

Regulations and Syllabus
For
**POST GRADUATE DIPLOMA IN SOLID WASTE
MANAGEMENT**

Offered by
BHARATHIAR UNIVERSITY, COIMBATORE

From 2010 – 2011

Under the
**CENTRE FOR COLLABORATION OF
INDUSTRY AND INSTITUTIONS (CCII)
COLLABORATIVE PROGRAMME**

Regulations and Syllabus

(Effective from Academic Year 2010 onwards)

1. Description of the course / objective of the course

Participants completing PGDSWM will be equipped with good insight into the current environmental and health problems caused by inadequate solid waste management, the strategies and approaches to resolve these problems as a best public health functionary.

2. Eligibility for admission

Candidates for admission to the PGDSWM course shall have passed degree in any discipline and an employee of urban sector. They should have minimum of one year work experience in urban sector.

3. Duration of the course

The duration of the PGDSWM course shall be for a period of one year. The total number of contact classes shall be 360 hours. Examinations will be conducted at the end of the year / period for the respective subjects.

4. Course of study

The Course of study shall contain the subjects as defined in section – 6.

5. Examination

The participants will be undergoing a continuous assessment throughout his/her period of study. The evaluation will consist of internal examinations and external examinations for each subject based on the specific requirements of the respective subjects.

5 (A). Evaluation systems and question papers

There will be three methods of evaluation

- a. Internal Assessment conducted by the Institute.
- b. The External examination conducted by the university at the end of the year for the subjects concerned.
- c. Project evaluation consisting of Viva-voce which conducted by the Institute.

a) Internal Assessment

Internal Assessments will be conducted for all the subjects for 100 marks which will be converted to 40 percent of total marks.

Tests conducted in the Institute	-	50 marks
Class Participation	-	30 marks
Assignments	-	20 marks

b) External Examination

The External examination shall be conducted by the University for 100 Marks and will be converted to 60 percent of total marks. The pattern of question papers will be as follows,

Section A: Objective type with multiple choices (20 questions 4 from each unit)	-	20%
Section B: Short answer question of 'either or type' (10 questions 2 from each unit)	-	40%
Section C: Essay type question of 'either or type' (5 questions 1 from each unit)	-	40%

c) Project evaluation

Each project work will have an Internal and

Continuous Assessment	-	40%
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Term end evaluation will contain two components:

Viva-voce examination	-	30%
Dissertation evaluation	-	30%
Total	-	100%

6. Examination Scheme

Sl. No	Paper Code	Paper Title	Final Exam Marks		Total Marks
			Internal Marks	External Marks	
1.	10PGDSWM01	Introduction to Solid Waste Management	40	60	100
2.	10PGDSWM02	Hazardous Waste Management	40	60	100
3.	10PGDSWM03	Environmental Policies and Legislation	40	60	100
4.	10PGDSWM04	Sustainable techniques in municipal solid waste management	40	60	100
5.	10PGDSWM05	Management of urban waste services	40	60	100
6.	10PGDSWM06	Project work	40	60	100

7. Requirement to appear for the external examination

A candidate will be permitted to appear for the university external examination of any year if he/she secures not less than 90% of attendance in the number of instructional days, failing which he/she should redo that course of study.

8. Medium of instruction and Examination

The medium of instruction and examination for all the papers shall be English/Tamil.

9. Passing requirements

- a) A candidate shall be declared to have passed the examination in a subject if he/she has secured not less than 40% in the university examination both internal and external examination (overall).
- b) A candidate who successfully completes the course and passes the examination prescribed in all the subjects of study shall be declared to have been qualified for the Post Graduate Diploma in Solid Waste Management.

- c) If a candidate does not complete the course successfully within a period of 6 years from the date of his/her joining he/she will not be eligible to receive the Post Graduate Diploma in Solid Waste Management.

10. Classification of Successful Candidates

- a) All candidates securing not less than 75% of the aggregate marks shall be declared to have passed in FIRST CLASS with DISTINCTION provided they have passed the examination in every subject without failure in one attempt within the minimum prescribed duration of study.
- b) All the candidates securing not less than 60% of the aggregate marks shall be declared to have passed in FIRST CLASS provided they have passed the examinations in all subjects.
- c) Other successful candidates shall be declared to have passed the examination in SECOND CLASS.

11. Conferment of the PG Diploma

Candidates shall be eligible for conferment of the PG Diploma if he/she has undergone the prescribed course of study for a period of one year in the institute and also has passed the examinations as prescribed.

12. Syllabus

The detailed syllabus for the course is as follow

Sl. No	Paper Code	Paper Title
1.	10PGDSWM01	Introduction to Solid Waste Management
2.	10PGDSWM02	Hazardous Waste Management
3.	10PGDSWM03	Environmental Policies and Legislation
4.	10PGDSWM04	Sustainable techniques in municipal solid waste management – Case Studies
5.	10PGDSWM05	Management of urban waste services
6.	10PGDSWM06	Project work

PAPER - I

Introduction to Solid Waste Management (Total Hours - 60)

Unit - I (6hrs)

Introduction to Environment

Ecosystem –meaning- Types -Components- Structure – Functions, Levels of organization in nature- Food chain and Trophic structure, Biogeochemical Cycles, Energy flow.

Unit - II (6hrs)

Municipal solid waste

Definition - Sources and types of solid waste- composition and its determinants of Solid waste-factors influencing generation-quantity assessment of solid wastes-methods of sampling and characterization.

Unit - III (24hrs)

Collection and Transfer

Collection: Collection of Solid waste – collection services – collection system, equipments – time and frequency of collection – labour requirement – factors affecting collection – analysis of collection system – collection routes – preparation of master schedules.

Transfer and Transport: Need for transfer operation – transfer stations – types – transport means and methods – location of transport stations - Manpower requirement – collection routes: Transfer stations – selection of location, types & design requirements, operation & maintenance.

Unit - IV (12hrs)

Processing Techniques and Recovery of Energy

Processing techniques – purposes mechanical volume reduction – necessary equipments – chemical volume reduction – incinerators – mechanical size reduction selection of equipments – components separation – methods – drying and dewatering.

Recovery of Resources, conversion products and energy recovery – recoverable materials – processing and recovery systems – incineration with heat recovery.

Unit - V

(12hrs)

Disposal of Solid Wastes

Refuse disposal – various methods – incinerations – principle features of an incinerator – site selection and plant layout of an incinerator - sanitary landfill- methods of operation – advantages and disadvantages of sanitary land fill - site selection – reactions accruing in completed landfills – gas and leachate movement and control – equipments necessary.

References

- 1) George Tchobanoglous et al, "Integrated Solid Waste Management" McGraw - Hill, 1993.
- 2) Tchobanoglous Thiesen Ellasen; Solid Waste Engineering Principles and Management, McGraw - Hill 1997.
- 3) R.E.Landrefh and P.A.Rebers, "Municipal Solid Wastes-Problems & Solutions" ,Lewis, 1997.
- 4) Manual on Municipal 1 Solid waste Management, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000.
- 5) Blide A.D.& Sundaresan, B.B, "Solid Waste Management in Developing Countries", INSDOC, 1993.
- 6) Ecology Science and Practice; Claude Fourie, Christian Ferra, Paul Medori, Tean Devaux, Oxford and IBH Publishing Co (Pvt) LTD, special Indian edition.
- 7) Principles of Ecology- P.S.Verma, V.K.Agarwal.S.Chand & Company (Pvt) LTD 1989.

PAPER – II

Hazardous Waste Management (Total Hours - 65)

Unit – I

Introduction (6hrs)

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 (13hrs)

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 (20hrs)

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

The scientific landfill (13hrs)

Concept – function – site selection and approval – acceptable wastes – Design and construction – Liners: clay, geomembrane, HDPE, geonet, geotextile – Treatment and disposal of leachate – Combined and separate treatment. Site remediation – Remedial techniques.

Unit – V

Management of hazardous wastes

(13hrs)

Identifying a hazardous waste – methods – Quantities of hazardous waste generated – Components of a hazardous waste management plan – Hazardous waste minimization – Disposal practices in Indian Industries – Future challenges.

References

- 1) J. Glynn Henry and Gary. W. Heinke, “Environmental Science and Engineering”, Prentice Hall of India, 2004.
- 2) A. D.Bhide and B.B.Sundaresan, “Solid Waste Management – Collection, Processing and disposal” Mudrashilpa Offset Printers, Nagpur, 2001.
- 3) Biomedical waste (Management and Handling) Rules, 1998.

PAPER - III

Environmental Policies and Legislation (Total Hours - 65)

Unit – I

Environment Definitions and Acts (7hrs)

Environment definition in Indian law- Different environmental protection legislations- History of Environmental protection in India - Provisions in Indian Penal Code for Environmental protection-The constitutions of India – Union list- State list – Concurrent list - Panchayats and Municipalities role

Unit – II

Water (prevention & control of Pollution) Act & Air (prevention & control of Pollution) Act (16hrs)

Water pollution – definition – Water (Conservation and protection) Act 1974 – Objectives of Water Act – Legislation to control water pollution – Functions of CPCB and SPCB - Local bodies role – Water (prevention & control of pollution) Act 1974 as amended by Amendment Act 1988. Water (prevention and control of pollution) Rules 1975 - Water (prevention & control of Pollution) Cess Act 1977 as amended by Amendment Act 1987 and relevant notifications - Tolerance limits for effluents discharge and drinking water - Constitution and Resources management and pollution control – Air (prevention & control of Pollution) Act 1981-Sections of Air (prevention & control of Pollution) Act 19, 20, 21, 22-Penalties -Ambient air quality standards-Noise and the Laws

Unit – III

Environmental (Protection) Act 1986 (13hrs)

Environment and pollution - definition as per Environmental law-General powers of Central and state Government under EPA-Important Notification in EPA 1986- The Indian Forest Act 1927- Forest Conservation Act 1980 - Wild Life (Protection) Act - Constitution of Pollution Control Boards - Powers, functions, Accounts, Audit etc. – Equitable remedies for pollution control

Unit – IV

Municipal Solid Waste Management Rules (16hrs)

Solid waste management – Hazardous Wastes (Handling and Management) Rules 1998-Bio-medical Wastes (Handling and Management) Rules 1998-Recycled plastics (Manufacture and Usage) Rules, 1999-Municipal Solid Waste Management Act 2003- Rules - E.I.A and Public Hearing- Eco-labeling-Eco Mark

Unit – V

Coastal Regulation Zone Notification and Green Benches (13hrs)

Coastal Regulation Zone - definition-Importance of coral reef-Regulation activities in CRZ - The Biological Diversity Act 2002-Bio diversity Rules 2004-The Intellectual Property Rights (IPR)-National Environment Appellate Authority –Environmental Tribunal and Green Benches - Some Important cases on Environment - International Conventions - Protocols for protection of the Environment

References

1. Constitutional Law of India – J.N. Pandey 1997 (31st Edn.) Central Law Agency Allahabad.
2. Administrative Law U.P.D. Kesari 1998. Universal Book Trade Delhi.
3. Environmental Law H.N. Tiwari, Allahabad Law. Agency 1997.
4. Environmental, A., Divan and Noble M. Environmental Law and Policy in India (cases, Materials and Statutes) 1991 Tripathi Bombay.
5. Environmental Policy. Forest Policy. Bare Acts – Government Gazette Notificaiton.
6. Environmental Laws of India-C.P.R. Environmental Education Centre

PAPER - IV

Sustainable Techniques in Municipal Solid Waste Management Plan- Case Studies (Total Hours – 60)

Unit – I

Sustainable Techniques for MSWM (6hrs)

Introduction - Segregation-Sorting-Composting-Vermi composting- Home composting- Recycling and Reuse- Incineration method-Scientific Land filling- Energy development

Unit – II

Composting, Incineration and Land filling (16hrs)

Definition and concepts-Palacode Model-Namakkal Model -Thudiyalur Model -Anthiyur Model -Mohanur Model – Exnora Method –CEE method in Bangalore- Coimbatore Corporation Model in Vellalore-Bio medical system in Coimbatore

Unit – III

Reuse and Recycling Techniques (12hrs)

Need for the concept-Variety Types - Hand made Paper production – Reuse of materials-Recycle of materials

Unit – IV

PPP Model (16hrs)

Definition, Concept and need- Tiruppur model-IWMUST Model in Udumalai-Erode-Pollachi-Coonur Model-Bangalore Model

Unit – V

Energy Development

(10hrs)

Chennai Koyambedu Model- Oodandurai Town Panchayat Model -
Developed countries model

References

- 1) J. Glynn Henry and Gary. W. Heinke, “Environmental Science and Engineering”, Prentice Hall of India, 2004.
- 2) A. D.Bhide and B.B.Sundaresan, “Solid Waste Management – Collection, Processing and disposal” Mudrashilpa Offset Printers, Nagpur, 2001.
- 3) Tchobanoglous Thiesen Ellasen; Solid Waste Engineering Principles and Management, McGraw - Hill 1997.

PAPER - V

Management of Urban Waste Services (Total Hours – 50)

Unit – I

Introduction (4hrs)

Urban growth – Municipal management – Administrative framework – Present scenario of solid waste management in ULBs – Current practices and deficiencies in SWM

Unit – II

Institutional aspects (10hrs)

Governmental organization – Central and State governmental agencies – Non-governmental organization – NGOs – CBOs – concepts – scope – methods and application in SWM – Joint venture of Community and ULBs – Role of rag pickers – Public awareness

Unit – III

JNNURM and SWM (10hrs)

Concept – Objectives – Mission – Facilities and Role of JNNURM in SWM – Impact and services – Best examples and practices from Indian perspective – Technological tools – GIS – GPS – MIS – Remote sensing

Unit – IV

Financial aspects (12hrs)

Financing of SWM projects – assessment of finance – Financial support of Central, State government and other financial institutions – Pricing of Municipal services – Cost recovery framework – SWM project evaluation techniques

Unit – V

Personnel aspects

(14hrs)

Protective measures – Hygienic and unhygienic practices – Welfare measures – Productivity of SWM staff and equipments – Training – contents, mode and tools – Motivation – stress management – Non-alcoholic practices – Communication – Change management

References

- 1) Archana Ghose “Urban Environment Management” Local government and community action, Concept publishing company, New Delhi, 2003.
- 2) Rajeev Narayan, “Human Resources Development in Urban Administration” , Serials publication, New Delhi, 2006.
- 3) K.Aswhathappa, “Human Resource Management”, Mc – Grow Hill companies, Third edition, 2007.

PAPER – VI

Project Work

List of Experiments

- 1) Determination of pH of MSW
- 2) Determination of Total Solids, fixed solids and volatile solids
- 3) Determination of nutrient value (NPK)
- 4) Lab scale study on vermicomposting
- 5) Lab scale study of aerobic and anaerobic digesting of solid wastes (Both industrial & Municipal)

List of Practical

- 6) A Visit to the Hazardous waste Generation or disposal site.
- 7) Practical knowledge and working of incinerators
- 8) Visit to Industrial area, especially the handling of Hazardous materials
- 9) Ecology baseline and impact of waste – disposal on vegetation
- 10) Preparation of Project report based on a case study of one hospital

Study of the source, generation rates and characteristics of hazardous wastes and their regulation, handling, treatment, and disposal. Special emphasis is placed on process design of waste handling, treatment and disposal systems.

Any one of the above practical can be chosen by the candidate.