

**Ph.D. Course work in Environmental Science and Engineering (Paper 2)**

**Index**

<b>Sr. No.</b>	<b>Title of Course</b>
1	Advanced Environmental Engineering

<b>Advanced Environmental Engineering</b>				
<b>Teaching Scheme</b>				
Lectures	Seminar	Library Work	Total	
40	10	10	60	
<b>Examination Scheme</b>				
Credits	Theory	Internal	Minimum for Passing	Total Marks
04	80	20	40	100
<b>Textbooks and References:</b>				
<ol style="list-style-type: none"> <li>1. Manual on water supply and Treatment ", CPHEEO, Ministry of Urban Development, GOI, New Delhi, 1999.</li> <li>2. M.J. Hammer, " Water and Wastewater Technology ", Regents/Prentice Hall, New Jersey, 1991</li> <li>3. Kiely, G., Environmental Engineering. McGraw Hill, 1996. ISBN: 007091272</li> <li>4. Wanielista, M., Kersten, R., and R. Eaglin.. Hydrology: Water Quantity and Quality Control. Wiley Interscience, 1996. ISBN: 0471072591</li> <li>5. Zipparro, V.J., Davis' Handbook of Applied Hydraulics Fourth Edition. McGraw Hill, 1993. ISBN: 0070730024</li> <li>6. Franzini, J., Freyberg, D., Linsley, R., and G. Tchobanoglous, Water Resources Engineering. McGraw Hill, 1991. ISBN: 0070380104 14</li> </ol>				
<b>Assessments: As per SUK Guidelines</b>				
<ul style="list-style-type: none"> <li>• <b>Theory Examination: is to be conducted by the university with duration of 3 hours per paper.</b></li> <li>• <b>Internal Examination is to be conducted by the concerned departments or research centers in the following form:</b> <ol style="list-style-type: none"> <li>1. <b>For paper 1 and 2 the internal evaluation will include 2 Seminars of 10 Marks each</b></li> <li>2. <b>For paper – 3 the internal evaluation will be as follows:</b> <ol style="list-style-type: none"> <li>a) <b>Seminars ( Submission and Presentation)- 10 marks</b></li> <li>b) <b>Review s Literature : Submission and Presentation- 10 marks</b></li> </ol> </li> </ol> </li> </ul> <p><b>(Papers will have separate passing head for theory examination and internal evaluation 32+8=40 )</b></p>				
<b>Course Contents</b>				
<b>Module 1: Water treatment</b> Water Quality: Requirement, Standards, Stream & Effluent standards. Water quality indices, Waterpurification, physical, chemical processes, Unit operations, unit processes. Aeration, Sedimentation, Coagulation & flocculation, Filtration: Adsorption, adsorption, Ion Exchange Membrane Processes, RO, Ultrafiltration, Electrolysis, Disinfection Wastewater Treatment, Waste waters-Sources, nature, characteristics, Analysis:- BOD progression & its formulations, Fundamentals of Process Kinetics, Zero order, First order, Second order Reactions, Different Reactors based on type of flow, Design of W/W treatment systems- Primary, secondary and tertiary; ASP, Nitrification denitrification, Ponds and aerated Lagoons, Attached Growth Biological Treatment Systems: TF, RBC, Activated Biofilters etc., Expanded /fluidized bed reactors, USAB, Expanded granular bed reactors, Sludge				<b>8 Hrs.</b>

Digestion: anaerobic and aerobic, Waste water reclamation and reuse, Effluent disposal..	
<b>Module 2: Air Quality Monitoring and Control Techniques:</b> Air pollutants: Sources, classification, Combustion Processes, pollutant emission, Effects on Health,vegetation, materials, atmosphere, Reactions of pollutants Scales of AP studies, effects as per scales,Air sampling, pollution measurement methods, Ambient air quality and emission standards, Airpollution indices, Air Act, legislation and regulations, Removal of gaseous pollutants. Particulateemission control; bioscrubers, biofilters, Air quality models : Gaussian dispersion model, Regional air quality models Indoor air quality	<b>8 Hrs.</b>
<b>Module 3: Water quality modeling</b> Modelling approaches to water quality - classification andconsiderations in selecting models, Model requirements and limitations. D.O. Models for Streams:DO model for streams,Streeter - Phelps model - oxygen 'sag' curve, Benthalex oxygen demand, Studyof Mathematical Models, Models for Estuary and Lakes,	<b>8 hr</b>
<b>Module 4: Environmental Management and Impact Assessment</b> Environmental management, problems and strategies; Future strategies; multidisciplinary environmental strategies, Environmental impact assessment (EIA), Sustainable development (SD) initial environmental examination (IEE), environmental impact statement (EIS), environmental appraisal, environmental audit (EA); Environmental impact factors and areas of consideration,measurement of environmental impact, SWM:Waste Management - Sources, Classifications,Characteristics, Generations, Onsite Handling and Storage, Collection, Transfer Recycling andDisposal Techniques of Municipal Solid Waste (MSW), Economic Evaluation of the Systems, Hospital Waste Management.	<b>8 Hrs.</b>
<b>Module 5: Remote Sensing</b> Remote Sensing, GIS and GPS Techniques and their applications in Environmental Studies. Softwares in Environmental Engineering. Pollutant Transport Mechanisms and Modelling, HazardousWaste Management, Waste Minimization Techniques, Environmental Risk Management .	<b>8 Hrs.</b>