**5.4.2:** **Alumni Contribution**

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| **Course Title: Environmental Engineering** | | **Course Code:** **15ECVC204** | |
| **L-T-P: 4-0-0** | **Credits: 4** | **Contact Hours: 4 Hrs/ week** | |
| **ISA Marks: 50** | **ESA Marks: 50** | **Total Marks: 100** | |
| **Teaching Hours: 50 Hrs** | **Examination Duration: 3 Hrs** | | |
| **Unit I** | | |  |
| 1.Introduction  Major causes of global environmental change of key life support systems.  Need for protected water supply. | | | **02 hrs** |
| 2. Demand and conveyance of water  Types of water demands, population forecasting- arithmetical, geometrical, incremental increase and simple graphical method. Surface and subsurface sources. Design of the economical diameter of the rising main. | | | **04 hrs** |
| **3. Quality of Water**  Concept of safe wholesome and palatability of water, Sampling of water, Examination of Water–Physical, chemical and Biological Examinations. Drinking water standards BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic etc. | | | **04hrs** |
| **4.Water Treatment**  Treatment flow-charts. Aeration- Principles, types of Aerators. Sedimentation aided Coagulant, design, jar test, Theory of filtration, slow sand, rapid sand and pressure filters, design – excluding under drainage system .Theory of disinfection, types of disinfection. | | | **10 hrs** |
| **Unit II** | | |  |
| **5.Miscellaneous Treatment and Distribution of Water**  Softening methods of removal of hardness by lime soda process and zeolite process. Adsorption technique, reverse osmosis technique, fluoridation and defluoridation.  System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems. | | | **05 hrs** |
| **6. Sewerage systems**  Types of sewerage systems. DWF, estimation of storm flow, design of storm water drain. Design of sewers - self cleansing and non-scouring velocities. Design of hydraulic elements for circular sewers flowing full and flowing partially full | | | **06 hrs** |
| **7. Sewage characteristics**  Physical, Chemical and Biological characteristics, CNS cycle. BOD and COD their significance | | | **03 hrs** |
| **8. Disposal of Sewage**  Self-purification phenomenon, Zones of purification, Sewage sickness, Sewage farming. Streeter Phelps equation - Oxygen sag curve. | | | **04 hrs** |
| **Unit III** | | |  |
| **9.** **Sewage Treatment and sludge disposal**  Flow diagram of municipal waste water treatment plant. Preliminary & Primary treatment: Screening, grit chambers, primary sedimentation tanks – Design.  Theory and design of biological unit operation- Trickling filter and Activated sludge process Sludge digestion process, Sludge drying beds.  Concepts of Oxidation pond and RBC | | | **09 hrs** |
| **Text Books**   1. Birdie, G.S., *Water Supply and Sanitary Engineering*, Dhanpath Rai and Son Publishers, New Delhi, 2003 2. Garg, S.K., *Sewage disposal and Air Pollution Engineering*, Khanna Publishers, 2003. 3. Garg, S.K., *Water supply Engineering*, 7ed., Khanna Publishers, New Delhi, 2005. 4. Modi, P.N., *Sewage Treatment and Disposal Engineering,* 15ed., Standard Book House, New Delhi, 2015. 5. Punima, B. C., and Jain Ashok, *Environmental Engineering-I,* 2ed., Laxmi Publications, New Delhi., 2008. 6. Punmia, B. C., Ashok K Jain and Arun Kumar Jain, *Wastewater Engineering*, Laxmi Publications, New Delhi, 2016. | | | |
| **Reference Books:**   1. Metcalf & Eddy, *Wastewater Treatment Engg. & Reuse*, Tata McGraw Hill Publications, 2003. 2. Fair, G.M., Geyer J.C., Okan D.A., *Elements of Water Supply and Wastewater Disposal*, John Wiley and Sons Inc. 2000. 3. Hammer M.J., *Water and Waste Water Technology*, John Wiley and Sons, New York, 2000. 4. Howard S. Peavy, Donald R. Rowe, George Techno Bano Glous, *Environmental Engineering*, McGraw Hill International, 1995. 5. IS:10500-2012,Drinking water- Specification. 6. *Ministry of Urban Development, Manual on Waste Water Treatment - CPHEEO*, New Delhi. 7. Srinivasan, D., *Environmental Engineering*, PHI Learning Pvt. Ltd., New Delhi, 2008. 8. W.K. Berry, *Water Pollution*, CBS Publishers Pvt. Ltd., New Delhi, 2016. | | | |

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| **Course Title: Solid Waste Management** | | **Course Code:** **15ECVE407** | |
| **L-T-P: 3-0-0** | **Credits: 3** | **Contact Hours: 3 Hrs/ week** | |
| **ISA Marks: 50** | **ESA Marks: 50** | **Total Marks: 100** | |
| **Teaching Hours: 40** | **Examination Duration: 3 Hrs** | | |
| **Unit I** | | |  |
| 1. Introduction  Solid waste -Definition, Land Pollution -scope and importance of solid waste management, functional elements of solid waste management. SOURCES: Classification and characteristics- municipal, hospital / biomedical waste, Quantity -Generation rate, methods. | | | **05 hrs** |
| 2. Collection and Transportation  Systems of collection, collection equipment, garbage chutes, transfer stations -bailing and compacting, route optimization | | | **05 hrs** |
| 3. Processing Techniques  Components separation, volume reduction, size reduction, chemical reduction and biological processing | | | **05 hrs** |
| **Unit II** | | |  |
| 4. Disposal Methods  Open dumping -selection of site, ocean disposal, feeding to hogs, composting, sanitary land. filling, merits and demerits. Construction/Demolition waste. | | | **04 hrs** |
| 5. Incineration  Processes -3 T 's, factors affecting incineration process, incinerators -types, prevention of air pollution, pyrolysis. | | | **04 hrs** |
| 6. Composting  Aerobic and anaerobic composting, factors affecting, composting, Indoor and Bangalore processes, mechanical and semi-mechanical composting processes. Vermi composting | | | **05 hrs** |
| **Unit III** | | |  |
| 7. Sanitary Land Filling  Definition, methods, trench area, Ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate collection and control methods, gas collection systems. | | | **07 hrs** |
| 8. Recycle and Reuse  Material and Energy Recovery Operations, Reuse In Other Industries, Plastic Wastes, Environmental Significance and Reuse | | | **05 hrs** |
| **Text Books**   1. George Tchobanoglous, Hilary Theisen and Vigil S. A., *Integrated solid waste management: engineering principles and management issues*, McGraw-Hill Inc,US, 1993. 2. Bhide A. D. and , Sundaresan B. B., *Solid Waste Management in Developing Countries,* Indian National Scientific Documentation Centre, 2010. 3. Ministry of Environment and Forests, Govt. of India, The Municipal Solid Wastes (Management and Handling) Rules, 2000. | | | |
| **Reference Books:**   1. Joseph L. Pavoni, [John E. Heer](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22John+E.+Heer%22), [D. Joseph Hagerty](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22D.+Joseph+Hagerty%22), *Solid Waste Management, Van Nostrand Reinhold Co.,* 1973. 2. Howard S. Peavy, Donald R. Rowe, [George Tchobanoglous](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22George+Tchobanoglous%22)*, Environmental Engineering,* McGraw-Hill Publishing Company Inc., New York, 2017. 3. [Ramesha Chandrappa](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Ramesha+Chandrappa%22), [Jeff Brown](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Jeff+Brown%22), *Solid Waste Management* – *Principles and Practice,* Springer Science & Business Media,  2012. | | | |

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| **Course Title: Advanced Waste Water Treatment** | | **Course Code:** **15ECVE408** | |
| **L-T-P: 3-0-0** | **Credits: 3** | **Contact Hours: 3 Hrs/ week** | |
| **ISA Marks: 50** | **ESA Marks: 50** | **Total Marks: 100** | |
| **Teaching Hours: 40** | **Examination Duration: 3 Hrs** | | |
| **Unit I** | | |  |
| **1.Introduction**  Wastewater Characteristics, Effluent Quality Standards, Receiving Stream Quality | | | **03 hrs** |
| **2. Primary Treatment**- Screening, Grit removal, Neutralization, equalization, Sedimentation, Flotation (oil & grease removal), | | | **06hrs** |
| **3. Secondary Treatment**- Fundamental concept of reactors: Mass balance relationships, analysis and descriptions of reactors- batch, completely mixed flow and plug flow oxygen requirement in aerobic process. | | | **06hrs** |
| **Unit II** | | |  |
| **4. Biological Treatment :** Activated Sludge Process: Substrate Utilization and Biomass Growth, Kinetic Parameters, Process Description and its Modification, Process Design , Biofilm Process: Trickling Filter, Rotational Biological Contactor  Aerated lagoons, oxidation pond-operation and maintenance | | | **10 hrs** |
| **5.Advanced Treatment Processes**- Chemical Coagulation, Carbon Adsorption, Phosphorus Removal, Nitrogen Removal (Nitrification/Denitrification), Media Filtration, UV Disinfection | | | **06 hrs** |
| **Unit III** | | |  |
| **6. Solids Handling Processes**- Gravity Thickening, Flotation Thickening, Dewatering, Pressure Filtration, Stabilization, Aerobic and Anaerobic Digestion, Composting, Drying, Incineration, Landfilling, Land Application | | | **09 hrs** |
| **Text Books**   1. Eddy and Metcalf ,*Wastewater Engineering* – *Treatment and Reuse* ,Tata McGraw Hill Education Pvt Ltd., New Delhi, 2003. 2. Modi, P.N., *Sewage Treatment and Disposal Engg.*, Standard Book House, New Delhi, 2000. 3. Howard S. Peavy, Donald R. Rowe, George Techno Bano Glous, *Environmental Engineering*, McGraw Hill International, 2010. | | | |
| **Reference Books:**   1. Qasim S.R., Motley E. M., *Wastewater Treatment Plants – Planning, Design and Operation*, Prentice Hall, New Delhi. 2002. 2. Davis, M.L. and Cornwell, D.A., *Introduction to Environmental Engineering*, Tata McGraw Hill Education Pvt. Ltd., New Delhi,. 2010 3. Hammer M.J., *Water and Waste Water Technology*, John Wiley and Sons, New York , 2000. | | | |

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| **Course Title: Air Pollution** | | **Course Code:** **15ECVE409** | |
| **L-T-P: 3-0-0** | **Credits: 3** | **Contact Hours: 3 Hrs/ week** | |
| **ISA Marks: 50** | **ESA Marks: 50** | **Total Marks: 100** | |
| **Teaching Hours: 40** | **Examination Duration: 3 Hrs** | | |
| **Unit I** | | |  |
| 1. Introduction  Definition -Classification and properties of Air pollutants, Primary and secondary Air pollutants, Concentrations of Air pollutants and sources. Behavior and Fate of Air Pollution: Chemical reaction in the Atmosphere, photochemical Smog. | | | **05 hrs** |
| 2. Effects of Air Pollution  On human health, Animals, Plant and properties, Major Episodes. | | | **05 hrs** |
| 3. Meteorology  Introduction -Meteorological Variables, Lapse Rate – Adiabatic - Dispersion, inversion, stability conditions, wind rose, general characteristics of stack plumes | | | **05 hrs** |
| **Unit II** | | |  |
| 4. Sampling and Analysis of Air Pollutants  Sampling and measurement of Gaseous and particulate pollutants, stack sampling, smoke and its measurements. | | | **05 hrs** |
| 5. Control of Air Pollutants  Control methods -Particulate emission control, gravitational settling chambers, cyclone separators, fabric filters, Electrostatic precipitators, wet scrubbers, control of gaseous emissions (Design not requires) | | | **10 hrs** |
| **Unit III** | | |  |
| 6. Air Pollution Due to Automobiles  Air pollution due to gasoline driven and Diesel driven engines, effects, control -direct and indirect methods. | | | **02 hrs** |
| 7. Global Environmental Issues  Acid rain, Green House effect, Global warming, Ozone layer Depletion. | | | **04 hrs** |
| 8. Environmental Impact Assessment  Environmental Impact Assessment in industrial plant locations and planning. Standards and legislation -Air quality and emission standards - legislation and regulation, Air pollution index | | | **04 hrs** |
| **Text Books**   1. Rao, H.V.N., and Rao, M.N., *Air Pollution*, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2007. 2. Rao, C.S., *Environmental Pollution Control*, New Age International Pvt. Ltd, New Delhi, 2006. | | | |
| **Reference Books:**   1. A.O.C., Stem, *Air Pollution -Vol I -IV*, Academic Press., 2010. 2. Henry C Perkins, *Air pollution*, Tata McGraw Hill Education Pvt Ltd., New Delhi, 1974. | | | |