COURSE STRUCTURE & DETAILED SYLLABUS

ACE - R22

DEPARTMENT OF CIVIL ENGINEERING

IV B.Tech II Sem (2022 Batch)

Course Structure
&
Syllabus

ACE
Engineering College
Ankushapur(V), Ghatkesar(M), Medchal Dist - 501 301
(An Autonomous Institution, Affiliated to JNTUH, Hyderabad)
Department of CIVIL ENGINEERING

B.Tech. in CIVIL ENGINEERING
COURSE STRUCTURE & SYLLABUS (ACE-R22 Regulations)
Applicable from AY 2022-23 Batch

ACE
Engineering College
Ankushapur(V), Ghatkesar(M), Medchal Dist - 501 301

(An Autonomous Institution)

B.TECH. FOUR YEAR DEGREE COURSE

CIVIL ENGINEERING

COURSE STRUCTURE & SYLLABUS

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Professional Elective – V	3	0	0	3
2.		Professional Elective - VI	3	0	0	3
3.		Open Elective - III	3	0	0	3
4.	CE801PC	Project Stage – II including seminar	0	0	22	11
		Total Credits	**9**	**0**	**22**	**20**

*MC – Satisfactory/Unsatisfactory

Professional Elective – I
1. Green Building Technologies
2. Geomatic Applications in Civil Engineering
3. Smart Cities Planning & Management
Professional Elective – II
1.Prestressed Concrete
2.Elements of Earthquake Engineering
3.Advanced Structural Analysis
Professional Elective – III
1.Earth Retaining Structures
2.Ground Improvement Techniques
3.Stability Analysis of Slopes
Professional Elective – IV
1.Design of Hydraulic Structures
2.Advanced Water Resources Engineering
3.Ground Water Hydrology
Professional Elective – V
1.Solid Waste Management
2.Environmental Impact Assessment
3.Air Pollution
Professional Elective – VI
1.Airport, Railways, and waterways
2. Pavement Asset Management
3.Pavement Analysis & Design
Open Electives -I
1. Disaster Preparedness & Planning Management
2. Building Management System
3. Environmental Impact Assessment
Open Electives -II
1.Geographical Information systems
2.Sustainable Infrastructure Development
3.Professional Practice, Law & Ethics
Open Electives -III
1.Energy Efficient Buildings
2.Multi Criterion Decision Making
3.Environmental Pollution and Control

CE851PE: SOLID WASTE MANAGEMENT (PE – V)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to

- **Define** the terms and understand the necessity of solid waste management.
- **Explain** the strategies for the collection of solid waste.
- **Describe** the solid waste disposal methods.
- **Categorize** Hazardous Waste.

Course Outcomes: At the end of the course the student will able to:

- Identify the physical and chemical composition of solid wastes.
- Analyze the functional elements for solid waste management.
- Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
- Identify and design waste disposal systems.

UNIT - I

Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management - Integrated solid waste management, Solid Waste Management Rules 2016.

UNIT - II

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning - transfer and transport; processing techniques.

UNIT - III

Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recovery systems; recovery of biological conversion products — Composting, pre and post processing, types of composting, Critical parameters, Problems with composing - recovery of thermal conversion products; Pyrolisis, Gasification, RDF - recovery of energy from conversion products; materials and energy recovery systems.

UNIT - IV

Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills — Landfills reclamation.

UNIT - V

Hazardous waste Management: Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management

TEXT BOOKS:

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, EngineeringPrinciples and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole ThomsonLearning Inc., 2002.

REFERENCE BOOKS:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw HillInc., New York, 1985.
2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction'Prentice Hall, 2002.

CE852PE: ENVIRONMENTAL IMPACT ASSESSMENT (PE – V)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to

- **Define and Classify** Environmental Impacts and the terminology.
- **Understands** the environmental Impact assessment procedure.
- **Explain** the EIA methodology.
- **List and describe** environmental audits.

Course Outcomes: At the end of the course the student will be able to

- Identify the environmental attributes to be considered for the EIA study.
- Formulate objectives of the EIA studies.
- Identify the methodology to prepare rapid EIA.
- Prepare EIA reports and environmental management plans.

UNIT - I

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT - II

EIA Methodologies: Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions - Construction Stage Impacts, post project impacts.

UNIT - III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT - IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules. Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria-case studies.

UNIT - V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Airports.

TEXT BOOKS:

1. Anjaneyulu.Y and Manickam. V. Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand ReinholdCo., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., NewYork, 1996.

CE853PE: AIR POLLUTION (PE – V)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course is to

- **Understand the** Air pollution Concepts.
- **Identify** the source of air pollution.
- **Know** Air pollution Control devices.
- **Distinguish the** Air quality monitoring devices.

Course Outcomes: At the end of the course the student will be able to

- Identify sampling and analysis techniques for air quality assessment.
- Describe the plume behavior for atmospheric stability conditions.
- Apply plume dispersion modelling and assess the concentrations.
- Design air pollution controlling devices.

UNIT - I

Air Pollution: Definition of Air Pollution - Sources & Classification of Air Pollutants - Effects of air pollution- Global effects– Ambient Air Quality and standards– Monitoring air pollution, Sampling and analysis of Pollutants in ambient air — Stack sampling.

UNIT - II

Meteorology and Air Pollution: Factors influencing air pollution , Windrose , Mixing Depths , Lapse rates and dispersion - Atmospheric stability, Plume behavior, Plume rise and dispersion, Prediction of air quality, Box model - Gaussian model - Dispersion coefficient - Application of tall chimney for Pollutant dispersion.

UNIT - III

Control of Particulate Pollutants: Properties of particulate pollution - Particle size distribution - Control mechanism

- Dust removal equipment – Working principles and operation of settling chambers, cyclones, wet dustscrubbers, fabric filters & ESP.

UNIT - IV

Control of Gaseous Pollutants: Process and equipment for the removal by chemical methods - Working principles and operation of absorption and adsorption equipment - Combustion and condensation equipment.

UNIT - V

Automobile and Indoor Pollution: Vehicular pollution — Sources and types of emission — Effect of operating conditions-Alternate fuels and emissions-Emission controls and standards, Strategies to control automobile pollution– Causes of indoor air pollution-changes in indoor air quality-control and aircleaning systems-indoor air quality.

TEXT BOOKS:

1. M. N. Rao and HVN Rao, Air Pollution, Tata McGraw Hill Publishers
2. Noel, D. N., Air Pollution Control Engineering, Tata McGraw Hill Publishers, 1999.

REFERENCE BOOKS:

1. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000.
2. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford &I.B.H.
3. Air Pollution and Health by T. Holgate, Hillel S. Koren, Jonathan M. Samet, Robert L. Maynardpublisher Academic Press.

CE861PE: AIRPORT, RAILWAYS AND WATERWAYS (PE – VI)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to

- Deal with the characteristics of aircrafts related to airport design; runway and taxiway design,runway orientation, length, grading and drainage.
- Introduce component of railway tracks, train resistance, crossing, signalling, high speed tracksand Metro Rail.
- Explain the classes of harbours, features, planning and design of port facilities.

Course Outcomes: At the end of this course, the students will develop:

- An ability to design of runways and taxiways.
- An ability to design the infrastructure for large and small airports.
- An ability to design Super elevation and transition curve for railway horizontal curves.
- An ability to design various crossing sturnout and signals in Railway Projects.
- An ability plan the harbours and ports projects including the infrastructure required for new portsand harbours.

UNIT - I

Airport Engineering: Introduction to Air Transportation - Aircraft Characteristics - Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram

UNIT - II

Introduction to Railways: Role of Indian Railways in national development — Railways for Urban Transportation — LRT, Mono Rail, Metro Rail &MRTS. Permanent Way: Components and their Functions: Rails

- Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density — Ballast, Functions, Materials, Ballast less Tracks, Subgrade and Embankments –Functions and Materials.

UNIT - III

Geometric Design of Railway Track: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

UNIT - IV

Track maintenance and Operation: Points and Crossings - Turnouts, Stations and Yards - Level Crossings. Signalling and Interlocking - Track Circuiting - Track Maintenance.

UNIT - V

Dock & Harbour Engineering: Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification. Harbourworks: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development,

planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lockgates: materials, size, Dredging: classification, dredgers, uses of dredged materials.

TEXT BOOKS:

1. Venkataramaiah C (2016), "Transportation Engineering Vol II – Railways, Airports, Docks,Harbors, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad
2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017

REFERENCE BOOKS:

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers andDistributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, Charotar PublishingHouse Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010,Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning &Design of Airports, McGraw-Hill Professional.
5. Transportation Engineering by R. Srinivasa Kumar, University Press India.

CE862PE: PAVEMENT ASSET MANAGEMENT (PE – VI)

B.Tech. IV Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to

- Understand the role of Pavement Asset Management.
- Understand the Flexible pavement failures and importance of maintenance.
- Understand the Rigid pavement failures and importance of maintenance.
- Understand pavement evaluation.
- Understand pavement performance and deterioration modeling.

Course Outcomes: At the end of this course, the students will be able to :

- Understand the role of Pavement Asset Management.
- Understand the Flexible and Rigid pavement failures and importance of maintenance.
- Understand importance of pavement evaluation.
- Understand pavement performance and deterioration modeling.

UNIT - I

Introduction to Pavement Asset Management

Introduction to road assets: Pavement structure, shoulders, road side tree plantations, street lighting, traffic signs, traffic signals, intersection elements, interchange elements; Pavement Management as a part of Road Asset Management: Evolution and Development of Pavement Management Systems (PMS), Components of PMS and their inter linkages, Project and Network level PMS.

UNIT - II

Flexible Pavement Failures and Maintenance

Flexible Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of surface defects, deformation and disintegration of flexible pavements.

Maintenance of Flexible Pavements: Periodic maintenance: periodic renewals, need and importance of periodic renewals, planning and programming of renewals, identification of stretches to be renewed, types of renewal treatments, periodicity of renewal, rectification of profile at the time of renewal; pothole filling / patching, tools and equipment for pothole / patch repairs, modern mobile mechanized pothole filling/road patching technologies, arrangements for traffic and safety measures during road maintenance, preventive maintenance: introduction, selection of preventive maintenance treatment, warrants for preventive maintenance, flexible pavement preservation tools.

Importance of maintenance: Homogeneous sections by AASHTO's cumulative difference approach, types of maintenance — Preventive maintenance, minor rehabilitation, major rehabilitation, reconstruction; planning of maintenance activities.

UNIT - III

Rigid Pavement Failures and Maintenance

Rigid Pavement Failures: Identification, measurement, causative factors and remedies for all the varieties of failure under the headings of joint spalling, faulting, polished aggregate, shrinkage cracking,pumping, linear cracking, durability cracking;

Maintenance of Rigid Pavements: Assessing maintenance needs, methods for repairing concrete pavements, crack sealing and joint resealing, crack stitching (cross stitching), partial-depth repair, full depth repair, slab stabilization, special techniques for rehabilitation of rigid pavements, repair materials, tools and plant, planning the maintenance operations, arrangement for traffic and safety, rigid pavement preservation tools.

UNIT - IV

Pavement Evaluation: Pavement Structural Condition Evaluation: Importance of structural condition evaluation of pavements, benkelman beam technique for flexible pavement evaluation, falling weight deflectometer technique for both flexible and rigid pavements

Pavement Functional Condition Evaluation: Importance of functional condition evaluation of pavements, pavement roughness concepts; instrumentation used to assess pavement roughness, international roughness index and its importance, measurement of surface defects in both flexible andrigid pavements

Pavement Safety Condition Evaluation: Pavement texture, importance of surface friction characteristics on pavement safety, discussion on the methods of evaluation of pavement safety

UNIT - V

Pavement Performance and Deterioration Modelling: Structural condition (Distress) models, functional condition models, initiation models and progression models; Combined measures of pavement quality, discussions on condition indices and serviceability indices, pavement condition rating, introduction to pavement rating manuals by different agencies.

TEXT BOOKS:

1. Ralph Haas, Ronald Hudson, Zanieswki with Lynne Cowe Falls, "Pavement Asset Management', Wiley, 2015.
2. Shahin, M.Y., "Pavement Management for Airports, Roads and Parking Lots", Springer, 2ndEdition, 2005

REFERENCE BOOKS:

1. IRC 82: 2015, First Revision, Code of Practice for maintenance of Bituminous Road Surfaces
2. IRC SP 83: 2018, First Revision, Guidelines for maintenance, repair and rehabilitation ofcement concrete pavements
3. Feng Li, Jinyan Feng, Youxin Li, Siqi Zhou, Preventive Maintenance Technology for AsphaltPavement, Springer, 2021
4. ACRP Synthesis 22, Common Airport Maintenance Practices, Transportation Research Board,Washington DC, 2011
5. R. Keith Moble, An Introduction to Predictive Maintenance, Second Edition, Butterworth Heinemann Publications, 2002
6. NCHRP 523 – "Optimal Timing of Pavement Preventive Maintenance Treatment Applications",Transport Research Board, 2004
7. NCHRP Synthesis 501 – "Pavement Management Systems: Putting data to work – A Synthesisof Highway Practice, Transport Research Board, 2017
8. Highway Rating manuals
9. HDM 4 manuals
10. Derek Pearson, "Deterioration and Maintenance of Pavements, Ice Publishing, 2012
11. Rajib Basu Mallick and Tahar El-Kochi, Pavement Engineering: Principles and Practice, CRCPress 2013.

CE863PE: PAVEMENT ANALYSIS & DESIGN (PE – VI)

B.Tech. IV Year II Sem. **L T P C**

3 0 0 3

Pre-Requisites: Transportation Engineering.

Course Objectives:

- Engineering analysis of stresses and strains in typical highway pavement structures due to loading from traffic and climate.
- Characterization of paving materials; structural pavement design by IRC, and AASHTO forflexible and rigid pavement are discussed.
- Overlay design for Flexible and Rigid pavement is discussed.

Course Outcomes: The student will be able to

- Understand Factors Affecting Pavement Design.
- Understand Stresses In Pavements and Material Characteristics.
- Design Flexible and Rigid Pavements.
- Design of Pavement for Low Volume Roads

UNIT – I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT – II

Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. **Stresses In Flexible Pavements**: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two- and Three-Layered Systems, Fundamental Design Concepts. **Stresses In Rigid Pavements**: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars.

UNIT – III

Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates — Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics.

UNIT - IV

Design Of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods.

Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

UNIT – V

Design of Pavement for Low Volume Roads: Pavement design for low volume roads, Rural Road designs – code of practice. **Design of Overlays**: Types of Overlays, Suitability, Design of overlays.

TEXT BOOKS:

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.

REFERENCE BOOKS:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Principles of Pavement Design, Yoder.J. &Witzorac Mathew, W. John Wiley & Sons Inc
3. Pavement and Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes 37,58,62,81 for Flexible and Rigid Pavements design, low volume roads and overlays.

CE831OE: ENERGY EFFICIENT BUILDINGS (OE – III)

B.Tech. IV Year II Sem. **L T P C**

3 0 0 3

Course Objectives: To introduce the different concepts of sustainable design and green building techniques to achieve energy efficient buildings concepts and how they may be synthesized to best fita specific construction project.

Course Outcomes: The students completing the course will have ability to describe the concepts of sustainable design and green building techniques including energy efficiency and indoor environmental quality management.

UNIT - I:

Introduction: Life Cycle impacts of materials and products – sustainable design concepts – strategies of Design for the Environment -The sun-earth relationship and the energy balance on the earth's surface, climate, wind – Solar radiation and solar temperature – Sun shading and solar radiation on surfaces – Energy impact on the shape and orientation of buildings – Thermal properties of building materials. Studying the Nation Building Code (NBC 2005) code with respect to the Chapter 11 on Sustainability.

UNIT - II:

Energy Efficient Buildings: Passive cooling and day lighting – Active solar and photovoltaic- Building energy analysis methods- Building energy simulation- Building energy efficiency standards- Lighting system design- Lighting economics and aesthetics- Impacts of lighting efficiency – Energy audit and energy targeting- Technological options for energy management.

UNIT - III:

Indoor Environmental Quality Management: Psychometric- Comfort conditions- Thermal comfort- Ventilation and air quality-Air conditioning requirement- Visual perception- Illumination requirement- Auditory requirement- Energy management options- -Air conditioning systems- Energy conservation inpumps- Fans and blowers- Refrigerating machines- Heat rejection equipment- Energy efficient motors- Insulation.

UNIT - IV:

Energy Conservation Building Codes: Energy Efficiency, Energy Efficient Design (Achieving Efficiency through design) Energy Conservation Building Codes (ECBC) Codes 2007 Learning Different Energy Simulation Techniques (Energy / Lighting) Advanced Energy Efficient Standards and Systems HVAC Lighting Appliances and Equipments Building Envelope Understanding and calculation of energy consumption of a House, office building.

UNIT - V:

Concepts of Sustainable Building Social, Economic and Environmental aspects Different types of Indian and International Rating Systems (GRIHA, LEED, IGBC, Eco Housing, BREEAM, CASBEE, etc)

TEXT BOOKS:

1. Kibert, C. "Sustainable Construction: Green Building Design and Delivery", John Wiley & Sons,2005
2. Edward G Pita, "An Energy Approach- Air-conditioning Principles and Systems", PearsonEducation, 2003.

REFERENCE BOOKS:

1. Colin Porteous, "The New Eco-Architecture", Spon Press, 2002.
2. Energy Conservation Building Codes: www.bee-india.nic.in
3. Lever More G J, "Building Energy Management Systems", E and FN Spon, London, 2000.
4. Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.
5. John Littler and Randall Thomas, "Design with Energy: The Conservation and Use of Energyin Buildings", Cambridge University Press, 1984.
6. Nation Building Code (NBC 2005)
7. ECBC code book.

CE832OE: MULTI CRITERION DECISION MAKING (OE – III)

B.Tech. IV Year II Sem. **L T P C**

3 0 0 3

Course Objectives: To introduce Normalization approaches, cluster analysis. Understand the role ofoptimization and analyze data using various techniques.

Course Outcomes: The students completing the course will have ability to:

- Understand role of Optimization.
- Understand Normalization approaches.
- Analyze data using various techniques.

UNIT - I:

Introduction to the course and role of optimization, data mining, MCDM methods in sustainable and effective decision making, Linear Programming Nonlinear Programming and other methods, Introduction to Fuzzy Logic, Membership development, Various types of membership functions.

UNIT - II:

Normalization approaches: Rating method, Entropy method, Analytic Hierarchy Process, Fuzzy Analytic Hierarchy Process; MATLAB perspective; Weighting methods: Constraint method, Case study, MATLAB perspective.

UNIT - III:

K-Means Cluster Analysis, Fuzzy Cluster Analysis, Artificial Neural Networks, Kohonen Neural Networks, Cluster Validation Techniques, Case Study, SPSS perspective, MATLAB perspective, Introduction to Discrete MCDM methods, Compromise Programming, Co-Operative Game Theory, TOPSIS, PROMETHEE, Weighted average, Multi Attribute Utility Theory, Analytic Hierarchy Process,Case Studies, MATLAB perspective.

UNIT - IV:

Role of uncertainty in decision making, Normalization techniques, Fuzzy TOPSIS, MATLAB perspective, Spearman rank correlation coefficient, Kendall rank correlation coefficient, Group decision making algorithms, SPSS perspective, MATLAB perspective, Data Envelopment Analysis (DEA): Methodology, Drawbacks and remedial measures, further topics in DEA.

UNIT - V:

Taguchi methodology: Description, ranking process, Ant colony optimization, Particle swarm optimization, Expert systems, Web-based decision making, Geographic Information System, MATLABperspective, Case Studies.

TEXT BOOK:

1. K. Srinivasa Raju, D. Nagesh Kumar, Multicriterion Analysis in Engineering and Management,PHI Learning Private Limited, New Delhi, 2014.

REFERENCE BOOKS:

1. S. N. Sivanandam and S. N. Deepa, Principles of Soft Computing, Wiley, 2013.
2. Ross TJ, Fuzzy Logic with Engineering Applications, John Wiley and Sons, 2013.

CE833OE: ENVIRONMENTAL POLLUTION AND CONTROL (OE – III)

B.Tech. IV Year II Sem. **L T P C**

3 0 0 3

Course Objectives:

- Impart knowledge on aspects of air pollution & control and noise pollution.
- Impart concepts of treatment of waste water from industrial source.
- Differentiate the solid and hazardous waste based on characterization.
- Introduce sanitation methods essential for protection of community health.
- Provide basic knowledge on sustainable development.

Course Outcomes: At the end of the course, the students will be able to:

- Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
- Identify the air pollutant control devices and have knowledge on the NAAQ standards and airemission standards.
- Differentiate the treatment techniques used for sewage and industrial wastewater treatment.
- Inventing the methods of environmental sanitation and the management of community facilitieswithout spread of epidemics.
- Appreciate the importance of sustainable development while planning a project or executing an activity.

UNIT – I:

Air Pollution:

Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards. Noise Pollution: Noise standards, Measurement and control methods

— Reducing residential and industrial noise – ISO:14000.

UNIT –II:

Industrial waste water Management:

Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

UNIT – III:

Solid Waste Management: solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration- Composting-Solid waste disposal methods – fundamentals of Land filling. Hazardous Waste: Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

UNIT – IV:

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT – V:

Sustainable Development: Definition- elements of sustainable developments-Indicators of

sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

TEXT BOOKS:

1. Peavy, H. S., Rowe, D. R, Tchobanoglous, "Environmental Engineering", Mc-Graw Hill International Editions, New York 1985.
2. J. G. Henry and G.W. Heinke, "Environmental Science and Engineering", Pearson Education.

REFERENCE BOOKS:

1. G. L. Karia and R.A. Christian, "Waste water treatment- concepts and design approach",Prentice Hall of India
2. M. N. Rao and H. V. N. Rao, "Air pollution", Tata McGraw Hill Company.
3. Ruth F. "Weiner and Robin Matthews Environmental Engineering", 4th Edition Elsevier, 2003.

K. V. S. G. Murali Krishna, "Air Pollution and Control" by, Kousal & Co. Publications, Ne