

**Programme Project Report (PPR)**  
**for**  
**Distance Learning Programme under School of Distance Education**

**Certificate in Waste Management (CWM)**

**Course Co-ordinator: Dr. Usha.K**

*Academic support by*

**Advanced Centre of Environmental Studies and Sustainable Development  
(ACCESSD)  
Mahatma Gandhi University  
Kottayam, Kerala**

**CERTIFICATE IN WASTE MANAGEMENT (CWM)**  
**(Distance Learning Programme - Certificate Programme)**

**Programme Project Report**

Mahatma Gandhi University started the School of Distance Education in 1989 with the vision of providing the opportunity for quality education to all realms of society. Since the beginning, thousands of students have availed themselves of this opportunity for higher education to a great extent throughout Kerala. Many students outside the State have also benefited from this. But after the new directions of the UGC in 2014, the University had stopped all the Off-Campus Centres of the School of Distance Education both inside and outside the State.

Now it is the new endeavour of the School to revamp its functioning by offering different types of Diploma and Certificate programmes very relevant to contemporary society, in addition to the conventional Graduate and Post Graduate programmes. This is being done with the academic and infrastructural support of the eminent Schools and Interdisciplinary Interuniversity Centres of the University. All these Schools/ Centres have already conducted similar Programmes or Post Graduate Programmes in the same area. This Certificate Programme has been designed by the Advanced Centre of Environmental Studies and Sustainable Development (ACCESSD) and is to be conducted by the School of Distance Education with the academic support of the Centre.

The Advanced Centre of Environmental Studies and Sustainable Development (ACCESSD) stands for interdisciplinary research which involves generation and integration of knowledge aiming at evolving sustainable development strategies. The Centre has established advanced facilities for interdisciplinary research to address emerging environmental issues. It fosters linkages with National and International institutions for collaborative academic and research activities. The Centre is actively engaged in extension activities aiming at capacity building and knowledge sharing for local bodies. NGOs, academic institutions and public with environmental awareness and best practices. It promotes sustainable development strategies linking advanced level knowledge with traditional environmental wisdom and practices.

**a) Programme's mission & Objectives :**

This programme is envisaged to provide integrated knowledge and training in waste management and technology. Tackling the problem of waste is a challenge the world over. Managerial measures from the source of waste production to the treatment and disposal levels need updated knowledge and effective practices. Proper management measures of wastes – liquid, solid and hazardous - all are integral to human health as well as on environmental well being. Development of innovative research in specific areas under waste management technology giving due importance to R & D as well as creation of awareness among the public are the thrust areas recognized. The curriculum formed aims to impart full justice to the subject matter with a strong knowledge base and skill development in waste management technology. In order to fully achieve the waste prevention goals there is the need for innovations in the technological design and operation, the so called clean technologies.

**b) Relevance of the programme with HEI's Mission Goals :**

Effective waste management is a challenge in our country. Knowledge on proper waste management measures is a prerequisite for meeting the problem effectively. The message involved in waste management can be spread to the public at large by this course through the learners.

**c) Nature of prospective target group of learners:**

Students from various streams can join for the programme. Thus the prospective target group of learners include undergraduates, postgraduates, researchers and the general public who are desirous of studying such a programme.

**d) Appropriateness of programme to be conducted in Open and Distance Learning mode to acquire specific skills and competence:**

Waste generation and management is of paramount importance in the public health and safety point of view. So the required information on the problem and the adequate measures can be extended to large section of learners through the Open and Distance Learning mode.

**e) Instructional design:**

The programme is of six month duration comprising four courses with a total of 16 credits. There are adequate contact classes and the assessment involves both internal as well as external components. Each student has to submit a report based case studies or project.

Duration-6 months							
Course Code	Course Type	Course Name	Contact Sessions (hours)	Credits	*Internal Marks	External Marks	Total Marks
DE-AC-1	Core course	Liquid waste management	12	4	20	80	100
DE-AC-2	Core course	Solid waste management	12	4	20	80	100
DE-AC-3	Core course	Hazardous waste management	12	4	20	80	100
DE-AC-4	Case study/ Project work and Report	Case study/ Project work and Report	12	4		100	100
Total			48	16			400

\*Through assignments

**a) Procedure for admission, curriculum transaction and evaluation:**

Admission to the programme will be done by the University through a common procedure for all the programmes under the School of Distance Education. A pass at the Plus Two level is the minimum eligibility criterion for admission. Candidates (undergraduates, graduates, and postgraduates) are eligible for admission irrespective of age. The fee structure will be decided by the University. The study materials will be delivered through online and print formats. The School will prepare an academic calendar/activity planner that will be circulated among all the learners at the time of admission itself. The academic calendar will include all the significant activities, important dates, schedule of submission of assignments, schedule of contact classes, schedule of examinations, etc.

Evaluation of the courses shall be done by the faculty themselves on the basis of internal assessment and end semester examinations. 20% of the marks will be decided by the internal evaluations and the remaining 80% by the end semester examinations which will be conducted by the University. The performance of a student in each course will be evaluated in terms of percentage of marks obtained with a provision for its conversion to grade points.

Each student shall be required to do one Assignment/Book Review/Debate/Seminar/Presentation of the case study for each course. Assignments/Book Review after valuation shall be returned to the students. The teacher shall define the expected quality of the above in terms of structure, content, presentation and the like, and inform the students of the same.

**Grading System** will be followed for the evaluation on a ten point scale. The details of the grading system are given in the following Table.

### Percentage Equivalence of Grade:

Range of % of Marks	Grade Letter	Performance	Grade Point
95 - ≤ 100	O	Outstanding	10
85 - < 95	A plus	Excellent	9
75 - < 85	A only	Very Good	8
65 - < 75	B plus	Good	7
55 - < 65	B only	Above Average	6
45 - < 55	C	Average	5
40 - < 45	P	Pass	4
< 40	F	Fail	0
Absent	Ab	Absent	0

'P' grade is required for a minimum pass in a course. The minimum GPA required for a pass in the Certificate programme is 4.

### Calculation of Grade Point Average (GPA) :

**Credit Points for the Course** = (No. of Credits assigned for the course x Grade Point secured for that course).

**GPA** indicates the performance of a student in the programme. GPA is based on the total **credit points** earned by a student in all the courses divided by the total number of credits assigned to the courses required in the programme.

Note: GPA is computed only if the candidate passes in all the required courses (gets a minimum required grade for a pass in all the required courses as per the curriculum).

$$\text{GPA} = \frac{\text{Total credit points earned by the student from all the required courses of the programme}}{\text{Total credits of all courses required in the programme}}$$

This formula shall be printed on the Grade Card issued to the student with a note that it could be used to convert the grades into mark-percentages. (The details of the grading system as indicated above shall also be printed on the Grade Card).

### Conversion of GPA to Grade

GPA	Grade
10	O
9.0 - < 10	A plus
8.0 - < 9	A only
7.0 - < 8	B plus
6.0 - < 7	B only
5.0 - < 6	C
4.0 - < 5	P
< 4	F
Absent	Ab

### Conversion of GPA to percentage

$$\text{Equivalent Percentage} = (\text{GPA obtained}) \times 10$$

**b) Requirement of the laboratory support and library resources:**

The library and infrastructure support of the Centre will be extended to learners as per requirement.

Mahatma Gandhi University Library and Information System consists of University Library, libraries of the Schools and Libraries of the 4 study centres. The University Library was established in 1989. The University Library which is situated on the main campus and provides a variety of facilities and has a user-friendly environment. These include individual work spaces, room for group study and teaching, audio-visual access and online information retrieval system. The building of the University Library is 2000 sq.m in area and consists of the cellar, the ground floor and the first floor.

Academic as well as public users are given the facility to use the library. Special category membership is provided to journalists. The library provides service from 8 am to 8 pm in three shift timings for its staff. The library functions on an average of 345 days in a year. Reading space is provided on all the three floors housing the various sections of the library. The library provides reading facility to visually impaired users too. For this, an electronic lab custom made for visually and physically challenged users has been set up during 2016. The libraries of teaching departments are open during working hours of the Schools.

The University Library has a Library Advisory Committee. It is an 18 member committee with the Vice-Chancellor as Chairman and University Librarian as Convener.

The library has a collection of 59,000 books, 232 journals, 2,135 Ph.D. theses and has access to 15000+ e-journals under E-Shodh Sindhu. The activities of the Library are comprehensively automated using open source library management software KOHA. OPAC, Journal Article Index, Bi-monthly Bibliography compilation and Literature Search Service are also available

The library is a member of the INFLIBNET Centre, Ahmedabad as well as & DELNET (Developing Library Network). As a member of these networks, the library provides access to the resources of other major libraries in the country. In addition to the access to UGC INFONET consortium, it has access to major online databases, such as EBSCO, ProQuest dissertations and theses, Oxford Scholarship Online, IEEE All Society Periodicals Package etc. Mahatma Gandhi University had won the State IT Award during the year 2009 in the e-learning category for its online thesis digital library. The various department libraries too have a good collection of subject specific books and journals.

<b>A. MAHATMA GANDHI UNIVERSITY LIBRARY</b>	
<b>Category</b>	<b>No.</b>
Books	59000
Journals	232
Bound Journals	7500
Ph.D theses	2135

E-Journals (in UGC-Infonet, renamed as E-ShodhSindhu)	15000
Online databases (in UGC Infonet)	11
Online Archives subscribed	185 Titles
Online databases subscribed	4
E-books	7338
DVDs: Educational Videos	293

<b>B</b>	<b>Name of School/Centre</b>	<b>Total No. of books</b>
	Advanced Centre for Environmental Studies and Sustainable Development	393

**c) Cost estimate of the programme and the provisions:**

Budget estimate (for 100 students)

S.No.	Item	Amount (Rs. in Lakh)
1.	Manpower	3
2.	Study material	2.5
3.	Laboratory	1
4.	Internal assessment	0.5
5.	End semester examination	1.5
	<b>Total</b>	<b>8.5</b>

**Total Programme fee: Rs.9000/-**

**d) Quality assurance mechanism and expected programme outcomes:**

The quality of the programme will be ensured through strict monitoring by an executive committee that includes the Co-ordinator of the programme, subject experts, Director, School of Distance Education and Head of the Advanced Centre for Environmental Studies and Sustainable Development. The Co-ordinator of the programme shall ensure regular student feedback of courses, teachers and the programme in the prescribed format towards the end of the semester and the same shall be analysed to draw conclusions for effecting improvement. Periodical review meetings on the programme's efficacy will be held, in which the remarks of teachers on curriculum, syllabi and methods of teaching and evaluation will be given due importance. Moreover, the progress and the quality of the programme will be monitored by the Internal Quality Assurance Cell of the University from the outcome and feedback of the learners as well as the proper documentation maintained in the Centre.

.....

## Syllabus

### **Certificate in Waste Management**

#### **Course 1. Liquid waste Management**

**Unit I :** Introduction – Waste management : an overview , Liquid wastes : Municipal, Domestic and Industrial wastewater , Solid wastes : Municipal and Industrial Solid wastes , Environmental Engineering and Environmental Systems – an overview: Mass- balance approach to problem solving

**Unit II :** Wastewater - Water resource and its significance – Water : a remarkable substance of planet earth , Water pollution : Types, sources and impacts – Surface water, ground water pollution, Wastewater : Domestic – black and grey water; industrial and agricultural wastewater

**Unit III:** Wastewater Treatment - Flow – Sheets: Unit operations and unit processes , Primary treatment, Pre – treatment : Screening – bar racks, Grit removal, Communication, Flow – equalization., Sedimentation : Design concepts, Secondary treatment : Chemical unit processes: Precipitation, Coagulation, Disinfection Process design , Biological unit processes : nature and kinetics of biological growth : Aerobic process – activated sludge system, trickling filters , Anaerobic process – CSTR, Anaerobic Filters, UASB Oxidation ponds Process design. Advanced techniques: Membrane filtration, Gas stripping, Ion exchange, Advanced Oxidation Process (AOP).

**Unit IV –** Water reuse: Water reclamation and reuse: Water reclamation technologies – process flow diagrams; Public health and environmental issues in water reuse, Agricultural and landscape irrigation; ground water recharge with reclaimed water – ground water recharge guidelines; Risk assessment for water reuse, Industrial water reuse: Cooling tower makeup water.

#### **References**

1. Abbasi, S. A. (1998). Environmental Pollution and its Control. Cogent International, Pondicherry.
2. Abbasi, S. A. and Ramasamy, E. V. (1999). Biotechnological Methods of Pollution Control. Universities Press (India) Limited, Hyderabad.
3. Peavy, H. S., Rowe, D. R. and Tchobanoglaus, G. (1985). Environmental Engineering, McGraw Hill Book Company, Singapore.
4. Rand, M. C., Greenberg, A. E. and Taras, M. J. (Ed.) (1995). Standard methods for the examination of water and wastewater: 19<sup>th</sup> edition, American Public Health association (APHA), Washington, D.C.
5. Scragg, A. (1999). Environmental Biotechnology, Addison Wesley Longman, Singapore.



6. Tchobanoglous, G. (1988). Wastewater Engineering: Treatment, Disposal, Reuse. Tata McGraw Hill, New Delhi.

## **Course 2. Solid Waste Management**

**Unit 1:** Types of solid wastes: municipal solid waste, industrial wastes,, hazardous wastes, hospital solid wastes. Evolution of Solid Waste Management - Solid waste: A consequence of life - Waste generation in a technological society - Material flow and waste generation - The development of solid waste management - Integrated solid waste management - Planning for integrated waste management - Operation of solid waste management system.

**Unit II:** Municipal Solid Waste Characteristics - Solid waste generation – Composition - Determination of composition, Particle size - Heat value - Bulk and material density - Types of materials recovered - Mechanical properties - Biodegradability.

**Unit III:** Collection of Solid Waste, Refuse collection systems- Commercial wastes - Transfer stations - Collection of recyclable materials - Litter and street cleanliness - Design of collection system.

**Unit IV:** Solid waste treatments: Landfills - Classification - Types and methods. Biological process – Composting - production of biofertilisers and energy. Thermal process – Incineration, gasification, wet oxidation, pyrolysis, pelletisation and energy production. Waste management through Reduce, Recycle and Reuse. Kitchen waste management. Current Issues in Solid Waste Management - Public and private ownership and operations - Role of the solid waste engineering.

### **References**

- 1) Aarve, V. P., William, A. W. and Debra, R. R. (2002). Solid waste engineering. Cengage reading, USA.
- 2) George, T., Hilary, T. and Samuel, A. V. (1993). Integrated solid Waste Management, Engineering Principles and Management Issues, Mc Graw Hills.
- 3) George, T. and Frank, K. (2002). Handbook of solid waste management: (Second Edition). Mc Graw Hills.
- 4) Tammemagi, H. Y. (2000). The Waste Crisis: Landfills, Incinerators, and the Search for a Sustainable Future. Oxford University press.
- 5) Kanthi, L. S. (2000). Basics of Solids and hazardous waste management Technologies. Prentice Hall.

### **Course 3. Hazardous Waste Management**

**Unit I:** Introduction - Definition and classification of hazardous waste- Need for hazardous waste management – Sources of hazardous wastes – Effects on community – terminology and classification – Storage and collection of hazardous wastes – Problems in developing countries – Protection of public health and the environment.

**Unit II:** Nuclear Wastes and e-waste - Characteristics – Types – Nuclear waste – Uranium mining and processing – Power reactors – Refinery and fuel fabrication wastes – spent fuel – Management of nuclear wastes – Decommissioning of Nuclear power reactors – Health and environmental effects.

**Unit III:** Biomedical and Chemical Wastes - Biomedical wastes – Types – Management and handling – control of biomedical wastes - Chemical wastes – Sources – Domestic and Industrial - Inorganic pollutants – Environmental effects – Need for control – Treatment and disposal techniques – Physical, chemical and biological processes – Health and environmental effects.

**Unit IV:** Physical and Chemical Treatments - Filtration and separation – Chemical precipitation - Solidification and stabilization technique – Chemical oxidation and Reduction – pervaporation – ozonation – Evaporation.

Remedial actions - Techniques : Containment techniques – In situ Biotreatment options – Site remediation – Phytoremediation – Biofiltration

#### **References**

- 1) Glynn, H. J., and Gary, W. H. (2004). Environmental Science and Engineering. Prentice Hall, India.
- 2) Bhide, A. D. and Sundaresan, B. B. (2001). Solid Waste Management – Collection, Processing and disposal. Mudrashilpa Offset Printers, Nagpur.
- 3) Biomedical waste (Management and Handling) Rules, Ministry of Environment and Forestry (1998).
- 4) Syed, E. H. (1996). Geology and Hazardous Waste Management. Prentice Hall.
- 5) Michael, D. L., Phillip, L. B. and Jeffrey C. E. (2001). Hazardous waste management. Mc Graw-Hill.
- 6) Charles, A. W. (1995). Hazardous waste management, Mc Graw-Hill.

### **Course 4. Case study / Project and Report**