KAMARAJ
COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institution - AFFILIATED TO ANNA UNIVERSITY, CHENNAI)
S.P.G.Chidambara Nadar - C.Nagammal Campus
S.P.G.C. Nagar, K.Vellakulam – 625 701 (Near VIRUDHUNAGAR).

B.E. CIVIL ENGINEERING
REGULATION – 2020
AUTONOMOUS SYLLABUS
CHOICE BASED CREDIT SYSTEM
VII TO VIII SEMESTER CURRICULUM AND SYLLABI

VISION:

To make the Department of Civil Engineering of this Institution the unique of its kind in the field of Research and Development activities in this part of world.

MISSION:

To impart highly innovative and technical knowledge in the field of Civil Engineering to the urban and unreachable rural student folks through Total Quality Education.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: Graduates of the program will be creative, able to apply scientific knowledge and computer aided design tools for technical problems in the field of Civil Engineering.

PEO 2: Graduates of the program will be a professional Civil Engineer and/or will pursue higher education in various domains of Civil Engineering by taking competitive examinations.

PEO 3: Graduates of the program will passionately perform as a competent team member, team leader and/or entrepreneur in the development of a sustainable environment.

PROGRAM OUTCOMES:

After going through the four years of study, the Civil Engineering graduates will have theability to

POs	Graduate Attribute	Programme Outcome
1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis	Identify,formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/Development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5	Modern tool usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO1 : Graduating students will be able to deal complex problems in the field of Civil Engineering to achieve design solutions with modern technological approach and application software..

PSO2 : Graduating students will be able to understand the professional Civil Engineering practice and apply contextual knowledge with the appropriate consideration of the society and environment.

SEMESTER VII

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	CE1701	Estimation,Costing and Valuation Engineering	PC	3	3	0	0	3
2	GE1771	Principles of Management	ES	3	3	0	0	3
3		Professional Elective III	PE	3	3	0	0	3
4		Professional Elective IV	PE	3	3	0	0	3
5		Open Elective*	OE	3	3	0	0	3
6		Online Course**	OL	NPTEL/SWAYAM				3
PRACTICALS								
7	CE1711	Irrigation and Environmental Engineering Drawing	PC	4	0	0	4	2
8	CE1721	Creative andInnovative Project	EEC	4	0	0	4	2
9	CE1722	Field Practices Training	EEC	0	0	0	0	2
			TOTAL	**23**	**15**	**0**	**8**	**24**

SEMESTER VIII

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
PRACTICALS								
1	CE1821	Project Work	EEC	16	0	0	16	8
			TOTAL	16	0	0	16	8

*****Course from the Curriculum of other UG programmes.

** Students can take online courses in any of the three semesters (5th, 6th, and 7th) for a total of 6 credits, and grades will be awarded in the consolidated mark statement accordingly.

PROFESSIONAL ELECTIVES (PEs)

PROFESSIONAL ELECTIVE III (SEMESTER VII)

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1	CE1731	Design of Prestressed Concrete Structures	PE	3	3	0	0	3
2	CE1732	Industrial Structures	PE	3	3	0	0	3
3	CE1733	Prefabricated Structures	PE	3	3	0	0	3
4	CE1734	Structural Dynamics and Earthquake Engineering	PE	3	3	0	0	3
5	CE1735	Advanced Concrete Technology	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE IV (SEMESTER VII)

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1	CE1736	Irrigation Engineering	PE	3	3	0	0	3
2	CE1737	Integrated Water Resources Management	PE	3	3	0	0	3
3	CE1738	Ground Improvement Techniques	PE	3	3	0	0	3
4	GE1471	Professional Ethics and Human Values	PE	3	3	0	0	3
5	GE1571	Intellectual Property Rights	PE	3	3	0	0	3

OPEN ELECTIVE (SEMESTER – VII)

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
(Offered to BT, ECE, EEE, MTR, MECH)								
1	OCE171	Climate Change and its Impacts	OE	3	3	0	0	3
(Offered to BT, ECE, EEE, MTR, MECH)								
2	OCE172	Environmental and Social Impact Assessment	OE	3	3	0	0	3
(Offered to BT, ECE, EEE, MTR, MECH)								
3	OCE173	Fundamentals of Planetary Remote Sensing	OE	3	3	0	0	3
(Offered to BT, ECE, EEE, MTR, MECH)								
4	OCE174	Green Building Design	OE	3	3	0	0	3
(Offered to BT, ECE, EEE, MTR, MECH)								
5	OCE175	Waste Water Treatment	OE	3	3	0	0	3

CE1701	ESTIMATION, COSTING AND VALUATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To acquire knowledge in estimation, tender practices, contract procedures, and valuation and will be able to prepare estimates, call for tenders and execute works.

UNIT I QUANTITY ESTIMATION 9

Philosophy – Purpose - Methods of estimation - Types of estimates - Approximate estimates -Detailed estimate - Estimation of quantities for buildings, bituminous and cement concrete roads, septic tank, soak pit, retaining walls – culverts (additional practice in class room using computer software)-Case study on estimation of a framed RC Residential building/ framed steel commercial building.

UNIT II RATE ANALYSIS AND COSTING 9

Standard Data – Observed Data - Schedule of rates - Market rates - Standard Data for Man Hours and Machineries for common civil works - Rate Analysis for all Building works, canals, and Roads - Cost Estimates (additional practice in class room using Computer software) - (Analysis of rates for the item of work asked, the data regarding labour, rates of material and rates of labour to be given in the Examination Question Paper)

UNIT III SPECIFICATIONS, REPORTS AND TENDERS 9

Specifications - Detailed and general specifications - Constructions - Sources - Types of specifications - Principles for report preparation – report on estimate of residential building - Culvert - Roads - TTT Act 2000 - Tender notices - types - tender procedures - Drafting model tenders , E-tendering-Digital signature certificates - Encrypting - Decrypting - Reverse auctions.

UNIT IV CONTRACTS 9

Contract - Types of contracts - Formation of contract - Contract conditions - Contract for labour, material, design, construction - Drafting of contract documents based on IBRD / MORTH Standard bidding documents - Construction contracts - Contract problems - Arbitration and legal requirements.

UNIT V VALUATION 9

Definitions - Various types of valuations - Valuation methods - Necessity - Capitalised value - Depreciation - Escalation - Valuation of land - Buildings - Calculation of Standard rent - Mortgage - Lease

TOTAL: 45 PERIODS

OUTCOMES

CO1: Estimate the quantities of Buildings, Roads, Septic tanks-Soak pits, Retaining walls and culverts.

CO2: Develop rate analysis for various types of construction and maintenance works

CO3: Illustrate a report on estimate of various major and minor projects works and apply acquired knowledge to prepare tender for an project.

CO4: Apply acquired knowledge to prepare contract documents

CO5: Apply acquired knowledge to prepare current value of a building and standard rent of a building.

TEXT BOOKS

1. B.N Dutta, 2010(T1), *Estimating and Costing in Civil Engineering*, UBS Publishers &Distributors(P) Ltd.
2. B.S.Patil,2006, *Civil Engineering Contracts and Estimates*, University Press.
3. D.N. Banerjee,1998, *Principles and Practices of Valuation*, V Edition, Eastern Law House.

REFERENCE BOOKS

1. Hand Book of Consolidated Data – 8/2000, Vol.1, TNPWD
2. Standard Data Book for Analysis and Rates, 2003, IRC, New Delhi.

GE1771 **PRINCIPLES OF MANAGEMENT**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To give a basic idea about the need of management principles in all kinds of organization
- To understand the managerial functions like planning, organizing, staffing, Directing and controlling
- To gain some knowledge about different structures of organization
- To understand the role played by leader in different levels, and to understand the qualities, skills required for the leader while leading a team globally.
- To gain some knowledge about international management.

UNIT I **INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS** **9**

Definition of Management - Nature, Scope and Functions of Management - Evolution of Management - Contributions of FW Taylor (14 principles of Management), Henri Fayol, Elton Mayo, Roethilisberger, H.A.Simon and P.F Drucker- Management theories - Science or Art – Manager Vs Entrepreneur- types of managers, managerial roles and skills – Evolution of Management –Scientific, human relations , system and contingency approaches –Current trends and issues in Management.

UNIT II **PLANNING** **9**

Nature and purpose of planning - Planning process - Types of planning - Objectives - Setting objectives - Policies - Planning premises - Strategic Management - Planning Tools and Techniques - Decision making steps and process.

UNIT III **ORGANISING** **9**

Nature and purpose - Formal and informal organization - Organization chart - Organization structure - Types - Line and staff authority - Departmentalization - delegation of authority - Centralization and decentralization - Job Design - Human Resource Management - HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV **DIRECTING** **9**

Directing meaning-importance-principles of directing - Motivation - Motivation theories - Motivational techniques - Job satisfaction - Job enrichment - Leadership - types and

theories of leadership - Communication - Process of communication, types of communication and its uses - Barrier in communication - Effective Communication - Communication and IT.

UNIT V CONTROLLING 9

System and process of controlling - Budgetary and non - Budgetary control techniques - Use of computers and IT in Management control - Productivity problems and management - Inventory Management - PERT, CPM - Application - Control and performance - Direct and preventive control.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Explain the trends and challenges of management in global scenario, the different types of organization and its effectiveness.

CO2: Utilize the strategies and policies which are involved in planning, Steps involved in the process of planning and use it for decision.

CO3: Identify the structure, purpose, selection and recruitment process in organizations.

CO4: Explain the various motivational theories and processes of management including its functions

CO5: Compare and contrast the various control techniques.

TEXT BOOKS

1. Harold Koontz and Heinz Weihrich *Essentials of Management*, Tata McGraw Hill, 1998.
2. Stephen P. Robbins and Mary Coulter, *Management*, Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.

REFERENCE BOOKS

1. Robert Kreitner and MamataMohapatra, *Management*, Biztantra, 2008.
2. Stephen A. Robbins and David A. Decenzo and Mary Coulter, *Fundamentals of Management,* Pearson Education, 7th Edition, 2011.

CE1711	IRRIGATION AND ENVIRONMENTAL ENGINEERING	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To conceive, design elevation and Sections and draw the irrigation and environmental engineering structures in detail showing the plan.

UNIT I TANK COMPONENTS 9

Fundamentals of design - Tank surplus weir - Tank sluice with tower head - Drawings showing foundation details, plan and elevation. .

UNIT II IMPOUNDING STRUCTURES AND DRAINGAE WORK 12

Design principles - Earth dam - Profile of Gravity Dam. General design principles - Aqueducts - Syphon aqueduct (Type III) - Canal drop (Notch Type) - Drawing showing plan, elevation and foundation details.

UNIT III CANAL REGULATION STRUCTURES 9

General Principles - Direct Sluice - Canal regulator - Drawing showing detailed plan, elevation and foundation details.

UNIT IV WATER SUPPLY AND TREATMENT 15

Design and Drawing of flash mixer, flocculator, and clarifier - Rapid sand filter - Service reservoirs - Pumping station - House service connection for water supply and drainage.

UNIT V SEWAGE TREATMENT AND DISPOSAL 15

Design and Drawing of screen chamber - Grit channel - Primary clarifier - Activated sludge process - Aeration tank - Trickling filter - Sludge digester - Sludge drying beds - Septic tanks and disposal arrangements.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Design and Draw Tank Sluice and Tank Surplus Weir

CO2: Design and Draw Impounding structures & Cross Drainage Works

CO3: Design and Draw Canal Regulation Structures

CO4: Design and Draw various components of water supply and treatment plant units

CO5: Design and Draw the various components of Sewage treatment plant

TEXT BOOKS

1. SatyaNarayana Murthy Challa., 2002,*Water Resources Engineering: Principles and Practice,* New Age International Publishers, New Delhi.
2. Garg, S.K., 1997,*Irrigation Engineering and Design of Structures,* New Age International Publishers, New Delhi.

REFERENCE BOOKS

1. Mohanakrishnan. A., 2011, *A few Novel and Interesting Innovative Irrigation Structures: Conceived, Designed and Executed in the Plan Projects in Tamil Nadu,* Publ. No. 44 and Water Resources Development & Management Publ.No.43, IMTI Thuvakudy,Trichy.
2. Raghunath, H.M., 2011,*Irrigation Engineering,* Wiley India Pvt. Ltd., New Delhi.

CE1721 CREATIVE AND INNOVATIVE PROJECT

L	T	P	C
0	0	4	2

OBJECTIVES:

- To use the knowledge acquired in Civil Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

STRATEGY

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

TOTAL: 60 PERIODS

OUTCOMES:

CO1: Summarize the state of art in the chosen area of study by conducting an exhaustive review of literature and making field visits

CO2: Choose a problem statement with scope for practical problem solving

CO3: Apply the analysis and design skills to develop a solution for the identified problem statement

CO4: Make use of modern computer tools and packages for problem solving

CO5: Develop documentation skills for reporting the design outcomes.

CE1722 **FIELD PRACTICES TRAINING**

L	T	P	C
0	0	0	2

OBJECTIVES:

- To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems.

STRATEGY

The students individually undertake training in reputed civil engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOMES:

CO1: Understand the broad principles of industrial projects

CO2: Make use of the advanced tools and techniques encountered during industrial training

CO3: Interact with industrial personanel to clarify about the field practices

CO4: Build internpersonal and team skills

CO5: Prepare professional work reports and presentation

CE1821 **PROJECT WORK**

L	T	P	C
0	0	16	8

OBJECTIVES:

- Develop the ability to solve a specific problem right from its identification and literatre review till the successful solution of the same.
- Train the students in preparing project reports and to face reviews and viva voce examination

The students in a group of 3 to 4 works on a topic approved by the Head of the Department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on the oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 240 PERIODS

OUTCOMES:

CO1: Choose any challenging practical problems and understand the background
CO2: Make literature review to classify project characteristics
CO3: Develop solution by formulating proper methodology
CO4: Analyze and apply relevant tools for evolving the solution
CO5: Function as a team in multidisciplinary approach.

CE1731 **DESIGN OF PRESTRESSED CONCRETE STRUCTURES**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce students, the need for prestressing in a structure, the methods, types and advantages of prestressing, design ofprestressed concrete structural elements and systems, effect of prestressing in the flexural and shear behaviour of structural elements

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9

Basic concepts - Advantages and disadvantages - Materials required - Systems and methods of prestressing - Analysis of sections - Stress concept - Strength concept - Load balancing concept- Effect of loading on the tensile stresses in tendons - Effect of tendon profile on deflections - Factors influencing deflections - Calculation of deflections - Short term and long term deflections - Losses of prestress - Estimation of crack width

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions of flexural design - Permissible stresses in steel and concrete as per I.S.1343 Code - Different Types of sections - Design of sections of Type I and Type II post-tensioned and pre tensioned beams - Check for flexural capacity based on I.S. 1343 Code - Influence of Layout of cables in post-tensioned beams - Location of wires in pre-tensioned beams - Design for shear, bond and torsion based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9

Factors influencing deflections - Short term deflections of uncracked members - Prediction of long term deflections due to creep and shrinkage - Check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams - design of anchorage zone reinforcement - Check for transfer bond length in pre-tensioned beams

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS 9

Analysis and design of composite beams - Methods of achieving continuity in continuous beams - Analysis for secondary moments - Concordant cable and linear transformation - Calculation of stresses - Principles of design.

UNIT V TENSION AND COMPRESSION MEMBERS 9

Factors influencing deflections - Short term deflections of uncracked members - Prediction of long term deflections due to creep and shrinkage - Check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams – design of anchorage zone reinforcement - Check for transfer bond length in pre-tensioned beams

TOTAL: 45 PERIODS

OUTCOMES

CO1: Illustrate the concepts of prestressing, methods of prestressing, and performance of prestressed elements.

CO2: CO2: Understand the codal provisions to gain knowledge on the design of prestressed concrete elements for flexure and shear

CO3: Develop knowledge on short term deflection, long term deflection and determination of anchorage zone stresses

CO4: Solve the stresses in composite beams and continuous beams

CO5: Utilize the codal provisions for the design of pipes and tanks

TEXT BOOKS

1. Krishna Raju N., 2012, *Prestressed concrete*, 5th Edition, Tata McGraw Hill Company, New Delhi.
2. Pandit.G.S. and Gupta.S.P., 2012., *Prestressed Concrete*, CBS Publishers and Distributers Pvt. Ltd.

REFERENCE BOOKS

1. Rajagopalan.N., 2002 *Prestressed Concrete*, Narosa Publishing House.
2. Dayaratnam.P.,*Prestressed Concrete Structures*, Oxford and IBH.
3. Lin T.Y. and Ned.H.Burns., 2013, *Design of prestressed Concrete Structures,* Third Edition, Wiley India Pvt. Ltd., New Delhi.
4. IS1343:1980.,2012, *Code of Practice for Prestressed Concrete*, Bureau of Indian Standards, New Delhi.
5. IS 3370- Part 4., (2008) *Indian standard Code of practice for concrete structures for the storage of liquid- Design tables, code of practice,* .

CE1732 **INDUSTRIAL STRUCTURES**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study the requirements and standards of industrial structures
- To complete the planning and design of industrial structures for functional requirements.
- To outline the design concepts of Towers, Bunkers, Silos, Machine foundation etc.

UNIT I PLANNING AND FUNCTIONAL REQUIREMENTS 9

Classification of Industries and Industrial structures - planning for Layout Requirements regarding Lighting, Ventilation and Fire Safety - Protection against noise and vibration - Guidelines of Factories Act.

UNIT II INDUSTRIAL BUILDINGS 9

Steel and RCC - Gantry Girder, Crane Girders - Design of Corbels and Nibs – Design of Staircase

UNIT III POWER PLANT STRUCTURES 9

Types of power plants – Containment structures - Cooling Towers - Bunkers and Silos - Pipe supporting structures

UNIT IV TRANSMISSION LINE STRUCTURES AND CHIMNEYS 9

Analysis and design of steel monopoles, transmission line towers - Sag and Tension calculations, Methods of tower testing - Design procedure of self supporting and guyed chimney, Design of Chimney bases

UNIT V FOUNDATION 9

Design of foundation for Towers, Chimneys and Cooling Towers - Machine Foundation - Design of Turbo Generator Foundation.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Develop the concept of planning & functional requirement of industrial standards.

CO2: Analyse and design of Steel Gantry girders & Crane girders and design of corbels, nibs and staircase.

CO3: Outline the design procedure of cooling towers, bunkers and silos

CO4: Analyse and design the steel transmission line towers and chimneys.

CO5: Summarize the design procedure for cooling tower, chimneys and turbo generator.

TEXT BOOKS

1. Ramamrutham.S.,2007, *Design of Reinforced Concrete Structures*, DhanpatRai Publishing Company.
2. Varghese.P.C., 2003, *Limit State Design of Reinforced Concrete*, Prentice Hall of India Eastern Economy Editions, 2nd Edition.
3. Bhavikatti.S.S., 2009, *Design of Steel Structures*, J.K. International Publishing House Pvt.Ltd

REFERENCE BOOKS

1. Henn W., 1995, *Buildings for Industry*, Vol.I and II, London Hill Books.
2. Santhakumar A.R. and Murthy S.S.,1992, *Transmission Line Structures*, Tata McGraw Hill.
3. Krishna Raju, N., 2016, *Advanced Reinforced concrete Design*, Tata McGraw Hill.
4. SP32-1986, *Handbook on Functional Requirements of Industrial buildings*, Bureau of Indian Standards, 1990.
5. Jurgen Axel Adam, KatharriaHausmann, Frank Juttner, Klauss Daniel, 2004, *Industrial Buildings: A Design Manual*, Birkhauser Publishers.
6. Swami saran, *Analysis & Design of substructures*, Limit state Design second Edition.
7. D, N. Subramaniyan, 2016, *Design of Steel Structures.*

CE1733 PREFABRICATED STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVES:

• To impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods.

UNIT I INTRODUCTION 9

Need for prefabrication - Principles of prefabrication - Modular coordination - Standarization - Materials - Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS 9

Behaviour and types of structural components – Large panel systems – roof and floor slabs – Walls panels - Beams - Columns - Shear walls

UNIT III DESIGN PRINCIPLES 9

Design philosophy- Design of cross section based on efficiency of material used - Problems in design because of joint flexibility - Allowance for joint deformation - Demountable precast concrete systems.

UNIT IV JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS 9

Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction, contraction, expansion. Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V DESIGN FOR ABNORMAL LOADS 9

Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse - Case studies

TOTAL: 45 PERIODS

OUTCOMES

CO1: Acquire knowledge about design principles, layout of factory and stages of loading in precast construction.

CO2: Acquire knowledge about panel systems, slabs, connections used in precast construction and they will be in a position to design the elements.

CO3: Acquire knowledge about types of floor systems, stairs and roofs used in precast construction.

CO4: Acquire knowledge about types of walls used in precast construction, sealants, design of joints.

CO5: Acquire knowledge about components in industrial building.

TEXT BOOKS

1. Bruggeling A.S. G and Huyghe G.F., 1991, *Prefabrication with Concrete*, A.A. BalkemaPublishers,USA.
2. Lewitt,M., 1982, *Precast Concrete- Materials, Manufacture, Properties And Usage*, Applied Science Publishers , London And New Jersey.
3. Bachmann, H. and Steinle, A., 2011, *Precast Concrete Structures*, Ernst &Sohn, Berlin.

REFERENCE BOOKS

1. Koncz T., 1976, *Manual of precast concrete construction*, Vol. I, II and III, Bauverlag, GMBH.
2. *Handbook on Precast Concrete Buildings*, 2016, Indian Concrete Institute.
3. *Structural design manual*, 2009, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag

CE1734 **STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the behaviour of dynamic loading.
- To Study the effect of earthquake loading on the behaviour of structures.
- To understand the codal provisions to design the structures as earthquake resistant.

UNIT I SINGLE DEGREE OF FREEDOM SYSTEM 9

Definition of degree of freedom – Idealization of structure as Single Degree of Freedom (SDOF) system – Formulation of equation of motion for various SDOF system – D' Alemberts Principles – Effect of damping – Free and forced vibration of damped and undamped structures – Response to harmonic forces and periodic forces.

UNIT II MULTI DEGREE OF FREEDOM SYSTEM 9

Formulation of equation of motion for multidegree of freedom (MDOF) system - Evaluation of natural frequencies and modes - Eigen values and Eigen vectors - Response to free and forced vibration of undamped and damped MDOF systems - Modal superposition methods

UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING 9

Elements of Engineering Seismology - Definitions, Introduction to Seismic hazard, Earthquake phenomenon - Seismotectonics - Seismic Instrumentation - Characteristics of Strong Earthquake motion - Estimation of Earthquake Parameters

UNIT IV EARTHQUAKE EFFECTS ON STRUCTURES 9

Effect of earthquake on different types of structures - Behaviour of RCC, Steel and prestressed Concrete Structures under earthquake loading - Pinching Effect - Bouchinger Effects – Evaluation of Earthquake forces - IS Code 1893: 2002 - Response Spectra – Lessons learnt from past earthquakes.

UNIT V CONCEPTS OF EARTHQUAKE RESISTANT DESIGN 9

Causes of damage - Planning considerations/Architectural concept (IS 4326–1993) - Guidelines for Earthquake resistant design - Earthquake resistant design of masonry

buildings – Design consideration - Guidelines - Earthquake resistant design of R.C.C. buildings – Lateral load analysis - Design and detailing (IS 13920:1993).

TOTAL: 45 PERIODS

OUTCOMES

CO1: Explain the mass-stiffness idealization for deriving equations of motion

CO2: Solve the Eigen values and mode shapes for SDOF and MDOF systems

CO3: Outline the causes associated with an earthquake and the estimation of earthquake parameters

CO4: Explain the performance of various structures under seismic loading

CO5: Make use of codal provisions for the design of an earthquake resistant structure

TEXT BOOKS

1. Mario Paz.,1997, *Structural Dynamics - Theory and Computations,* Fourth Edition, CBS publishers.
2. Agarwal.P and Shrikhande.M.,2007, *Earthquake Resistant Design of Structures,* Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS

1. Clough.R.W, and Penzien.J.,1995,*Dynamics of Structures, Second Edition*, McGraw Hill International Edition.
2. Jai Krishna, Chandrasekaran.A.R., and Brijesh Chandra,1994, *Elements of Earthquake Engineering*, South Asia Publishers.
3. Minoru Wakabayashi,1986,*Design of Earthquake Resistant Buildings*, McGraw – Hill Book Company.
4. Humar.J.L,1990, *Dynamics of Structures,* Prentice Hall Inc.
5. Anil K Chopra,2007,*Dynamics of structures – Theory and applications to Earthquake Engineering,* Prentice Hall Inc.
6. Moorthy.C.V.R.,2002,*Earthquake Tips*, NICEE, IIT Kanpur,2002.
7. IS13920-1993 *Ductile detailing of reinforced concrete structures subjected to seismic forces - Code of practice.*

8. IS 1893 part 1 2002 *Indian standard criteria for earthquake resistant design of structures.*

CE1735 ADVANCED CONCRETE STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To make the students be familiar with the limit state design of RCC beams and columns
- To design special structures such as Deep beams, Corbels, Deep beams, and Grid floors
- To make the students confident to design the flat slab as per Indian standard, yield line theory and strip method.
- To design the beams based on limit analysis and detail the beams, columns and joints for ductility

UNIT I DESIGN PHILOSOPHY 9

Limit state design - beams, slabs and columns according to IS Codes. Calculation of deflection and crack width according to IS Code. Interaction curve generation for axial force and bending

UNIT II DESIGN OF SPECIAL RC ELEMENTS 9

Design of slender columns - Design of RC walls. Strut and tie method of analysis for corbels and deep beams, Design of corbels, Deep-beams and grid floors.

UNIT III FLAT SLABS AND YIELD LINE BASED DESIGN 9

Design of flat slabs and flat plates according to IS method – Check for shear - Design of spandrel beams - Yield line theory and Hillerborg's strip method of design of slabs

UNIT IV INELASTIC BEHAVIOUR OF CONCRETE BEAMS AND COLUMNS 9

Inelastic behaviour of concrete beams and Baker's method, moment - rotation curves, ductility definitions, evaluation

UNIT V DUCTILE DETAILING 9

Concept of Ductility – Detailing for ductility – Design of beams, columns for ductility - Design of cast-in-situ joints in frames.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Summarize the design philosophies involved in the design of beams, columns and calculate the deflection and crack width of beams.

CO2: Solve problems in design of slender columns, RC walls, deep beams, corbels and grid beams.

CO3: Solve flat slabs as per IS Code and design of slabs based on yield line theory.

CO4: Model the inelastic behavior of concrete beams and columns.

CO5: Solve the ductile detailing of beams and columns and cast-in-situ joins in frames.

TEXT BOOKS

1. Gambhir, ML, 2012, *Design of Reinforced Concrete Structures*, Prentice Hall of India.
2. Varghese, PC, 2005, *Advanced Reinforced Concrete Design*, Prentice Hall of India.
3. Varghese, PC, 2007, *Limit State Design of Reinforced Concrete*, Prentice Hall of India

REFERENCE BOOKS

1. Unnikrishna Pillai & DevdasMenon, 2007, "*Reinforced Concrete Design*, Third Edition, Tata McGraw Hill Publishers Company Ltd., New Delhi.
2. Purushothaman, 1986, P, *Reinforced Concrete Structural Elements: Behaviour Analysis and Design*, Tata McGraw Hil.

CE1736 **IRRIGATION ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

- The student is exposed to different phases in irrigation practices and Planning and management of irrigation. Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigation management.

UNIT I CROP WATER REQUIREMENT 9

Historical development of irrigation - merits and demerits -Need and classification of irrigation- types of crops-crop season-duty, delta and base period-Problems-consumptive use of crops- estimation of Evapo-transpiration using experimental and theoretical methods.

UNIT II IRRIGATION METHODS AND EFFICIENCY 9

Lift irrigation-Tank irrigation – Well irrigation - Irrigation methods: Surface and Sub-Surface and Micro-Irrigation-Merits and demerits- ridge and furrow irrigation-Irrigation scheduling – Water distribution system - Irrigation efficiencies.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Types of Impounding structures - Gravity dam - Forces on a dam -Design of Gravity dams; Earth dams, Arch dams- Diversion Head works - Weirs and Barrages

UNIT IV CANAL IRRIGATION 9

Canal regulations – direct sluice - Canal drop - Cross drainage works-Canal outlets - Design of prismatic canal - canal alignments - Diversion Head works - Canal drop - Cross drainage works – Canal regulations - Canal outlets - Canal lining - Kennady"s and Lacey"s Regime theory

UNIT V WATER MANAGEMENT IN IRRIGATION 9

Modernization techniques- Rehabilitation - Optimization of water use-Minimizing water losses- On form development works-Participatory irrigation management with a case study - Water resources associations- Changing paradigms in water management-Performance evaluation-Economic aspects of irrigation.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Paraphrase the crop water requirements.

CO2: Discuss the methods and management of irrigation.

CO3: Express knowledge on types of Impounding structures.

CO4: Understand canal irrigation and drainage works.

CO5: Express knowledge on water management on optimization of water use

TEXT BOOKS

1. Sharma R.K.2007,*Irrigation Engineering***,** S.Chand& Co.
2. Dilip Kumar Majumdar,2008, *Irrigation Water Management*, Prentice-Hall of India, New Delhi, 2008.
3. Punmia B.C., et. al;2009, *Irrigation and water power Engineering*, Laxmi Publications, 16th Edition, New Delhi.
4. Garg S. K.2009,*Irrigation Engineering and Hydraulic structures*, Khanna Publishers, 23rd Revised Edition, New Delhi.

REFERENCE BOOKS

1. Asawa, G.L.2000, *Irrigation Engineering*, New Age International Publishers, New Delhi.
2. Basak, N.N,1999,*Irrigation Engineering,* Tata McGraw Hill Publishing Co. New Delhi.
3. Chaturvedi M.C.,1997,*Water Resources Systems Planning and Management*, Tata McGraw- Hill Inc., New Delhi.
4. Michael A.M.2008, *Irrigation Theory and Practice*, 2nd Edition, Vikas Publishing

CE1737	INTEGRATED WATER RESOURCES MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- The student is exposed to interdisciplinary analysis of water and conceptual design of intervention strategies and to develop a knowledge-base on capacity building on IWR

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

CO1: Understand objectives, principles and evolution of integrated water resources management.

CO2: Have an idea of contextualizing IWRM

CO3: Gain knowledge in emerging issues in water management, flood, drought, pollution and poverty.

CO4: Understand the water resources development in India and wastewater reuse.

CO5: Gain knowledge on integrated development of water management

TEXT BOOKS

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.

REFERENCE BOOKS

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.

CE1738 GROUND IMPROVEMENT TECHNIQUES

L	T	P	C
3	0	0	3

OBJECTIVES:

- At the end of the course student is expected to identify the problematic soil and suitable suggest remedial measures to improve their behaviour.

UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 9

Role of ground improvement in foundation engineering - methods of ground improvement - Geotechnical problems in alluvial, lateritic and black cotton soils - Selection of suitable ground mprovement techniques based on soil conditions.

UNIT II DEWATEREING 9

Dewatering Techniques - Well points – Vacuum and electroosmotic methods - Seepage analysis for two - dimensional flow for fully and partially penetrated slots in homogeneous deposits - Simple cases - Design.

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 9

Insitu densification of cohesion-less soils and consolidation of cohesive soils: Dynamic compaction Vibroflotation, Sand compaction piles and deep compaction. Consolidation: Preloading with sand drains, and fabric drains, Stone columns and Lime piles-installation techniques – simple design - elative merits of above methods and their limitations

UNIT IV EARTH REINFORCEMENT 9

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – simple design - applications of reinforced earth. Role of Geotextiles in filtration, drainage, separation, road works and containment.

UNIT V GROUT TECHNIQUES 9

Types of grouts – Grouting equipments and machinery – injection methods – Grout monitoring – stabilization with cement, lime and chemicals – stabilization of expansive soil.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Understand the role of ground improvement.

CO2: Have basic knowledge on Dewatering Techniques

CO3: Have basic knowledge on insitu treatment on soils.

CO4: Understand the concept of earth reinforcement

CO5: Express knowledge on grout techniques

TEXT BOOKS

1. Purushothama Raj. P, *Ground Improvement Techniques*, Firewall Media, 2005,
2. Mittal.S, *An Introduction to Ground Improvement Engineering*, Medtech Publisher, 2013

REFERENCE BOOKS

1. Coduto, D.P. *Geotechnical Engineering – Principles and Practices*, Prentice Hall of India, 2011
2. Das, B.M. – *Principles of Foundation Engineering* 7th edition, Cengage learning, 2010

GE1471 PROFESSIONAL ETHICS AND HUMAN VALUES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and
- To impart Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation –Commitment – Empathy – Self-confidence – Character – Spirituality – Stress management Techniques.

UNIT II ENGINEERING ETHICS 9

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas –Moral Autonomy – Kohlberg‘s theory – Gilligan‘s theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics –A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk - Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk -Respect for Authority - Collective Bargaining – Confidentiality – Conflicts of Interest –Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES 8

Multinational Corporations - Environmental Ethics - Computer Ethics - Weapons Development -Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors - Moral Leadership - Code of Conduct - Corporate Social Responsibility.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Summarize the various Morals, Values, Ethics, Integrity and other Human Values

CO2: Describe the Senses of Engineering ethics, its related Theories and Models of Professional Roles

CO3: Explain the Codes of Ethics for various Engineering Experiments.

CO4: Examine the various Risk, Safety and Risk Benefit Analysis for a Product/Service in an Organization

CO5: Explain the Various Global Issues in Ethics and Review the Responsibilities and Rights of Professionals and Employees in an Organization

TEXT BOOKS

1. Mike W. Martin and Roland Schinzinger,2017. *Ethics in Engineering*, 4th Edition, McGraw Hill.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, 2004. *Engineering Ethics*, Prentice Hall of India.
3. Charles B. Fleddermann, 2012. *Engineering Ethics*, 4th Edition, Prentice Hall.

REFERENCE BOOKS

1. Charles E. Harris, Michael S. Pritchard, Raw W. James, Elaine E. Englehardt, and Michael J. Rabins, 2019. *Engineering Ethics – Concepts and Cases*, 12th Edition, Cengage Learning.
2. John R Boatright, Jeffery Smith, 2016. *Ethics and the Conduct of Business*, 8th Edition, Pearson Education.
3. Edmund G Seebauer and Robert L Barry, 2001. *Fundamentals of Ethics for Scientists and Engineers*, South Asia Edition, Oxford University Press.

GE1571 INTELLECTUAL PROPERTY RIGHTS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To give an idea about IPR, registration and its enforcement.
- To have an insight on various agreements and legislations on IPR.
- To introduce digital innovations and IP laws.

UNIT I INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs 10

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS 10

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW 9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENTOF IPRs 7

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Outline the concepts, need and nature of intellectual property

CO2: Demonstrate the practical aspects of registration of Copy Rights, Trademarks,

CO3: Patents, Geographical Indications, Trade Secrets and Industrial design registration of IPR.

CO4: Summarize the digital innovations and developments, meaning and relationship between unfair competition

CO5: Outline the International Treaties, Conventions and agreements on IPRs.

TEXT BOOKS

1. V. ScopleVinod, 2012,*Managing Intellectual Property*, Prentice Hall of India Pvt Ltd.
2. S. V. Satakar, 2002, *Intellectual Property Rights and Copy Rights*,EssEss Publications, New Delhi,

REFERENCE BOOKS

1. Deborah E. Bouchoux,2012, *Intellectual Property: The Law of Trademarks*, Copyrights, Patents and Trade Secrets, Cengage Learning, Third Edition.
2. PrabuddhaGanguli, 2011, *Intellectual Property Rights: Unleashing the Knowledge Economy*, McGraw Hill Education.
3. Derek Bosworth and Elizabeth Webster, 2013, *The Management of Intellectual Property*, Edward Elgar Publishing Ltd.

OCE171 CLIMATE CHANGE AND ITS IMPACTS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the basics of weather and climate
- To have an insight on Atmospheric dynamics and transport of heat.
- To develop simple climate models and evaluate climate changes using models

UNIT I BASICS OF WEATHER AND CLIMATE 9

Shallow film of Air– stratified & disturbed atmosphere – law – atmosphere Engine. Observation of parameters: Temperature – Humidity – Wind - Pressure – precipitation-surface – networks. Constitution of atmosphere: well stirred atmosphere – process around turbopause – in dry air – ozone – carbon Dioxide – Sulphur Dioxide– Aerosol - water. Evolution of Atmosphere. State of atmosphere: Air temperature – pressure – hydrostatic – Chemistry – Distribution – circulation.

UNIT II ATMOSPHERIC DYNAMICS 9

Atmosphere dynamics: law – isobaric heating and cooling – adiabatic lapse rates – equation of motion - solving and forecasting. Forces – Relative and absolute acceleration – Earth's rotation coriolis on sphere – full equation of motion – Geostrophy - Thermal winds –departures – small-scale motion. Radiation, convection and advections: sun & solar radiation – energy balance – terrestrial radiation and the atmosphere – Green house effect- Global warming - Global budget – radiative fluxes - heat transport. Atmosphere and ocean systems convecting&advecting heat. Surface and boundary layer – smaller scale weather system – larger scale weather system.

UNIT III GLOBAL CLIMATE 9

Components and phenomena in the climate system: Time and space scales – interaction and parameterization problem. Gradients of Radiative forcing and energy transports by atmosphere and ocean – atmospheric circulation – latitude structure of the circulation - latitude – longitude dependence of climate features. Ocean circulation: latitude – longitude dependence of climate features – ocean vertical structure – ocean thermohaline circulation – land surface processes – carbon cycle.

UNIT IV CLIMATE SYSTEM PROCESSES 9

Conservation of motion: Force – coriolis - pressure gradient- velocity equations – Application – geotropic wind – pressure co-ordinates. Equation of State – atmosphere

– ocean. Application: thermal circulation – sea level rise. Temperature equation: Ocean – air – Application – decay of sea surface temperature. Continuity equation: ocean – atmosphere. Application: coastal upwelling – equatorial upwelling – conservation of warm water mass. Moisture and salinity equation: conservation of mass – moisture. Source & sinks – latent heat. Moist processes – saturation – convection – Wave processes in atmosphere and ocean.

UNIT V CLIMATE CHANGE MODELS 9

Constructing a climate model – climate system modeling – climate simulation and drift – Evaluation of climate model simulation – regional (RCM) – global (GCM) – Global average response to warming – climate change observed to date.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Understand the concepts of climate and weather

CO2: Understand the principles of atmospheric dynamics, transport of heat and air mass

CO3: Understand the concepts in global climate system.

CO4: Understand the various equations governing climate system processes

CO5: Understand the development of simple climate models and prediction of climate change.

TEXT BOOK

1. Robin Moilveen, 2010, *Fundamentals of weather and climate*, Oxford University Press.

REFERENCE BOOK

1. David Neelin. J., 2011, *Climate change and climate modeling*, Cambridge University press.

OCE172	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- 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

CO1: Carry out scoping and screening of developmental projects for environmental and social assessments

CO2: Explain different methodologies for environmental impact prediction and assessment

CO3: Plan environmental impact assessments and create environmental management plans.

CO4: Evaluate environmental impact assessment reports.

CO5: Apply all the concepts in real time case study.

TEXT BOOKS

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

REFERENCE BOOKS

1. Becker H. A., Frank Vanclay., 2003, *The International handbook of social impact assessment conceptual and methodological advances,* Edward Elgar Publishing.
2. Barry Sadler and Mary McCabe., 2002,*Environmental Impact Assessment Training Resource Manual,* United Nations Environment Programme.
3. Judith Petts., 1998,*Handbook of Environmental Impact Assessment Vol. I and II* Blackwell Science New York.
4. Guidelines of Government of India.,2018, *Ministry of Environment and Forests EIA Notification and Sectoral Guides,* New Delhi.

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OCE173	FUNDAMENTALS OF PLANETARY REMOTE SENSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide an insight to the basics of planetary Remote Sensing
- To demonstrate how the Remote Sensing technique is applied to explore the surface characteristics of the planets and its environ.

UNIT I PLANETAR Y SCIENCE 9

History and inventory of solar system – planet-definition –properties – Formation of solar system. Planetary Atmospheres: composition - thermal structure – clouds – meteorology – photo chemistry – Eddy Diffusion. Surfaces and Interiors: Mineralogy and Petrology – Planetary interiors – surface morphology. Terrestrial planets and the Moon: The moon & Mercury – surface – Atmosphere – Interior – Magnetic Field.

UNIT II SATELLITE ORBIT 9

Equation of 2 body motion: Energy, orbits and energy - Circular Orbits-EOS TerraGeosynchronous satellite orbit- orbital elements. Launching Satellites and space probes - Retrograde orbits-Inter planetary Transfer - Hohmann Transfer – Gravity Assist-Cassini Messenger. Breaking into orbit or landing- Retro Rockets-Aerobraking-Parachutes- Impact.

UNIT III PROPERTIES OF EMR 9

Definition of Remote Sensing – Electro Magnetic Radiation: Electromagnetic Spectrum Development of EM theory – White Light – Excited hydrogen gas – Quantum physics – Definition. EM Radiation: Properties – Radiant energy – Sun’s luminosity calculation. Other Energy: Black body radiation – Plank curve of black body. Properties of EMR: Kinetic energy – Polarization, laws of Max Plank, Wien’s and Stephen Boltzmann

UNIT IV RADIOMETRY AND SCATTEROMETRY 9

Radiometry – Radar Altimetry – Effect of surface roughness – Altimetry derived data – Reflectivity – Radiometry and Derived emissivity – Incorporation of data set into image analysis – Introduction to SAR – convolution – bidirectional reflectance distribution – Microwave scatterometry - side looking RADAR , SAR – Interferometry.

UNIT V PLANETARY APPLICATION 9

Planetary Imaging Spectroscopy- USGS Tetracoder and Expert system - Mars Global Surveyor Mission (MGS) - Digital Elevation Model(DEM) of Mars - Mars Orbiter Camera (MOC) - Stereo and photoclinometric techniques for DEM.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Summarize the fundamentals of planetary science or orbital mechanics.

CO2: Identify the principles of satellite orbit system.

CO3: Understand the Properties of EMR.

CO4: Knowledge of radiometry and scatterometry for determining surface elevation.

CO5: Knowledge of planetary application for mapping of planet.

TEXT BOOKS

1. Jack J. Lissauer, Imke de Pater (2013), *Fundamental Planetary Science* :*Physics, Chemistry and Habitability*, Cambridge University Press.
2. Rees, W.G., (2013), *Physical principles of Remote Sensing*, 3rd Edn, Cambridge University Press.

REFERENCE BOOKS

1. Bruce A Campbell, (2011), *Radar Remote Sensing of Planetary Surfaces*, Cambridge University Press.
2. Kumar Deepak (2014), *Remote Sensing Application for Planetary Surfaces*, Lambert Publication.

OCE174 **GREEN BUILDING DESIGN**

L	T	P	C
3	0	0	3

OBJECTIVES:

- This course enables the students to acquire the knowledge and concept of green building design
- Understand the technologies to recycle the waste materials in buildings.
- Understand the utilization of green composites in buildings

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

OUTCOMES

CO1: Summarize the environmental implications of energy and materials in buildings

CO2: Implement technologies to recycle the waste materials and utilize the bio resources in buildings

CO3: Illustrate the fundamental thermal comforts with respect to geographical location

CO4: Demonstrate the utilization of solar energy in buildings

CO5: Utilize the various green composites in buildings

TEXT BOOKS

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

REFERENCE BOOKS

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

OCE175 **WASTE WATER TREATMENT**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To make the student conversant with the water treatment methods including adsorption and oxidation process.
- To provide basic under standings about the requirements of water, its preliminary treatment.

UNIT I **WATER QUALITY AND PRELIMINARY TREATMENT** **9**

Water Quality-physical - chemical and biological parameters of water- water quality requirement - potable water standards - wastewater effluent standards -water quality indices. Water purification systems in natural systems - physical processes-chemical processes and biological processes, primary, secondary and tertiary treatment-Unit operations-unit processes. Mixing, clarification - sedimentation; Types; aeration and gas transfer - coagulation and flocculation, coagulation processes - stability of colloids - destabilization of colloids- transport of colloidal particles, clariflocculation.

UNIT II **INDUSTRIAL WATER TREATMENT** **9**

Filtration - size and shape characteristics of filtering media - sand filters hydraulics of filtration - design considerations - radial, upflow, highrate and multimedia filters, pressure filter. Water softening - lime soda, zeolite and demineralization processes - industrial water treatment for boilers. Practical application in Industries-source reduction options and waste treatment flow sheet for Textiles - Tanneries - Pulp and paper - Petroleum Refining - Pharmaceuticals - Sugar and Distilleries - Food Processing - fertilizers - Thermal Power Plants and Industrial Estates

UNIT III **CONVENTIONAL TREATMENT METHODS** **9**

Taste and odour control - adsorption - activated carbon treatment - removal of color - iron and manganese removal - aeration, oxidation, ion exchange and other methods - effects of fluorides - fluoridation and defluoridation - desalination - corrosion prevention and control - factors influencing corrosion - Langelier index - corrosion control measures.

UNIT IV **WASTEWATER TREATMENT** **9**

Wastewater treatment - pre and primary treatment - equalization neutralization - screening and grid removal - sedimentation - oil separation gas stripping of volatile organics - biological oxidation - lagoons and stabilization basins - aerated lagoons - activated sludge process - trickling filtration - anaerobic decomposition.

UNIT V **ADSORPTION AND OXIDATION PROCESSES** **9**

Chemical process - adsorption - theory of adsorption - ion exchange process - chemical oxidation - advanced oxidation process - sludge handling and disposal - miscellaneous treatment processes.

TOTAL: 45 PERIODS

OUTCOMES

CO1: Describe water quality and preliminary treatment methods

CO2: Explain various methods of industrial waste water treatment

CO3: Discuss conventional treatment methods of waste water

CO4: Summarize different waste water treatment methods

CO5: Discuss adsorption and oxidation processes techniques

TEXT BOOKS

1. Metcalf and Eddy.,2002, *Wastewater Engineering*, 4th ed., McGraw Hill Higher Edu.,.
2. W. Wesley Eckenfelder, Jr.,1989, *Industrial Water Pollution Control*, 2nd Edn., McGraw Hill Inc.

REFERENCE BOOKS

1. S.P. Mahajan.,2012, *Pollution control in process industries*, 27th Ed. Tata McGraw Hill Publishing Company Ltd.,.
2. M. Lancaster.,2010, *Green Chemistry: An Introductory Text*, 2nd edition, RSC publishing,.
3. C.S. Rao.,2007, *Environmental Pollution Control Engineering*, New Age International,.