

MBA Programme in Waste Management and Social Entrepreneurship



MHRD

Government of India
Ministry of Human Resource Development

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Waste Management and Social Entrepreneurship – Way towards Swachhta

Of late, employment generation and entrepreneurship is becoming a prime mover of environment management. Gandhiji saw *Swachhta* as a means of spreading dignity of labour and equality in the communities. No matter what vocation one chooses, one must face the issues of '*swachhta*'. The term '*swachhta*' is a Hindi word meaning cleanliness. But essentially it implies environmental management as a step towards sustainability.

We are a generation at the crossroads of a major natural resource crunch and very soon we will find it difficult to sustain this burgeoning population of ours. Nature has always been kind to provide bountiful resources simply because every substance in nature follows a cycle of creation and destruction and thereby regular replenishment which has been taking place silently since eons. However, despite having learnt to utilize these natural resources through science and technology, humankind is falling prey to its over-usage causing serious depletion of resources. This is the result of human interventions causing incomplete ecological cycles. Now the key to reversing the damage caused over centuries lies in facilitating the completion of the natural cycles and restoring nature's innate balance. Yes, this is possible.

To convert this theory into reality, a large, trained cadre of focused workforce needs to be put into place. Today as the youth are facing job crunch and technology is making many of the traditional familial jobs redundant, the field of *Swachhta* or Cleanliness opens many doors. It has the potential to provide fulfilling, well-paying livelihoods and holds the promise to a clean, liveable future. The students who choose this line of study are opting into not just for a career, but a healthy living for themselves and for the society. An MBA Programme in Waste Management focusing on Waste management and Social Entrepreneurship will empower today's youth to leave an indelible mark on the sands of time.

About MGNCRE

Mahatma Gandhi National Council of Rural Education (MGNCRE) under the Ministry of Human Resource Development, in Government of India, strives to promote resilient India through Higher Education interventions. MGNCRE designs, develops and promotes curriculum inputs for higher education programmes offered by Universities and Autonomous Institutions in India. The higher educational streams of focus for MGNCRE include: Rural Studies, Rural Development, Rural Management, Social Work and Education. The curriculum inputs are both theoretical and practical field-related relevant to rural India. With a vision to involve higher education curriculum in India in the process of building resilient rural India i.e., *Uthkrisht Gram for Unnat Bharat*, MGNCRE is involved in formulating and recognizing curricular inputs and accredit courses and higher educational institutions, which enable development of sustainable, climate and disaster resilient rural livelihoods.

As part of its constant endeavour to facilitate learning and greater awareness among the students in Higher Education Institutions (HEIs) about the surrounding environment and rational and better management of the finite resources, MGNCRE proposes the preparation of curriculum of an MBA Programme on Waste Management and Social Entrepreneurship.

While remembering Mahatma Gandhi on his 150th birth anniversary it is a bounden duty of all us to take on his ideals and present national priorities of *Swachhta* from this historical perspective. Gandhiji saw *Swachhta* as a means of spreading dignity of labour and equality in the communities. No matter what vocation one

chooses, one must face the issues of 'swachhta'. Essentially it implies environmental management as a step towards sustainability. It also offers potential for entrepreneurship and employment.

Scope

The MBA Programme in Waste Management focusing on Waste Management and Social Entrepreneurship is proposed as a new course with a fresh take on age-old nagging issues of the much neglected sector of Waste Management – its Reuse, Recycle and issues of Cleanliness and Sanitation. There is a burning need to motivate people to invest their time and resources in the core issues of Swachhta.

It is therefore crucial to make these 2 years in the students' life the most useful and enriching to their careers. The success of the first few batches could well be the turning point in the history of Indian Environment. Being a newly introduced course, it is likely that it may not be well known for attracting more students to join this course on their own accord. They may be looking at it from a career point of view. However, the majority of the others would be pressurized by family or circumstances to undertake this programme. Hence, the new adage "I hear and I forget; I see and I remember; I do and I can do it again and I repeat it I can of course do it better" has been deployed while creating this curriculum for MBA in EH-W- SWM.

With this pragmatic and realistic outlook, MGNCRE has designed and created this curriculum which will hold the interest of the student and guarantee their lifelong dedication to the arena of swachhta and building a better nation – both entrepreneurially as well as personally. At the end of the programme, our students should transform into confident, responsible, reflective, innovative individuals who are socially and intellectually engaged in environment management, i.e., Swachhta. The potential area that such students can venture into further are annexed to this proposal.

Background

As Mahatma Gandhi rightly said, "Earth provides enough to satisfy every man's needs, but not every man's greed." We are a generation at the crossroads of a major natural resource crunch and very soon we will find it difficult to sustain this burgeoning population of ours. Earth can provide sufficiently for all its denizens due to its aptitude for recycling resources unendingly- such as through the water cycle, nutrient cycles, etc. Human interventions have caused failure in the proper cycling of resources. The solution lies in facilitating the completion of the natural cycles and restoring nature's innate balance through proper waste management. However, it is not easy to change habits and routines, especially with the advent of modern lifestyle that encourages disposable. A large, trained cadre of focused workforce is needed to bring about this change.

Key Features

The following core characteristics form the basic framework of the community-based learning model in the MBA Programme in Waste Management focusing on Solid Waste Management and Social Entrepreneurship curriculum.

Contemporary, Relevant, Completeness of Content: It adopts a multi-disciplinary approach incorporating key elements of management including development and planning, resilience management and social entrepreneurship. It will equip the student to harness emerging and growing opportunities in the public and private domains in the industry sector.

Inclusive and Equitable: MBA Programme in Waste Management focusing on Waste Management and Social Entrepreneurship curriculum must promote opportunities to handle the scale and potential of village based economic activities efficiently for various

social groups and encompassing the array of economic activities including the students who pursue the curriculum.

Experiential Learning: In MBA Programme in Waste Management focusing on Waste Management and Social Entrepreneurship, learning tasks are active processes and they allow students to assume an active role in the decision making process in practice.

Personal and Public Purpose: In field level engagement process, the learning goals connect personal achievement of the students for professional careers to public purpose of improving the managerial input into the industry spheres. It is a professional attempt to attain an effective balance between education and economic development.

Practical and Competency Based: MBA Programme in Waste Management focusing on Waste Management and Social Entrepreneurship course curriculum provides framework for continuous community-business interaction, exposing students to the challenges of living. It enables development of competencies and values to address industrial challenges effectively.

Assessment and Feedback: MBA Programme in Waste Management focusing on Waste Management and Social Entrepreneurship Course is based on ongoing assessment supported by mentoring. It provides the students an opportunity to learn from their successes and failures.

Resources and Relationships: Community partnerships increase effectiveness of harnessing community resources and community relationships. Students extensively use these partnerships during learning and action, making the process interactive and real time learning.

Curriculum Design

- Objectives
- Rationale
- Pedagogy
- Proposed Model of Curriculum
- Assessment
- Outcomes

Program Objectives

The following objectives have been framed for the proposed curriculum.

- To understand the changing pattern and profile of Waste Management and Social Entrepreneurship in India.
- To study and understand the changing profile of Waste Management and Social Entrepreneurship in India in terms of consumption patterns, land use patterns, lifestyles, living standards, usage and location.
- To study and understand waste identification, segregation, collection, transport and management and issues in waste management.
- To study and understand water budget, water use, sewerage, wastewater recycling and management and issues in wastewater management.
- To study and adopt various interventions in Waste Management and Social Entrepreneurship including warehousing, marketing, communication, financial management, human resource management and project management.
- To understand, learn and practice various research methodologies and use tools for data analytics in the Waste

Management and Social Entrepreneurship sector.

- To study Waste Management and Social Entrepreneurship infrastructure needs and align them with the local government budgets and programs.
- To understand the new village-technology interface in terms of information, participatory processes, mainstream and alternative technologies in agriculture, rural livelihoods and Waste Management and Social Entrepreneurship.
- To provide practical opportunities for students for participation in community mobilization for Waste Management and Social Entrepreneurship Infrastructure development and maintenance.
- To create interface programs with public representatives and district authorities for implementing local projects, Central/State Government schemes and address their challenges
- To develop an understanding about Entrepreneurship
- To develop entrepreneurial skills in the youth
- To explore and identify potential for a business idea
- To develop skills to convert the idea into a commercial viable business concept
- To measure the feasibility of the identified concept by the students
- To develop a framework for integrating the business concepts and markets
- To develop and implement Enterprises.

Rationale

MBA Programme in Waste Management focusing on Waste Management and Social Entrepreneurship with community engagement methodology will be a big game changer for India. In view of the continued industrial distress, though traditional extension and outreach programs have been desperately trying to bring in the desired outcomes, these are just not sufficient to bridge the gap between the demand for technically qualified professionals in Waste Management and Social Entrepreneurship (to be supplied by the higher education institutions) and the current availability of managers. What is required is an approach that extends beyond service and outreach to actual 'engagement'.

Pedagogy

1. *Class Room teaching*
2. *Case Studies*
3. *Problem Solving*
4. *Group Exercises*
5. *Group Discussions*
6. *Audio, Video, Film-based discussions*
7. *Field Visits*
8. *Internship*
9. *Report-writing and Documentation*

Transaction Approach and Teaching Methodology

The course covers a large variety of topics. It is recommended that the educational Institute offering this course collaborates with a large number of agencies working in allied sectors, during and after the course.

Through the association the Institution initiating this Course can benefit in the following manner:

- Firstly, the experts from these institutions could be invited to speak on the subject, thereby enriching classroom lectures.
- Secondly, the same experts could liaison with their parent institution for a field visit to their workplace/ institution.
- Finally, they can also guide a certain number of students during their internship within their own organization.

Transaction Resources

Resources including Reference Books, Films, PPTs, caselets and Case Studies, Community Project Work and Field Work; Course material and caselets will be prepared by Mahatma Gandhi National Council of Rural Education (MGNCRE). Suitable video and text resource material along with case studies will be identified and a copy will be provided where they are available free of cost in open source.

The Educational Institute initiating this Course should connect with a variety of institutions including the local government hospital, reputed private hospitals, 5-star hotels, local restaurants, campus canteen/ mess, a near-by Gram Panchayat, local religious institution (temple/ mosque/ church which holds at least one large scale annual event), construction sites, shopping malls, textile manufacturing units, refineries, pharmaceutical companies, etc., Local Municipality - to expose students to current solid waste management and waste water treatment facilities, a local food processing unit, a large garment manufacturing unit, glass recycling unit, glass producing unit. Unorganized sector of *kabadiwalas*, ship breaking, or other such entities should be included because often these have the most environmental concerns and least safeguards due to various reasons. Also plan visits to organic nursery, a local dairy farm, a local vegetable or fresh meat market and abattoir.

The purpose of the field visit is to observe the *swachhta* aspect at each location. Questions that must be pondered to during such visits are:

- How do the authorities maintain sanitation?
- How are the waste/ by-products disposed of?
- How much of it is recycled or reused?
- Which areas need improvement?
- What are the legal permissions sought and procured?
- What are the Standard Operating Procedures (SOPs) on such matters?
- Is there a Compliance and/or Non-compliance?
- What are some of the good practices and similarly avoidable practices etc.

Students should interact with not only the staff of institution they visit, but also the community living around the area to verify and validate claims and counter-claims through discussion and observation. For instance, look at the waste disposal trends in independent houses vs. apartments. Allow them to debate on the pros and cons of each style of living.

Working in teams, students will analyze the information gathered from their field visit and present their findings and suggestions in their weekly seminar. It is essential for students to be exposed to well- managed places as a source of inspiration as well as poorly managed places to give them an opportunity to compare and find economically viable solutions to sanitation issues. This will help them appreciate as well as examine the issue critically. If students arrive at any attainable solutions, these must be intimated to the said institution in a well-written report, suitably edited by the concerned faculty. If the institution visited is suitable for encouraging *shramdaan* (or Community labour), this must be welcomed and organized by the Department.

Practicals

The course prescribes practical activities, done in a scientific manner. These experiments should include scientific experiments to test the quality of air, water, soil and food. For instance, it is necessary to understand the concept of leaching, hardness of water, microbial growth, composition and nature of common cleaning agents. Also documenting experience on people's participation would be useful. The Indian mindset is to some extent fatalistic and pessimistic, especially in matters related to social evils. Often people ignore cleanliness issues until they become too large to tackle. Every student in class must be exposed to this mindset and be trained to persuasively counter-argue to change this mindset.

The intent of this entire curriculum is to create a well-rounded individual ready to face the challenges of *Swachhta* armed with the knowledge and skills to handle the issues without fear or hesitation. As the course has a heavy focus on out-of-classroom teaching, it is recommended that this point should be explained at the time of admission and an appropriate fee be charged for organizing field trips. The most cost-effective mode of public transport should be selected for each field visit.

Project

Students get a chance to apply their knowledge and skills in an individual project investigating environmental *swachhta* issues in the local context. They must identify a local environmental problem, which is specific, accessible and measurable. They must then analyse it from the point of view of a natural resource, its use and progress to the impact of the activity with details of management/ mismanagement. Data collection must include a component of field work to procure some primary data using a suitable range of research techniques. Primary and secondary analysis should draw some meaningful conclusions and workable solutions. Present the report in an orderly and reasoned way, supported by a suitable range of illustrative techniques.

This project will be conducted under the guidance of a teaching faculty in association with the collaborating agency where the student completes their Internship. At the end of the second semester, the students will submit a concise written report (of about 3,000-4,000 words, i.e., about 10 pages) and make a verbal presentation before his peers, opening their project to scrutiny and debate. The written report should be compact, with a clear title, contents page, logically ordered sections, list of sources, bibliography, acknowledgements. The sections should include aim, background information, and description of research methods, proper presentation of primary and secondary data, analysis, a reasoned conclusion, and suggestions for improvement. If a solution was tested in field, the report should contain the results of the trials and further lessons from it. Summary of raw data, questionnaires and experiments should be included in the appendix.

Guide's Role in Project Work

The faculty member will explain the scope of topic, range of research methods available, help the student to choose a project topic which is of particular interest to him/her. The topic could be original or a repeat from previous batches, but the research should be done afresh with primary data collection and a new line of enquiry so that it leads to new conclusions, analysis and improved solutions. The supervisor will discuss problems and difficulties encountered during the research and suggest appropriate presentation techniques. Guides should ensure that photographs, tables of data, etc. from other sources, should not be copied and included in their original form; instead candidates should translate such data into a form of their own. Similarly, plagiarism from library, Internet or other sources is not permitted.

Proposed Model of Curriculum for MBA in Waste Management covering Waste Management and Social Entrepreneurship

The Programme

The Indian economy has a vast potential for development through micro, social and innovative enterprises. Higher education Institutions need to contribute in the socio-economic development through capacity building and human resources development in the critical areas of market linkages, entrepreneurship, technology development, microfinance, livelihoods and skill development, natural resources management, management of agriculture and technical assistance in the areas of health, education, management of village administration, sanitation and infrastructure development. Thus, a two year MBA Programme in Waste Management focusing on Waste Management and Social Entrepreneurship developed with a multi- disciplinary approach will equip the student to tap the emerging and growing opportunities in the public and private domains.

In the first year, this program will dwell into specially identified oriented courses that cover general principles of management and the core subjects provide students with basic analytical, decision making and inter personal skills. Thus most of the topics handled in the curriculum in the first year can be same as that are present in any other general management course. The context and the focus must be on the Waste Management and Social Entrepreneurship sector.

This program stands out for its Waste Management and Social Entrepreneurship component- in-depth field exposure, duration and frequency. It has three components of field engagement and learning opportunities for students, covering Government Organizations, NGOs and commercial enterprises like co- operatives or social and industrial business enterprises. Vast online repositories through university libraries and other digital media provide a unique ability for Higher Education Institutions to share success and failure case studies and experiences in ways that were unimaginable in 1980s.

MGNCRE-Structurefor2-YearMBAProgrammeinWasteManagement and Social Entrepreneurship

Semester1				Semester2			
Courses	No.of Credits	No.of Sessions		Courses	No. of Credits	No. of Sessions	
101: Introductionto Waste Management	4	40hrs	107:Lab,FieldVisit(1month) (4credits)	201: Individual and Organizational Behaviour	4	40hrs	206:FieldExperience: -2months(8credits)
102: PrinciplesandPracticesof Management	4	40hrs		202: Waste Management Logistics and Technical Processes and Methods	4	40hrs	
103: Fundamentals of Operations Management	4	40hrs		203: FinancialManagement	4	40hrs	
104: ManagerialEconomics	4	40hrs		204: MarketingManagement	4	40hrs	
105: Financial Accounting	4	40hrs		205: Entrepreneurship in Waste Management	4	40hrs	
106: ResearchMethodsfor Management	2	20hrs					
Total Credits(22+4)	26			Total Credits(20+8)	28		
Curriculum-Second Year							
Semester3				Semester4			
Courses	No. of Credits	No. of Sessions		Courses	No. of Credits	No. of Sessions	
301: Human Resource Management and Organizational Development	4	40hrs	306: FieldExperience on waste management (1month) 4 credits	401: ICTandMIS	4	40hrs	
302: StrategicManagement	4	40hrs		402: WasteManagementas Project Management and GIS	4	40hrs	
303: Regulatory Framework- Legal Aspects and Mandatory Regulations	4	40hrs		403: CreativityandInnovation	4	40hrs	
304: Elective1	4	40hrs		404: Elective3	4	40hrs	
305: Elective2	4	40hrs					
Credits(20+4)	24			TotalCredits	16		

Electives	Code	Courses	Credits
Operations Management(OM)	OM-1	Operations and Maintenance	4
	OM-2	Environment Impact Assessment	4
	OM-3	Cost of non-management of Solid and Liquid Waste	4
	OM-4	Hotel Waste Management	4
	OM-5	Reclamation, Remediation and Capping	4
	OM-6	Sanitation and Hygiene	4
Marketing (MM)	MM-1	Market Integration for Waste Management	4
	MM-2	Consumer Behavior	4
	MM-3	Integrated Marketing Communication	4
	MM-4	Service Marketing	4
	MM-5	Product and Brand Management	4
	MM-6	Waste Exports, Procedures and Documentation	4
Waste Management (WM)	WM-1	E-Waste Management	4
	WM-2	Resource Efficiency and Resource Recovery	4
	WM-3	Integrated Waste Management	4
	WM-4	Bio Medical Waste Management	4
	WM-5	Water Security	4
	WM-6	Waste Management Banks	4
	WM7	Waste Management Technologies	4

Semester 1

S. No.	Course Code	Course Title
1.	101	Introduction to Waste Management
2.	102	Principles and Practices of Management
3.	103	Fundamentals of Operations Management
4.	104	Managerial Economics
5.	105	Financial Accounting
6.	106	Research Methods for Management
7.	107	Lab, Field Visit (1 month)

Course Name: Introduction to Waste Management

Course Code: 101

Learning Objectives:

- To provide insights in basics of environment and waste
- To provide insights in waste characterisation, source reduction and sustainability tools
- To Sensitise and make students aware of environmental health and individual responsibility in waste management

Course Content:

Unit 1 Introduction to Environment

Ecosystem –meaning, -components- Structure – Functions, Levels of organization in nature- Food chain and Trophic structure, Biogeochemical Cycles, Understanding Carrying Capacity and Assimilation Capacity of Earth, UN Sustainable Development Goals, waste movement – cyclic vs linear, innovating techniques to revert from linear to cyclic

Unit 2 Introduction to waste Generation

Waste around us, definition, Waste Handling in Previous Ages, Increasing waste piles – indicates inefficient use of raw material; Reasons for increase in waste quantity, Consumption and population, consumption patterns, Exponential growth of consumption, Effects of Excess Waste Generation, Resource depletion, waste disposal vs waste management, Principles of waste management, Rural waste vs Urban Waste; Pollution – types, waste vs pollution, Statistics for exponential growth of waste generation

Unit 3 Waste Characterisation

Types of waste; geographical waste or regional waste; Solid Waste management tools – techniques for reducing production of waste, managing through segregation and scientific disposal, Ill-effects of mixing of waste, Categories of Solid Wastes - Domestic Waste, Market Waste, Food Waste, Agricultural waste, Fruit- vegetable market waste, e-Waste, Industrial Inert Waste, Industrial Hazardous Waste, Bio-Medical Waste and Radioactive Waste, Hazardous waste, Plastic Waste – spread all over oceans, Managing them at source, Next Generation Waste, inventorisation or projection of waste, Domestic waste vs industrial waste; Domestic waste vs institutional waste, C & D waste, Laboratory waste management; non-routine waste (like festivals or functions)

Unit 4 Source Reduction & Waste Disposal Practices

Source Reduction, Waste reduction strategies, Economic benefits, Demarcations between Source Reduction and Waste Reduction, Operation on a daily basis, Waste Reduction Program Guideline, Importance of source reduction, Economic benefits of waste reduction, Operation on a daily basis, Innovations examples of waste reduction

Waste Disposal Practices: Conventional Practices vs Modern Practices; Dumping off wastes; Landfill, Recycling; Biological Recycling; Recovery for Energy; Incineration

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

Unit 5 Sustainability Tools

Life Cycle Analysis, Extended Producer Responsibility, Corporate Social Responsibility in waste management

Introduction, Environmental Management Systems, Cradle to Cradle design, Natural Capitalism, Ecological Footprint, Small Business is ideal, Sustainable materials usage; Take – back Policy; Carbon Credits

Suggested Readings:

1. Akolkar, A. B., (2005). Status of Solid Waste Management in India, Implementation Status of Municipal Solid Wastes, Management and Handling Rules 2000, Central Pollution Control Board, New Delhi.
2. Appasamy P. Paul, (2004), 'Economic benefit Cost Analysis of a proposed Solid Waste Resource Recovery plant' in Gopal K. Kadekodi (eds) 'Environmental Economics in Practice' Oxford University Press, New Delhi
3. Assessment of status of MSW management system in Metro Class I cities and class II towns, NEERI (2006).
4. Introduction to Waste Management, Syed E. Hassan; Wiley-Blackwell; ISBN 978-1-119-43394-2: 2020
5. Waste Management Practices; John Pichtel; 2nd Edition CRC Press
6. Not in My Backyard- Solid Waste Management in Indian Cities by Sunita Narain & Swati Singh Sambyal
7. Integrated Solid Waste Management – Engineering Principles and Management Issues by George et al, McGraw-Hill
8. CPHEEO manual on Solid Waste
9. NPTEL online courses
10. Environmental Engineering Series - Environmental Management by T.V. Rama Chandra & Vijay Kulkarni
11. Text book of Solid Wastes Management by Naved Ahsan & Iqbal H. Khan
12. Solid wastes management by Stephen Burnley

Practicum:

Local Organized or unorganised waste collectors; point of collection/backyards; Household waste generation and disposal practices; institutional/industrial waste generation & waste disposal methods

Case Studies:

1. Water Crisis 2018 in Capetown, SA
2. Success stories of waste to energy projects on MNRE Website

Resource Persons (Experts whom the institutions can refer for inviting as visiting faculty or as a guest speaker)

1. Dr Sharad Kale, Ex Director, BARC- Email- sharadkale@gmail.com
2. Prof Allapati, IIT Delhi
3. Prof B K Dubey, IIT KGP

Field Visit (Students may be taken to)

- Nisarguna Technology Development Project of Ashoka Biogreen Pvt Ltd. Talwode, Nashik

Course Name: Principles and Practices of Management

Course Code: 102

Learning Objectives:

- To facilitate the students to recognize the principles on which Management is based.
- To facilitate students appraise the different practices of Management and Management styles.
- To enable students to incorporate these theories as practices into their work life.
- To enable students to communicate effectively/accurately

Course Content:

Unit 1: Introduction to Management: Management - Meaning, nature, scope and importance of Management, productivity, Management as a Science, Art or a Profession, Universality of Management, Management Principles, Functions of management, Management roles, Levels of Management, Management Skills, Social Responsibility, Ethics and Values in Management, Corporate Social Responsibility, Corporate Governance, Management Vs Administration, Evolution of Management thought- Scientific Management, Fayol's Principles of Management, Hawthorne Experiments, Decision Theory Approach, System Approach, Contingent Approach, Contribution of Peter Drucker.

Unit 2: Planning – Meaning, nature and importance, Planning Process, Types of Planning, Measures of effective Planning, Barriers to Effective Plan, Management by Objectives; **Decision Making** - Meaning, Types of decisions, Decision Making Process, Individual Vs Group Decision Making, Decision Making Conditions, Creativity

Unit 3: Organizing - Meaning, Organization Structure, forms of Organization Structure, Departmentation, Task Force, Virtual Organization, power, authority, accountability, delegation, centralization, decentralization, working team, team effectiveness, dynamics of group behaviour, influence of group on individual and group decision making

Unit 3: Staffing- Meaning, man power planning, job analysis, job description, job specification, recruitment and selection, training and development, transactional analysis, organization development, performance appraisal, job evaluation. **Directing**– Meaning, nature, scope and principles of direction, supervision;

Unit 4: Controlling: Meaning, importance, controlling process, types of control, essential of effective control system, behavioural importance of control, control techniques, quality circles, Budgetary and Non-budgetary control. **Leadership** - Meaning, importance, leadership theories, leadership styles – managerial grid, tri- dimensional grid, leadership as a continuum

Unit 5: Communication - Meaning, process, oral, written, Non-verbal, pictorial communication, communication channel, barriers in communication. Communication in Business: Importance and benefits, components – concepts and problems- nonverbal communication – The seven Cs of effective communication: Completeness, Conciseness, consideration, concreteness, clarity, courtesy and correctness – Business Communication in the Global Context: Background to inter-cultural communication - cultural variables, individual cultural variables **Forms of Communication:** Personal, Interpersonal, Technology & Communication, Communication for Organizational Effectiveness

Suggested Readings:

1. George Phirippidis, "The Six Functions of Management: A practical action planning guide for people in management", Kerr Hill, Incorporated; 1 Edition 2014.
2. George Tchobanoglous and Frank Kreith, "Handbook of Solid Waste Management", McGraw Hill, 1994.
3. Keytone J., "Communication and Organizational Culture", Sage Publication, 2005.
4. Koontz O Donnell–Principles of Management (Tata McGraw Hill)
5. Koontz, Weihrich–Essentials of Management (Tata McGraw Hill)
6. L.M.Prasad–Principles & Practices of Management (Sultan Chand & Sons, New Delhi)
7. Murphy A Herta, Hildebrandt W Herbert and Thomas P Jane, 2008, Effective Business Communication, 7th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi.
8. Parag Diwan–Management Principles and Practices (Excel Books, New Delhi)
9. Patil A. R, "Social Organization and Development: An Indian Perspective", Prentice Hall India Learning Private Limited, 2012.
10. Prasad L.M, "Principles and practices of Management", SCHAND Publication, 2016.
11. Schein E. H, "Organizational Culture and Leadership", Jossey-Boss Publication, 2010.
12. Stoner, Freeman, Gilbert. Jr. – Management (Prentice Hall of India)
13. Tchobanoglous, G. Theisen, H. and Eliassen, R. 1997. Solid wastes: Engineering Principles and Management Issues, McGraw-Hill publications, New York, USA: 52
14. Urmila Rai and S M Rai, 2008, Business Communication, 10th Edition, Himalaya Publishing House. Mumbai
15. Wieland J., "Governance Ethics: Global Value creation, economic organization and normativity", Springer Publication, 2014.

Resource Persons

(Experts whom the institutions can refer for inviting as visiting faculty or as a guest speaker)

1. Dr M Kishore Babu, Director, Industrial Relations, K L University
2. Dr Raman, Director, Symbiosis Institute of Business Management, Symbiosis International University

Course Name: Fundamentals of Operations Management

Course Code: 103

Learning Objectives:

- To make students understand the importance of production planning and control in organizations
- To enable students to calculate optimal costs of mandatory expenses.

Course Content:

Unit 1: Facilities Location and Layout & Production Planning and Control: Strategic Importance, Factors affecting Locations (and related problems) and Layout, Installation of facilities, Single Location and Multi location Decisions, Principles and Types of facilities layout. **Production Planning and Control :** Production Planning Techniques for various Process Choices, Techniques of production control, aggregate planning techniques, Master Production Schedule (MPS); Product Scheduling, Scheduling Procedure and Techniques.

Unit 2: Product and Service Design: Origin of the Product Idea and Selection from Various Alternatives, Characteristics of a Good Design, Process Design, Type of Process Designs, Process Planning Procedure.

Unit 3: Quality Management: Introduction, Meaning, Quality Characteristics of Goods and Services Tools and Techniques for Quality Improvement – Check Sheet, Histogram, Scatter Diagram, Cause and Effect Diagram, Pareto Chart, Statistical Control Chart, Quality assurance, Total Quality management, Model, Service Quality, Concept of Six Sigma and its Application; Maintenance: TPM: Total Productive Maintenance (TPM), Meaning and Objectives of TPM, Methodology of TPM, Advantages of TPM.

Unit 4: Inventory Management: Key Processes to Eliminate Waste, Implementation of JIT, Pre-requisites for implementation, JIT Inventory and Supply Chains Functions of Materials Management, Purchase Management, The Methods of Purchasing, Purchasing Procedure; Inventory Management and Coding, Related problems

Unit 5: Problem Solving: Problems on Transportation, Problems on Assignment, Linear Programming Problems- Formulation and Solving, Problems on Network Modelling, PERT, CPM

Suggested Readings:

1. R. Panneerselvam, Production and Operations Management, New Delhi, Prentice Hall of India Publications. Third edition 2012
2. K Aswathappa, G Sudarsana Reddy, Production and Operations Management, Himalaya Publishing house, 2017
3. Barry Render, Chuck Munson, and Jay H Heizer Operations Management: Sustainability and Supply Chain Management, 2013
4. William J Stevenson, thirteenth Edition of Stevenson "Operations Management" Mc Graw Hill Education. 2018
5. Operations Research, S.D. Sharma-Kedarnath, 2007
6. Anderson, D.R. Sweeney, D. J. Williams, T.A. and Martin K., An Introduction to Management science: Quantitative Approach to Decision Making, 13th Edition, South western, 2012
7. Gupta P K and Comboj, Introduction to Operations Research, S. Chand, 2012.
8. Operations Research, R. Panneerselvam, PHI Learning Pvt Ltd. 2nd edition, 2009.
9. S.N. Chary, Cases and Problems in Production and Operations Management, New Delhi, Tata McGraw Hill Publications.
10. Bester field Dale H. Besterfield – Michna, C., Besterfield – sacre, Besterfield, G., Urdhwaresh, Total Quality Management, 3rd edition, Pearson Education, New Delhi, 2010

11. Evans, J., and Lindsay, W.M. The Management and control of Quality, 8th Edition, South Western, 2012

E Book to download

<http://dl4a.org/uploads/pdf/Ebook%20for%20Operations%20Management%20by%20anil%20&%20suresh.pdf>

Resource Persons

(Experts whom the institution can refer for inviting as visiting faculty or as a guest speaker)

1. T.S. Krishnan, IIM Bangalore
2. Papi Reddy, IIM Bangalore
3. SIMS Recycling, Earthsense Recyclers, E-Parisara

Course Name: Managerial Economics

Course Code: 104

Learning Objectives:

- To help students understand the concepts of Economics – Supply and Demand, Cost and Pricing, Theory of Consumer behaviour.
- To understand Economy- Competition- Monopoly, Duopoly, Oligopoly and Monopolistic Competition.

Course Content:

Unit 1: Managerial Economics: Ten Principles of Economics, Market Forces of Demand and Supply, Elasticity and its applications. Revenue, Cost and Pricing. Theory of Demand: Indifference Curve Approach and Utility theory, Marginal analysis, Theory of Consumer, Determinants of Demand, Modelling Consumer Demand, Forecasting Consumer Demand, Elasticity of Demand, Consumer Decisions in the Short Run and Long Run.

Unit 2: Production Function: Cost Approach v/s Resource Approach to Production Planning, Economies of Scope and Joint Products, Marginal Cost of Inputs and Economic Rent, Marginal Revenue Product and Derived Demand, Horizontal Integration, Vertical Integration, Transfer Costs, Cost Centre v/s Profit Centre. Market Equilibrium, Shifts in Supply and Demand Curves.

Unit 3: Theory of Production and Cost: Production with one and two variable inputs, cost concepts, short and long run cost functions, production function in short and long run, economies of scale and scope.

Unit 4: Market Structure: Perfect Competition, Why it is desirable? Imperfect Competition, Monopolistic Competition, Monopoly, Oligopoly, Duopoly, Oligopoly and Cartels, Production Decisions in Non-Cartel Oligopolies, Seller Concentration, Competing in Tight Oligopolies: Pricing Strategies – transparency in cost of production with respect to cost of land, Buyer Power, Firm Strategies in Highly Competitive Markets.

Unit 5: Market Externalities: Importance of economic and social equity. Free Market Economies v/s Collectivist Economies, Efficiency and Equity, Circumstances under which Market Regulation is desirable, Regulation to Offset Power of Seller and Buyers, Natural Monopoly, Externalities, Externality Taxes, High Cost to Initial Entrant and the Risk of Free Rider Products, Limitations of Market Regulation

Suggested Readings:

1. Arrow, K.J. (1962). The economic implications of learning by doing. *Review of Economic Studies* 29(3), 155–173.
2. Baumol, W.J., Panzar, J.C., & Willig, R.J. (1982). *Contestable markets and the theory of industry structure*. San Diego, CA: Harcourt Brace Jovanovich.
3. Coase, R. H. (1937). The nature of the firm. *Economica* 4(16), 386–405.
4. Milgrom, P.R., & Roberts, J. (1992). *Economics, organization & management*. Englewood Cliffs, NJ:
5. Porter, M. E. (1980). *Competitive strategy*. New York, NY: The Free Press.
6. Samuelson, W.F., & Marks, S.G. (2010). *Managerial Economics* (6th ed.). Hoboken, NJ: John Wiley & Sons.
7. Shapiro, C., & Varian, H.R. (1999). *Information rules*. Boston, MA: Harvard Business School Press.
8. *Managerial Economics: Theory and Applications* by DMMithani, 2016, Himalaya Publishing house
9. Not in my background by Sunita Narain and Swati Singh Sambyal
10. Text book on Economics- payment for giving up developmental rights by Krugman

Course Name: Financial Accounting

Course Code: 105

Learning Objectives:

- To enable the students to understand, analyse and interpret the information provided by financial statements manually and using software.

Course Contents:

Unit 1: Introduction: Accounting and its functions, Accounting as an information system, Basic Accounting Concepts and Accounting Conventions, Accounting Principles, Generally Accepted Accounting Policies (GAAP), Accounting Standards, Accounting Structure, Types of Accounts. Rules regarding Journal Entries, Recording of Journal Entries, Ledger Posting, Cash book, Trial Balance

Unit 2: Preparation of Final Accounts: Preparation of Final Accounts, Trading Account, Profit & Loss Account, Balance Sheet, Treatment of Adjustments into trial balance. Accounting for Non-Profit Organizations

Unit 3: Financial Statement Analysis: Meaning and Objectives of Financial Statement Analysis, Limitation of Financial Analysis. Tools of financial analysis: Ratio analysis-liquidity, solvency, performance and profitability, Common size statements, Trend analysis, Fund flow and cash flow statement.

Unit 4: Cost Accounting: Cost Accounting, Elements of cost, Cost sheet, Budgeting and Budgetary control, CVP analysis, Break even and decision making tools. Components of cost due to use of land, Pay lease rental for the land and not allow ownership

Unit 5: Regulatory and Statutory Compliances, System and control- Importance of systems and control, direct taxation-IT, Indirect Taxation-GST. **Application of Software:** Application of Software: Tally Latest Version, GST based accounting software

Suggested Readings:

1. Charles T. Horngren, Gary L. Sundem, John A. Elliott and Donna Philbrick: Introduction to Financial Accounting, Prentice Hall India.
2. Hanif Mukherjee: Financial Accounting, Tata McGraw Hill
3. Charles T. Horngren, Jeff Schatzberg, Gary L. Sundem and William O. Ostratton: Introduction to Management Accounting, Pearson Education.
4. Charles T. Horngren, Srikant M. Datar and George Foster: Cost Accounting - A Managerial Emphasis, Prentice Hall India.
5. N. R. Swamy: Financial Accounting - A managerial Perspective, Prentice Hall India.
6. J. R. Williams, S. F. Haka, M. S. Bettner and R. F. Meigs: Financial and Managerial Accounting - The Basis for Business Decisions, Tata McGraw Hill.
7. Financial Accounting by SM Shukla
8. Cost Accounting by M L Agrawal and K L Gupta

Course Name: Research Methods for Management

Course Code: 106

Learning Objectives:

- To initiate the students into methods of research
- To facilitate students to practice and conduct research

Course Content:

Unit 1: Introduction to Research methods: Concept, Role, nature, scope, need, objectives and managerial value of research, Types of research, Research process, Problems encountered by researcher Understanding the language of research: concept, construct, definition, variable Research Design: Concept, need, importance and feature of a good research design, Different research designs (Exploratory, Descriptive, Experimental and Diagnostic research) – Concept, types and uses

Unit 2: Sampling: Concept of statistical population, sample, sampling frame, sampling error, sample size, characteristic of a good sample; Types of sampling: Probability sampling – simple random sampling, stratified sampling, cluster sampling, systematic sampling, and Multi-stage sampling. Non-probability sampling – Judgment sampling, convenience sampling and quota sampling; Attitude Scaling Techniques: concept of scale, Rating scales – Likert scales, semantic differential scales and Graphic rating scales; Measurement: Concept of measurement, Level of measurement – Nominal, Ordinal, Interval, and ratio Types of data: Primary data and Secondary data Primary data– definition, Advantages and disadvantages over secondary data; Secondary data– definitions, sources, characteristics; Methods and tools for data collection

Unit 3: Introduction to Statistics: Meaning and definitions of statistics, scope and limitations of statistics, Role of statistics in Management decisions; Measures of Central Tendency: Mean, Median, Mode, Percentile and Quartiles; Measures of Dispersion: Range, Inter-quartile Range, Quartile Deviation, Mean Deviation, Standard Deviation, Variance and Coefficient of variation.

Probability and Testing of Hypothesis: Basic Concept and approaches of probability, Additive and Multiplicative law of probability, Conditional probability rules, Baye's Theorem; Probability distributions: Meaning, Types and Applications of Binomial, Poisson and Normal distributions. Hypothesis testing and statistical influence (Introduction to methodology and types of errors), Introduction to sample tests for univariate and bivariate analysis using Normal distribution, F-test, t-test, Z-test and Chi-Square test.

Unit 4: Correlation Analysis: Meaning and types of correlation, Karl Pearson's coefficient of correlation, Spearman's Rank correlation; Regression Analysis: Meaning and two lines of regression, Relationship between correlation and regression coefficients; Time series Analysis: Time series and

its components, Methods of studying components of Time Series, Measurement of trend (Moving Average, Exponential Smoothing and Least Square method); Participatory Action Research (PAR): Principles, Dangers and Drawbacks of Participatory Approaches, Application of PAR in rural and urban setting, Tools of PAR: Wealth Ranking, Timeline, Transect Walk, Seasonality, Social and Resource Mapping, Venn Diagram and Focus Group Discussion.

Block 5: Data Analysis: Editing, coding, Classification and Tabulation; Data Analysis –Various kinds of charts and diagrams used in data analysis, Application of statistical techniques for analysing the data, different statistical tests for hypothesis testing, MCDM techniques, Report writing– Significance of report writing, steps in report writing, layout of research report and precautions in writing research reports.

Softwares: SPSS, R programming, Python

Suggested Readings:

- [1]. Cooper, D. R. and Schindler, P., “Business Research Methods”, New Delhi, Tata McGraw Hills, 2010.
- [2]. Fowler, F.J., “Survey Research Methods”, 4th ed., Sage Publishers, 2009.
- [3]. Gupta, K.R., “Business Statistics”, New Delhi, Atlantic Publishers & Distributors Pvt. Ltd., 2017.
- [4]. Hooda, R.P., “Statistics for Business and Economics”, 5th ed.”, Vikas Publishing House, 2013.
- [5]. Kothari C. R., “Research Methodology: Methods and Techniques”, New Delhi, Vishwa Prakashan, 2004.
- [6]. Lancaster, G., “Research Methods in Management, a concise introduction to research in management and business consultancy”, Elsevier, 2005.
- [7]. Narayanasamy, N., “Participatory Rural Appraisal”, Sage Publications, 2009.
- [8]. Paul, S.K., “Research Methods for Practitioners”, New Delhi, Atlantic Publishers & Distributors Pvt. Ltd., 2018.
- [9]. Richard, I.L., Masood, S., David, S.R. and Sanjay, R., “Statistics for Management”, 8th ed., Pearson, 2017.
- [10]. Taylor, M and Søndergaard, M.,” Unravelling the Mysteries of Case Study Research: A Guide for Business and Management Students”, Edward Elgar Publishing, 2107.
- [11]. The SAGE Handbook of Qualitative Business and Management Research Methods, 2017.
- [12]. Almquist, Ashir&Brännström, “A guide to quantitative methods”, Version 1.0.4.

Course Name: Lab, Field Visit (1 month)

Course Code: 107

Learning Objectives:

- To provide Waste Management facility field experience to students
- To enable students to study waste management issues and limitations.

Course Content:

Working in a waste management facility will provide the opportunity for students to learn first-hand about a subject area. The objective is to expand students' knowledge of the Solid Waste Management facility and also to help them gain an understanding of the importance of reducing waste. At the end of the Field Visit, students will participate in a hands-on interactive lesson that reinforces what they learned during their visit. The students are expected to submit a comprehensive report (not less than 10000 words) followed by a presentation in the Classroom.

Semester 2

S. No.	Course Code	Course Title
1.	201	Individual and Organizational Behaviour
2.	202	Waste Management Logistics and Technical Processes and Methods
3.	203	Financial Management
4.	204	Marketing Management
5.	205	Entrepreneurship in Waste Management
6.	206	Field Experience: Working in a Waste management facility – 2 months

Course Name: Individual and Organizational Behaviour

Course Code: 201

Learning Objectives:

- To provide a basic understanding of Organizational behaviour (OB) – Evolution, challenges, opportunities, and Individual behaviour - Values, types, Attitudes, Personality - Meaning, determinants, traits, and perception.
- To provide a basic understanding of Group behaviour, Organizational process and Organizational Development (OD) - concept, scope, practice and processes.

Course Content:

Unit 1: Introduction: Organizational Behaviour- Concept and Importance, Historical Development of O.B., Contributing disciplines to the O.B. field, Challenges and Opportunities for O.B., Models of O.B.

Unit 2: Individual Behaviour: Values: Importance, types, values across culture, Attitudes: Types, cognitive dissonance theory, measuring attitude, Personality: Meaning, determinants, traits, major personality attitudes influencing O.B., Perception - Meaning, factors influencing perception, person perception, Emotions and stress, learning- Kurt Lewin's theory of learning.

Unit 3: The Group Behaviour: Foundations of Group behaviour, Defining and classifying groups, stages of group development, Group structure, Group decision making, Negotiation and Conflict Management, Understanding work teams, Difference between Groups and teams, types of teams, creating effective teams, turning individual into team players.

Unit 4: Organizational Process- Organizational Development: Concept, Scope, practice and process of organizational Development interventions, Personal, Interpersonal, group process, in Organizational development, Team Building and team development, Power and Politics, Case study & simulation exercise.

Unit 5: Organizational Culture and Change: Definition, culture's functions, creating and sustaining culture, how employees learn culture, creating an ethical organizational culture, creating a Customer responsive culture, Organizational change, forces for change, resistance to change, managing, organizational change, Empowerment and quality of work life,

References

1. American Management Association How to handle emotions at work. Accessed from (2009).
2. Davis, K Human relations at work: The dynamics of organisational behavior. New York: McGraw-Hill (1967).
3. Fisher, C D Gittelson, R "A meta-analysis of the correlates of role conflict and role ambiguity," Journal of Applied Psychology, 68(2), 320–333; (1983).
4. Goleman, D Emotional Intelligence: Why it can matter more than IQ. London: Bloomsbury Publishing Plc (1995).
5. Holmes, T H Rahe, R H "The social readjustment rating scale," Journal of Psychosomatic Research, 11(2), 213–

218(1967).

6. Hofstede, G. *Culture's consequences: Comparing values, behaviors, institutions and organisations across nations*. Thousand Oaks, CA: Sage(2001).
7. Judge, T A Bretz, R D "Effects of work values on job choice decisions," *Journal of Applied Psychology*, 77(3), 261–271(1992).
8. Jackson, S E Shuler, R S "A meta-analysis and conceptual critique of research on role ambiguity and role conflict in work settings," *Organisational Behavior and Human Decision Processes*, 36(1), 16–78; (1985).
9. Jenkins, C D Zyzanski, Rosenman, R *Jenkins activity survey manual*. New York: Psychological Corporation (1979).
10. John W Newstrom, *Organizational Behavior HUMAN BEHAVIOR AT WORK*, Tata McGraw- Hill publishing Company Limited 2007.
11. Kasser, T Koestner, R Lekes, N "Early family experiences and adult values: A 26-year prospective longitudinal study," *Personality and Social Psychology Bulletin*, 28(6), 826–835(2002).
12. K.C.S. Ranganayakulu, *Organisational Behavior*, Atlantic Publishers & Distributors 2005.
13. L M Prasad *Organizational Behavior*, Sultan Chand & Sons (2000).
14. Mayer, J D Salovey, P What is emotional intelligence? In P. Salovey & D. J. Sluyter (Eds.), *Emotional development and emotional intelligence: Educational implications* (pp. 3-34). New York: Harper Collins (1997).
15. Mayer, J D Salovey, P Caruso, D R Sitarenios, G "Measuring emotional intelligence with the MSCEIT V2.0," *Emotion*, 3(1), 97-105 (2003).
16. Netemeyer, R G Boles, J S McMurrin, R "Development and validation of work–family conflict and family–work conflict scales," *Journal of Applied Psychology*, 81(4), 400–410 (1996).
17. Newstrom J W Davis K *Organisational Behaviour: Human Behavior at Work*. New York: McGraw-Hill(1993).
18. Örtqvist, D Wincent, J (1996). "Prominent consequences of role stress: A meta-analytic review," *International Journal of Stress Management*, 13(4), 399–422 (1996).
19. Petrides, K V Furnham, A "Trait emotional intelligence: Psychometric investigation with reference to established trait taxonomies," *European Journal of Personality*, 15(6), 425–448 (2001).
20. Petrides, K V *Trait Emotional Intelligence Theory*. *Industrial and Organisational Psychology*, 3 (2), 136–139 (2010).
21. Ravlin, E C Meglino, B M "Effect of values on perception and decision making: A study of alternative work values measures," *Journal of Applied Psychology*, 72(4), 666–673(1987).
22. Rokeach, M. *The nature of human values*. New York: The Free Press (1973). Schein, E "Organisational socialization and the profession of management," *Industrial management review*, 9(1), 1-15(1968).
23. Salovey, P Mayer, J D "Emotional intelligence," *Imagination, Cognition, and Personality*, 9(3), 185-211 (1990).
24. Schick, A G Gordon, L A Haka, S "Information overload: A temporal approach," *Accounting, organisations, and society*, 15(3), 199–220 (1990).
25. Selye, H. *Stress of life*. New York: McGraw-Hill (1976).
26. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra *Organizational Behavior*, Pearson (2005).

27. Stephen P. Robbins, Timothy A. Judge & Seema Sanghi, *Organizational Behavior*, Pearson Education (Singapore) Pte. Ltd., 2009.
28. Steven L. McShane, Mary Ann Von Glinow & Radha R. Sharma, *Organizational Behavior: Emerging knowledge and practice for the real world*, Tata McGraw-Hill Education Private Limited 2011.
29. Suja R. Nair, *ORGANISATIONAL BEHAVIOR Text & Cases*, Himalaya Publishing House 2005.
30. Young W, Tilley F "Can businesses move beyond efficiency? The shift toward effectiveness and equity in the corporate sustainability debate," *Business Strategy and the Environment*, 15(6), 402–415(2006).
31. <https://www.amanet.org/training/articles/how-to-handle-emotions-at-work.aspx> on 11th February 2019.

Course Name: Waste Management Logistics and Technical Processes and Methods

Course Code: 202

Learning Objectives:

- To provide insights in components of logistics
- To provide insights in importance of waste technical processing, responsibility of waste management and waste reduction

Course Content:

Unit 1: Components of Logistics

Introduction to Waste Management Logistics, importance, methods of logistics, Human Components, Technological Components- Waste Handling Equipment and Technology, and Managerial Goals, Steps in waste management logistics. Basics of GPS & GIS - introduction, importance; GPS aided vehicle; GPS in India, US, Russia; inventorization- understanding, sources, kinds of waste, quantity of waste; social mapping; waste generation estimation for zonal wise; allocation of collection vehicle according to waste generation; large vehicle for market & households; Source segregation implementation – different collecting vehicles

Unit 2: Collection and Transportation

GIS & GPS add here Route optimization, planning, scheduling time, dynamic dispatching, mobile communication, performance auditing and GPS real-time asset tracking, Savings and efficiency, improved service levels, Variable cycle (multi-day, weekly, bi-weekly, monthly, quarterly), Variable route start location, Route Optimization, scheduling, GPS tracking, mobile communications, Categorisation of waste recycling, Economics of recycling, Success stories in recycling/ reuse, accurate mapping for route; AHP (Analytical Hierarchy Process) use with GIS; best practices followed by firms in reverse logistics/ reverse supply chain of waste; unique challenges

Unit 3: Storage and Processing

Inventory and material management, Management of Waste Collection, Segregation, Manifest, Transport, Preventive Maintenance, Source segregation management, Management at transfer stations, tertiary transfer Composting –Types and Processes, General Process of Recycling, Precautions for Recycling –Aluminium, Glass, Precautions while Recycling of Plastics, Precautions while Recycling paper, Re-use, Treatment, Disposal

Unit 4: Trade of Waste

Logistics chain in regional and global level, cradle to grave for producers (industries), managing non- routine waste, agricultural waste, Polluter Pays Principle, Extended Producer Responsibility, Producer Responsibility Organization, Carrying Capacity, precautionary principle, reverse logistics, scrap trade; International Trade of Waste

Initiatives taken by firms & government to do 3R; implications for business – reducing weight of products impact on the supply chain

Case Studies

Case Studies in legal aspects, Institutional case studies, municipalities

Real time case studies like Emerald Emerging Market, HBS

Suggested Readings:

1. AhmedElRabbany, IntroductiontoGPS, , Artech House, 2002.
2. Armin Rosencranz and Shyam Divan, "Environmental Law and Policy in India: Cases", Materials, and Statutes, Oxford; Edition edition, 2002.
3. C.S. Rao, "Environmental pollution control engineering", New Age International Publishers; Third edition, 2018.
4. Dekkar, " Reverse Logistics", Springer-Verlag Berlin Heidelberg. 2007.
5. GIS best practices, 2007.www.esri.com, 2007.
6. George Teho Banglous Hilary Theisen Samuel A. Vigal, Integrated Solid Waste Management, Engineering Principles and Management Issues,
7. Jagbir Singh & AL Ramanathan, " Solid Waste Management - Present and Future Challenges", I K International Publishing House Pvt. Ltd, 2009.
8. John Pichtel , " Waste Management Practices", CRC Press; 2 edition, 2014.
9. John Pichtel, "Waste Management Practices",CRC Press, 2005.
10. Kulkarni M M and S S S Prakash, Fleet management: A GPS-GIS integrated approach, Geospacial World, 2009.
11. Lester R.Brown , "Eco-Economy: Building an Economy For The Earth" , ,W W. Norton and company, 2001.
12. Mateusz Jakubiak , AGH w Krakowie, Reverse logistics in waste management from landfilling on streets to sustainable waste management and "zero waste" strategy, LOGISTYKA 4:8990-8996, 2015.
13. Menard R.J. and Knieff J.L., "GPS at Ground Zero", Tracking World Trade Center Recovery, Criticom International Corporation, Minneapolis, Minnesota, USA, GPS World Magazine, September 2002 edition.
14. M.P Dube , " Smart Cities - Transforming India" , 2016.
15. Municipal solid waste management manual, Govt. of India, 2014, www. Moud.gov.in
16. Naved Ahsan & Iqbal H.khan , "Text book of Solid Wastes Management", CBS publishers, 2013.
17. P. Leelakrishnan "Environmental Law" in India, Oxford; Edition edition, 2002.
18. P.S Ajith & Dr P.N. Hari Kumar, " Solid Waste Management of Municipalities", Abhjeet, 2016.
19. R. Rajagopalan , "Environmental Studies" by, Oxford University Press; Third edition, 2015.
20. Saaty, T.L., "Fundamentals of decision making and priority theory", 2nd ed. Pittsburgh, RWS publications, 2000.
21. Saaty, T.L. "Multicriteria Decision Making: The Analytic Hierarchy Process", RWS Pittsburgh: Publications, 1990.
22. Saaty, T.L., " The Analytic Hierarchy Process", New York: Mc Graw Hill Inc, 1980.
23. Stephen Burnley,"Solid wastes management", Wiley Publishing, 2014.
24. Sunil Kumar, "Municipal Solid Waste Management in India: Present Practices and Future Challenge" 2007.

25. S.C.Bhatia, Wealth, "From Waste - Agricultural food and chemical Processing Waste", Atlantic; 1 edition, 2007.
26. T.V.Rama Chandra, Environmental Engineering Series –" Management of Municipal Solid Waste "-, The Energy and Resources Institute, TERI, 2009
27. Trevor M. Letcher, Daniel A. Vallero, "Waste: A Handbook for Management", Second Edition, academic press, 2001.
28. Textbook of Environmental Studies for Undergraduate Courses , Erach Bharucha, UGC New Delhi and Bharti vidyapeeth Institute of environment and research, Pune, 2013.
29. Wilson, D.C., " Waste management: Planning, evaluation and technologies", Oxford. Oxford University Press: New York, 1981.
30. Waste to resources handbook, 2014.

Resource Persons:

Dr. Prem Pandey & Prof. Jyothi K. Sharma from Shiv Nadar University
Prem Ananth
from Dell India can speak on challenges in Waste Logistics

Institutions to refer for input materials

Shiv Nadar University

Metal Recycling Association of India (Scrap Trade)

Internship with any firm that's in the business of collecting waste from consumers

Course Name: Financial Management

Course Code: 203

Learning Objectives:

- To enable the students to apply concepts and applications related to financial management including investment, dividend, and financial decisions

Course Content:

Unit 1: Introduction: Introduction to Financial Management, Concept of time value of money and annuities, Introduction to risk and returns, Types of business organizations, proprietor, partnership, LLP, Companies, OPC, etc. Regulators, credit rating agencies. Calculation of Present value and future value of single cash flow, multiple cash flows, annuity and perpetuity. **Determination of Project Cost and Cash flows-** Project cost estimation, project financials, project cash flows

Unit 2: Investment Decisions: Capital budgeting techniques-traditional and discounted techniques, Management of Working Capital: Meaning of WC, Need of WC Management, Determinants of WC, Operating Cycle, Estimation of WC. **Sources of Funds-** LT sources- equity debt, hybrid sources, PE funding, Venture capital, IPO, ECB, Angel Funding. Short term sources, leasing, hire purchase

Unit 3: Management of Working Capital: Working Capital Financing: Trade credit, bank finance, commercial paper, factoring, and money market instruments.

Unit 4: Cost of Capital and Capital Structure: Cost of equity capital, Cost of preference shares, Cost of debt and weighted average cost, Capital structure theories, Concepts of operating, financial and total leverage

Unit 5: Dividend Decisions: Types of dividends, factors influencing dividends, dividend theories. **Business Evaluation:** Income approach method, market approach method

Suggested Readings:

1. I.M. Pandey: Financial Management, Vikas Publishing House
2. Prasanna Chandra: Financial Management, Tata McGraw-Hill Publishing.
3. M.Y. Khan and P.K. Jain: Financial Management-Text and Problems, McGraw-Hill.
4. James C. Van Horne: Financial Management, Pearson Education.
5. Richard A. Brearley and Stewart C. Myres: Principles of Corporate Finance, McGraw Hill.
6. John J. Hampton: Financial Decision Making-Concepts, Problems and Cases, Prentice Hall India

Course Name: Marketing Management

Course Code: 204

Learning Objectives:

- To provide an understanding of waste Marketing issues and concepts,
- To familiarize the learners about the Consumer Behaviour and its limitation,
- To create awareness about Communication Channels, Market Feedback and importance of Social Marketing in Settings

Course Content:

Unit 1: Overview of Marketing: Meaning and definition of Solid Waste Markets. Issues in Waste Marketing. Consumer Behaviour, product categories in waste management, product or service or combination, 4 Ps and 7 Ps of product and service marketing. Branding the product, product features

Unit 2: Marketing Strategy: evolving Waste Marketing Strategy; role of informal sector in solid waste management, pricing of the product/service, pricing strategies, Determinants of price, types or levels of products, value creation in product, value chain analysis

Unit 3: Distribution Systems: Solid Waste Communication and Distribution systems, marketing, cost of channels of distribution, management in solid waste

Unit 4: ICTs in Marketing: ICTs in waste Marketing, Role of Social Media, promotion mix elements, role of contemporary modes of marketing communications

Unit 5: Market support: Role of commercial bank, Credit and Marketing linkages, identifying waste management industry stakeholders, creating awareness within stakeholders for the product or service, generating a standard on-going feedback system for improvements

Suggested Readings:

1. Marketing Management: Philip Kotler
2. Marketing Management: T.N. Chhabra
3. Principles of Marketing: Armstrong & Kotler

Course Name: Entrepreneurship in Waste Management

Course Code: 205

Learning Objectives:

- To understand Entrepreneurship in Waste Management- Definition, Evolution, Characteristics, Qualities and Functions
- To appreciate Entrepreneurial Inputs, Micro Entrepreneurial Systems in the context of managing waste
- To have basic understanding about Financing, issues and limitations of managing waste
- Scope can be expanded to Entrepreneurship & Business Models for Waste Management

Course Content:

Unit 1: Introduction to Entrepreneurship, Entrepreneurial Traits, Types & Significance: Definitions, Evolution, Characteristics of entrepreneur and entrepreneurship; Qualities and functions of entrepreneurs, Difference between entrepreneur, leader, businessman and Manager; Types of entrepreneur; Factors influencing entrepreneurship: Individual factors- Environmental factors- Socio- cultural factors- Support systems- Entrepreneurial motivation Role and importance of entrepreneur in economic growth. Entrepreneurship as a style of management. Cases of Entrepreneurship Culture.

Unit 2: Entrepreneurial Inputs: N-Achievement and Entrepreneurial success; Entrepreneurial Behaviours and entrepreneurial motivation Locus of control, Innovation and entrepreneur, sources of Innovation; Management of Innovation, creativity and risk taking. Case study & Simulation exercise, Systems thinking perspectives to SWM, Social Entrepreneurship, and business case development

Unit 3: Entrepreneurial System: Search for business ideas, sources of idea, idea processing and selection. Input requirements; source and criteria of financing fixed and working capital, New venture management, corporate entrepreneurship, experimental learning of successful and unsuccessful entrepreneurs. Women Entrepreneur: Concept and functions of women entrepreneurs- Problems of women entrepreneurs- Developing women entrepreneurs. Case study & simulation exercise. Idea to implementation (tools and techniques), Government entrepreneurial programme (Aids /funding), incubation opportunities.

Unit 4: Entrepreneurship in Waste Management: Scope and types of Entrepreneurship, Micro Resource Enterprise, Planning A Waste Managing Enterprise, Human Resources and Infrastructure, Arranging and Managing Finance, Managing a Waste Enterprise, Successful Experiences, Government rules and regulation regarding small industries, role of financial institution – IDBI, SIDBI, SFCs and commercial banks in assisting entrepreneurs, Other supporting institutions- District Industries Centers (DIC), Small Industries Development Organization (SIDO), MSME-DI, Case study presentation. Innovations in waste management, value chain analysis, strategy development

Unit 5: Business Models: Revenue models, different types, role of ICT in business models, ICT based business models, Role of IT Strategy in formulating business models for waste management. Value chain analysis – Strategic Development core competence; Marketing analysis of SWM; challenges in Entrepreneurship; scale – up opportunities

Suggested Readings:

1. C.B Gupta: Entrepreneurship Development, Sultan Chand and Sons, Delhi

2. Vasant Desai.: Dynamics of Entrepreneurship Development, Himalaya Publishing House
3. Charantinath, Poornima M., Entrepreneurship Development and Small Business Enterprises, Pearson Publication. 2nd edition.
4. SBSrivastava: A Practical Guide to Industrial Entrepreneurs, Sultan Chand and Sons, New Delhi
5. Pareck, Udai and TV Rao : Developing entrepreneurship, Sanjiv Printers, Ahmedabad
6. Drucker, Peter, "Innovation and Entrepreneurship" Heinemann London
7. Ecological Intelligence – The hidden impact of what we buy by Daniel Goleman

Resource Persons:

1. Prof. L.S. Ganesh – IITM
2. Kannan-developed low cost ATM MIC – from Chennai
3. Ramesh Manikam designed namma toilet in Tamil Nadu – from Chennai

Institutions to refer for inputs- WHO

Practicum

1. Sessions with start-ups
2. Waste segregation management & local community services
3. Discussions with Entrepreneurship
4. Develop business case & Review sessions

Course Name: Field Experience: Working in a Waste Management Facility

Course Code: 206

Learning Objectives:

1. To learn the working of a waste management facility
2. To learn operations, marketing, finance, production and human resources perspective of waste management facility

Course Content:

The students are required to do the following:

- Identify and quantify wastes
- Coordinate the documentation required to label, move, track and report waste and waste initiatives
- Evaluate waste management options and apply a waste hierarchy model in order to reduce, refuse, recycle, recover, and dispose of waste material
- Conduct research and analytical studies on waste management facilities
- Investigate the life expectancy of consumable products and recommend options for more economical and environmentally friendly materials or processes.
- Budget preparation and administration, including determining financial methods, procedures, and costs pertaining to environmental compliance and waste management services
- Study if the facility is adhering to waste management rules and regulations

At the end of the internship, students are required to submit a comprehensive report (not less than 10000 words) followed by a presentation in the classroom.

Semester 3

S. No.	Course Code	Course Title
1	301	Human Resource Management and Organization Development
2	302	Strategic Management
3	303	Regulatory Framework-Legal Aspects and Mandatory Regulations
4	304	Elective 1
5	305	Elective 2
6	306	Field Experience in Waste Management

Course Name: Human Resource Management and Organization Development

Course Code: 301

Learning Objectives:

- To understand Human Resource Management (HRM)-nature, scope, significance
- To appreciate HR Planning, Job Analysis, and Retention issues
- To understand contemporary issues in HRM
- To prepare the students as organizational change facilitators using the knowledge and techniques of behavioural sciences
- To understand the applicability of OD interventions.

Course Content:

Unit 1: Introduction: Meaning of Human Resource Management, Evolution of HRM, Functions of HRM, Nature, Scope and significance of HRM, Changing environment and duties of HR Manager, HRM in Indian scenario. **Motivation:** Meaning, nature and importance of motivation, Theories of motivation – Maslow, Herzberg, McClelland, Alderfer, Vroom, Porter – Lawler, McGregor, Rewards – Monetary and Non – Monetary, Job design, job enrichment, job satisfaction, quality of work life, morale and productivity
Human Resource Planning: Process of HRP, Assessing Human Resource requirements; Human resource forecasting; Work load analysis; Job analysis- Job description and specifications; Job design; Job redesign- job enlargement, job rotation.

Unit 2: Recruitment and Selection: HR planning, Job Analysis, Recruitment and Selection, Transfer and Promotion, An overview of Training and Development; process of recruitment- internal and external sources of recruitment Emerging trends in Recruitment, Selection- different types of selection tools to contemporary issues in HRM, and development, E-recruitment, and current trends in recruitment.
Contemporary Issues in HRM: Employee compensation concept, factors affecting employee compensation, components of employee compensation, knowledge management, Human Resource Information System, issues of HRM in organizations

Unit 3 : Introduction to Organization Development: Concepts, Nature and Scope of O.D, Historical Perspective of O.D, Underlying Assumptions & Values Theory and Practice on change and changing, The Nature of Planned Change, The Nature of Client Systems : Group Dynamics, Intergroup, Dynamics and Organizations as Systems.

UNIT 4: O.D. Interventions: Team Interventions, Inter-group Interventions, Personal, Interpersonal and group process interventions, Comprehensive interventions, Structural Interventions.

UNIT 5: Implementation and assessment of O.D: Implementation conditions for failure and success in O.D efforts, Assessment of O.D. and change in organizational performance, the impact of O.D. Some key considerations and Issues in O.D: Issues in consultant, Client relationship, the future of O.D, Some Indian experiences in O.D, Effect of OD interventions leading to organizational effectiveness.

Suggested Readings:

1. Aswathappa .K, Human Resource Management ,8th Edition,New Delhi, Tata Mac Graw Hill, 2017
2. Aziz, Abdul (1993), Decentralized Planning.
3. Bannock, G. (1981), The Economics of Small Firms: Return to the Wilderness, Basil Blackwell, Oxford.
4. Baron, R A and Shane, S A (2005), Entrepreneurship: A Process Perspective, Thomson, Mason, OH.
5. Begley, T M and Boyd, D P (1987), “A comparison of entrepreneurs and managers of small business firms”, Journal of Management, Vol. 13 No. 1, pp. 34-47.
6. Bernadin , Human Resource Management ,6th edition ,Tata Mcgraw Hill ,2012.
7. Bertrand, A L, Social Sociology.
8. Boyd, N G and Vosikis, G S (1994), “The influence of self-efficacy on the development of entrepreneurial intentions and actions”, Entrepreneurial Theory and Practice, No. 13, pp. 63-77.
9. David Decezo ,et al, Personal/HRM, Prentice-Hall of India, 2000, p.223
10. Decenzo and Robbins, Human Resource Management, 11th Edition, Wiley, 2013
11. Eugence Mckenna and Nic Beach, Human Resource Management, 2nd edition, Pearson Education Limited, 2008.
12. Gary Dessler, Human Resource Management, 15th edition, Pearson Education Limited, 2016. ISBN 10: [0134304233](#) ISBN 13: [9780134304236](#)
13. Girard, J.P., & Girard, J.L. (2015). Defining knowledge management: Toward an applied compendium, *Online Journal of Applied Knowledge Management*. 3(1), 1-20
14. Gupta, S. C., Advanced Human Resource Management: Strategic Perspective, ANE Books. ISBN 10: 8180521931 ISBN 13: 9788180521935, 2009
15. Herbert G. ,Heneman III, et. al., Personnel/Human Resource Management, 4th ed. Homewood, IL : Irwin, 1989.
16. Irma Becerra-Fernandez and Rajiv Shaberwal, Knowledge management system and processes, M.E. Sharpe, Inc.,NewYork, 2010. ISBN 978-0-7656-2351-5
17. Ivancevich, Human Resource Management, 7th edition, McGraw Hill, 2010.
18. KimizDalkir *Knowledge Management Theory and Practice, 3rd Edition* ,MIT Press.ISBN: 9780262036870, 0262036878
19. Mamoria C.B. and Mamoria S. Personnel Management, Himalaya Publishing Company, 5th edition, 2011
20. Nahapiet, J. and Ghoshal, S. 1998. Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review*, 23(2), 242–266.
21. Nonaka, I. 1994. A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1) (February), 14–37.
22. Nonaka, I. and Takeuchi, H. 1995. The knowledge creating company: How Japanese companies create *the dynamics of innovation*. New York: Oxford University Press.
23. Parikh, I. J., &Jeyavelu, S. (2002). New trends in sensitivity training in organizations. *Vikalpa*, 27(4), 5-14.<http://journals.sagepub.com/doi/pdf/10.1177/0256090920020402>
24. Ramnaryan,S. ,Rao,T.V. & Singh,K. Organizational Development: Intervention and Strategies. Response Books ,NewDelhi, 1998.
25. Ramnarayan,s. & Rao,T.V. Organizational Development: Accelerating Learning and Transformation, Sage Publication. 2011.
26. Rao, T. V. (2008). Organization Development Experiences-A Case for Enriching HRD through OD. NHRD Network Journal, 2(3), 71-80.<http://vsilir.iima.ac.in:8080/jspui/bitstream/11718/10843/1/2010-01-01Rao.pdf>

27. Rao, T. V. (2012). Organizational development and human resource development in India: A historical perspective. Indore Management Journal, 11-17.<http://www.iimidr.ac.in/wp-content/uploads/Organizational-Development-and-Human.pdf>
- Sabherwal, R. and Sabherwal, S. 2007. How do knowledge management announcements affect firm value? A study of firms pursuing different business strategies. *IEEE Transactions on Engineering Management*, 54(3) (August), 409–422.
28. Sharma, Bhat, U K (1995), New Panchayati Raj System, Appropriate Technology India (ATI).
29. Singh, G (2011) The Tensegrity Mandala: A Model for Organization Design. Integral Leadership Review. Online: <http://integralleadershipreview.com/595-the-tensegrity-mandala-a-model-for-organization-design/>
30. Singh,G.& Ananthanarayanan ,R. Organisational Development and Alignment: The transegrity Mandala Framework.Sage Publication.2013
31. Stephen P. Robbins & Timothy A. Judge, Organizational Behavior ,14th Edition, Prentice Hall, 2010
32. Stewart, T.A. The house that knowledge built. *Fortune*, October 2. 2000
33. Thomas G. Cummings & Christopher G. Worley, Organization Development and Change, 10th Edition, Cengage learning, USA, 2013
34. Wendell L. French & Cecil H. Bell Organization Development: Behavioral Science Interventions for Organization Improvement, 6th Edition, Pearson, 1999
35. William.B.Werther and Keith Davis, Personnel Management and Human Resource ,McGraw-Hill Education; International Ed edition , 1982
36. Wayne Cascio, Managing Human Resource, 8th edition, McGraw Hill, 2009.

Course Name: Strategic Management

Course Code: 302

Learning Objectives:

- To understand various functional areas of management such as marketing, accounting, finance, management, production/operations management, information system and economics.
- To enable participants to identify central issues and problems in complex, comprehensive cases
- To suggest alternative course of action; and present well-supported recommendations for future action
- To develop conceptual skills so that participants are able to integrate previously learned aspects of organizations in a holistic perspective
- To understand critical aspects from the point of view of the top executives

Course Content:

Unit 1: Introduction to Strategic Management: Concepts of Strategic management, process and strategic decision making, defining business purpose, mission and objectives, strategic intent. Environmental Appraisal- external and internal and Industry analysis, corporate capabilities – SWOT analysis, concept of core competence and value chain analysis, (Case Studies for related topics), concept of competition, PESTEL Analysis, Industry analysis

Unit 2: Formulation of Strategy: Level of strategy formulation, Generic competitive strategies: cost leadership, and differentiation, framework for analysing competition, competitive positioning of a firm, Game Theory approach to competitive dynamics, market entry.

Unit 3: Strategic Tools: business process reengineering, and Balance Score Card. Aggregate and granular metrics and metrics of value creation. (Case Studies for related topics)

Unit 4: Strategic alternatives and Choices: Grand strategies, business level strategies, horizontal, vertical integration, diversification. Strategic Choices- BCG matrix, G.E matrix portfolio analysis - Technology based versus mature industries, External growth strategy – Strategic Alliances, merger-acquisition, collaborative partnerships. (Case Studies for related topics)

Unit 5: Implementation of Strategy: Elements of strategy implementation, structure, McKinsey's 7s framework Resources allocation, corporate leadership, personal values, organizational culture, Strategy evaluation and control. Strategic Issues of development organizations. (Case Studies for related topics)

Suggested Readings:

1. Andrews, K.R., "The Concept of Corporate Strategy", Homewood. IL, Dow Jones Irwin, 1971
2. John Kotter, 'Leading Change', Harvard Business Review Press, 1996
3. Mintzberg, H., "The Strategy Concept 1: five Ps for Strategy", California Management Review, 1987
4. Max Mckeown, "The Strategy Book, Financial Times Publishing", 2016
5. Porter .M.E. "Competitive Strategy: Techniques for Analyzing Industries and Competitors", New York: Free press, 2018

6. Wheelen.L.Thomas & HungerD.J.(2002), "Strategic Management and Business Policy:Concepts",8Edition,Published by Pearson Education, 2002
7. William Bridges, 'Managing Transitions: Making the Most of the Change', Da Capo Lifelong Books; 3 edition 2009.

CourseName:RegulatoryFrameworkLegalAspectsandMandatoryRegulations

Course Code: 303

Learning Objectives:

- To promote eco-responsible behaviour and practice compliance with regulatory requirements

Course Content:

Unit 1: Constitutional provisions for the protection of Environment

Fundamental Rights and Fundamental Duties, Directive Principles of State Policy and other Constitutional mandates, Public Interest Litigation and Doctrine of Trust, National Green Tribunal, The Ministry of Environment, Forest and Climate Change, role of CPCB / SPCB; Supreme Court & High Courts case laws discuss for Constitutional Objectives & Environmental Jurisprudence

Unit 2: Regulation for Natural Resource Management

Framework for Established Industries :Consent for Establishment (CFE), Consent for Operations (CFO), Environment Public Hearing, Forest & Wildlife Protection Laws, Air and Water Pollution Control Laws, Factories Act 1948, Motor Vehicles Act 1988, Public Liability Insurance Act 1991, The Environment Protection Act 1986

Unit 3: Legal Framework for Hazardous and Biomedical Waste Management

The Hazardous Waste Management Rules, Biomedical Wastes (Management and Handling) Rules 2016 & 2018, E-waste (Management and Handling) Rules 2018, The Batteries (Management and Handling) Rules 2001

Unit 4: Legal Aspects for Solid Waste Management

Municipal Solid Waste Management Rules 2016, Plastic Waste Management Rules 2018, The Construction and Demolition Waste Management Rules 2016, EPR- Extended Producer Responsibility, Cleaner Production Option and Waste Management ; Indian legislation; recycling opportunities; reuse of e-waste; Plastic Waste Management Rules amended in 2018

Unit 5: National and International Instruments

International Instruments, Corporate Social Responsibility, International Conventions, An assessment of the legal and regulatory framework in India; Assessment of actual/ground implementation of Rules must be undertaken to find out solutions for better Legal & Regulatory frameworks

Suggested Readings:

1. Environmental Law and Policy in India: Cases, Materials, and Statutes by Armin Rosencranz and Shyam Divan
2. Environmental Law in India by P. Leela Krishnan
3. Environmental and Pollution Laws In India by Justice T S Doabia
4. Environmental Law by Stuart Bell, Donald McGillivray, Ole Pederson, 2002, Oxford University Press
5. Environmental Law- An introduction by Vibhav Navneet, LEXIS-NEXIS, 2016, 1st edition
6. Operation Management: Theory and practices, 2nd edition by B Mahadevan, Pearson Publication
7. Environmental law case book: P Leela Krishnan, 2010, ISBN- 9788180381324

Resource Persons

- Rajesh Luthra, Head HRD, CSIR, GOI
- Sri Rakesh Chetal, advisor CSIR

Institutions to refer for inputs

Nalsar, Hyderabad

NLSIU, Bangalore

Practicum

Visits to NGT, PCB, Dump yards, landfills

Case Studies – include links

Course Name: Field Experience in Waste Management Facility– (1 Month)

Course Code: 306

Learning Objectives:

- To facilitate students' interaction within a Waste Management Facility
- To enable students observe functioning of a Waste Management Facility

Course Content:

This will be the third Field experience for the students. The students are expected to be attached with a successful and efficiently managed Waste Management Facility so as to understand the practices and principles of facility. They are expected to interact with the personnel working in wastemanagement facility and observe the functioning of the facility carefully.

At the end of 4weeks, all the students are expected to submit a comprehensive report (not less than 40 pages), individually, on the Objectives, Programs, Implementation Plan and Impact of Waste Management Facility. Their report mayinclude:

- Mission and Vision of Waste Management Facility
- Why in this area? (Geographic as well as functional).
- Funding/ Accounting/Reporting.
- Staffing Concerns.
- Engagement with other stakeholders/ partners.
- Social Impact

Semester4

S. No.	Course Code	Course Title
1.	401	ICT and MIS
2.	402	Waste Management as Project Management
3.	403	Creativity and Innovation
4.	404	Elective 3

Course Name: ICT and MIS

Course Code: 401

Learning Objectives:

- To equip students with essential knowledge and skills required to handle ICT equipment and Software
- To create awareness in upcoming managers of different types of information systems in an organization so as to enable the use of computer resources efficiently, for effective decision making.
- To understand various MIS operations in functional areas of an organization and explain its relationship with the various activities of the organization.

Course Content:

Unit 1: ICTs: Concept, Principles, and Scope of ICT in Rural Development, Introduction to IS, Technology and modern enterprise, Introduction to Computers, Computer Generations, Operating systems, Browsers: Google Chrome, Internet Explorer, Microsoft Office: MS Word, MS PowerPoint, MS Excel and MS-Project. Use of e-mail, Facebook, twitter and WhatsApp.

Developing multi-media content and communication systems (DVD, CD, tele/video conferencing), ICT Applications in e-agriculture, e-awareness generation, e-banking, e-commerce, e-development, e-education, e-empowerment, e-entertainment, e-governance, e-health (human & veterinary), e-insurance, e-marketing, Applications of Local Area Portal (LAP) Software, Digital imaging and GIS mapping

Unit 2: Foundations of Information Systems: A framework for business users - Roles of Information systems - System concepts - Organization as a system - Components of Information Systems - IS Activities
- Types of IS. Strategy and technology, internet and telecommunications, e-commerce technologies

Unit 3: IS for operations and decision making: Marketing IS, Manufacturing IS, Human Resource IS, Accounting IS and Financial IS - Transaction Processing Systems - Information Reporting System - Information for Strategic Advantage, internet marketing, web 2.0, SEO

Unit 4: Managing Information Technology: Managing Information Resources and technologies – IS architecture and management - Centralised, Decentralised and Distributed - EDI, Supply chain management & Global Information technology Management, Business process reengineering, BPM

Unit 5: Security and Ethical Challenges: IS controls - facility control and procedural control - Risks to online operations - Ethics for IS professional - Societal challenges of Information technology, data, warehouse, and BT. Enterprise architecture, mobile computing, ethics.

Suggested Readings:

1. James O'Brien, "Introduction to Information Systems", Tata McGraw Hill, 14th Edition, 2008.
2. O'Brien, J.A., and Marakas, G.M. Management Information Systems. (7th edn.), Tata McGraw Hill: India
3. Oz, E. (2008). Management Information Systems. (2nd edn.), India: Cengage Learning
4. Laudon, J. and Laudon, K.C. (2007). Management Information System. (10th edn.), Pearson Education: India
5. Haag, S., Cummings, M., and Phillips, A. (2008). Management Information Systems. (6th edn.), Tata McGraw Hill: India

Course Name: Waste Management as Project Management

Course Code:

402 Learning

Objectives:

- To comprehend the special characteristics and problems in waste management
- To help students to evaluate various steps of project management

Course Content:

Unit 1: Projects in Contemporary Organizations: Introduction to Project Management, Meaning of a project, relevance of project management principles for waste management. Project vs. operations, Roles and Responsibilities of Project Manager, Benefits of project management, Project lifecycle. Introduction of GIS and Remote Sensing in waste management applications. Familiarisation with ArcGIS, and open source software QGIS, Factors influencing waste disposal site, soil, water bodies, population density, scope, drainage, road.

Unit 2: Project Selection Techniques: Beginning a project, Project Selection, Defining criteria, Project selection methods, Scope Definition, Project Charter development, Work break down structures, Project resources and scheduling, building a project schedule. Project Planning Tools (Bar charts, Logical Frame work approach, CPM, and PERT)

Unit 3: Project Development: Project Execution, Monitoring through Information Systems, Project control, scope creep, Capital Cost Estimating, Monitoring Techniques and time control System, Project Cost Control and Time cost Trade-off, Project Procurement and Materials Management, Pre-Feasibility Study, Feasibility Studies, Project Break-even point.

Unit 4: Monitoring a Waste-based Project: Conflict Resolution, Team Management and Diversity Management, Change management, Quality, Quality Concepts, Risk Management- Risk identification, Qualitative risk analysis, Quantitative risk analysis, Risk planning, Risk control, Use of MS-Project Software for Project Planning and Monitoring, GIS

Unit 5: Project completion: Project Close-out, Steps for Closing the Project, Project Termination, Project Follow-up, Project auditing, Case Studies for all the above Modules, should be incorporated as per the current requirements of the course.

Suggested Readings:

- 1) Brownlee, D. The secrets to running project status meetings that work! Paper presented at PMI® Global Congress, 2008—North America, Denver, CO. Newtown Square, PA: Project Management Institute.
- 2) Chalkias and Katia Lasaridi, “ Benefits from GIS Based Modelling for Municipal Solid Waste Management”, 2011.
- 3) Cleland D. and Geresis “Global Project Management Handbook: Planning, Organizing and Controlling International Project”, Second Edition: Planning, Organizing, and Controlling International Projects , MCGraw Hill Publication. 2006.
- 4) Cloke, K. “The Crossroads of Conflict: A Journey into the Heart of Dispute Resolution”, 2006.
- 5) Glen B Alleman, “ Performance based Project Management”, Amcon, 2014.
- 6) Jack R. Meredith, Samuel J. Mantel, Jr., “Project Management”, A Managerial Approach, Wiley, 1999.
- 7) Kang Tsung Chang, “ Introduction to Geographic Information Systems”, McGraw Hill Education, 2017.
- 8) Maccoby, Michael, "Dealing with the New Diversity", Research Technology Management, 2006.

- 9) Passenheim Olaf., "Project management". Ventus Publishing ApS. 2009.
- 10) Paul and Longley , "GIS and science" , 3rd Edition, ISBN: 978-0470721, Routledge, 2016.
- 11) Phillips Joseph., "IT Project management". McGraw Hill Publication Pvt. India Ltd, 2010.
- 12) Pinto, J. K. "Project Management: Achieving Competitive Advantage", Chapter Project Selection and Portfolio Management. Prentice Hall, 2010.
- 13) Pledger, Marcia, "Handling Conflict in a Diverse Work Environment", Black Enterprise Magazine, 2006.
- 14) PMBOK* Guide. A guide to the Project management body of Knowledge, Project Management Institute). Newtown Square, PA, USA: Project Management Institute (PMI), 2000.
- 15) Ramasamy SM, Kumanan CJ, Palanivel K. , "GIS Based Solutions for Waste Disposals. In: GIS Development", India, 2003.
- 16) Robert K Wyoski, "Effective Project Management" , Wiley Int, 2016 ISBN: 1118729168
- 17) Saaty, T. L., "Fundamentals of decision-making and priority theory", second edition, Pittsburg, PA: RWA Publication, 2000.
- 18) Xuan zhu, "GIS for Environmental Applications- practical approach," Routledge, 2016.

Course Name: Creativity and Innovation

Course Code: 403

Learning Objectives:

- To enhance creative potential by strengthening various mental abilities
- To expose the learners to creative problem-solving exercises by developing integrative intelligence to become managers with creative skills
- To help the learners to become thoughtful managers by understanding workplace creativity and ways of harnessing it for organizational excellence

Course Content:

Unit 1: Realms of Creativity: Creativity-Concept-Convergent and Divergent Thinking-Creativity Intelligence-Enhancing Creativity Intelligence-Determinants of Creativity-Creativity Process-Roots of Human Creativity-Biological, Mental, Spiritual and Social-Forms of Creativity-Essence, Elaborative and Expressive- Existential, Entrepreneurial and Exponential.

Unit 2: Creative Personality: Traits Congenial to Creativity- Motivation and Creativity-Strategies for changing Motivation-Creative Environment- Formative Environment and Creativity- Adult Environment- Environmental Stimulants-Blocks to Creativity-Strategies for unblocking Creativity.

Unit 3: Managerial Creativity: Creative Manager-Techniques of Creative Problem Solving- Creative Encounters and Creative Teams- Perpetual Creative Organizations-Creative Management Practices- Human Resource Management, Marketing Management, Management of Operations, Management of Product Design and Growth Strategies.

Unit 4: Management of Creativity: Issues and Approaches to the Design of Creative Organizations-Policy frameworks- Organizational Design for Sustained Creativity-Mechanism stimulating Organizational Creativity-Creative Diagnosing-Creative Societies-Necessity-Model of a Creative Society.

Unit 5: Innovation: Nature of Innovation-Technological Innovations and their Management-Inter- Organizational and Network Innovations- Design of a Successful Innovative Organization-Training for Innovation-Management of Innovation-Agents of Innovation- Skills for Sponsoring Innovation.

Suggested Readings:

1. Pradip Khandwalla- Lifelong Creativity- An Unending Quest, Tata McGraw Hill, 2006.
2. Pradip Khandwalla- The Corporate Creativity- The Winning Edge, Tata McGraw Hill, New Delhi
3. Pradip Khandwalla- The Fourth Eye, Wheeler Publishing, New Delhi.
4. Rastogi, P.N, Managing Creativity for Corporate Excellence, Macmillan, New Delhi.
5. Jone Ceserani, Peter Greatwood- Innovation and Creativity, Crest Publishing House, New Delhi.
6. Clayton, Christensen- Innovation and the General Manager, McGraw Hill.
7. Margaret, A. White & Gary D. Bruton- The Management of Technology Innovation- A Strategic Approach
8. Praveen Gupta- Business Innovations in the 21st Century, S.Chand, 2008.
9. CSG Krishnama Charyulu & R.Lalitha- Innovation Management, Himalaya Publishing House, 2007.

Operations Management (OM) Electives

S. No.	Course Code	Course Title
1.	OM-1	Operations and Maintenance
2.	OM-2	Environment Impact Assessment
3.	OM-3	Cost of non-management of Solid and Liquid Waste
4.	OM-4	Hotel Waste Management
5.	OM-5	Reclamation, Remediation and Capping
6.	OM-6	Sanitation and Hygiene

Operations Management Electives

Course Name: Operations and Maintenance

Course Code: OM1

Learning Objectives:

- To learn about operations in waste management methods and techniques
- To understand government and local bodies' initiatives in waste management
- To know how to address environmental hygiene and safety

Course Content:

Unit 1: Waste Management methods and techniques, government priorities, local involvement, Management of Collectives, NGOs, political will, community mobilization, resolving bottle necks, addressing environmental hygiene and safety

Unit 2: Operation and maintenance – importance, Monitoring plant operation in the central control room, actively employing local residents, Conducting a daily equipment inspection, Waste crane operation, Loading bulky waste, Operations Management/Maintenance manuals/plans, and Environmental Health and Safety Contingency Plans, Facility/System day-to-day operations protocol /procedures, Site and equipment maintenance schedule / regime, Staff/operator training in facility operations, & environmental health and safety, Record keeping and Reporting

Unit 3: Waste Collection & Transport; Collection & storage of Municipal solid waste, Methods of collection – House to House collection, Community bins, Collection routes, Manpower requirement on- site storage methods, transfer station, transportation methods, mechanical methods – with or without compaction, economy in transportation, waste optimization of transport routes, Replacing, repairing, track recording of vehicles, machinery

Unit 4: Daily operations including recording and reporting data, maintenance data, operational record data, Access Control and Hours of Operation, Regulation of Scavenging, Burning for Volume Reduction, Landfill Operation, Control of Windblown Debris, Control of Fire, Release to the Receiving Environment, Troubleshooting and Resolving Safety, Service, and Operational Issues Maintain and distribute department related information on a daily basis. **Predictive Maintenance-** Waste management equipments, life cycles, capacity, labor effort cost, predictive methods

Unit 5: Usage of software tools to manage a variety of tasks, such as procurement, time and attendance, safety incidents, contract labour, Data collection and reporting required for incentive pay programs, processing of payments and other financial tasks as necessary, implementation of operational projects, employees scheduling and work assignments, Facility Maintenance & Renovation, Inspection and Monitoring, Odour Management Program, Vector (rodents, flies, other) Control Programs, siting, design, construction, operation, and decommissioning of waste management facilities, reduce and mitigate adverse environmental impacts associated with management of waste material; **Predictive Maintenance-** pro-data science and information age

Suggested Readings:

- [1] Central Pollution Control Board , “National Action Plan for Municipal Solid Waste Management”, New Delhi, 2015.
- [2] Cherubini, F., Bargigli, S., &Ulgiati, S. (2009), “Life cycle assessment (LCA) of waste management strategies: Landfilling, sorting plant and incineration”, *Energy*, 34, 2116-2123.
- [3] Central Pollution Control Board , “Guidelines for Selection of Site for Landfilling”, New Delhi,2003.
- [4] Central Pollution Control Board , “Guidelines on Odour Monitoring & Management in Urban Municipal Solid Waste (MSW) Landfill Site”, New Delhi 2017.
- [5]Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, Government of India , “Manual on Municipal Solid Waste Management”, New Delhi, 2000.
- [6]Central Pollution Control Board , “Municipal Solid Wastes Processing Technologies: Reference Manual for Local Bodies”, New Delhi, 2002.
- [7] De Feo, G., &Malvano, C. (2009), “The use of LCA in selecting the best management system”, *Waste Management*, 29, 1901-1915.
- [8] Debishree Khan and Sukha Ranjan Samadder, “Municipal Solid Waste Management using Geographical Information System aided methods: A Mini Review”, Sage Publication, *Waste Management & Research*, 2014.
- [9] Govt of India, “Salient Features of Solid Waste Management Rules 2016”, New Delhi, 2016.
- [10] Govt of India, “Solid Wastes Management Rules 2016”, New Delhi, 2016.
- [11] KonstadinosAbeliotis , “Life Cycle Assessment in Municipal Solid Waste Management”, August 23rd, 2011.
- [12] ILO , “Advocacy manual for the NGO’s, CBO’s and other related organization”, Geneva, 2007.
- [13] Meena Deswal and J.S Laura, “Application of GIS in MSW management in India. “, *International Journal of Engineering Research and Development* e-ISSN: 2278-067X, p-ISSN: 2278-800X, www.ijerd.com Volume 10, Issue 10 (October 2014), PP.24-32.
- [14]Ministry of Urban Development, Govt of India , “Municipal Solid Waste Management Manual”, New Delhi, 2016.
- [15] Ministry of Law and Justice, Govt of India, “The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act”. 2013.
- [16] Ministry of Rural Development, Govt of India, “ Municipal Solid Waste Management Manual”, New Delhi,2016.
- [17] National Law School of India University, “Manual Scavenging Act and Municipal Waste Water Workers in India - Policy and Practice”, Bangalore, 2007.
- [18] Ohri. A, Singh, P.K, BHU,“Development of Decision Support System for Municipal Solid Waste Management in India”, *International Journal Of Environmental Sciences*, Volume 1, No 4, 2010.

Operations Management

Electives Course Name: Environment Impact

Assessment

Course Code: OM-2

Learning Objectives:

- To facilitate and provide insights in environment impact assessment and application
- To enable them to conduct waste audit efficiently
- To learn about international agreements on waste.

Course Content:

Unit 1: Environment Impact Assessment: Definition, Background, Objectives, Scope of EIA, Policies, Legal and Institutional framework, Guidelines EIA for Waste Management, checklists for Impact Assessment in Waste Management; Social Impact Assessment

Unit 2: Fundamentals of EIA, Steps in EIA, Prediction of Impacts, Evaluation, Mitigation measures, Public Hearing, EIA Report, Monitoring Audits, Assessment Methodology, Identification of Potential Sources of Impact, Costs of EIA; Social Perspective

Unit 3: Strategic Environmental Assessment (SEA), EIA in India, Environmental Management Plan (EMP), Applications of EIA specific to this course – to site dump yards and landfill areas

Unit 4: Waste Audit: Introduction, Definition, Objectives of Audit, Steps in Waste Audit, Management through Environmental Audit: ISO 14000, 14001; Quality of the implementation process, Environmental Management benefits Implementing Certification Maintaining your ISO 14001, ISO 9000:2015 Principles of Quality Management

Unit 5: International Agreements on Waste: MARPOL Convention, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Joint Convention, Convention on Nuclear Safety, National Waste Management Systems

Practicum

Identification of social entrepreneurs

Operations Management Electives

Course Name: Cost of Non-Management of Solid and Liquid Waste

Course Code: OM-3

Learning Objectives:

- To calculate, study and report the socio-economics of neglecting waste management and environmental hygiene
- To understand cost to human health, the environment and the economy.

Course Content:

Unit 1: Ecological Costs of Non-Management of Waste: Overview, Eco-economics, Valuation Techniques, Obsolescence - Strategies for improved durability of products, Ecological Cost – benefits, Ecological Cost of Waste Production, Pollution – types, threats to life forms, Activities that threaten biodiversity; remedies and solutions, waste of monoculture in farming – effect of burning rice straw instead of using it as fodder for cattle; pesticide waste residues; Strategies for ecological balance & maintenance; Remedial measures

Unit 2: Human Cost of Not Managing Waste: Introduction to Human Cost techniques for assessment; consequences of non-management; Holistic meaning of Human Development, Measuring the burden of disease-DALY and QALY, Occupational and Environmental Health Hazards for Wastepickers, Vulnerability of citizens, Strategies for eliminating such costs, remedies and solutions

Unit 3: Social costs: Introduction to social costs; Vulnerability, Most vulnerable people in pyramid; Human Development Costs, Littering costs, Plastic world – suffocating living beings, micro-plastics spread all over, Major Threats to Sustainability; Cultural & Ethical Costs with case studies; Strategies for eliminating social costs

Unit 4: Economic Cost of Improper Waste Management: Waste – to be contained at Source, Consumerism & its effects, Efficiency of Resource Use- Production and Consumption, Environmental Taxes, Life Cycle Assessment, Cost-Benefit Analyses, economic comparison of waste storage and source management; costs of eliminating waste through small closed loop cycles; economic comparison of waste storage & source management; Economic & Business consequences in case of non-management

Unit 5: Product Stewardship, Product Stewardship Act, Product Stewardship vs Extended Producer Responsibility, Voluntary product stewardship, Businesses and Product Stewardship, Consumers and Product Stewardship, Principles of Responsible Product Stewardship

Suggested Readings:

1. Solid Waste Management - Present and Future Challenges - Jagbir Singh & AL Ramanathan
4. Smart Cities - Transforming India - Prof M.P Dube
5. Waste Management Practices by John Pichtel
6. Solid wastes management by Stephen Burnley
7. Eco-Economy: Building an Economy for the Earth by Lester R. Brown
8. Not in My Backyard - Solid Waste Management in Indian Cities by Sunita Narain & Swati Singh

Sambyal

9. Gram Swaraj by M.K. Gadwal

10. Prof. K. K. Pant, IIT Delhi

11. Prof. Sanjay Mahajan, IIT Mumbai

Institutions to refer for inputs

1. Rajasthan Pollution Control Board
2. IIT Delhi
3. Manipal University

Practicum

1. Visit to landfill site or Municipal Corporation or waste Processing Plant
2. Case & Situation Analysis

Operations Management Electives

Course Name: Hotel Waste Management

Course Code: OM-4

Learning Objectives:

- To know the types of hotel waste produced and ways to handle them
- To know how this initiative can save economy of the hotels
- To know the importance of waste audit in hotels
- To know how to conduct waste audit and tools needed

Course Content:

Unit 1: Introduction: Importance of Hotel Waste Management, Objectives, actions needed on Waste Management, monitoring, Designing the recovery system

Unit 2: Overview of Hotel Waste, Types of Waste in Hotels, Steps of Effective Waste Management in Hotels, Benefits of Waste Reduction, Recognize role at different levels to manage waste, Importance of allocating budget for managing waste

Unit 3: Organizing a Waste Management Program, Purchase Recycled Content Products, Food Waste Management Strategy, Waste Types by Department/Activity in hotels, Staff Training & Communication

Unit 4: Audit: Auditing of Waste in Hotels, **Performing Waste Audit**, Tools to Conduct Waste Audit, Restaurant Food Waste Reduction Ideas

Suggested Readings:

1. International Tourism Partnership (ITP) presents Green Hotelier – Know How Guide to Reducing and Managing Food Waste in Hotels, September 2014
2. Environmental Management for Hotels, The Industry Guide to Sustainable Operation 4 Waste First published 1993 | Third edition 2008 | Digital Release 2014 © International Tourism Partnership
3. International Journal of Scientific and Research Publications, Volume 6, Issue 9, September 2016 670 ISSN 2250-3153 www.ijsrp.org/WasteManagementinHotelIndustryinIndia:AReview

Operations Management Electives

Course Name: Reclamation, Remediation and Capping

Course Code: OM-5

Learning Objectives:

- To assess contamination before reclamation and remediation
- To know waste management technologies on reclamation
- To provide insights in landfill reclamation, soil remediation and MCDA

Course Content:

Unit 1: Assessment of contamination before reclamation and remediation

Characterization of contamination and assessment of exposure, risk and resilience, Sample collection and analytical methods, Factors influencing risk assessment of contaminated site, Assessing exposure, risk and resilience

Unit 2: Waste Management Technologies

Eco Friendly Waste Management Technologies, Reclamation, Overview of Bioremediation Technologies; Microbial Bio-remediation & Myco-remediation

Phytoremediation; Introduction to Phytoremediation, Plant processes, Different phytoremediation methods, Phytoremediation-Design considerations, microbial bioremediation and mycoremediation

Unit 3: Landfill Reclamation

Landfill reclamation projects, Waste Lands-Classification and Reclamation, Use of waste as Filling, Material in Land Reclamation, Criteria Approach, and Implementation analysis – Land reclamation, Implementation of Land Reclamation Sample Check-Points, Land Reclamation-Scenario Development

Unit 4: Bio Remediation

Soil resources and bioremediation, Soil Restoration and Night Soil Management, Soil remediation technologies, Classification of Soil Remediation Technologies, Bio-mining, Capping, Gas Recovery, Power Generation and Landfills, Remediation of water and air.

Unit 5: Multi-Criteria Decision Analysis (MCDA)

Multi-Criteria Decision Analysis or Multi-Criteria Decision Making (MCDM), Methodological process and criteria options, Identification and implementation of waste options/alternatives

Suggested Readings:

1. Guerriero, J.R. 1994. Landfill Reclamation and its Applicability to Solid Waste Management. Landfill Reclamation Conference, Lancaster, PA.
2. Sharma, H. D., and Reddy, K. R. (2004). Geo-environmental engineering: site remediation, waste Containment and emerging waste management technologies. Wiley, Hoboken, N.J.
3. Singh SN, Tripathi RD (2007) Environmental bioremediation technologies, Springer-Verlag Berlin Heidelberg.

Operations Management Electives

Course Name: Sanitation and Hygiene

Course Code: OM-6

Learning Objectives:

- To provide basic understanding of sanitation and hygiene, its importance
- To provide insights in faecal sludge treatment, evaluation of construction of sanitation facility

Course Content:

Unit 1: Sanitation and Hygiene – definitions, scope, importance, its link with health, relation with economic development, specific areas to focus, effects of poor sanitation, Sanitation ladder – sanitation technologies

Unit 2: Toilets: Proportion and Number of toilets, Gender sensitive sanitation facilities, Ramps for differently abled, Types – Indian, Western; Latest technologies in Toilet infrastructure with emphasis on feasibility of usage, maintenance and sustainability

Unit 3: Faecal Sludge treatment -Single /twin pit, EcoSan, Septic tank, Formal sewerage, Sanitation infrastructure Status evaluation; Robust decentralised /centralised solutions including, source segregation, composting and recycling, Zero Waste Institution; Wastewater technologies to separate black and grey water, waste water treatment methods, Quality of treated water, Sludge management treatment and wetland treatment

Unit 4: Evaluation of Construction and Maintenance of Community, Public, Institutional and Individual Sanitation Infrastructure, Levels of investment, Resource Allocation, Subsidies for sanitation, Sanitation marketing

Unit 5: Community Sanitation, Maintenance of Community Toilets, IHHL procedures, Promotion of Sanitation & Hygiene, Capacity Building at Community level, Subsidy Mechanism, Working with Communities & households

Suggested Readings:

1. Rural water supply and sanitation by S Gupta, Vayu Education of India
2. Manual on liquid and solid waste management by UNICEF and Ministry of drinking water and sanitation
3. Eulers and steel- municipal and rural sanitations by McGraw Hill

Field Experience

Visit to Rural area and sewage treatment facilities, wetland treatment systems

Marketing Management (MM) Electives

S. No.	Course Code	Course Title
1.	MM-1	Market Integration for Waste Management
2.	MM-2	Consumer Behavior
3.	MM-3	Integrated Marketing Communication
4.	MM-4	Service Marketing
5.	MM-5	Product and Brand Management
6.	MM-6	Waste Exports, Procedures and Documentation

Marketing Electives

Course Name: Market Integration for Waste Management

Course Code: MM-1

Learning Objectives:

- To help students understand the Sales & Distribution functions as an integral part of marketing functions in a business firm.
- To make students appreciate the role of sales managers in the context of Indian economy with particular reference to essential consumer and industrial goods and services.

Course Content:

Unit 1: Introduction to sales and distribution Management: Nature and scope of sales management, personal selling objectives, Types of sales management positions, theories of personal selling, personal selling strategies, sales forecasting and budgeting decisions, emerging trends in selling, ethical leadership, case analysis

Unit 2: Personal selling process, sales territories and quotas: Selling process, relationship selling, designing sales territories, sales quotas and sales organization structures, case analysis.

Unit 3: Sales Force & Distribution Management: Sales Force Management: Recruitment and selection of sales force, training, motivating and compensating the salesforce, controlling the salesforce, case analysis.

Unit 4: Distribution Management: Introduction, need and scope of distribution management, marketing channels strategy, levels of channels, institutions for channel-retailing wholesaling, designing channel systems, channel management, case analysis.

Unit 5: Management of logistics & SCM: Definition & Scope of logistics, Components of logistics, inventory & warehouse management, transportation, channel information systems, Extension into Supply Chain Management distribution management in international market. Online market places- B2B, B2C, C2C, online auction, specific online market places for energy, construction, recycling, reuse, government market places

Suggested Readings:

1. Krishna K. Havaladar and Others – Sales and Distribution Management, TATA McGraw Hill Co.
2. Louis W. Stern and Ansar – Marketing Channels, Prentice Hall India.
3. Dr. Matin Khan – Sales and Distribution Management, Excel Books.
4. S.A. Chuna wala – Sales and Distribution Management, Himalaya Publishing House.
5. Mark W Johnstan and Others. – Sales Force Management, TATA McGraw Hill Co.
6. Spiro – Stanton Rich – Management of Sales Force, TATA McGraw Hill Co.
7. Richard R Still and Others – Sales Management,
10. Rosen bloom: Marketing Channels, Cengage Learning.
11. Shah, J, “Supply Chain Management”, 2009, 1st Ed. Pearson.
12. Crandall, Richard E & others, “Principles of Supply Chain Management”, 2010, CRC Press.
13. Electronic commerce by Gary Schneider

Marketing Electives

Course Name: Consumer Behaviour

Course Code: MM-2

Learning Objectives: To enable the students grab a basic understanding of how the consumers make purchase decisions & the factors associated with their decision making.

Course Content:

Unit 1: Introduction to Consumer Behaviour: Concept- Types of consumers- Current trends in consumer behaviour- Approaches to studying consumer behaviour- Inter- disciplinary analysis- Consumer Behaviour applications in designing marketing strategies- Problems in studying consumer behaviour.

Unit 2: Internal Determinants of Consumer Behaviour: Motivation- Learning- Perception- Attitude- Personality and Lifestyle.

Unit 3: External Determinants of Consumer Behaviour: Family- Social Class- Reference Group and Opinion Leader- Diffusion of innovations- Culture and subculture- Relationship marketing.

Unit 4: Consumer decision making process: Consumer Decision Making Process and Models: Howard Sheth Model- EKB Model- Organizational Buyer Behaviour and Influences on Organizational Buyer Behaviour, Post purchase behaviour, Consumer Dissonance, Post- purchase cognitive dissonance.

Unit 5: CRM concept and components: Evolution, development & challenges in implementing CRM Organization for CRM, CRM Strategy cycle – CRM Program measurement and Tools – CRM practices in Banking, Insurance and Retail. Emerging trends- emerging issues, past, and present marketing apps.

Suggested Readings:

[1] East, R., Wright, M. & Vanhuele, M, “Consumer Behaviour: Applications in Marketing”, 2nd edition, SAGE Publication, 2016.

[2] Motherbaugh & Mookerjee, “Consumer Behaviour: Building Marketing Strategy”, 12th Edition, McGraw Hill Education (India) Private Limited, 2018.

[3] Ramanuj Majumdar, “Consumer Behaviour: Insights from Indian Market”, Kindle Edition, PHI, 2017.

[4] Satish K Batra & Kazmi, “Consumer Behaviour”, 2Rev Ed edition, Excel Books, 2018.

[5] Schiffman & Kumar, “Consumer Behaviour”, 11th edition, Pearson Education India, 2017.

Resource Persons to Contact: Dr M Kishore Babu, KL University

Marketing Electives

Course Name: Integrated Marketing Communication

Course Code: MM-3

Learning Objectives:

- To familiarize the students with concepts and practices in marketing communication
- To enable students learn various communication tools and their effectiveness, in contemporary time and to draw a lesson from that knowledge in form of various marketing communication tools with creative ideas for effective marketing

Course Content:

Unit 1: An Introduction to Integrated Marketing Communication (IMC): IMC – Definition and role, Global Developments in IMC, Introduction to IMC tools and techniques, Marketing Objectives and IMC, Strategies by waste and recycling industry

Unit 2: Understanding Communication Process: Introduction to the communication process, Identifying important elements in communication, Information processing approaches and human cognition, AIDA model, Hierarchy of effect model and the Innovation adoption curve

Unit 3: Planning for Marketing Communication (Marcom): Establishing Marcom Objectives and Budgeting for Promotional Programs-Setting communication objectives, Sales as Marcom objective, DAGMAR approach for setting ad objectives. Budgeting for Marcom-Factors influencing budget, Theoretical approach to budgeting viz. Marginal analysis and Sales response curve, Method to determine Marcom budget.

Unit 4: Developing the Integrated Marketing Communication Programs: Planning and development of creative Marcom. Creative strategies in advertising, sales promotion, publicity, event sponsorships etc. Creative strategy in implementation and evaluation of Marcom- Types of appeals and execution styles. Media planning and selection decisions-steps involved and information needed for media planning,

Unit 5: Measuring effectiveness and Control of Promotional Programs: Meaning and importance of measuring communication effectiveness, the testing process, measuring the effectiveness of other promotional tools and IMC. The ethical, social, and legal aspects of advertising and promotion-, Social Communication Different legislative and self regulatory codes controlling advertising and promotions in India viz. advertising councils code, print media codes, broadcasting media codes and regulations governing sales promotion, packaging, direct marketing and internet marketing.

Suggested Readings:

1. Alsem, Karel Jan. Applied Strategic Marketing: A Step by Step Approach. Routledge, 2019.
2. Broderick, Amanda, and David Pickton. Integrated marketing communications. Pearson Education UK, 2005.
3. Chaffey, Dave, and Fiona Ellis-Chadwick. Digital marketing. Pearson UK, 2019.
4. DeVito, Joseph A. "The interpersonal communication book." Instructor 1 (2019).
5. GREEN, MARK C. KEEGAN, and J. WARREN. GLOBAL MARKETING. Pearson, 2019.
6. Kitchen, Philip J., and Don E. Schultz. "A multi-country comparison of the drive for IMC." Journal of Advertising

Research 39, no. 1 (1999): 21-21.

7. Kucuk, S. Umit. "What Is Brand Hate?." In Brand Hate, pp. 23-48. Palgrave Macmillan, Cham, 2019.
8. Lu, Pierre Xiao. International Luxury Brand Strategy. Routledge, 2019.
9. Palmatier, Robert W., and Lena Steinhoff. Relationship Marketing in the Digital Age. Routledge, 2019.
10. Percy, Larry. Strategic integrated marketing communications. Routledge, 2008.
11. Polonsky, Michael Jay. "An introduction to green marketing." Electronic green journal 1, no. 2 1994.
12. Schultz, Don E., and Philip J. Kitchen. Communicating globally. McGraw Hill Professional, 2000.
13. Varey, R. J., "Marketing communication: principles and practice". Psychology Press. Journal of Advertising Research, vol 39, no.1, 2002.
14. Yeshin, Tony. "The integration of marketing communications." The marketing book (2003): 395.

Marketing Electives

Course Name: Service Marketing

Course Code: MM-4

Learning Objectives

- To familiarize the students with concepts of Service Relationship Management- Services Perspective, customer interface, balancing demand and supply.
- To provide a basic understanding of the Role of intermediaries, challenges of distribution in large domestic markets.
- To empower the students to understand profitable service strategies and need for short-term and long-term customer engagement.

Course Content:

Unit 1: Understanding Service Products: Introduction, importance of services in economy, service environment, Why study services? Industries or the Service Sector? Powerful forces transforming service market; four broad categories of services- A service perspective, Services pose distinct marketing challenges, the traditional marketing mix applied to services, the extended services marketing mix for managing the customer interface, a framework for developing effective service marketing strategies

Unit 2: Understanding Consumers and Markets: Consumer Behaviour in service context, Positioning services in competitive markets, segmentation and targeting, purchase model

Unit 3: Apply the 4ps of Marketing to Services: Planning and creating service products, The flow of service, Branding service products and experiences, New service Development, Distribution in a services context, Distribution options for serving customer: Determining the type of contact, Place and Time Decisions, Delivering services in cyberspace, The role of intermediaries, The challenges of Distribution in large domestic markets, Distributing services internationally, Setting price and implementing revenue management, Promoting services and educating customers

Unit 4: Managing the Customer Interface: Designing and managing service processes-Flowcharting customer service processes, Blueprinting, Service process redesign, Balancing demand and productive capacity-Fluctuations in Demand threaten profitability, crafting the service environment, managing people for service advantage

Unit 5: Implementing profitable Services Strategies: Managing relationships and building loyalty-The search for customer loyalty, Understanding the customer firm relationship, the wheel of loyalty, Strategies for developing loyalty bonds with customer, Complaint Handling and Service Recovery, Improving Service Quality and Productivity, Striving for service leadership, Balancing demand and productive capacity-Fluctuations in Demand threaten profitability, Gap model 2 analysis

Suggested Readings:

1. Anderson R. (2001): Customer Relationship Management, New York, McGraw Hill
2. Grover S.K. (2003): Marketing: A Strategic Orientation, New Delhi, S. Chand & Co.
3. Jain S.C. (2001): International Marketing, New Delhi, South-Western Thomson Learning
4. Service Marketing by Christopher Lovelock, Pearson Education

Marketing Electives

Course Name: Product and Brand Management

Course Code: MM-5

Learning Objectives:

- To familiarize the students with concepts and practices in Product and Brand Management.
- To provide a basic understanding of the need for Product Strategy and Planning.
- To enable students to understand Product Offering and Analysis, Brand equity and related issues.

Course Content:

Unit 1: Introduction to Product and: Product Strategy and Planning, Product and Market Focused Organizations, Product and Market Evolution, Product Life Cycles, Branding (to create awareness on waste management)

Unit 2: Introduction to Competitive Structure: Defining the Competitive Set, Category Attractiveness Analysis, Competitor Analysis and Customer Analysis.

Unit 3: Product Strategy, Product Offering and Analysis: Developing Product Strategy, New Product Development, Designing the Offer, Market and Sales Potential, Pricing Decisions, Advertising and Promotion decisions, Concept and Product Testing, Financial Analysis for Product Management

Unit 4: Brands, Branding and Brand Equity: Introduction to Brands and Branding, Rationale for Building Brands, Types of Brands, Creating a Brand Designing Brand Identity using Kapferer's Identity Prism, Customer Brand Building Equity Model, Strategic Brand Wheel and Maps, Brand Mantras, Organization and Branding, Brand Equity and Building Brand Equity, Measuring Brand Equity.

Unit 5: Brand Positioning and Branding Strategy: Brand Positioning, Consumer Behaviour, Crafting Brand Positioning Strategy, Building Marketing Programs for Brands, E-Branding and building Online Brands, Brand Strategies including Line and Category Extensions, Umbrella Branding and Managing the Brand Architecture

Suggested Readings:

1. Product Management by Donald Lehman and Russell Winer, Tata McGraw Hill, Latest Edition
2. Product Management by Moore and Pessemer, McGraw International, Latest Edition
3. Strategic Brand Management by Kevin Keller, Pearson Education, Latest Edition
4. Brand Management, Principles and Practices by Kirti Dutta, Oxford Publication, Latest Edition.

Marketing Electives

Course Name: Waste Exports, Procedures and Documentation

Course Code: MM-6

Learning Objectives:

- To provide an understanding of the nature of export-import business and trade regulations
- To familiarize with trade procedures and documentation involved in an international business

Course Content:

Unit 1: Meaning and definition of export: classification-strategy and preparation for export marketing- Export marketing Organizations-Registration formalities-IEC-RCMC-export licensing –selection of Export Product-Identification of Markets-Methods of Exporting-Pricing Quotations-Payment terms-letter of credit.

Unit 2: Export procedure: Starting an export firm- selection of an export product, market and buyer- Registration procedure with sales Tax, Central exercise and various boards and councils. Quality Control and Pre-shipment; inspection concept scheme and procedures. Export Promotion Councils; Commodity Boards/Product Export Development Authorities; Specific Service Institutions;

Unit 3: Export Documents: EXIM code number-Elements of export contract-In co terms-Terms of payment and letter of Credit. Export Documentation: Types of documents-Transport, Negotiation and insurance documents. Processing of an Export Order: World Shipping: Structure, Liners and Tramps, Conference System Freight; and Structure. Containerisation and other developments, International Agreements and Conferences on Sea Transport. Concepts of Dry Port, Containerisation, Air Transport: International set-up, Freight rate structure. Role of Clearing and Forward Agents.

Unit 4: Sources of finance: role of commercial bank, EXIM Bank, ECGC and others-Export Promotion Schemes-Insurance for Export-Types –export credit insurance

Unit 5: Risk Management: Types of Risks-mitigation methods. Documentation for Availing Export Incentives – Duty Drawbacks. Foreign Exchange Regulations and Formalities; Role of State Trading Organizations in Foreign Trade, Export Processing Zones; Export Oriented Units and Export and Trading House Schemes

Suggested Readings:

1. PK Khurana “Export Management”, Galgotia publishing company,
2. Rathor B.S, Export Marketing, Himalaya Publishing House
3. Foreign Trade Policy: Handbook of Export Procedure and Annual of the Ministry of Commerce, Government of India
4. Paras Ram “Export : What, Where and How” Delhi, Anupam Publication
5. Export and Import Manual, Nabhi Publications, New Delhi.
6. World Development Indicator, World Bank Publication
7. Desai, H.B., Indian Shipping Perspective, Delhi, Anupam Publications, 1988

Waste Management (WM) Electives

S. No.	Course Code	Course Title
1.	WM-1	Waste Collection and Transport
2.	WM-2	Resource Efficiency and Resource Recovery
3.	WM-3	Integrated Waste Management
4.	WM-4	Bio Medical Waste Management
5.	WM-5	Water Security
6.	WM-6	Waste Managing Banks
7	WM-7	Waste Management Technologies

Waste Management Electives

Course Name: E-waste Management

Course Code: WM-1

Learning Objectives:

- To provide insights in generation of e-waste, ICT, hazardous nature of e-waste, lifecycle of EEE

Course Content:

Unit 1: Generation of E-waste & its comparison with other countries; e-waste as fastest obsolete items; digitalization of nations; increase in e-waste amounts – trends & reasons; Classifications for E-waste; segregation of e-waste; e-waste identified 17 Sustainable Development Goals (SDGs); Planned Obsolescence; International E-waste Statistics, International Laws

Unit 2: Information and Communication Technology (ICT) and EEE Consumption Trends, Expanding Networks, More Internet Users, and Online Businesses, Falling Prices

Unit 3: Hazardous nature of e-waste, E-waste in Waste Bins; Illegal dumping of E-waste; Urban Mining of E-waste, Potential value of raw materials in e-waste; toxicity of e-waste; public health impacts & environment impacts of e-waste Risk assessment due to e-waste on soil, air & water; extraction of valuable resources from e-waste techniques & potential applications

Unit 4: Life cycle of EEE into e-waste, common e-waste management scenarios; Official Take-Back System, Transboundary Movement of E-waste, Extended Producers Responsibility, EPR, Sustainable technologies for producers; International Laws on E-waste; Take-back Laws; necessity for government regulation; developed and developing nations; ; E-waste Legislation & comparison with other countries

Unit 5: Recycling & Refurbishing: introduction; recycling of different types of e-waste, business opportunities in recycling, market consumer analysis profitability; product stewardship in EEE products; Industrial clusters; History of Metal Recycling; e-waste rules in India; Recycling Parties; e-waste recycling in formal, informal sectors (business model);

Suggested Readings

1. The Global E-waste Monitor 2017, Quantities, Flows, and Resources Authored by Baldé, C.P. Forti, V. Gray, R. Stegmann, P. United Nations University
2. Book on E-waste by Royal Society of Chemistry
3. Economic & Political Weekly
4. Book “e-waste” by David M Barkch. Abdo publishing
5. NPTEL video lecture on “NOC: E-waste Management – issues & challenges” by Prof. B.K. Dubey, IIT, Khargapur
6. The complete technology book on e-waste Recycling – NIIR

Resource Persons

1. Bineesha – IWM
2. T.S. Krishnan, IIM Bangalore

3. Verena Redulovic, EPA,US
4. Manish Patil , Hi-tech Recycling, Pune
5. Prof. B.K. Dubey, IIT, Khargapur
6. Prof. K. Pant, IIT Delhi
7. Faculty from IT & ECE from Engineering Institutes

Institutions to refer for inputs

1. INSEAD Business School – has a group that studies e-waste and take-back legislations
2. IIWM
3. IIT Delhi
4. NITs

Practicum:

1. Existing treatment policies visits such as – “Thermo-chemical conversion assembly” available in IIT, Delhi & also in Manipal University, Jaipur
2. Case & Field visit to Refurbishers & Recycling Business owners

Waste Management Electives

Course Name: Resource Efficiency and Resource Recovery

Course Code: WM-2

Learning Objectives:

- To provide insights in how to use resources efficiently
- To familiarise minimizing the impact on environment & society
- To introduce Life-cycle analysis(LCA) of different treatment technologies
- To appreciate “waste to wealth” concept

Course Content:

Unit 1: Introduction – Definitions, differences, advantages, Circular economy, Resource security, Ways to minimize impact on environment & societal burdens, Life-cycle analysis(LCA), Zero Waste Strategy, Improvements to administration, source separation and collection, reuse and recycling

Unit 2: Consumerism: History, Advertising – a Vicious Trap; Problems with Consumerism, Efficiency of Resource Use- Production and Consumption, patterns of consumption, Eco- labels – importance, increasing eco-labels

Unit 3: Use & Throw Culture: Disposable Products, Comfort vs. Cost of disposables, Higher Resource efficiency, thoughtless extensive use and disposal of resources, Changing habits, Promoting plastic free living, increase demand for recycled materials

Unit 4: Building Sustainability: Basic Principles Of Sustainable Waste Management, traditional reductionist approach, Role of EPR, **Sustainable Materials Management**, Living a Minimalist Lifestyle, Sustainable waste management an opportunity, not burden, Sustainable waste management implementation requires – dedicated financial support and political will, Systems and processes that change organizations from managing wastes to a resource recovery system

Unit 5: Resource Recovery: Resource recovery in the context of sanitation (waste water and human excreta) Toilet resources: nutrients (nitrogen and phosphorus), organic matter, energy and water, role of incentives in design of recycling programs, Energy recovery from waste Electricity from biodegradable (waste burning) power plant, industrial water reuse, Reuse of water from kitchen, and water basins for gardening and irrigation, recovery of methane gas from solid waste dumping sites for energy, reuse of plastic for road building-plastic road. Recovery of water- waste water treatment using constructed wetland techniques, removal of heavy metals using hydroponic methods, utilisation of fly ash as bricks and use as cement component, sludge treatment- used as bio fertilizers. Urine as fertilizer, biogas from human excreta

Suggested Readings

1. Energy and Resource Efficiency without the tears by Niall Enright, vol I and II
2. Max Roser and Hannah Ritchie (2019) - "Food per Person". Published online at OurWorldInData.org. Retrieved from: '<https://ourworldindata.org/food-per-person>' [Online Resource]
3. Waste Management Practices: Municipal, Hazardous and industrial by John Pichter, CRSPress, 2nd Edition
4. Wealth from Waste: Trends and technologies, 4th Edition, Banwari Lal and Priyanshu Sarma

Case studies of Sterial Sharon Park

1. Conversion of waste dumping sites in to eco-park aerial Sharon park, Bengurian—Israel
2. Methane gas recovery from dumping sites (Bengurian aerial Sharon Park, Israel)

Resources Persons (Experts whom the institution can refer for inviting as visiting faculty or a guest speaker)

1. Dr Rajagopalan Vasudevan
2. Dr Prem Chandra Pandey and Prof Jyoti k Sharma, Shiv Nadar Unviersity

Institutions to refer for input materials: TERI, Sulabh International, New Delhi, NATPAC

Waste Management Electives

Course Name: Integrated Waste Management

Course Code: WM-3

Learning Objectives:

- To understand basic elements in Integrated Waste Management
- To provide insights in development of an integrated waste management facility
- To provide insights in business models of creating wealth from waste
- To provide insights in social and economic reflections on waste for energy

Course Content:

Unit 1: Integrated Waste Management – basics, Elements in IWM, Characteristics of IWM, Strategic Planning for IWM, Implementing IWM, Importance of Integrated Solid Waste Management (ISWM), Goals, Functional Elements Priorities of Integrated Waste Management, Benefits of IWM for developing economies, Geographical Coverage of Integrated Waste Management

Unit 2: Understanding the Life Cycle Perspective, Generation Source Perspective, Stakeholders'/Management Perspective of Integrated Waste Management, Planning public involvement, Alternatives approaches, **Development of the Integrated Waste Management Facility**, Decentralised waste management

Unit 3: Designing Approaches to sustainable management of wastes covering all sources and all aspects, covering generation, segregation, transfer, sorting, treatment, recovery and disposal in an integrated manner, with an emphasis on maximizing resource use efficiency

Unit 4: Wealth from Waste- consumers as active participants; an art for some; entrepreneurship for some; Social implications, Creating social and environmental dividends contributing healthy communities, From waste to food; articles out of waste; composting units; Refuse-derived fuels

Unit 5: Waste Collection, Inorganic Waste processing, Organic Waste processing, Building business models of creating wealth from waste and providing employment, Creating new opportunities for local economic development

Unit 6: Social and economic reflections on Waste for Energy, Increasing costs of W2E treatment (and disposal), Major concerns with Waste for Energy approaches, W2E is not a 'green' technology, Multinational funding of Waste to Energy.

Suggested Readings:

1. Waste Management and Minimization – Integrated Waste Management – A.J. Nordone, P.R. White, F. McDougall, G. Parker, A. Garmendia, M. Franke Encyclopedia of Life Support Systems (EOLSS) Integrated Waste Management A.J. Nordone, P.R. White and F. McDougall Procter and Gamble, Newcastle, UK
2. Waste to Energy, Wasting Resources and Livelihoods, By Jutta Gutberlet
3. Wealth from Waste – Agricultural food and chemical Processing Waste by S.C. Bhatia

Waste Management Electives

CourseName: BiomedicalWasteManagement

Course Code: WM-4

Learning Objectives:

- To provide insights in prevention of transmission of communicable diseases and handling of risks in healthcare management.

Course Content:

Unit 1: Sources of Biomedical Waste

Overview of Biomedical Waste, Sources of Biomedical Waste, Categories of Biomedical Waste, definition of general and hazardous biomedical waste and diseases, Infectious waste, genotoxic waste, waste sharps, biomedical waste categories, categorization and composition of Biomedical waste Specification of materials, Colour coding, Sources of Health care wastes, Hospitals and healthcare establishments & other sources, Primary health care facilities- BMW management

Unit 2: Impacts on health

Specific Communicable diseases, Diseases epidemiology and mode of transmission of disease and prevention, consequences and remedies, Health impacts of biochemical waste, Direct & indirect hazards, Potential health hazards, Persons at risk, Basic information about infection, Infection agents on organizations spread of infection and Hospital acquired infection, Communication about Workplace Hazards, Safety precautions for doctors, nurses, para-medical staff, waste handlers.

Unit 3: Legal aspects

Legislation, policies and law regarding bio medical waste management, Biomedical waste management and handling rules, CPCB guidelines, (Central pollution control board) Safe disposal of Radioactive waste rules, guideline of BARC, International Scenario World Health Organization guidelines on Management of wastes from Hospitals wastes, Hospital budget allocation for hospital waste management, Maintenance of records, annual report.

Unit 4: Steps Involved in Biomedical Waste Management

Basic steps in Biomedical Waste Management, Segregation at the point of generation sharp Decontaminating/Disinfections unit or container for autoclaving Sharp waste containers for Collection and Storage and transportation autoclaving/ shredding /incineration /bio hazard symbols, Microwave, Hydropulping, plasma torch, segregation, transport within the hospital to central waste management

facility, CBWMTF- land requirement, facility requirement, Treatment and Disposal

Unit 5: Management and Administration

Collection of waste, Principles of Safe Handling, Infection control system in hospital, Needle sticks injury and other sharp injury and hospital policy for protection of health care workers, On site Pre-treatment of waste Mechanical Treatment & Chemical Disinfections store & Off-site transportation, Health & safety Practices Usage of protective equipment Occupational health programmers & safety practices, Emergency measures, Measures for Waste Minimization, Zero Waste Hospital, Stakeholders of Waste Management

Suggested Readings:

1. Srishti., (2000). 5 th survey of medical waste disposal practices in health care units of Delhi. New Delhi.

Field Experience: Visit to important hospitals, where proper waste management has been implemented is mandatory for the course.

Waste Management Electives

CourseName:Soil & WaterResourceManagement

Course Code: WM-5

Learning Objectives:

- To orient in reducing the use of water and improving the quality of waste water
- To employ advanced methods for waste water treatment
- To appreciate the importance of water quality monitoring
- To adopt sampling techniques and laboratory techniques of water quality analysis

Course Content:

Unit 1:Water Issues: Overview of Water Security, Inequitable Global Distribution of water, Water quality, Individual & Community responsibility towards water Management; Consequences of Water Pollution, Causes of Water Pollution, Types of Water Pollution, Biohazard, Radiation Hazard and Security Threat

Unit 2: Waste Water Management: Individual responsibility towards wastewater production, Community responsibility towards waste water disposal, Municipal responsibility for treating waste water, Conventional Wastewater treatment: Sewage Treatment Plants, Issues facing present day STPs, Treatment of Leachate from Waste Dumps; Used water treatment for homes & small organizations; community level or decentralized used water treatment- involvement of communities or Self Help groups

Unit 3: Alternative Technologies for Waste Water Treatment: Alternative technologies for wastewater treatment, Summary of waste water treatment technologies, Biological Nutrient Removal Systems, Sludge Management, Disinfection; Primary, Secondary & Tertiary Treatment of Water; Eco-friendly technologies in water treatment

Unit 4: Clean Water Solutions: Introduction, Ancient Water Technology, Rainwater Harvesting, Solution for Flood Management, Watershed Management, Urban Watershed Management, River Restoration, Water Reclamation, Individual Responsibility, Community Responsibility

Unit 5: Testing of Water, Waste Water, Soil and Solid Waste: Importance of Water Monitoring; Water sampling techniques, Water analysis parameters, Microbiological Analysis, Toxicity Characteristic Leaching Procedure (TCLP), Soil Testing, Soil Sampling, soil monitoring, soil quality parameters, TCLP, treatment of leachate from dump-yards

Suggested Readings

1. Lankford, Bruce; Bakker, Karen; Zeitoun, Mark, Conway, Declan (2013). Water Security: Principles, Perspectives and Practices (Earthscan Water Text) 1st Edition, Routledge
2. World Health Organization and UN-Habitat 2018, progress-on-wastewater-treatment-2018.pdf
3. World Health Organization; 2018. Guidelines on Sanitation and Health. Geneva: Licence: CC BY-NC-SA 3.0 IGO.

Resource Persons

Dr. V.S. Ramachandran, Amritha Vishwa Vidyapeetam, Coimbatore Dr. S. Rajendra

Kumar, Amritha Vishwa Vidyapeetam, Coimbatore

Institutions to approach for inputs

Amritha Vishwa Vidyapeetam, Coimbatore

Practicum STP in Amritha Vishwa Vidyapeetam, Coimbatore

Waste Management Electives

Course Name: Waste Managing Banks

Course Code: WM-6

Learning Objectives:

- To provide insights in how waste bank can act as an intermediary institution for transforming trash into cash
- To provide insights in importance of creating banks that collect waste

Course Content:

Unit 1: Waste Banks: New concept, Importance and need, turning kabadiwallahs into bankers – an organised sector, Waste circulation through waste bank, Advantages of waste banks

Unit 2: Reuse / Recycle methods: Deposit waste, distribution, identification and linking with the needy humans – beggars, old age homes, orphanages; Food waste - supply to animal shelters, goshalas, piggeries; e-waste and plastic, other lethal waste – link with authorised specific dealers; Bio-degradable waste – compost and sell

Unit 3: Simple daily banks: Clothes banks, books banks, toy banks, e-banks, Food banks, Scrap metals, Medicine Banks, Plastic banks, Household items bank, Furniture banks – connect to resale, recycle or reuse, drop off and buyback centre

Unit 4: Community-Based Waste Management, Local Economic Development (LED), Community Economic Development (CED), Decentralized waste banks, trash banks, garbage banks

Unit 5: Leadership, Management and Incentives in Waste Banks, Partnership in the Waste Bank, Impact of Waste Bank to Local Economy, Waste Bank as Household Waste Management, Motivate public through schemes of tax reduction, Safety of waste handlers – body equipment

Suggested Readings

1. Waste Bank: Waste Management Model in Improving Local Economy, DwiWulandari, Sugeng Had iUtomo, Bagus Shandy Narmaditya, International Journal of Energy Economics and Policy, 2017, 7(3), 36-41
2. The role of waste bank partnership in efforts to decrease waste volume in urban: A case study at a waste bank in Kalibaru, Cilodong, Depok City, IOP Conference Series: Earth and Environmental Science, Suparmini, PurnawanJunadi
3. Waste Bank as Community-based Environmental Governance: A Lesson Learned from Surabaya DyahRetno Wijayantia, SriSuryania, Procedia - Social and Behavioral Sciences 184 (2015) 171–179
4. Community-based Solid Waste Bank Model for Sustainable Education NurlIndrianti, Procedia - Social and Behavioural Sciences 224 (2016) 158 – 166
5. Case studies on successful waste banks globally- 1. The unilever waste bank 2. community based solid waste bank model for sustainable education 3. Waste bank: wastemanagement model in improving local economy

Waste Management Electives

Course Name: Waste Management Technologies

Course Code: WM-7

Learning Objectives:

- To facilitate students to apply waste management techniques in an efficient manner
- To provide insights in designing new techniques, composting, and landfills.

Course Content:

Unit 1: Waste Management Techniques

Waste Management Techniques - Salient features, business profitability, environmental regulations and economic viability, product design for waste minimization, Waste Management interventions - generation, prevention, characterization, monitoring, treatment, handling, reuse and ultimate residual disposal of solid wastes, Household hazardous waste; environmental regulations, product design for waste minimization; waste management interventions; occupational risks in waste management techniques are more appropriate

Unit 2: Alternative Technologies

Technological development, assess, analyse and material recycling systems with low environment loading and find better alternatives, Develop technologies for small & medium scale, techno-economic feasibility of proposed methodologies/ technologies, System to efficiently collect PET bottles, Biomass utilization technology, Home appliance recycling technology; Technological development, assess analyse material Recycling; Develop technologies for small & medium scale, techno-economic feasibility; Business utilization Science of recycling as waste categorization.

Unit 3: Designing New Techniques

Green Product development and Design for recycling, Development of simple indigenous material recovery technology for specific applications (precious & other metals, plastics, glass and rare earths). Newer technologies for Biomedical Waste, Urban & Rural Solid Waste, including Plastic Waste, E-Waste (Electrical & Electronics Waste): Recycling & Recovery, Resource recycling technology to produce high quality products; Green Product Development & design for recycling; development of simple material recovery; newer technologies- recycling topics can all form a separate unit

Unit 4: Composting, Recycling & Treatment Methods

Composting: Types and processes, Counter Current Management, Recycling: Changed form; Reducing: Compacting, Reusing: with and without recasting, Incineration and pyrolysis, gasification technologies.

Unit 5: Remediation

Landfill Bio-reactor; Existing Landfills: Gas Extraction, Leachate Treatment, Material Mining, Remediation, Value-added Material Recovery, Non-recyclable packaging material, Construction & demolition debris, Co- digestion of sewage sludge; Landfills: Aerobic and semi aerobic, Earth Layer and HDPE liner, Capping of Waste; Basic design on requirements for engineered landfills; landfills vs dump-site

Suggested Readings:

1. Central Pollution Control Board.,(2007).Guidelinesfortheselectionofsiteforlandfilling.NewDelhi.
2. CPCB(2000),“StatusOfMunicipalSolidWasteGeneration,Collection,TreatmentAndDisposalinClassI Cities”, Central Pollution Control Board, Ministry of Forest and Environment, GOI, New Delhi
3. SWM (2016)manual by Ministry of Urban Development
4. Solid Waste Management by Arnie Resilind
5. Solid Waste Technology & Management by Thomas H Christene

Municipal Solid Waste Management Manual (2016)- case studies in large & small cities and towns

Assessment

The course will be modeled in the same pattern as other compulsory courses, with fifty percent (50%) marks assigned for coursework and written assessment, thirty percent (30%) for field work and twenty percent (20%) for presentations and report-writing.

Presentations and report writing: Twenty percent (20%) of total assessment for presentations and report writing is based on weekly seminars and case discussions.

Outcomes of the MBA Programme

With technology supplementing and sometimes replacing human labour, it is increasingly difficult for today's youth to find rewarding jobs. The fields of Solid Waste Management and Social Entrepreneurship can open many doors. It has the potential to provide fulfilling, well-paying livelihoods and holds the promise to a clean, liveable future. The student who chooses this line of study is opting into not just a career, but a healthy living for themselves and for society. A Post Graduate Diploma will provide the necessary wherewithal to build a career in the fields of Solid Waste Management.

Environmental concerns on management of our surroundings, and solid waste management have been a neglected area so far, as far as the collective responsibility of society towards this issue is concerned. However its importance cannot be negated, nor overlooked any further. It is a potent lucrative case for business. Hence a specialized understanding of the subject will be essential and would pave the way for scientific handling of surroundings, and adopting safe and secure methods of disposal of inevitable domestic and industrial wastes.

Selection of Students

Applicants would be shortlisted on the basis of Written Test, Group Discussion and Personal Interview to test the communication skills and the interests of the students who would like to join the program in terms of their engagement with the communities, their development concerns and their business interests.

Strategy for Internship

Every department should have a database of the organizations, in their respective regions with whom the students will work for internship. The relationship with the organizations and the university needs to be on a continuum basis. The university can organize student-industry interactions throughout the year by inviting designated resource persons from the organization. It could be in the form of inviting the experts in the organizations in a respective field as a guest speaker or as an adjunct faculty for any of the subjects to be taught.

Placement

Placement cell in the respective university needs to develop a brochure of students with their background to facilitate the placement of students. The universities should build a network of institutions where students do internships get converted as Management Trainees at the end of the second year. The placement will include in the entrepreneurship, business planning, Banks, Financial Institutions, CSR, Nodal Officer for Industrial Development, and many more.

Potential areas of building a Career through MBA Programme in WMSE

On completion of the Course the student will be able to make waste management a rewarding career or a lucrative business in any of the following areas:

- Management of Collectives: which deal with different varieties of wastes, recycling as well as organic compost, or waste-to-energy facility.
- Medical bio-waste management: This includes hazardous biological waste and animal waste from slaughter houses.
- Scrap management systems: The age-old scrap business can be improved immensely through networking and collectives.
- Refuse-derived energy generation: Depending in the quality of waste, energy can be derived through anaerobic digestion or bricks, pellets.
- Waste market promotion: Waste exchange for organic and inorganic wastestreams.
- Food banks: Systematic collection and redistribution of excess cooked- and raw-food, while maintaining good, hygienic standards requires round-the-clock dedication.
- Medicine Banks: For collection and redistribution of unused portions of medicines before expiry date. These need to be handled responsibly to avoid misuse.
- Recycling and up-cycling: Methods to reuse resources by harvesting them from old, out-of-use goods and converting them into new, useful articles. This is a more economical and environmentally sustainable process than creating fresh goods from scratch.
- Clothes, books and toys banks: The collection and redistribution of unused and gently used clothes, books and toys, while maintaining them during transfer. This provides maximum circulation of these goods, touching the lives of many more children/families before being discarded.
- Composting: Vegetable waste, fruit waste and garden waste composting. Maintaining and managing compost facilities and STPs in parks and residential areas is a long-term business.
- Agricultural waste management: Dairy waste and farm animal waste management and composting in the proper way can significantly reduce the dependence on chemical fertilizers while preventing land and water pollution. It will economically benefit the farmer.
- Waste recycling of paper, wood, plastic and metal, and especially glass which can be recycled endlessly if handled responsibly.
- Construction waste and building debris recycling: These can easily be processed to reuse in the construction industry.
- Hotel waste management: The scale and variety of wastes produced by the hotel and hospitality industry demands individual attention; the scope of reuse, up-cycling and recycling is immense.
- Hospital waste management: A flourishing line of work, with special attention to sharps, bio-medical wastes, radioactive wastes and chemicals.
- Water Recycling and Management: Fresh water can be utilized several times if handled in a systematic manner. This area has tremendous scope in present times.
- E-waste management: A specialized area of work, subject to a separate set of stringent norms for handling e-waste.
- Research opportunities: to develop technology for waste management or recycling, or applying traditional knowledge to find new methods to alter wastes into wealth.

This list is indicative and not exhaustive. The number of institutes may be increased to cover as many different institutions as possible to give the students a wide array of experiences.

Acknowledgement

- “Aano bhadra kratvo yantu vishwatah. (Let noble thoughts come to us from all directions.)”
- 1.89.1, RigVeda

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सत्यमेव जयते


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