MOUNT CARMEL COLLEGE, AUTONOMOUS

(Affiliated to Bengaluru Central University)

58, PALACE ROAD

BANGALORE – 560052

Department of Environmental Science

CBCS

PG Diploma in Environmental Management and Auditing

(2020-21)

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ENVIRONMENTAL MANAGEMENT AND AUDITING
Course Structure

Semester I						
Code	**Name of The Course**	**LTP**	**Credits**	**CIA Marks**	**ESE**	**Total**
EMA-01	Sustainability and stakeholder management	4:2:0	5	30+15	70+35	150
EMA-02	Environmental Impact Assessment, Hazard Management and Monitoring Lab	3:0:4	5	30+15	70+35	150
EMA-03	Industrial Effluent treatment and Environmental Health	5:0:0	5	30+15	70+35	150
EMA-04	Environmental law and CSR accounting auditing & reporting	5:0:0	5	30+15	70+35	150
AC-05	Statistical Analysis and Report Writing	2:0:0	2	15	35	50
	Community Project Report + Viva Voce(Internship with an NGO / Research Institute / Company / Industry)	0:0:4	2	---	100	100
	TOTAL		**26**			**750**
SEMESTER II						
EMA-05	ISO 14001:2015 Environmental Management	4:0:2	5	30+15	70+35	150
EMA-07	Safety Management	5:0:0	4	30+15	70+35	150
EMA-08	Occupational Health and Environmental Safety Management	4:2:0	5	30+15	70+35	150
	Project/Viva Voce	12	8	50	150	200
	TOTAL		22			**650**

ENVIRONMENTAL MANAGEMENT AND AUDITING
Syllabus

I SEMESTER

SUSTAINABLITY & STAKEHOLDER MANAGEMENT

EMA-01

Credit:4

Total Hours:52

UNIT I: Sustainability and sustainable development: - Concept and seven key factors of Sustainability – UN Sustainable Development Goals and Sustainability – Environmental Sustainability : Global Initiatives on Environmental Sustainability. 10 hours

UNIT II: Corporate Sustainability Footprint: The Value Chain Footprint - Sustainability and Greenhouse gases (GHG) - Facility Operations: Energy Efficiency & Green Building - Sustainable Procurement & Logistics.- Sustainable Production and Consumption. Corporate Sustainability Footprint - Resource use and loss – Process view and Life Cycle Assessment - Industry and competition analysis. Accountability Index – Bureau of Indian Standard (BIS), Dow Jones Sustainability Index, Cradle – to – Cradle, Green Building & Purchasing. 15 hours

UNIT III: Business (corporate) sustainability: Evolution of business approaches to SD- Business Sustainability – UN Global Compact - Key players in sustainability field: Corporate Sustainability Strategy: Developing strategy through benchmarking and balanced scorecard - Entrepreneurs and employee engagement - Operationalising Sustainability - Corporate Sustainability Management System: Determining sustainability "current state" – Corporate level; Benchmark sustainability program – Gap analysis; Creating sustainability strategy - Sustainability Challenges and Solutions.

15 hours

UNIT IV: Corporate Stakeholder Engagement : Multilateral engagement (UN/World Bank/OECD) - Government engagement - NGO's – influence and engagement -Trade associations (WBCSD) - Stakeholder interests and engagement -Creating a comprehensive Stakeholder engagement strategy - Implementation and engagement- Analysis and evaluation. 12 Hours

Reference Books:

1. Farver, Mainstreaming Corporate Sustainability
2. Blackburn, The Sustainability Handbook
3. "R. Edward Freeman on Stakeholder Theory"
4. Rate the Raters Phase Four: The Necessary Future of Ratings (SustainAbility, July 2011); scan key points
5. CSRHUB.com (review high level)

6. Accountability AA1000 Stakeholder Engagement Standard (AA1000SES) • AccountAbility & UNEP: From Words to Action: The Stakeholder Engagement Manual (Volumes One & Two) (review high level)

7. Accountability & UNEP: From Words to Action: The Stakeholder Engagement Manual (Volumes One & Two)

ENVIRONMENTAL IMPACT ASSESSMENT AND HAZARD MANAGEMENT

EMA-02

Credit:3

Total Hours:45

ENVIRONMENTAL IMPACT ASSESSMENT

UNIT I : Environmental impact assessment: Introduction, aims, objectives, constraints in EIA, environmental assessment process (impact prediction, evaluation, mitigation and monitoring), environmental impact statement (EIS), methods of impact analysis (check lists, overlays, matrices, models, comparative studies), environmental items in Leopold's identification matrix, questions for impact identification, impact interpretation, impact communication, impact statements.15 hours

UNIT II : Prediction, evaluation, assessment and monitoring of impacts of different developmental activities on the air environment, water environment, noise environment, biological environment, cultural environment, socio-economic environment. 15hours

HAZARD MANAGEMENT

UNIT III : Hazard and Risk Identification Techniques :Hazard and Risk Analysis: Quantitative and Qualitative, Failure, Mode and Effect Analysis (FMEA) &Maximum Credible Accident Analysis(MCAA). Fault Tree Analysis, event tree Analysis. Example of each. HAZAN, HAZOP, Managerial Technique 15 hours

Practical

Monitoring Lab 20 hours

Water analysis parameters:Sampling procedure , pH ,Conductivity ,Turbidity, TDS Meter Dissolved oxygen , BOD and COD of sewage and estimation in industrial waste water plants ,COD of sewage , Acidity industrial waste water Jackson turbidity meter , Lux meter , Anemometer , Sound meter , , (RDS) Respirable Dust Sampler , To study the different methods of air monitoring Ambient air monitoring for SO_2, NO_x, CO, CO_2 & SPM . To study the different methods of water sampling Visit to nearby Sewage/effluent treatment plants

Hypothetical EIA of following: (Two exercises to be given) 1. Urbanisation 2. Dam construction 3. Hydroelectric power generation 4. Tourism 5. Sugar mills 6. Road construction 7. Industry.

Reference Books :

1.Albert R. Wilson Environmental Risk: Identification and Management, CRC

2. Kletz Hazop and Hazan-Ref to cheme, Macmillan Education Australia

INDUSTRIAL EFFLUENT TREATMENT AND ENVIRONMENTAL HEALTH

EMA-03

Credit: 5

Total Hours: 65

INDUSTRIAL EFFLUENT TREATMENT

UNIT I : Difference between Domestic and Industrial Wastewater, Sources and Characteristic of Industrial Effluent Waste Reduction Alternatives-Treatment and Disposal of Sludge Solids Removal of Inorganic suspended solids, Removal of Organic Solids, Removal of suspended solids and colloids. Treatment and Disposal of Sludge Solids.Feasibility of combined Treatment of Industrial Raw Waste with Domestic Waste, Discharge of Raw, Partially Treated and completely treated Wastes to Streams. 20 hour

UNIT II: Process flow sheet showing origin / sources of waste water, characteristics of waste, alternative treatment methods, disposal, reuse and recovery along with flow sheet. Effect of waste disposal on water bodiesThe industries to be covered ARE:1. Cotton Textile Industry2. Tanning Industry 3. Cane Sugar Industry & Distillery Industry 15 hour

ENVIRONMENTAL HEALTH

Unit III: Introduction Definition : Environmental health ,waterair,Ventilation,lighting,Noise,Radiation,Artthpodal ,Borrne diseses and its control environmental Epidemology 15 hour

UNIT IV: Toxicology and Disease Health in the Workplace and Hospitals. First Aid:Body structure and Functions, Position of causality, the unconscious casualty, fracture and dislocation, Injuries in muscles and joints, Bleeding, Burns, Scalds and accidents caused by electricity, Respiratory problems, Rescue and Transport of Casualty. Cardiac massage, poisoning wounds 15 hour

Reference books:

1. Agarwal, S.K. Water pollution. APH Publishing Corporation. 2009.
2. Tchobanoglous, G., Burton, F.L., Metcalfe and Eddy (ed). 2004. Wastewater Engineering: Treatment and Reuse. Mc Graw Hill Puclishing Company.
3. Hollinger, M.A. and Derelanko, M.J. Handbook of toxicology. CRC Press, 2002.

ENVIRONMENTAL LAW AND CSR ACCOUNTING AUDITING & REPORTING

EMA-04

Credit: 5

Total Hours: 65

ENVIRONMENTAL LAW

UNIT I: Constitutional Provisions for Environmental Protection: Specific Provisions for Environmental Protection in the Constitution of India, Provisions in the Directive Principles of State Policy. Public Interest litigation. 15 Hour

UNIT II : Environmental Acts a) Water (Prevention& Control of Pollution) Act b) Water (Prevention & Control of Pollution) Cess Act c) Air (Prevention & Control of Pollution) Act d) Environment (Protection) Act e) Hazardous Waste (Management & Handling) Rules f) Manufacture, Storage and Import of Hazardous Chemicals Rules. Regulation on Bio-Medical Waste. g)Public Liability Insurance Act and Rule Important Judgments and Cases: Discussion on landmark cases: Sriram Chemicals Oleum Leak Case, Bhopal Gas Leak case, Ganga Action Plan case etc. Green Benches 20 Hour

CSR ACCOUNTING AUDITING & REPORTING

UNIT-III : Corporate Sustainability, Definition, Overview in global Prospect. Global Guidance Standard on Social Responsibility's 26000, seven principles of social responsibility. SEBI Guide Line on CSE Reporting, Life Cycle Assessments, Factors Driving Corporate Sustainability.

15 Hour

UNIT IV: The Global Reporting InitiativeandCorporate Sustainability ReportingGuidelines.Social Accountability International's SA8000 standard. Accountability's AA1000 standard, based on JohnElkington's triple bottom line (3BL) reporting. Social Auditing, The Social Audit Process, The Social Audit Standard. Social Audit Verification, SocialAccounting, Social Audit Report.CA format for Annual report on CSR activities.CSR Audit &Reporting Guidelines by Companies act 2013. 15 Hour

Reference books:

1. R. K. Trivedy – Handbook of Environmental Laws, Guidelines, Compliance & Standards, Vol. 1 & 2 Environ – Media karad, India 2. Mhaskar A. K. Environmental Laws

2. SOCIAL AUDIT TOOLKIT Fourth Edition 2008.

3. For the Common Good: redirecting the economy toward community, the environment and a sustainable future by Herman Daly

4. Ishmael: an adventure of the mind and spirit by Daniel Quinn

5. Natural Capitalism by Paul Hawken, Amory Lovins & Hunter Lovins

6. Small is Beautiful: economics as if people mattered by E.F. Schumacher

7.. CSR India – Ready Reckoner Comprehensive guidelines for CSR Activities by IICA.

8. AA1000 STAKEHOLDER ENGAGEMENT STANDARD 2011

9. Handbook for Implementers of ISO 26000, Global Guidance Standard on Social Responsibility.

10. G4 Sustainability Reporting Guidelines by GRI. SUSTAINABLITY

STATISTICAL ANALYSIS

AC-05

Credit: 2

Total Hours: 26

UNIT I: Biostatistics: concept of measurement in environmental studies, sources and presentation of data, Frequency distribution and graphical representation, measures and central tendencies: Mean, mode and median, arithmetic, geometric mean 10 hour

UNIT II: Measures of dispersions, Quartile deviation, standard deviation, test of significance– testing hypothesis, t-test, F-test, Chi-square test. correlation and linear regression, analysis of variance. Laboratory Quality Control and Assessment, Correction, Limit of Detection, Bias, Precision and Accuracy 16 hour

Reference books:

1. Kothari, C.R. 1991. Research Methodology – Methods and Techniques.Wiley Eastern Ltd.
2. Khan, I.A. and Khanum, A. 1994. Fundamentals of Biostatistics. Ukaaz Publications.

II SEMESTER

ISO 14001; ENVIRONMENTAL MANAGEMENT

EMA-05
Credit: 4

Total Hours: 52

UNIT I: Introduction to ISO 14001 ;Environmental Management Specification-A general overview , Aim of an environmental management system;ISO 14001:2015 CLAUSE 0 to 3; auditing context of organisation and leadership;Auditing planning; auditing support; auditing operations,Auditing performance evaluation and improvements 10 hours

UNIT II: EMS audits process, protocol for EMS audits, Requirement Of ISO 14001 with respect to EMS audits;Non conformation and corrective and preventive action ,the Relationship between EMS audits and compliance audits 10 hour

UNIT III: Auditor and auditee responsibilities during an EMS audit;Auditor Responsibilities, Qualification,Auditee Responsibilities: Guidance for planning and conducting an EMS Audit; program and procedures; planning and scheduling ;conducting an internal EMS audit 12 hour

UNIT IV: The value of ISO 14001;Keys to success for an EMS auditing program; Case study; Example Audit report;Core elements of environmental management System. Salient features of ISO 14000 series highlighting upon - ISO 14000; EMS- General Guidelines on Principles, Systems and Supporting Techniques; ISO 14020 - EL- Basic Principles of Environmental Labelling; ISO 14031 - Environmental Performance Evaluation.. ISO 14040 - LCA- General Principles and Practices; ISO 14060 - Guide for the Inclusion of Environmental Aspects in product standards .

20 hours

Practical 20 hours

1. Overview of ISO 14001
2. The audit process
3. Non Conformation tracking log
4. Planning and scheduling an EMS audit
5. Audit Matrix
6. Audit check list preparation
7. Creating Audit report form

Reference books:

1. ISO,2001.Manual 10-Environmental management andISO14000.ISOISBN92-67-10341-5(www.iso.org)
2. John Brady Environmental Management and organization.The IEMA hand book ,James earth scan .ISBN 1-85383-976-0
3. Kolstad, C.D. Environmental Economics. Vol. 1. Oxford university press, 2000.
4. Clayton, A.M.H., Radcliffe, N.J. Sustainability: A Systems Approach. 2nd ed. 1997. Earthscan Publications Ltd., UK.
5. Dupont, R.R., Baxter, T.E. and Theodore, L. Environmental Management: problems and solutions. Lewis publishers, 1998.

SAFETY MANAGEMENT

EMA-06

Credit: 5

Total Hours: 65

UNIT I: Introduction, importance of environmental safety in industry; Work Factor-plant layout, type of tools, work method and material used.Physical environmental factor- (a) Workstations, (b) Room dimensions and space, (c) Floors & Gangways, (d) Stairways, (e)Lighting, (f) Temperature, (g) Ventilation, (h) Housekeeping –Safe storage, Falling objects.Promoting Safety, Safety and Health training, Importance of environmental safety, role of safety department, Safety committee and Function, Concept and Significance of ISO standards and internal auditing, Industrial Pollution, Accident and Environmental Damage, Conservation of Environment, Restoration of ecosystem
Accident Prevention Techniques 15 hour

UNIT II: Accident Prevention-Obligation of employer,Notice of Accident, Report of Fatal Accident,Obligation of workers,Manufactures, Code of practices-Industrial Building,Engines and Machines,Electrical equipmentHand Tools,Wood Working,Material Handling,Hazardous Materials,Fire protection,Noise and vibration, 15 hour

UNIT III: Principles of accidents prevention-Definition: Incident, accident, injury, dangerous occurrences, unsafe acts, unsafe conditions,hazards, error, oversight, mistakes, etc.
Accident Prevention: Theories / Models of accident occurrences, Principles of accident prevention,Accident and Financial implications, Hazard identification and analysis, fault tree analysis, Event tree analysis, failure modes and effects analysis, Hazop studies, Job safety analysis - examples,Plant safety inspection - objectives and types check procedure inspection report.
20 hour

UNIT IV: Theories and principles of accident causation
i. The effect of accident, unsafe act, unsafe condition, unpredictable performance, Human factors contributing to accidents - causes for unsafe acts,
ii. Safety and psychology -Theories of motivation and their application to safety. Consequences of accident, accident prevention programmers, Role of safety
iiI. Personal Protective Equipments: Need, selection, supply, use, care and maintenance, Personal protective devices for head, ear, face, eye, foot, knee and body protection, Respiratory personal protective devices. 15hours

Reference Books:

1. Frank P Lees – Loss of prevention in Process Industries, Vol. 1 and 2, Butterworth- Heinemann Ltd., London (1991).
2. R. K. Jain and Sunil S. Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi (2006)

OCCUPATIONAL HEALTH AND ENVIRONMENTAL SAFETY MANAGEMENT

EMA-07

Credit: 4

Total Hours: 52

UNIT I: Definition of Occupational Health as per WHO/ILO.;Occupational Health and Environmental Safety Management - Principles and practices , Occupational Health Management Services at the work place: Pre-employment, periodic medical examination of workers, medical surveillance for control of occupational diseases and health records, Common occupational diseases

10 hours

UNIT II: Industrial Hygiene :Defined Control Methods, Substitution, Changing the process, Local Exhaust Ventilation, Isolation, Wet method, Personal hygiene, housekeeping and maintenance, waste disposal, special control measures Chemical Hazards: Introduction to chemical hazards, dangerous properties of chemicals, dust, gases, fumes, mist, vapors, smoke and aerosols. Route of entry to human system, recognition, evaluation and control of basic hazards, concepts of dose-response relationship, bio-chemical action of toxic substances 12 hours

UNIT III: Occupational Safety, Health and Environment Management Bureau of Indian standards on safety and health 14489 - 1998 and 15001 – 2000, OSHA, Process Safety Management (PSM) as per OSHA, PSM principles, OHSAS – 18001, EPA Standards, Performance measurements to determine effectiveness of PSM 15 hour

UNIT IV: Ergonomics : Musculoskeletal Disorders and Cumulative Trauma Disorders. Physiology of respiration, cardiac cycle, muscle contraction, nerve conduction system, etc. Assessment of workload based on human physiological reactions. Permissible limits of load for Manuals . 15 hour

References Books:

RK Jain and Sunil S. Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers, New Delhi (2006) .

Stole , Handbook of Occupational Safety and Health, John Wiley and Sons, NewYork

Jeanne Mager Stellman, Encyclopaedia of Occupational Health and Safety (ILO) Ms. Irma Jourdan Publication