ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
B.E. GEOINFORMATICS ENGINEERING
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM
OPEN ELECTIVES (Offered By Other Branches)

SEMESTER V
OPEN ELECTIVE - I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	OCE551	Air Pollution and Control Engineering	OE	3	3	0	0	3
2.	OIT552	Cloud Computing	OE	3	3	0	0	3
3.	OAI551	Environment and Agriculture	OE	3	3	0	0	3
4.	OCE552	Geographic Information System	OE	3	3	0	0	3
5.	OAI552	Participatory Water Resources Management	OE	3	3	0	0	3
6.	OAI553	Production Technology of Agricultural machinery	OE	3	3	0	0	3

SEMESTER VII
OPEN ELECTIVE – II & III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	OAI751	Agricultural Finance, Banking and Co-operation	OE	3	3	0	0	3
2.	OCS751	Data Structures and Algorithms	OE	3	3	0	0	3
3.	OCE751	Environmental and Social Impact Assessment	OE	3	3	0	0	3
4.	OEN751	Green Building Design	OE	3	3	0	0	3
5.	OAI752	Integrated Water Resources Management	OE	3	3	0	0	3

OCE551   **AIR POLLUTION AND CONTROL ENGINEERING**   **L T P C**
                                                                          3 0 0 3

OBJECTIVE:
- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

UNIT I   INTRODUCTION   7
Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

UNIT II   METEOROLOGY   6
Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III   CONTROL OF PARTICULATE CONTAMINANTS   11
Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

UNIT IV   CONTROL OF GASEOUS CONTAMINANTS   11
Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

UNIT V   INDOOR AIR QUALITY MANAGEMENT   10
Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

                                                                    TOTAL: 45 PERIODS
OUTCOMES:
The students completing the course will have
- an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- ability to identify, formulate and solve air and noise pollution problems
- ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures.

TEXTBOOKS:
1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.
3. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

REFERENCES:
1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, "Air Pollution",Tata Mcgraw Hill Publishing Company limited,2007.
5. C.S.Rao, "Environmental Pollution Control Engineering",New Age International(P) Limited Publishers,2006.

OIT552   **CLOUD COMPUTING**   **L T P C**
                                                                     3 0 0 3

OBJECTIVES:
- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I   INTRODUCTION TO CLOUD COMPUTING   9
Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT II   VIRTUALIZATION   9
Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Seven Layers of Virtualization – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT III   CLOUD ARCHITECTURE, SERVICES AND STORAGE   9
NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage.

UNIT IV   RESOURCE MANAGEMENT AND SECURITY IN CLOUD   9
Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security –Application Security – Virtual Machine Security.

UNIT V   CASE STUDIES   9
Google App Engine(GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services(AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

                                                        TOTAL: 45 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:
- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Be able to install and use current cloud technologies.
- Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXT BOOKS:
1. Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", First Edition, John Wiley & Sons, 2011.
2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management, And Security", CRC Press, 2017.

OAI551   **ENVIRONMENT AND AGRICULTURE**   **L T P C**
                                                                        3 0 0 3

OBJECTIVE:
- To emphasize on the importance of environment and agriculture on changing global scenario and the emerging issues connected to it.

UNIT I   ENVIRONMENTAL CONCERNS   8
Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT II   ENVIRONMENTAL IMPACTS   9
Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts – Agriculture versus urban impacts.

UNIT III   CLIMATE CHANGE   8
Global warming and changing environment – Ecosystem changes – Changing blue-green-grey water cycles – Water scarcity and water shortages – Desertification.

UNIT IV   ECOLOGICAL DIVERSITY AND AGRICULTURE   10
Ecological diversity, wild life and agriculture – GM crops and their impacts on the environment – Insets and agriculture – Pollination crisis – Ecological farming principles – Forest fragmentation and agriculture – Agricultural biotechnology concerns.

UNIT V   EMERGING ISSUES   10
Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural environment policies and its impacts – Sustainable agriculture.

                                                           TOTAL: 45 PERIODS

OUTCOMES:
- Students will appreciate the role of environment in the current practice of agriculture and concerns of sustainability, especially in the context of climate change and emerging global issues.
- Ecological context of agriculture and its concerns will be understood

TEXTBOOKS:
1. M.Lakshmi Narasaiah, Environment and Agriculture, Discovery Pub. House, 2006.
2. Arvind Kumar, Environment and Agriculture, ABH Publications, New Delhi, 2005.

REFERENCES:
1. T.C. Byerly, Environment and Agriculture, United States. Dept. of Agriculture. Economic Research Service, 2006.
2. Robert D. Havener, Steven A. Breth, Environment and agriculture: rethinking development issues for the 21st century : proceedings of a symposium, Winrock International Institute for Agricultural Development, 1994
3. Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium, Bangkok, Thailand. 1989

OCE552   **GEOGRAPHIC INFORMATION SYSTEM**   **L T P C**

                                                                                          3 0 0 3

OBJECTIVES :
- To introduce the fundamentals and components of Geographic Information   System
- To provide details of spatial data structures and input, management and output processes.

UNIT I   FUNDAMENTALS OF GIS   9
Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT II   SPATIAL DATA MODELS   9
Database Structures – Relational, Object Oriented – ER diagram - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models - OGC standards - Data Quality.

UNIT III   DATA INPUT AND TOPOLOGY   9
Scanner - Raster Data Input – Raster Data File Formats – Vector Data Input –Digitiser – Topology - Adjacency, connectivity and containment – Topological Consistency rules – Attribute Data linking – ODBC – GPS - Concept GPS based mapping.

UNIT IV   DATA ANALYSIS   9
Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

UNIT V   APPLICATIONS   9
GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.

                                                                 TOTAL: 45 PERIODS
OUTCOME:
This course equips the student to
- Have basic idea about the fundamentals of GIS.
- Understand the types of data models.
- Get knowledge about data input and topology.
- Gain knowledge on data quality and standards.
- Understand data management functions and data output

TEXT BOOKS:
1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical Information Systems, Pearson Education, 2nd Edition,2007.

REFERENCE:
1. Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006

OAI552   **PARTICIPATORY WATER RESOURCES MANAGEMENT**   **L T P C**
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OBJECTIVE:
- To gain an insight on local and global perceptions and approaches on participatory water resource management

UNIT I   FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH   6
Sociology – Basic concepts – Perspectives- Social Stratification – Irrigation as a Socio technical Process - Participatory concepts– Objectives of participatory approach

UNIT II   UNDERSTANDING FARMERS PARTICIPATION   10
Farmers participation –need and benefits – Comparison of cost and benefit -Sustained system performance - Kinds of participation – Context of participation, factors in the environment – WUA - Constraints in organizing FA – Role of Community Organiser – Case Studies.

UNIT III   ISSUES IN WATER MANAGEMENT   9
Multiple use of water – Issues in Intersectoral Water Allocation - domestic, irrigation, industrial sectors - modernization techniques – Rehabilitation – Command Area Development - Water delivery systems

UNIT IV   PARTICIPATORY WATER CONSERVATION   10
Global Challenges -Social – Economic – Environmental - Solutions –Political - Water Marketing – Water Rights -Consumer education – Success Stories Case Studies

UNIT V   PARTICIPATORY WATERSHED DEVELOPMENT   10
Concept and significance of watershed - Basic factors influencing watershed development –- Principles of watershed management - Definition of watershed management – Identification of problems - Watershed approach in Government programmes –- People's participation – Entry point activities - Evaluation of watershed management measures.

                                                                         TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Gain knowledge on various processes involved in participatory water resource management.
- Understand famers participation in water resources management.
- Aware of the issues related to water conservation and watershed development
- Get knowledge in participatory water conservation
- Understand concept , principle , approach of watershed management.

TEXTBOOKS:
1. Sivasubramaniyan, K. Water Management, SIMRES Publication, Chennai, 2011
2. Uphoff.N., Improving International Irrigation management with Farmer Participation – Getting the process Right – Studies in water Policy and management, No.11, Westview press, Boulder,CO, 1986.
3. Tideman, E.M., "Watershed Management", Omega Scientific Publishers, New Delhi, 1996.

REFERENCE:
1. Chambers Robert, Managing canal irrigation, Cambridge University Press, 1989

OAI553   **PRODUCTION TECHNOLOGY OF AGRICULTURAL MACHINERY**   **L T P C**
                                                                              3 0 0 3

OBJECTIVES:
- To understand the concept and basic mechanics of metal cutting, working of standard machine tools, such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching.
- To understand the basic concepts of Computer Numerical Control (CNC) machine tool and CNC programming.

UNIT I   **ENGINEERING MATERIALS**   **9**
Engineering materials - their classification - Mechanical properties of materials, strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, toughness, hardness, resilience, machinability, formability, weldability. Steels and cast irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron, cast iron. Alloy steels: Stainless steel, tool steel.

UNIT II   **MACHINING**   **9**
Basic principles of lathe - machine and operations performed on it. Basic description of machines and operations of Shaper-Planner, Drilling, Milling & Grinding.

UNIT III   **WELDING**   **9**
Introduction, classification of welding processes. Gas welding, types of flames and their applications. Electric Arc welding. Resistance welding, Soldering & Brazing processes and their uses.

UNIT IV   **ADVANCED MANUFACTURING PROCESS**   **9**
Abrasive flow machining - abrasive jet machining - water jet machining - Electro Discharge Machining (EDM) - Wire cut EDM - Electro Chemical Machining (ECM) - Ultrasonic Machining / Drilling (USM / USD) - Electron Beam Machining (EBM) - Laser Beam Machining (LBM).

UNIT V   **CNC MACHINE**   **9**
Numerical control (NC) machine tools - CNC: types, constitutional details, special features - design considerations of CNC machines for improving machining accuracy - structural members - slide ways - linear bearings - ball screws - spindle drives and feed drives. Part programming fundamentals - manual programming.

                                                         TOTAL: 45 PERIODS

OUTCOME:
- Upon completion of this course, the students can able to apply the different manufacturing process and use this in industry for component production.

TEXTBOOKS:
1. "Manufacturing Engineering and Technology", Kalpakjian and Schmid, Pearson, 2010.
2. Hajra Choudry, "Elements of workshop technology - Vol II", Media promoters, 2002.

REFERENCES:
1. Gupta. K.N., and Kaushik, J.P., 1998, Workshop Technology Vol I and II, New Heights, Daryaganj, New Delhi.
2. Arthur. D., et. al. 1998, General Engineering Workshop Practice, Asia Publishing House, Bombay.
3. Chapman W.A.J., Workshop Technology, 1992, Part I, II, III, E.L.B.S. and Edward Amold Publishers Ltd, London.

OAI751   AGRICULTURAL FINANCE, BANKING AND COOPERATION   L T P C
                                                                    3 0 0 3

OBJECTIVES:
- To make the students aware about the agricultural Finance, Banking and Cooperation.
- To acquaint the students with the basic concepts, principles and functions of management.
- To understand the process of finance banking and cooperation.

UNIT I   AGRICULTURAL FINANCE - NATURE AND SCOPE   9
Agricultural Finance: Definition, Importance, Nature and Scope - Agricultural Credit: Meaning, Definition, Need and Classification - Sources of credit - Role of institutional and non - Institutional agencies: Advantages and Disadvantages - Rural indebtedness: consequences of rural indebtedness - History and Development of rural credit in India.

UNIT II   FARM FINANCIAL ANALYSIS   9
Principles of Credit - 5C's, 5R's and & 7P's of Credit - Project Cycle and Management - Preparation of bankable projects / Farm credit proposals - Feasibility - Time value of money: Compounding and Discounting - Appraisal of farm credit proposals - Undiscounted and discounted measures - Repayment plans - Farm Financial Statements: Balance Sheet, Income Statement and Cash Flow statement - Financial Ratio Analysis.

UNIT III   FINANCIAL INSTITUTIONS   9
Institutional Lending Agencies - Commercial banks: Nationalization, Agricultural Development Branches - Area Approach - Priority Sector Lending - Regional Rural Banks, Lead bank, Scale of finance - Higher financial institutions: RBI, NABARD, AFC, ADB, World Bank and Deposit Insurance and Credit Guarantee Corporation of India - Microfinance and its role in poverty alleviation - Self-Help Groups - Non -Governmental Organizations - Rural credit policies followed by State and Central Government - Subsidized farm credit, Differential Interest Rate (DIR), Kisan Credit Card (KCC) Scheme - Relief Measures and Loan Waiver Scheme and Know Your Customer (KYC).

UNIT IV   CO-OPERATION   9
Co-operation: Philosophy and Principles - History of Indian Cooperative Credit Movement: Pre and Post-Independence periods and Cooperation in different plan periods - Cooperative credit institutions: Two tier and three tier structure, Functions: provision of short term and long term credit, Strength and weakness of cooperative credit system, Policies for revitalizing cooperative credit: Salient features of Vaithiyananthan Committee Report on revival of rural cooperative credit institutions, Reorganisation of Cooperative credit structure in Andhra Pradesh and single window system and successful cooperative credit systems in Gujarat, Maharashtra, Punjab etc, - Special cooperatives: LAMPS and FSS: Objectives, role and functions - National Cooperative Development Corporation (NCDC) and National Federation of State Cooperative Banks Ltd., (NAFSCOB) - Objectives and Functions.

UNIT V   BANKING AND INSURANCE   9
Negotiable Instruments: Meaning, Importance and Types - Central Bank: RBI - functions - credit control - objectives and methods: CRR, SLR and Repo rate - Credit rationing - Dear money and cheap money - Financial inclusion and Exclusion: Credit widening and credit deepening monetary policies. Credit gap: Factors influencing credit gap - Non - Banking Financial Institutions (NBFI) - Assessment of crop losses, Determination of compensation - Crop insurance: Schemes, Coverage, Advantages and Limitations in implementation - Estimation of crop yields - Livestock, insurance schemes - Agricultural Insurance Company of India Ltd (AIC): Objectives and functions.
                                                                    TOTAL: 45 PERIODS

OUTCOME:
After completion of this course, the students will
- Be familiar with agricultural finance, Banking, cooperation and basic concepts, principles and functions of management.

REFERENCES:
1. Muniraj, R., 1987, Farm Finance for Development, Oxford & IBH, New Delhi
2. Subba Reddy. S and P.Raghu Ram 2011, Agricultural Finance and Management, Oxford & IBH, New Delhi.
3. Lee W.F., M.D. Boehlje A.G., Nelson and W.G. Murray, 1998, Agricultural Finance, Kalyani Publishers, New Delhi.
4. Mammoria, C.B., and R.D. Saxena 1973, Cooperation in India, Kitab Mahal, Allahabad.

OCS751 **DATA STRUCTURES AND ALGORITHMS** **L T P C**
3 0 0 3

OBJECTIVES:
- To understand the various algorithm design and analysis techniques
- To learn linear data structures – lists, stacks, and queues
- To learn different sorting and searching algorithms
- To understand Tree and Graph data structures

UNIT I   ALGORITHM ANALYSIS, LIST ADT   11
Algorithms: Notation - analysis – running time calculations. Abstract Data Types (ADTs): List ADT – array-based implementation – linked list implementation – singly linked lists- applications of lists: Polynomial Manipulation. Implementation of List ADT using an array and using a linked list in C.

UNIT II   STACKS AND QUEUES   7
Stack ADT - Applications - Evaluating arithmetic expressions- Conversion of Infix to Postfix- Recursion. Queue ADT – Priority Queue - applications of queues. Implementation of Stack ADT and palindrome checking using C.   Implementation of Queue operations using arrays in C.

UNIT III   SEARCHING AND SORTING ALGORITHMS   10
Divide and conquer methodology - Searching: Linear Search - Binary Search. Sorting: Insertion sort – Merge sort – Quick sort – Heap sort. Analysis of searching and sorting techniques. Implementation of linear search, binary search, insertion sort, merge sort and quick sort algorithms in C.

UNIT IV   TREES   9
Tree ADT – tree traversals - Binary Tree ADT – expression trees – binary search tree ADT – applications of trees. Heap – applications of heap. Implementation of Binary search tree and its operations, tree traversal methods, finding height of the tree using C. Implementation of heap and heap sorting using arrays in C.

UNIT V   GRAPHS   8
Definition – Representation of Graph – Breadth-first traversal - Depth-first traversal – Dynamic programming Technique – Warshall's and Floyd's algorithm – Greedy method - Dijkstra's algorithm – applications of graphs. Implementation of graph, graph traversal methods, finding shortest path using Dijkstra's algorithm in C

TOTAL: 45 PERIODS
OUTCOMES:
At the end of this course, the students should be able to:
- Implement linear data structures and solve problems using them.
- Implement and apply trees and graphs to solve problems.
- Implement the various searching and sorting algorithms.

TEXT BOOKS:
1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education,1997.
2. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson Education, 1988.

REFERENCES:
1. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education,1983.
2. S.Sridhar, "Design and Analysis of Algorithms", First Edition, Oxford University Press. 2014
3. Byron Gottfried, Jitender Chhabra, "Programming with C" (Schaum's Outlines Series), Mcgraw Hill Higher Ed., III Edition, 2010
4. Yashvant Kanetkar, "Data Structures Through C", BPB publications, II edition, 2003.

REFERENCES:
1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", O'Reilly, 2009.

OCE751   ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT   L T P C
3 0 0 3

OBJECTIVE:
* To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects

UNIT I   INTRODUCTION   9
Impacts of Development on Environment – Rio Principles of Sustainable Development- Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle –EIA Notification and Legal Framework.

UNIT II   ENVIRONMENTAL ASSESSMENT   9
Screening and Scoping in EIA – Drafting of Terms of Reference,Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction.

UNIT III   ENVIRONMENTAL MANAGEMENT PLAN   9
Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Public Hearing-Environmental Clearance

UNIT IV   SOCIO ECONOMIC ASSESSMENT   9
Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental impacts – Cost benefit Analysis-

UNIT V   CASE STUDIES   9
EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems - Airports - Dams and Irrigation projects - Power plants.

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have ability to
- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment
- plan environmental impact assessments and environmental management plans
- evaluate environmental impact assessment reports

TEXTBOOKS:
1. Canter, R.L, "Environmental impact Assessment ", 2nd Edition, McGraw Hill Inc, New Delhi,1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank,1997.
3. Peter Morris, Riki Therivel "Methods of Environmental Impact Assessment", Routledge Publishers,2009.

REFERENCES:
1. Becker H. A., Frank Vanclay,"The International handbook of social impact assessment" conceptual and methodological advances, Edward Elgar Publishing,2003.
2. Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme,2002.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", Blackwell Science New York, 1998.
4. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

OEN751	GREEN BUILDING DESIGN	L T P C
		3 0 0 3

UNIT I   ENVIRONMENTAL IMPLICATIONS OF BUILDINGS   9
Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

**UNIT II   IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF
                BUILDINGS   9**
Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

UNIT III   COMFORTS IN BUILDING   9
Thermal Comfort in Buildings- Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations.

UNIT IV   UTILITY OF SOLAR ENERGY IN BUILDINGS   9
Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT V   GREEN COMPOSITES FOR BUILDINGS   9
Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TOTAL: 45 PERIODS

TEXT BOOKS:
1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
2. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

REFERENCES:
1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke

OAI752	INTEGRATED WATER RESOURCES MANAGEMENT	L T P C
		3 0 0 3

OBJECTIVE:
- To introduce the students to the interdisciplinary analysis of water and conceptual design of intervention strategies.
- To develop a knowledge-base on capacity building on IWRM.

UNIT I   IWRM FRAMEWORK   9
Definition – Objectives – Principles - Evolution of IWRM - IWRM relevance in water resources management – Paradigm shift : Processes and prospective outcomes

UNIT II   CONTEXTUALIZING IWRM   9
UN formulations - SDG goals - IWRM in Global, Regional and Local water partnership – Institutional transformation - Bureaucratic reforms - Inclusive development

UNIT III   EMERGING ISSUES IN WATER MANAGEMENT   9
Emerging Issues -– Drinking water management in the context of climate change - IWRM and irrigation - Flood – Drought – Pollution – Linkages between water, health and poverty

UNIT IV   IWRM AND WATER RESOURCES DEVELOPMENT IN INDIA   9
Rural Development - Ecological sustainability- -Watershed development and conservation - Ecosystem regeneration – Wastewater reuse - Sustainable livelihood - Food security

UNIT V   ASPECTS OF INTEGRATED DEVELOPMENT   9
Capacity building - Conceptual framework of IWRM – Problems and policy issues - Solutions for effective integrated water management - Case studies

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Understand objectives, principles and evolution of integrated water resources management.
- Have an idea of contextualizing IWRM
- Gain knowledge in emerging issues in water management, flood, drought, pollution and poverty.
- Understand the water resources development in India and wastewater reuse.
- Gain knowledge on integrated development of water management.

TEXTBOOKS:
1. Mollinga P. *et al.* "Integrated Water Resources Management", Water in South Asia Volume I, Sage Publications, 2006.
2. Sithamparanathan, Rangasamy, A., and Arunachalam, N., "Ecosystem Principles and Sustainable Agriculture", Scitech Publications (India) Pvt.Lt, Chennai, 1999.

REFERENCES:
1. Cech Thomas V., Principles of Water Resources: History, Development, Management and Policy. John Wiley and Sons Inc., New York. 2003.
2. Murthy, J.V.S., "Watershed Management in India", Wiley Eastern Ltd., New York, 1995.
3. Dalte, S.J.C., "Soil Conservation and Land Management", International Book Distribution, India, 1986.