

# MGNCRE - MBA Programme in Waste Management and Social Entrepreneurship

## Proposed Curriculum



**MGNCRE**

महात्मा गांधी राष्ट्रीय ग्रामीण शिक्षा परिषद  
**Mahatma Gandhi National Council of Rural Education**  
Department of Higher Education  
Ministry of Human Resource Development, Government of India



**MGNCRE-Structurefor2-YearMBAProgrammeinWasteManagement and Social Entrepreneurship**

Semester1				Semester2			
Courses	No.of Credits	No.of Sessions		Courses	No.of Credits	No.ofSessions	
101:Introductionto Waste Management	4	40hrs	107:Lab,FieldVisit(1month)– (4credits)	201: Individual and OrganizationalBehaviour	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:FinancialManagementfor Waste	4	40hrs	
104:ManagerialEconomics	4	40hrs		204:MarketingManagementfor Waste	4	40hrs	
105:Financial Accounting	4	40hrs		205:Entrepreneurship in Waste Management	4	40hrs	
106:ResearchMethodsfor Management	2	20hrs					
<b>Total Credits(22+4)</b>	<b>26</b>			<b>Total Credits(20+8)</b>	<b>28</b>		
Curriculum-Second Year							
Semester3				Semester4			
Courses	No.of Credits	No.of Sessions		Courses	No.of Credits	No.OfSessions	
301:Human Resource Management and Organizational Development	4	40hrs	306:FieldExperience inWasteManagement (1month) 4 credits	401:ICTandMIS	4	40hrs	
302:StrategicManagement	4	40hrs		402:WasteManagementas ProjectManagementandGIS	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					
<b>Credits(20+4)</b>	<b>24</b>			<b>TotalCredits</b>	<b>16</b>		

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<b>Electives</b>	<b>Code</b>	<b>Courses</b>	<b>Credits</b>
<b>Operations Management(OM)</b>	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
<b>Marketing (MM)</b>	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
<b>Waste Management (WM)</b>	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

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### Semester 1

S. No.	Course Code	Course Title
1.	101	IntroductiontoWasteManagement
2.	102	PrinciplesandPracticesofManagement
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 978-1-119-43394:2020
5. Waste Management Practices; John Pichtel; 2<sup>nd</sup> 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

**Resources 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](mailto: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 AshokaBiogreenPvt 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-budgetarycontrol.**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

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### **Suggested Readings:**

1. Koontz O Donnell– Principles of Management (Tata McGraw Hill)
2. L.M. Prasad – Principles & Practices of Management (Sultan Chand & Sons , New Delhi)
3. ParagDiwan – Management Principles and Practices (Excel Books, New Delhi)
4. Stoner, Freeman, Gilbert. Jr. – Management (Prentice Hall of India)
5. Koontz, Weihrich – Essentials of Management (Tata McGraw Hill)
6. Murphy A Herta, Hildebrandt W Herbert and Thomas P Jane, 2008, Effective Business Communication, 7<sup>th</sup> Edition, Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Urmila Rai and S M Rai, 2008, Business Communication, 10<sup>th</sup> Edition, Himalaya Publishing House. Mumbai
8. Tchobanaglou,G. Theisen,H. and Eliassen,R. 1997. Solid wastes: Engineering Principles and Management Issues, McGraw-Hill publications, New York, USA: 52

### **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, KLUUniversity
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. Paneerselvam. Production and Operations Management, New Delhi, Prentice Hall of India Publications.
2. S.N.Chary, Cases and Problems in Production and Operations Management, New Delhi, Tata McGraw Hill Publications.
3. Everett E. Adam Jr. and R.J. Ebert, Production and Operations Management, New Delhi, Prentice Hall of India Publications.
4. Operations Research / S.D.Sharma-Kedarnath
5. Operations Research: Methods & Problems / Maurice S Ashimi, ArhurYaspan& Lawrence Friedman
6. Operations Research / R.Panneerselvam, PHI Publications.
7. Matching Supply with Demand- Gerard Cachon, and Christian Terwiesch
8. The Goal by Eliyahu M Goldratt

### 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, Earth sense 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.

**Unit 3: Cost and Demand Analysis:** 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, Market Equilibrium, Shifts in Supply and Demand Curves, Perfect Competition, Why perfect Competition is Desirable.

**Unit 4: Market Structure:** 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 D M Mithani, 2016, Himalaya Publishing house
9. *Not in my back yard* 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).

**Unit 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. Hooda P.R Statistics for Business and Economics Tata McGraw Hill

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2. Kothari C. R., Research Methodology: Methods and Techniques, New Delhi, VishwaPrakashan.
3. Cooper, Donald R- and Pamela Schindler, Business Research Methods, Tata McGraw Hills, New Delhi
4. A guide to Quantitative Methods by Almquist, Ashir, and Brannstorm
5. Research Methods for Practitioners by SK Paul, 2018, Atlantic Publishers and distributors pvt ltd.
6. Survey Research methods by Flyd J Fowler jr, 4<sup>th</sup> edition, ISBN 13:978-14 12958417

### **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 of Waste
4.	204	Marketing Management for Waste
5.	205	Entrepreneurship in Waste Management
6.	206	Field Experience: Working in a Waste management facility – 2 months

## Course Name: Individual and Organizational Behaviour towards Waste

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,

### Suggested Readings:

1. Organizational Behaviour-Concept, Controversies, Applications-Stephan Robbins.
2. Organizational Behaviour-Fred Luthans
3. Organizational Theory and Behaviour- R.A. Sharma
4. Organizational Behaviour-K. Aswasthapa
5. Robbins, P. Stephen, Timothy, A. Judge, and NeharikaVohra (2013). Organizational Behaviour, 15/e; New Delhi: Pearson Education

## 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 practises 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



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Real time case studies like Emerald Emerging Market, HBS

### **Suggested Readings:**

1. Waste: A Handbook for Management, Second Edition, by Trevor M. Letcher, Daniel A. Vallero
2. Waste Management Practices by John Pichtel
3. Solid Waste Management of Municipalities Dr P.S Ajith& Dr P.N. Hari Kumar
4. Solid Waste Management - Present and Future Challenges - Jagbir Singh & AL Ramanathan
5. Environmental Engineering Series - Management of Municipal Solid Waste - T.V.Rama Chandra
6. Introduction to GPS by Ahmed El Rabbany
7. Global Positioning System by NelSamana
8. Reverse Logistics by Dekkar
9. Relevant articles of California Management Review, Harvard Business Review

### **Resource Persons:**

Dr.Prem Pandey & Prof. Jyothi K. Sharma from Shiv Nadar University

PremAnanth 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 communication, 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, sales teams and targets

**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

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3. Charantinath, Poornima M., Entrepreneurship Development and Small Business Enterprises, Pearson Publication.2<sup>nd</sup> edition.
4. S B Srivastava : A Practical Guide to Industrial Entrepreneurs, Sultan Chand and Sons, New Delhi
5. Pareck, Udai and T V 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 Manikyam 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.

**Semester3**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>
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. Human Resource Management-V.S.P. Rao
2. Human Resource Management-Keith Davis
3. HRD Practices-Bhatia B.S., Verma H.L.
4. Human Resource Management K. Aswathapa



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5. Personnel Management Mamoria.
6. L Wendell, A Robert French, Organisation Development and Transformation
7. L Wendell, French, Cecil H. Bell, Organization Development: Behavioural Science Interventions for Organization Improvement, Pearson Education India
8. HRM by Gary Dessler, 15th edition, ISBN 10: 0134235452
9. OD by Cummings and Worley

## 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. David, Strategic Management, Prentice Hall of India
2. Strategy by Robert Grant
3. Winning in Emerging markets by Krishna Pulepu

## Course Name: Regulatory Framework Legal Aspects and Mandatory Regulations

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. Leelakrishnan
3. Environmental and Pollution Laws In India by Justice T S Doabia
4. Environmental Law by Stuart Bell, Donald Mc Gillivray, Ole Pederson, 2002, Oxford University Press
5. Environmental Law- An introduction by Vibhav Navneet, LEXIS – NEXIS, 2016, 1<sup>st</sup> edition
6. Operation Management :Theory and practices, 2<sup>nd</sup> 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 waste management 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 may include:

- 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 A 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.P 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. Glen B Alleman, performance based Project Management
2. Jack R. Meredith, Samuel J. Mantel, Jr., Project Management, A Managerial Approach.
3. GIS and science by Paul and Longley, 3<sup>rd</sup> Edition, ISBN: 978-0470721
4. Introduction to project management- Kathy Schwalble, 7<sup>th</sup> edition, 978.1544 701899
5. Effective Project Management by Robert K Wyoski, Wiley Int, 2016 ISBN: 1118729168
6. GIS for Environmental Applications: a (2016) practical approach by Xuan zhu
7. Introduction to Geographic Information Systems by Kang Tsung Chang, McGraw Hill



## 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. PradipKhandwalla- Lifelong Creativity- An Unending Quest, Tata McGraw Hill, 2006.
2. PradipKhandwalla- The Corporate Creativity- The Winning Edge, Tata McGraw Hill, New Delhi
3. PradipKhandwalla- The Fourth Eye, Wheeler Publishing, New Delhi.
4. Rastogi, P.N, Managing Creativity for Corporate Excellence, Macmillan, New Delhi.
5. JoneCeserani, 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 21<sup>st</sup> Century, S.Chand, 2008.
9. CSG KrishnamaCharyulu&R.Lalitha- Innovation Management, Himalaya Publishing House, 2007.

**Operations Management (OM) Electives**

S. No.	Course Code	Course Title
1.	OM-1	OperationsandMaintenance
2.	OM-2	Environment Impact Assessment
3.	OM-3	Costofnon-managementofSolidandLiquidWaste
4.	OM-4	Hotel Waste Management
5.	OM-5	Reclamation,RemediationandCapping
6.	OM-6	SanitationandHygiene

## Operations Management Electives: Course Name: Operations and Maintenance

Course Code: OM 1

### 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 bottlenecks, 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., (2002). Management of Municipal Solid Wastes. New Delhi, India.
2. Central Pollution Control Board., (2004). Management of Municipal Solid Waste. Ministry of Environment and Forests, New Delhi, India.

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3. Bhide A.D. and Sundaresan, B.B, 1984. Street Cleansing and Waste Storage and Collection in India, Managing Solid Waste in Developing Countries, Holmes J.R.(ed).

### 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, Predication 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

#### Suggested Readings:

#### 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 Waste pickers, 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, microplastics 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

## **MGNCRE - MBA in Waste Management and Social Entrepreneurship – Proposed Curriculum**

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
1. International Journal of Scientific and Research Publications, Volume 6, Issue 9, September 2016 670  
ISSN 2250-3153 www.ijsrp.org Waste Management in Hotel Industry in India: A Review

## 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 myco remediation

#### 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: BioRemediation

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 differentlyabled, 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, wastewater 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 McGrawHill

### 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 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, Printice Hall India.
3. Dr.Matin Khan – Sales and Distribution Management, Excel Books.
4. S.A. Chunawala – 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 Schnider

**Marketing Electives: Course Name: Consumer Behaviour**

**Course Code: MM-2**

**Learning Objectives:**

- To enable students understand Making Post Purchase Behaviour, Dissonance Reduction Behaviour, Satisfaction and Involvement, Family Buying Decisions and Affinity Groups

**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 life style.

**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 Dissonance – Consumer Decision Making Models: Howard Sheth Model-EKB Model-Organizational Buyer Behaviour and Influences on Organizational Buyer Behaviour, learning models

**Unit 5: CRM concept and components:** Evolution and 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, post purchase behaviour, post purchase cognitive dissonance

**Suggested Readings:**

1. Schiffman, Leon, G and Kannuk, Leslie Lazar: Consumer Behaviour Prentice Hall of India.
2. David L.Loudon& Albert J. Della Bitta: Consumer Behaviour, McGraw Hill.
3. SujaR.Nair: Consumer Behaviour in Indian Perspective, Himalaya Publishing House.
4. Dr. Rajeev Kumara, Consumer Behaviour: Himalaya Publishing.
5. Roger J.Baran, Robart J. Galka, Deniel P. Strunk: Customer Relationship management, South West CengageLerning.
6. S. ShanmukaSundaram: Customer Relationship management, Modern Trends and Perspective, Prentice Hall of India.
7. Peelan – Customer Relationship Management, Pearson Education.

**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):** Meaning and role of IMC in Marketing process, one voice communication V/s IMC. Introduction to IMC tools – Advertising, sales promotion, publicity, public relations, and event sponsorship. The role of advertising agencies and other marketing organizations providing marketing services and perspective on consumer behaviour

**Unit 2: Understanding Communication Process:** Source, Message and channel factors, Communication response hierarchy- AIDA model, Hierarchy of effect model, Innovation adoption model, information processing model, The standard learning Hierarchy, Attribution Hierarchy, and low involvement hierarchy Consumer involvement- The Elaboration Likelihood (ELM) model, The Foote, Cone and Belding (FCB) Model

**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:

- Blakeman, Robyn (2007). Integrated Marketing Communication: Creative Strategy from Idea to Implementation, Rowman & Littlefield Publishers

## 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 flower 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 Pessemier, McGraw International, Latest Edition
3. Strategic Brand Management by Kevin Keller, Pearson Education, Latest Edition
4. Brand Management, Principles and Practices by KirtiDutta, 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-Incoterms-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: Hand book 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	WasteCollectionandTransport
2.	WM-2	ResourceEfficiency and Resource Recovery
3.	WM-3	IntegratedWasteManagement
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, life cycle 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 & Refurnishing: 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, V. Kuehr, 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 – IIWM
2. T.S. Krishnan, IIM Bangalore
3. Verena Redulovic, EPA, US

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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:Buildingsustainability:**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. Wealth from Waste: Trends and technologies, 4<sup>th</sup> Edition, Banwari Lal and Priyanshu Sarma
2. Energy and Resource Efficiency without the tears by Niall Enright ,vol I and II
3. Waste Management Practices: Municipal, Hazardous and industrial by John Pichter, CRS Press, 2<sup>nd</sup> Edition

### Case studies of Sterial Sharon Park

1. Conversion of waste dumping sites in to eco-park aerial Sharon park, Bengurion – Israel

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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 as a guest speaker)**

1. Dr RajagopalanVasudevan
2. Dr Prem Chandra Pandey and Prof Jyoti k Sharma, Shiv NadarUnviersity

**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: Course Name: Biomedical Waste Management**

**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 health care 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, Hydropulbing, 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.

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**Waste Management Electives: Course Name: Soil & Water Resource Management**

**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 Waste water 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 waste water 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**

Lankford, Bruce; Bakker, Karen; Zeitoun, Mark, Conway, Declan (2013). Water Security: Principles, Perspectives and Practices (Earthscan Water Text) 1st Edition, Routledge

**Resource Persons**

Dr. V.S. Ramachandran, AmrithaVishwaVidyapeetam, Coimbatore

Dr. S. Rajendra Kumar, AmrithaVishwaVidyapeetam, Coimbatore

**Institutions to approach for inputs**

AmrithaVishwaVidyapeetam, Coimbatore

**Practicum** STP in AmrithaVishwaVidyapeetam, 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, MedicineBanks, 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, SugengHadiUtomo, BagusShandyNarmaditya, 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 DyahRetnoWijyantia, Sri Suryania, Procedia - Social and Behavioral Sciences 184 ( 2015 ) 171 – 179
4. Community-based Solid Waste Bank Model for Sustainable Education NurIndrianti, 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: waste management model in improving local economy

**MGNCRE - MBA in Waste Management and Social Entrepreneurship – Proposed Curriculum**  
**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:Typesandprocesses, CounterCurrentManagement,Recycling:Changedform; Reducing: Compacting, Reusing:withandwithoutrecasting, Incinerationandpyrolysis,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). Guidelines for the selection of site for landfilling. New Delhi.
2. CPCB (2000), "Status Of Municipal Solid Waste Generation, Collection, Treatment And Disposal in Class I Cities", Central Pollution Control Board, Ministry of Forest and Environment, GOI, New Delhi
3. SWM (2016)manual by Ministry of Urban Development

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4. Solid Waste Management by Arnie Resilind\_
5. Solid Waste Technology & Management by Thomas H Christene
6. Municipal Solid Waste Management Manual (2016)- case studies in large & small cities and towns

### **Practicum**