

SEMESTER III

**21GW31
INTERNSHIP II**

00168

Course Requirements

- a) Students will have to undergo a summer internship for minimum eight to ten weeks in a company/firm/research organization at the end of Semester II.
- b) All students placed for summer internship through campus placement process are mandated to attend the same and cannot change unless prior permission is taken.
- c) Students will be assigned a faculty mentor for the entire period. Stage-wise approval as to the intended company, the start and finish dates and periodic reports has to be confirmed and completion certificates should be obtained and submitted to the mentor.
- d) The internship assessment is a multi-stage sequential process.
- e) At the end of the internship and in the beginning of the Semester III, students have to submit an internship report and make a presentation in which they will present their work to examiners from the industry and academia for evaluation.

A detailed guideline and instruction manual will be given to students at the end of Semester II.

**21GW32
HUMAN RESOURCE MANAGEMENT AND ORGANIZATIONAL DEVELOPMENT**

3003

UNIT I :Introduction

9 hrs

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 II :Recruitment and Selection

9 hrs

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 III :Introduction to Organization Development

9 hrs

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 IV :Interventions**9 hrs**

Team Interventions, Inter-group Interventions, Personal, Interpersonal and group process interventions, Comprehensive interventions, Structural Interventions.

UNIT V :Implementation and assessment of O.D**9 hrs**

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.

TOTAL : 45 hrs**Reference Books:**

1. Aswathappa .K, "Human Resource Management" ,8th Edition,New Delhi, Tata Mac Graw Hill, 2017
2. Bernadin ,"Human Resource Management" ,6th edition ,Tata Mcgraw Hill ,2012.
3. Gary Dessler, "Human Resource Management", 15th edition, Pearson Education Limited, 2016. ISBN 10: 0134304233 ISBN 13: 9780134304236
4. Thomas G. Cummings & Christopher G. Worley, "Organization Development and Change", 10th Edition, Cengage learning, USA, 2013
5. Dowling, P. J., Festing, M., & Engle A. D. Sr, "International Human Resource Management", 7th Edition, Cengage, India, 2017.

21GW33**STRATEGIC MANAGEMENT****3 0 0 3****UNIT I :Introduction to Strategic Management****9 hrs**

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 II :Formulation of Strategy**9 hrs**

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 III :Strategic Tools**9 hrs**

Business process reengineering, and Balance Score Card. Aggregate and granular metrics and metrics of value creation.

UNIT IV :Strategic alternatives and Choices**9 hrs**

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.

UNIT V :Implementation of Strategy**9 hrs**

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.

TOTAL : 45 hrs

Reference Books:

1. Max Mckeown, "The Strategy Book, Financial Times Publishing", latest edition, 2016
2. Porter .M.E. "Competitive Strategy: Techniques for Analyzing Industries and Competitors", New York: Free press, 2018
3. Thomas L. Wheelen, J. David Hunger, Alan N. Hoffman, Charles E. Bamford, PurvaKansal, "Strategic Management and Business Policy: Globalization, Innovation and Sustainability", Pearson Publication, 15th Edition, 2018.
4. David Fred and David Forest, "Strategic Management-Concepts and Cases", Pearson Education, 15th Edition, 2015.
5. Thompson, Peteraf, Gamble and Strickland, "Crafting & Executing Strategy: Concepts & Cases", McGraw Hill publication, 21st Edition, 2017.

21GW34

REGULATORY FRAMEWORK- LEGAL ASPECTS AND MANDATORY REGULATIONS

3 0 0 3

UNIT I : Constitutional provisions for the protection of Environment

9 hrs

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 II : Regulation for Natural Resource Management

9 hrs

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 III : Legal Framework for Hazardous and Biomedical Waste Management

9 hrs

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 IV :Legal Aspects for Solid Waste Management

9 hrs

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 V :National and International Instruments

9 hrs

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

TOTAL : 45 hrs

Reference Books:

1. Armin Rosencranz and Shyam Divan. "Environmental Law and Policy in India: Cases, Materials, and Statutes", Oxford, 2012
2. P. Leela Krishnan, "Environmental Law in India", LEXIS- NEXIS, 5th edition, 2019.
3. Justice T S Doabia. "Environmental and Pollution Laws In India", LEXIS- NEXIS, 3rd edition, 2017.
4. Stuart Bell, Donald McGillivray, Ole Pederson, "Environmental Law", Oxford University Press, 2012
5. Vibhav Navneet, "Environmental Law- An introduction". LEXIS – NEXIS, 1st edition, 2016.

21GW35

HEALTH, FITNESS AND NUTRITION FOR MANAGERS

0 0 2 1

UNIT I : Communicable diseases and non-communicable diseases

10 hrs

Dimensions of health, determinants of health, agent factors, host factors, environmental factors, modes of transmission, prevention of communicable diseases

Risk factors and prevention of obesity, hypertension, diabetes, coronary heart disease, stroke, cancer, accidents

UNIT II : Healthy practices and nutrition

10 hrs

Personal hygiene, proper disposal of solid waste, first aid, stress management, sleep, informing other team members to be healthy

Balanced diet, nutritional requirements, nutritional content of foods, nutritional factors in selected diseases like cardiovascular disease, diabetes, cancer, obesity

UNIT III: Physical fitness

10 hrs

Role of physical fitness in maintenance of good health and avoidance of diseases, Types and duration of physical activity, assessment of fitness level, creating a daily workout routine

TOTAL 30 hours

Reference Books:

1. Park K. Park's Textbook of "Preventive and Social Medicine", M/s Banarsidas Bhanot Publishers, 24th edition, 2017.
2. World Health Organization, (2015), Factsheet No. 394 Available from : <http://www.who.int/mediacentre/factsheets/fs394/en/> (accessed on 07-02-2018)
3. World Health Organization, "Global recommendations on physical activity for health", 2010.

21GW36

DESIGN THINKING

0 0 2 1

UNIT I : Introduction to Design Thinking

10 hrs

Types of thinking – Analytical, Intuitive, Deduction, Induction, Abduction; Definitions of Design Thinking, Principles and elements of Design Thinking, Human centric approach, Understanding the business hypothesis, customer perspective, inspiration, visualization through storyboarding etc.

UNIT II : Design Thinking Process

10 hrs

Defining the problem, Data Collection, Observation techniques, gaining insights, Ideation, concept development, Experimentation, prototyping principles, Prototyping, Testing, Assumptions Identification

UNIT III: Design Thinking for Innovation

10 hrs

Design Thinking in organisations, how to diffuse Design Thinking into work culture, Using Design Thinking to innovate in business, Disruptive innovation

TOTAL 30 hours

Reference Books:

1. Tim Brown, "Change by Design, Revised and Updated: How Design Thinking Transforms Organizations and Inspires Innovation", Harper Business, 5th Edition, 2019.
2. Kelley, Tom, and Littman, Jonathan, "The Art of Innovation : Lessons in Creativity from IDEO", America's Leading Design Firm Profile Books Ltd, 2015
3. Ling, Daniel, "Complete Design Thinking Guide for Successful Professionals", Emerge Creative Groups LLP, 2015
4. Kahneman, Daniel, "Thinking, Fast and Slow", 1st Edition, Penguin, 2012.
5. Jeanne Liedtka, "Solving Problems with Design Thinking – Ten Stories of What Works", 1st Edition, Columbia University Press, 2013.

21GW37

ENERGY AND SIMULATION LAB

0 0 4 2

Energy Engineering

30 hrs

Performance evaluation of solar thermal system, Performance evaluation study of biomass digester/gasifier, Energy consumption and lumen measurement of lights and ballasts, Power quality measurements of electrical power systems, Performance evaluation of wind energy systems, Aerodynamic performance study of bluff and streamlined bodies.

Computational Fluid Dynamics

30 hrs

Flow simulation - Internal flow – Laminar region, Flow simulation - External flow – Laminar region, Flow simulation - Internal flow – Turbulence region, Flow simulation - External flow – Turbulence region, Flow simulation - Internal flow with heat transfer, Flow simulation - External flow with heat transfer.

TOTAL : 60 hrs

SEMESTER IV

**21GW41
INTERNSHIP III**

0 0 8 4

Students are to undergo a field immersion experiential internship spanning 120 hours over the semester III. They are to submit field visit learning reports and submit a comprehensive report at the end of the semester. Students will be allotted a faculty guide to keep track of the same and evaluate the learning progress through the semester. At the end of the semester, there will be a comprehensive evaluation based on the report and a viva voce conducted by a suitable evaluation committee appointed by the HoD

**21GW42
Information and Communication Technology & Management Information Systems**

3 0 0 3

UNIT I : ICTs

9 hrs

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 II :Foundations of Information Systems

9 hrs

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 III :IS for operations and decision making

9 hrs

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 IV :Managing Information Technology

9 hrs

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 V :Security and Ethical Challenges

9 hrs

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.

TOTAL : 45 hrs

Reference Books:

1. Ramesh Bhel, James A.O'Brien, George M.Marakas, "Management Information Systems", McGraw Hill Education, 11th Edition, 2019.
2. Jaytilak Biswas, "Management Information Systems", Sage Publications India, 2020.
3. Oz, E. "Management Information Systems", 2nd Edition, Cengage Learning, 2008
4. Kenneth C.Laudon, Jane P.Laudon, Management Information Systems – Managing the Digital Firm, 14th Edition, 2017.
5. Haag, S., Cummings,M., and Phillips, A. Management Information Systems. (6th edn.), Tata McGraw Hill: India. 2008

21GW43**WASTE MANAGEMENT AS PROJECT MANAGEMENT AND GEOGRAPHIC INFORMATION SYSTEM****3 0 0 3****UNIT I :Projects in Contemporary Organizations****9 hrs**

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 II :Project Selection Techniques**9 hrs**

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 III :Project Development**9 hrs**

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 IV :Monitoring a Waste-based Project**9 hrs**

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 V :Project completion**9 hrs**

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.

TOTAL : 45 hrs**Reference Books:**

1. Passenheim Olaf, "Project management". Ventus Publishing ApS. latestedn, 2009.
2. Robert K Wyoski, "Effective Project Management" , Wiley Int, 2016 ISBN: 1118729168
3. Greg Horeine, "Project Management", 2017

21GW44
CREATIVITY AND INNOVATION

3 0 0 3

UNIT I :Realms of Creativity

9 hrs

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 II :Creative Personality

9 hrs

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 III :Managerial Creativity

9 hrs

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 IV :Management of Creativity

9 hrs

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 V :Innovation

9 hrs

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.

TOTAL : 45 hrs

Reference Books:

1. Margaret, A. White & Gary D. Bruton, "The Management of Technology Innovation- A Strategic Approach", Cengage Learning, latest edition, 2010.
2. Praveen Gupta, "Business Innovations in the 21st Century", S.Chand, 2008.
3. CSG KrishnamaCharyulu&R.Lalitha- Innovation Management, Himalaya Publishing House, latest edition, 2013

21GW45

MANAGING CONTRACTS

0 0 2 1

UNIT I : Basics of Contracts

10 hrs

Agreement vs contract-Communication-acceptance-revocation- consideration-express and implied promises-voidable, void, illegal, unenforceable contracts-fraud vs undue influence-mistakes by one party

Express contract-Implied contract-quasi contract-bilateral contract- unilateral contract-contingent contracts-compulsory contracts

UNIT II : Indemnity, guarantee, Bailment**10 hrs**

Pledge and Agency - Rights of indemnity holder-guarantee components-various cases in guarantee-bailor and bailee-various cases in bailment-pawner and pawnee-agent and principal-sub agent-revocation and termination- rights of agent

UNIT III : Drawing up a contract**10 hrs**

Purchase and sales contract-employment contracts-Service contracts-Lease contracts-Outsourcing contracts-non disclosure contracts-non competing contracts

Rescinding contract-compulsory execution-penalty for damages- initiating legal process as remedy

TOTAL : 30 hrs**Reference Books:**

1. Bangia, R K,"Indian Contract Act", 14th Ed, Allahabad Law Agency, 2015.
2. Rajkumar, C A,Adukia, S ,"Drafting commercial contracts and agreements", 1st Ed, Aisa Law House, 2012
3. Nabhi's Board of Editors,"Legal Drafting for Layman", Nabhi Publications, 1 st edition, 2014.
4. Saha, TusharKanti , "Law of contract: Theories and Principles", 1st Nexis Ed, Universal Law Publishing-an imprint of Lexis , 2016
5. Kumar, H L, "Legal Drafting: Do it yourself", Universal Law Publishing-an imprint of Lexis Nexis, 4th edition, 2016.

21GW46**THROUGHPUT ACCOUNTING AND THEORY OF CONSTRAINTS****0 0 2 1****UNIT I :Introduction to TOC****10 hrs**

Theory of constraints-History of productivity-- Philosophies of TOC- -Goal of an organization-Appreciation of variability and dependency. Pillars (Inherent simplicity, Goodness of people, no conflict existence). Five focusing steps- Type of Constraints. Methods of TOC-An overview - TOC Measurements on Productivity-Throughput, Operating Expenses, Inventory.

UNIT II :Throughput Accounting**10 hrs**

Throughput accounting (TA)- Fundamental difference between TA -Cost accounting- Lean accounting-Cost world vs throughput world- Decision making based on exposed capacity. Ratios of TA – Throughput-margin per unit, Throughput-margin per unit time on constrained resource, Productivity (TA) ratio, T/I, $\Delta T/\Delta OE$, ROI. Decision making on Product mix problems. Throughput Dollar days and Inventory Dollar days.

UNIT III :TOC Thinking Process**10 hrs**

Thinking process-Logically and clearly- Change and improvements-Six layers of resistance-Verbalizing the problems-Dettmer's categories of legitimate reservations- Destination: Goal tree- Strategy and tactic tree. Analysis and possible solution: Logical tree diagrams- Current Reality Tree, Evaporating cloud, Future Reality Tree. Execution of change: Prerequisite trees. Transition and progress: Action tree diagram-Network chart-Gantt chart-Fever chart.

TOTAL : 30 hrs

Reference Books:

1. Dettmer, H. W. The logical thinking process. A Systems Approach to Complex Problem Solving. American Society for Quality, 2007
2. Sekkizhar, J. Throughput accounting: Numerical solutions from theory of constraints, KDP publishing, 2020
3. Bragg, S. M. Throughput accounting: a guide to constraint management. John Wiley & Sons. 2012
4. Goldratt, E. M. The Goal, The process of ongoing improvement, Productivity press India Ltd., Edition 3, 2016.

21GW47**ORGANIC WASTE MANAGEMENT LAB****0 0 4 2****Organic Waste Management :**

Waste auditing: Sampling, auditing, segregation; Waste Characterization: Physico-chemical and Biological analysis, Proximate and Ultimate analysis; Mini-Project: Composting: Setting up of composting, monitoring parameters, evaluation of composting; Mini-project: Anaerobic digestion: Setting up of the reaction, monitoring and evaluation of the gas evolved

TOTAL : 60 hrs

ELECTIVES

**21GWA1
OPERATIONS AND MAINTENANCE**

3 0 0 3

UNIT I :Waste Management methods and techniques

9 hrs

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

UNIT II :Operation and maintenance

9 hrs

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 III :Waste Collection & Transport

9 hrs

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 IV :Daily operations

9 hrs

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 V :Usage of tools

9 hrs

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

TOTAL : 45 hrs

Reference Books:

1. Central Pollution Control Board, “Municipal Solid Wastes Processing Technologies: Reference Manual for Local Bodies”, New Delhi, 2002.
2. Govt of India, “Salient Features of Solid Waste Management Rules 2016”, New Delhi, 2016.
3. Ministry of Urban Development, Govt of India , “Municipal Solid Waste Management Manual”, New Delhi, 2016.
4. Central Pollution Control Board , “National Action Plan for Municipal Solid Waste Management”, New Delhi, 2015.

21GWA2
ENVIRONMENT IMPACT ASSESSMENT

3 0 0 3

UNIT I : Introduction

9 hrs

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 II :Fundamentals of EIA

9 hrs

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 III :Environmental Assessment

9 hrs

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 IV :Waste Audit

9 hrs

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 V :International Agreements on Waste

9 hrs

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

TOTAL : 45 hrs

References Books:

1. Dr. R. R. Barthwal, "Environmental Impact Assessment", New age International Pvt. Ltd, 2nd Edition, 2018
2. Dr. R.K. Kitoliya, "Environmental Impact Assessment and Management", Discovery Publishing house, Edition 2017.

21GWA3

ENVIRONMENT ECONOMICS

3 0 0 3

UNIT I :Ecological Costs of Non-Management of Waste

9 hrs

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 II :Human Cost of Not Managing Waste

9 hrs

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 III :Social costs

9 hrs

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

UNIT IV :Economic Cost of Improper Waste Management

9 hrs

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 V :Product Stewardship

9 hrs

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

TOTAL : 45 hrs

Reference Books:

1. Pichtel, John, "Waste Management Practices", CRC Press, 2014
2. Sunita Narain & Swati Singh Sambyal, "Not in My Backyard- Solid Waste Management in Indian Cities", Centre for Science and Environment, 2018.

21GWA4

HOTEL WASTE MANAGEMENT

3 0 0 3

UNIT I :Introduction

9 hrs

Importance of Hotel Waste Management, Objectives, actions needed on Waste Management, monitoring, designing the recovery system

UNIT II :Overview of Hotel Waste

9 hrs

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 III :Waste Management Program

9 hrs

Organizing a Waste Management Program, Purchase Recycled Content Products

UNIT IV :Food Waste Management Strategy

9 hrs

Food Waste Management Strategy, Waste Types by Department/Activity in hotels, Staff Training & Communication

UNIT V :Audit**9 hrs**

Auditing of Waste in Hotels, Performing Waste Audit, Tools to Conduct Waste Audit, Restaurant Food Waste Reduction Ideas

TOTAL : 45 hrs**Reference Books:**

1. International Tourism Partnership (ITP) presents "Green Hotelier – Know How Guide to Reducing and Managing Food Waste in Hotels", September 2014
2. Jennifer Raga, "Environmental Management for Hotels: A Comprehensive Guide for Sustainable Operation", Society Publishing , 2018
3. Claire Baker, Scott Mycock, "Environmental Management For Hotels: The Industry Guide To Sustainable Operation", International Tourism Partnership, Digital Release 2014

21GWA5**RECLAMATION, REMEDIATION AND CAPPING****3 0 0 3****UNIT I :Assessment of contamination before reclamation and remediation****9 hrs**

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 II :Waste Management Technologies**9 hrs**

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 III :Landfill Reclamation**9 hrs**

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 IV :Bio Remediation**9 hrs**

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 V :Multi-Criteria Decision Analysis (MCDA)**9 hrs**

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

TOTAL : 45 hrs**Reference Books:**

1. C. Paul. Nathanail, "Reclamation of Contaminated Lands", Wiley Publications, 1st edition, 2008
2. Singh SN, Tripathi RD, "Environmental bioremediation technologies", Springer-Verlag Berlin Heidelberg., 2007

21GWA6
SANITATION AND HYGIENE

3 0 0 3

UNIT I :Sanitation and Hygiene

9 hrs

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 II :Toilets

9 hrs

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

UNIT III :Faecal Sludge treatment

9 hrs

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

UNIT IV :Sanitation Infrastructure

9 hrs

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

UNIT V : Community Sanitation

9 hrs

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

TOTAL : 45 hrs

Reference Books:

1. S Gupta, "Rural water supply and sanitation" Vayu Education of India, 1st edition, 2012
2. UNICEF and Ministry of drinking water and sanitation, "Manual on liquid and solid waste management"

21GWB1
MARKET INTEGRATION FOR WASTE MANAGEMENT

3 0 0 3

UNIT I :Introduction to sales and distribution Management

9 hrs

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 II :Personal selling process, sales territories and quotas

9 hrs

Selling process, relationship selling, designing sales territories, sales quotas and sales organization structures, case analysis.

UNIT III :Sales Force & Distribution Management**9 hrs**

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

UNIT IV :Distribution Management**9 hrs**

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 V :Management of logistics & SCM**9 hrs**

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

TOTAL : 45 hrs**Reference Books:**

1. Spiro Stanton Rich, "Management of Sales Force", TATA Mcgraw Hill Co., 2015.
2. Richard R Still and Others, "Sales Management", 6th edition, 2017.
3. Rosen bloom, "Marketing Channels", Cengage Learning, 8th edition, 2012.
4. Shah, J, "Supply Chain Management", 2009, 1st Ed. Pearson.
5. Gary Schnider. Electronic commerce. Course technology, 19th edition. 2014.

21GWB2**CONSUMER BEHAVIOUR****3 0 0 3****UNIT I :Introduction to Consumer Behaviour****9 hrs**

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 II :Internal Determinants of Consumer Behaviour**9 hrs**

Motivation- Learning- Perception- Attitude- Personality and Lifestyle.

UNIT III :External Determinants of Consumer Behaviour**9 hrs**

Family- Social Class- Reference Group and Opinion Leader- Diffusion of innovations- Culture and subculture- Relationship marketing.

UNIT IV :Consumer decision making process**9 hrs**

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

UNIT V :CRM concept and components**9 hrs**

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

TOTAL : 45 hrs

Reference Books:

1. Schiffman& Kumar, "Consumer Behaviour", 11th Edition, Pearson Education India, 2017
2. East, R., Wright, M. & Vanhuele, M, "Consumer Behaviour: Applications in Marketing", 2nd Edition, SAGE Publication, 2016.
3. Motherbaugh&Mookerjee, "Consumer Behaviour: Building Marketing Strategy", 12th Edition, Mcgraw Hill Education (India) Private Limited, 2018.
4. RamanujMajumdar, "Consumer Behaviour: Insights from Indian Market", Kindle Edition, PHI, 2017.
5. Satish K Batra&Kazmi, "Consumer Behaviour", 2nd Edition, Excel Book.2018.

18GWB3

INTEGRATED MARKETING COMMUNICATION

3 0 0 3

UNIT I :Introduction to IMC

9 hrs

IMC – Definition and role, Global Developments in IMC, Introduction to IMC tools and techniques, Marketing Objectives and IMC, Strategies by waste and recycling industry

UNIT II :Understanding Communication Process

9 hrs

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

UNIT III :Planning for Marketing Communication (Marcom)

9 hrs

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 IV :Developing IMC Programs

9 hrs

Planning and development of creative Marcom. Creative strategies in advertising, sales promotion, publicity, event sponsorships etc. Creative strategy in implementation and evaluation of Mrcom-Types of appeals and execution styles. Media planning and selection decisions- steps involved and information needed for media planning

UNIT V :Measuring effectiveness and Control of Promotional Programs

9 hrs

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.

TOTAL : 45 hrs

Reference Books:

1. Yeshin, Tony. "The integration of marketing communications." The marketing book (2003): 395.
2. Chaffey, Dave, and Fiona Ellis-Chadwick. Digital marketing. Pearson UK, 2019.
3. GerardusBlokdyk. Integrated marketing Management.5starcooks, 3rd edition, 2018.

4. Belch, George E. and Michael A. Belch, "Advertising and Promotion: An Integrated Marketing Communications Perspective", 11th Edition, Tata McGraw-Hill, 2018.
5. Kenneth E. Clow and Donald Baack, "Integrated Advertising, Promotion and Marketing Communications, 8th Edition, Pearson, 2017.

21GWB4
SERVICE MARKETING

3 0 0 3

UNIT I :Understanding Service Products

9 hrs

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 II :Understanding Consumers and Markets

9 hrs

Consumer Behaviour in service context, Positioning services in competitive markets, segmentation and targeting, purchase model

UNIT III :Apply the 4ps of Marketing to Services

9 hrs

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 IV :Managing the Customer Interface

9 hrs

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 V :Implementing profitable Services Strategies

9 hrs

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

TOTAL : 45 hrs

Reference Books:

1. JochenWitz, "Services Marketing : People, technology & Strategy", World scientific, 8 the edition, 2016
2. Helen Woodruff, "Services Marketing", Himalayan Publishing House,2017.
3. Jeff Toister,"The Service Culture Handbook: A Step-by-Step Guide to Getting Your Employees Obsessed with Customer Service", AMACOM, 2016.
4. Roland Rust, "Services Marketing", Macmillan Limited, 2016.
5. Zeithaml, V.A., Bitner, M.J., Gremler, D.D, "Services Marketing: Integrating Customer Focus Across the Firm", McGraw-Hill Education, 7thEdition, 2018.

21GWB5
PRODUCT AND BRAND MANAGEMENT

3 0 0 3

UNIT I :Product and Product Strategy

9 hrs

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 II :Introduction to Competitive Structure

9 hrs

Defining the Competitive Set, Category Attractiveness Analysis, Competitor Analysis and Customer Analysis.

UNIT III :Product Strategy, Product Offering and Analysis

9 hrs

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 IV :Brands, Branding and Brand Equity

9 hrs

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 V :Brand Positioning and Branding Strategy

9 hrs

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

TOTAL : 45 hrs

Reference Books:

1. Donald Lehman and Russell Winer, "Product Management", Tata McGraw Hill, 4th edition, 2004.
2. U.C .Mathur, "Product and Brand Management", Excel Books. 2nd edition, 2012
3. David Aaker, "20 Branding Principles That Drive Success", Sage Publication, 2015
4. Isaac C. Jacob Kevin Lane Keller, VanithaSwaminathan, Ambi M.G. Parameswaran, "Strategic Brand Management", Pearson, 5th Edition, 2020.
5. J N Kapferer, "The New Strategic Brand Management", Kogan Page, 5th edition, 2017

21GWB6
WASTE EXPORTS, PROCEDURES AND DOCUMENTATION

3 0 0 3

UNIT I :Meaning and definition of export

9 hrs

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 II :Export procedure**9 hrs**

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 III :Export Documents**9 hrs**

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

UNIT IV :Sources of finance**9 hrs**

Role of commercial bank, EXIM Bank, ECGC and others-Export Promotion Schemes-Insurance for Export-Types –export credit insurance

UNIT V :Risk Management**9 hrs**

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

TOTAL : 45 hrs**Reference Books:**

1. PK Khurana, "Export Management", Galgotia publishing company, 8th edition, 2014.
2. Foreign Trade Policy: Hand book of Export Procedure and Annual of the Ministry of Commerce, Government of India
3. Paras Ram " Export: What, Where and How" Anupam Publication, Delhi, 47th edition, 2017.
4. Nabi's Board of editors, "Export and Import", Nabhi Publications, New Delhi., 2019.

21GWC1**E-WASTE MANAGEMENT****3 0 0 3****UNIT I :Generation of E-waste****9 hrs**

Generation of E-waste& it's 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 II :Information and Communication Technology**9 hrs**

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

UNIT III :Hazardous nature of e-waste**9 hrs**

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 IV :Life cycle of EEE into e-waste

9 hrs

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 V :Recycling & Refurnishing

9 hrs

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)

TOTAL : 45 hrs

Reference Books:

1. Balde, Cornelis P., Forti, Vanessa, Gray, Vanessa, Kuehr, Ruediger and Stegmann, Paul, "The Global E-waste Monitor 2017: Quantities, Flows and Resources", Bonn, Geneva, and Vienna: United Nations University, International Telecommunication Union, and International Solid Waste Association, 2017.
2. Book on E-waste by Royal Society of Chemistry, chapter 8, RSC Publishing, 2019.
3. David M Barkch. "E – Waste" , Abdo publishing, 1st edition. 2017.
4. NPCS Board of Consultants & Engineers, "The complete technology book on e-waste Recycling", Asia Pacific Business Press Inc., 2018

21GWC2

RESOURCE EFFICIENCY AND RESOURCE RECOVERY

3 0 0 3

UNIT I :Introduction

9 hrs

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 II :Consumerism

9 hrs

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 III :Use & Throw Culture

9 hrs

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 IV :Building Sustainability

9 hrs

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 V :Resource Recovery

9 hrs

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

TOTAL : 45 hrs

Reference Books:

1. Niall Enright, "Energy and Resource Efficiency without the tears" ,vol I and II, Iwik Publishers, 2017.
2. John Pichter, "Waste Management Practices: Municipal, Hazardous and industrial", 2nd Edition. CRC Press, 2014.
3. BanwariLal and Priyanshu Sharma, "Wealth from Waste: Trends and technologies", 4th Edition. Tata McGraw Hill, 2009.

21GWC3

INTEGRATED WASTE MANAGEMENT

3 0 0 3

UNIT I :Introduction

9 hrs

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 II :Life Cycle Perspective

9 hrs

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 III : Sustainable management

9 hrs

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 IV :Wealth from Waste

9 hrs

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 V :Waste Collection and Processing**9 hrs**

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, 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.

TOTAL : 45 hrs**Reference Books:**

1. A. J. Nordone, P. R. White, F. McDougall, G. Parker, A. Garmendia, M. Franke, "Waste Management and Minimization – Integrated Waste Management", Encyclopedia of Life Support Systems (EOLSS), Procter and Gamble, Newcastle, UK
2. Jutta Gutberlet, "Waste to Energy, Wasting Resources and Livelihoods", Research gate, 2011.

21GWC4**BIO MEDICAL WASTE MANAGEMENT****3 0 0 3****UNIT I :Sources of Biomedical Waste****9 hrs**

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 II :Impacts on health**9 hrs**

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 III :Legal aspects**9 hrs**

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 IV :Steps Involved in Biomedical Waste Management**9 hrs**

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

UNIT V :Management and Administration**9 hrs**

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

TOTAL : 45 hrs

Reference Books:

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

21GWC5

WATER RESOURCE MANAGEMENT

3 0 0 3

UNIT I :Water Issues

9 hrs

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 II :Waste Water Management

9 hrs

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 III :Alternative Technologies for Waste Water Treatment

9 hrs

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 IV :Clean Water Solutions

9 hrs

Introduction, Ancient Water Technology, Rainwater Harvesting, Solution for Flood Management, Watershed Management, Urban Watershed Management, River Restoration, Water Reclamation, Individual Responsibility, Community Responsibility

UNIT V :Testing of Water, Waste Water, Soil and Solid Waste

9 hrs

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

TOTAL : 45 hrs

Reference Books:

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

21GWC6
WASTE MANAGEMENT BANKS

3 0 0 3

UNIT I :Waste Banks

9 hrs

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

UNIT II :Reuse / Recycle methods

9 hrs

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 III :Simple daily banks

9 hrs

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 IV :Community-Based Waste Management

9 hrs

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

UNIT V :Leadership, Management and Incentives in Waste Banks

9 hrs

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

TOTAL : 45 hrs

References Books:

1. Sunita Narain, Swati Singh Sambyal, “Not in my Backyard”, Centre for Science & Environment, 2018.
2. Kaza, Silpa, Yao, Lisa C., Bhada-Tata, Perinaz, Van Woerden, Frank, “What a waste 2.0 - A global snapshot of Solid Waste Management to 2050”, The World Bank Group, 2018
3. Wijayanti, D. R., & Suryani, S. (2015). Waste bank as community-based environmental governance: a lesson learned from Surabaya. *Procedia-Social and Behavioral Sciences*, 184, 171-179.

21GWC7
WASTE MANAGEMENT TECHNOLOGIES

3 0 0 3

UNIT I :Waste Management Techniques

9 hrs

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 II :Alternative Technologies**9 hrs**

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 III :Designing New Techniques**9 hrs**

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 IV :Composting, Recycling & Treatment Methods**9 hrs**

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

UNIT V :Remediation**9 hrs**

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

TOTAL : 45 hrs**Reference Books:**

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

21GWD1

BUSINESS ANALYTICS

3 0 0 3

Unit 1 : Overview of Business Analytics

9 hrs

Big Data - Data Science - Business Intelligence – Business Analytics; Applications of Analytics - Types of Analytics Techniques - Descriptive analytics, Diagnostic analytics, Predictive analytics, Prescriptive analytics; Machine Learning Algorithms; R and R studio environment - Basics of R – Variable Types, Basic Operators, Functions, Vectors, Lists, Data Frame, R Packages

Unit 2 : Exploratory Data Analysis and Data Visualization

9 hrs

Need for Exploratory Data Analysis - Analytics Process Model; Data Pre-processing Steps - Transforming variables, Creating Dummy variables, One hot encoding; Data Visualization Techniques - Univariate Plots - Histogram, Bar Plots, Pie Chart, Box and Whisker Plot, Density Plot; Multivariate Plots - Strip Chart, Scatter Plot, Heat Maps, GGPlots in R

Unit 3 : Unsupervised Learning Algorithms

9 hrs

Unsupervised learning algorithm Techniques - Association rule mining - Transaction dataset, Support, Confidence, Lift , Apriori Algorithm, Item frequency plots, Association rules, Plotting of rules; Clustering Techniques - K-means Clustering - Hierarchical Clustering - Distance measures, Dissimilarity matrix, Linkage methods - Agglomerative clustering - Divisive clustering - Dendrogram; Unstructured Data - Text analytics - Word Cloud - Sentiment analysis - Word Polarity - Quantifying Sentiments

Unit 4 : Supervised Learning Algorithms: Linear and Logistic Regression

9 hrs

Supervised Learning Algorithm Techniques - Regression - Multiple linear regression - Interpretation of Multiple Linear Regression Coefficients, Coefficient of Determination, Model performance measures; Classification Technique - Logistic Regression, Binary Logistic Regression, Sigmoid function Interpretation of Logistic Regression Parameters, Odds ratio, Variable selection

Unit 5 : Supervised Learning Algorithms: KNN and Decision Tree

9 hrs

Frequency Based Algorithm - K-Nearest Neighbours - Similarity based on distance function, Select Appropriate K Value; KNN Model Building - Evaluating Model Performance; Decision Tree - Tree structure, Criteria for splitting the Decision Node - Classification and Regression Technique (CART)- Control Parameters, Pruning the tree, Important Variables, Insights from Decision Rules

Total : 45 hrs

Reference Books:

1. AntoniosChorianopoulos, "Effective CRM using Predictive Analytics", Wiley Publications, latest edition, 2016
2. Bart Baesens, "Analytics in a Big Data World – The essential guide to Data Science and its Applications", Wiley Publications, 2 nd edition, 2018
3. GalitShmueli, Peter C Bruce, Nitin R Patel, "Data Mining for Business Analytics – Concepts, Techniques and Applications", Wiley Publications, 2016 edition
4. James Evans, "Business Analytics", Pearson Publications, 2nd Edition, 2018
5. SandhyaKuruganti, Hindol Base, "Business Analytics - Applications to Consumer Marketing", McGraw Hill Education, 2 nd edition, 2017

**21GWD2
DATA VISUALIZATION**

3 0 0 3

UNIT 1: Data Visualization –A primer of Business Intelligence

8 hrs

Business Intelligence - Data Visualization Evolution and Characteristics – Importance of Data Visualization –Data Visualization Process - Data Visualization Tools and Software - Data Visualization Techniques – Best Practices in Data Visualization

UNIT 2: Data visualization Using Tableau – Basics

9 hrs

Introduction to Tableau – Tableau interface & Architecture – Data connections & Data Sources – Preparation of Data – Exploring and analyzing Data – Creating basic charts – Apply analytics to a worksheet – Creating Groups and Hierarchies - Mapping -Sharing Insights

UNIT 3: Data visualization Using Tableau – Advanced

9 hrs

Advanced calculations - Parameters – Special Charts -Creation of Dashboards – Dashboard Actions - Story Boards Preparation - Sharing the work – Profile creation in Tableau Public

UNIT 4: Reports & Dashboards using Power BI

10 hrs

Power BI introduction – Power BI Architecture & Process – Connecting Power BI with different Data Sources – Power Query for Data transformation- Data Modelling in Power BI – Reports – Visualization types in Power BI – Statics and Live Dashboards- Data Refresh & Security

UNIT 5: Visualizing through R , Python &Qlikview

9 hrs

Grammar of Graphics – GGplot and visualizations using R – Advanced visualizations using matplotlib, seaborn and pyplot – Qlikview overview

Total: 45 hrs

Reference Books

1. Cole NussbaumerKnaflc, “Storytelling with Data: A Data Visualization Guide for Business Professionals”, Amazon Asia-Pacific Holdings Private Limited, 1st edition, 2015.
2. Devin Knight, “Microsoft Power BI Complete Reference: Bring your data to life with the powerful features of Microsoft Power BI”, Packt Publishing, 1st edition, 2018.
3. Eric Pimpler, “Data Visualization and Exploration with R: A practical guide to using R, R Studio, and Tidyverse for data visualization, exploration, and data science applications”, Create Space Independent Public Platform,2018 latest edition
4. Ryan Sleeper, “Practical Tableau”, O'Reilly Media,latest edition, 2018.
5. The Open University, “Visualization: Visual representations of data and information”, Amazon Asia-Pacific Holdings Private Limited, latest edition, 2016.

21GWD3

MACHINE LEARNING

3 0 0 3

UNIT 1 : Introduction

9 hrs

Introduction to Machine Learning – Artificial Intelligence – Deep Learning - Practical Applications of Machine Learning, Artificial Intelligence, Deep Learning – Dimensionality Reduction Techniques – Factor Analysis

UNIT 2 : Supervised Machine Learning Techniques

9 hrs

Conjoint Analysis – Full/fractional factorial design, choice cards , attribute Importance. Linear Discriminant Analysis - Fisher’s method, Mahalanobis method, Standardised coefficients, Unstandardised coefficients, Structured coefficients. Naïve Bayes – Bayes theorem, conditional probability, building naïve bayes classifier

UNIT 3 : Advanced Supervised Machine Learning Techniques **9 hrs**

Random Forest – out of bag error rate, variable importance, tuning hyperparameters. SVM – hyperplanes and support vectors, SVM model building. Ensemble Methods – bagging, boosting, adaboost, gradient boosting, extreme gradient boosting, bias variance trade off, Synthetic minority oversampling technique.

UNIT 4 : Artificial Neural Networks **9 hrs**

Neural networks – Neural network model building – Perceptron – Bias – Activation Function – Hidden layers – Forward Propagation – Backward Propagation – Introduction to Convolutional Neural Network and Reinforcement Learning

UNIT 5 : Time Series Analysis **9 hrs**

Visualizing time series data - Components of Time Series Data - Stationarity of the Data - Differencing the Time Series – Time Series Models - Simple Exponential Smoothing, Double Exponential Smoothing, Holt’s Model, Holt Winters – additive model, multiplicative model - Auto-Regressive Integrated Moving Average Model Building - Residual Analysis - Auto ARIMA Model

Total: 45 hrs

Reference Books

1. Daniel T.Larose and Chantal D, Larose, “Data Mining and Predictive Analytics”, Wiley, 2nd Edition, 2018.
2. Dean Abbot, “Applied Predictive Analytics- Principles and techniques for the professional data analyst”, Wiley, 2018.
3. Efraim Turban, Ramesh Sharda, DusunDelen, “Business Intelligence and Analytics- Systems for Decision support”, Pearson, 10th Edition, 2018.
4. Gordon S.Linoff, MichealJ.A.Berry, “Data Mining Techniques”, Wiley, 3rd Edition, 2017.
5. MehmedKantardzic, “Data Mining- Concepts, Models, Methods and Algorithms”, Wiley, 2nd Edition, 2018.

21GWD4

PYTHON PROGRAMMING FOR ANALYTICS

3 0 0 3

UNIT 1 : Introduction to Python **9 hrs**

Python Overview – Environment Setup – Jupyter Notebook –Working Directory - Syntax, comments, variables, datatypes - numbers, strings, Booleans, operators, lists, tuples, sets, dictionaries – Operators in Python – Branching statement in Python functions, lambda, array, classes, objects, python dates, string formatting

UNIT 2 : Python For Data Analysis **9 hrs**

Python Libraries – Numpy – Vector and Matrix indexing, slicing, shape, reshape, joint split, sort filter, copy vs view - Random numbers; Pandas Library – Creating Dataframe, Slicing and Dicing the Data Frame, .loc and iloc, Adding Columns to Data Frame, Dropping Rows and Columns, Sorting Dataframe, Grouping the Data, Data cleaning and preprocessing

UNIT 3 : Data Visualization using Python**9 hrs**

Matplotlib Library –Histogram, Scatter Plot, Pie Chart, Area Chart, Meshgrid, Quiver Plot, Contour Plot; Seaborn Library - Count Plot, Bar Plot, Point Plot, Violin Plot, Swarm Plot, Rug Plot, Cat plot; Introduction to Plotly – Animated plots

UNIT 4 : Model Building using Python**9 hrs**

Statistical libraries for model building – Random forest, Support vector machines, ensemble methods

UNIT 5 : TensorFlow**9 hrs**

TensorFlow Basics – Introducing Tensors – Directed Graph – Visualizing a graph – Estimator API – Feature Extraction - Train a model – Simple programs in Tensor Flow - Deep learning with Tensorflow

Total: 45 hrs**Reference Books**

1. Camm, Cochran, Fry, Ohlmann, Andeson, Sweeny, Williams, “Essentials of Business Analytics”, Cengage Learning, 2019.
2. Nishant Shukla, “Machine Learning with Tensorflow”, Manning Publications, 1st Edition, 2018.
3. Sebastian Raschka, VahidMirjalili, “Python Machine Learning”, Packt Books, 2nd Edition, 2017.
4. Wes McKinney, “Python for Data Analysis : Data Wrangling with Pandas, Numpy and IPython”, O’Reilly Media, 2nd Edition, 2017.
5. YehezkelS.Resheff, Itay Lieder, “Learning with Tensorflow : A Guide to Building Deep Learning Systems”, O’Reilly Media, 1st Edition, 2017.