declaration– Environmental Protection Act, Water (P&CP) Act, Air (P&CP) Act – Institutional framework(SPCB/CPCB/MoEF) | | | | | |
| Module II | Water (P&CP) Act, 1974 | 8 Hours | | | |
| Power & functions of regulatory agencies - responsibilities of Occupier Provision relating to prevention and control Scheme of Consent to establish, Consent to operate – Conditions of the consents – Outlet – Legal sampling procedures, State Water Laboratory – Appellate Authority – Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation. | | | | | |
| Module III | Air (P&CP) Act, 1981 | 8 Hours | | | |
| Power & functions of regulatory agencies - responsibilities of Occupier Provision relating to prevention and control Scheme of Consent to establish, Consent to operate – Conditions of the consents – Outlet – Legal sampling procedures, State Air Laboratory – Appellate Authority – Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation | | | | | |
| Module IV | Environment (Protection) Act 1986 | 13 Hours | | | |
| Genesis of the Act – delegation of powers – Role of Central Government - EIA Notification – Sitting of Industries – Coastal Zone Regulation - Responsibilities of local bodies mitigation scheme etc., for Municipal Solid Waste Management - Responsibilities of Pollution Control Boards under Hazardous Waste rules and that of occupier, authorisation – Biomedical waste rules – responsibilities of generators and role of Pollution Control Boards | | | | | |
| Module V | Other Topics | 7 Hours | | | |
| Relevant Provisions of Indian Forest Act, Public Liability Insurance Act, CrPC, IPC -Public Interest Litigation - Writ petitions - Supreme Court Judgments in Landmark cases. | | | | | |
| Total: | | | | | 45 Hours |
| COURSE OUTCOMES: | | | | | |
| After completion of the course, Student will be able to | | | | | |
| 1. Know the National environmental legislations and the policies | | | | | |
| 2. plan programmes to comply with the legal requirements related to organizations | | | | | |
| REFERENCES: | | | | | |
| 1. CPCB “Pollution Control acts, Rules and Notifications issued there under “Pollution Control Series – PCL/2/1992, Central Pollution Control Board, Delhi, 1997. | | | | | |
| 2. Greger I.Megregor “Environmental law and enforcement”, Lewis Publishers, London. 1994. | | | | | |
| 3. Shyam Divan and Armin Roseneranz “Environmental law and policy in India “Oxford University Press, New Delhi, 2001. | | | | | |