Department of
CIVIL ENGINEERING

4 Years B.Tech Degree Programme

REGULATION & SYLLABUS 2017

Choice Based Credit System
Outcome Based Assessment

SEMESTER-VII & VIII

AUTONOMOUS

Accredited by NBA

Accredited by NAAC with 'A' Grade (3.28 out of 4.00 CGPA)

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Affiliated to UGC New Delhi &Biju Patnaik University of Technology, Odisha

GUNUPUR – 765022, Odisha, India

7th semester

S. No.	Course category	Subject Code	Subjects	L	T	P	Credits
1	PC	BCVPC7010	Geotechnical Engineering-II	3	-	-	3
2	PC	BCVPC7020	Water Resource Engineering	3	-	-	3
3	PE	BCVPE7031	Advanced Design of Concrete Structures	3	-	-	3
	PE	BCVPE7032	Prestressed Engineering				
	PE	BCVPE7033	Earthquake Geotechnical Engineering				
4	PE	BCVPE7041	Estimation Costing and Professional Practice	3	-	-	3
	PE	BCVPE7042	Tall Buildings				
	PE	BCVPE7043	Bridge Structures				
5	OE	B**OE7051	Open Elective - 3	3	-	-	3
	OE	B**OE7052	Open Elective - 3				
	OE	B**OE7053	Open Elective - 3				
Sessional							
6	PC	BCVPC7110	Geotechnical Engineering-II Lab	-	-	2	1
7	PE	BCVPE7120	MOOC subject*	-	-	2	2
8	PC	BCVPC7130	Mini Project	-	-	6	3
9	PC	BCVPC7140	Advanced lab – II	-	-	2	1
10	PC	BCVPC7150	Summer Internship	-	-	-	1
Total							**23**

Subject code	course title	L	T	P	C	QP
BCVPC7010	**GEOTECHNICAL ENGINEERING-II**					

CEO-1- plan a site investigation program, including: types, number, and location of borings

CEO-2- the calculation of bearing capacity for both shallow and deep foundations

CEO-3- -the calculation of predicted settlements for both shallow and deep foundations

CEO-4- -be able to choose an appropriate foundation method based on soil conditions and structural loads.

CEO-5- design methods for deep foundations and shallow foundations

Pre-Requisites (If any) – It is expected you have passed a course in undergraduate soil mechanics.

Course Outcomes

CO1	Determine the earth pressures on foundations and retaining structures
CO2	Analyze shallow and deep foundations
CO3	Calculate the bearing capacity of soils and foundation settlements
CO4	Understand soil exploration methods
CO5	Student will have an understanding of shear stress and shear strength properties in soils, Mohr diagrams, and methods of finding the shear strength parameters of soils using direct shear test, unconfined compression test and tri-axial shear tests

Unit:1 **(10 Hours)**

Lateral Earth Pressure and Retaining Structures: Concept of earth pressure, Earth pressure at rest, active and passive earth pressure for both cohesionless and cohesive soils, Earth pressure theories: Rankine's theory, Coumb's Wedge theory, Graphical methods: Rebhan's and Culmann's graphical solutions, Stability conditions for retaining walls.

Unit:2 **(9 Hours)**

Bearing Capacity: Definitions, Rankine's analysis, Types of failures: General and local shear failure, Terzaghi's Analysis, Brinch-Hansen analysis, Meyerhof's analysis, Vesics's bearing capacity equation, Effect of water table on bearing capacity, IS code method for computing bearing capacity
Field Methods: Plate load test and its limitations, Standard penetration test. Shallow **Foundations**: Types of foundations: Spread footing, combined and strap footing, mat or raft
Footing, Settlement of footings.

Unit:3 **(10 Hours)**

Deep Foundations: Difference between shallow and deep foundations, Types of deep foundations.
Pile Foundations: Types of piles, pile driving, load carrying capacity of piles-static and dynamic formulae, Pile load test and its limitations, correlation with penetration tests, Group action in piles settlement and efficiency of pile groups in clay, negative skin friction, Under reamed pile foundation.
Basics of well foundation - types, component parts and ideas about the forces acting on a well foundation.

Unit:4 **(10 Hours)**

Subsoil Exploration: Necessity and planning for subsoil exploration, Methods - direct (test pits and trenches), indirect (sounding, penetration tests and geophysical methods).
Soil sampling – types of samples, standard penetration test, static and dynamic cone penetration test, in-situ vane shear test, Rock coring, soil exploration report.
Rock Mechanics: Introduction, problems, defects in rock mass, joints, faults, folds, methods of geophysical prospecting, seismic and electrical method.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Principles of Foundation Engineering by B. M. Das, Cenage Learning
2. Foundation Analysis and Design by Joseph E. Bowles, McGraw Hill

Ref. Books

1. Geotechnical Engineering by S. K. Gulati&Monoj Gupta, McGraw Hill
2. Soil Mechanics and Foundations by Dr B. C. Punmia et al., Laxmi Publications

Subject code	course title	L	T	P	C	QP
BCVPC7020	**WATER RESOURCE ENGINEERING**	3	-	-	3	

CEO-1- To prepare the students for a successful career as hydrologist and water resources engineers

CEO-2- To develop the ability among students to synthesis data and technical concepts for application in hydrology and water resources engineering

CEO-3- - To provide students with a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, analyze, solve engineering problems and to prepare them for their career

CEO-4- - To promote student awareness of the life-long learning and to introduce them professional ethics and codes of professional practice in water resource engineering

Pre-Requisites (If any) –

Course Outcomes

CO1	Various components of hydrologic cycle that affect the movement of water in the earth
CO2	Various Stream flow measurements technique
CO3	the concepts of movement of ground water beneath the earth
CO4	Enable the students to understand the basic aquifer parameters and groundwater resources for different hydro-geological boundary conditions
CO5	The student is exposed to the application of systems concept, advanced optimization techniques to cover the socio-technical aspects in the field of water resources

Unit:1 **(10 Hours)**

Precipitation, its Measurement and Analysis: Hydrologic cycle, catchment area and watershed, Rainfall and its characteristics, Rain gauges, Non-Recording and Recording type, Average rainfall over a catchment, Evapo-transpiration, Pan evaporation, Pan coefficient, Infiltration, Windex and -Index.

Unit:2 **(8 Hours)**

Discharge Measurement: Stream gauging, Flow rating curve, Use of current meters for velocity measurement, Dye-dilution method of discharge measurement, Estimation of discharge.

Unit:3 **(10 Hours)**

Hydrograph: Characteristics of a Run off hydrograph, Unit hydrograph, S-hydrograph, Instantaneous Unit hydrograph, Synthetic Unit hydrograph, Duration Curve, Mass flow hydrograph.

Flood Control: Flood flows, Frequency studies, Statistical analysis for flood prediction, Method of flood control, Flood routing, Reservoir routing and Channel routing, River training works.

Unit:4 **(8 Hours)**

Open Channel Flow: Definition, Uniform flow, Chezy'sKutter's equation, Most economical section, specific energy, critical, subcritical, supercritical flow, Non-uniform flow, Gradual varied flow, Hydraulic jump,

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Engg. Hydrology by K. Subramanian, McGraw-Hill
2. Hydrology and Water Resources Engineering by K. C. Patra, Narosa Publishing House, New Delhi

Ref. Books

1. Engineering Hydrology by C.S.P. Ojha, Oxford University Press
2. Hydrology by H.M. Raghunath, New age Int. Publication, New Delhi

Subject code	course title	L	T	P	C	QP
BCVPE7032	**PRESTRESSED ENGINEERING**	3	-	-	3	

CEO-1- To learn the principles, materials, methods and systems of prestressing

CEO-2- To know the different types of losses and deflection of prestressed members

CEO-3- To learn the design of prestressed concrete beams for flexural, shear and tension and to calculate ultimate flexural strength of beam

CEO-4- To learn the design of anchorage zones, composite beams, analysis and design of continuous beam

CEO-5 To learn the design of water tanks

Pre-Requisites (If any) –

Course Outcomes

CO1	Understand the basic properties of pre-stressed concrete constituents.
CO2	Analyze the flexural behavior of simple and composite pre-stressed concrete girders.
CO3	Capable to calculate pre-stress losses for simple pre-stressed concrete girders.
CO4	To acquire knowledge in knowing Analysis for stress of composite pre-stressed concrete girders for flexure using current design procedures
CO5	Able to design pre-stressed concrete members.

Unit:1 **(9 Hours)**

Prestressing system, materials and codes: Basic concept, Losses of prestress, analysis of prestress and bending stresses. Need for high strength steel and concrete. Advantages and applications. Pre-tensioning and post tensioning systems.

Unit:2 **(12 Hours)**

Design of beams : Analysis and design of section for bending and shear, pressure line, concept of load balancing, cracking moment, bending of cables, limit state analysis and design, anchorage zone stresses, design of end block, Application to bridges.

Unit:3 **(10 Hours)**

Selection of prestress concrete members, short term and long term deflections of uncracked members.

Unit:4 **(10 Hours)**

Flexural strength of prestresed concrete sections Continuous beams, Design concept concordancy of cables, Secondary design consideration. Design pre-tensioned and post tensioned beam

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

Ref. Books

1. Prestressed Concrete, Raju,N.K., Tata McGraw Hill
2. Prestressed Concrete, T. Y. Lin

Subject code	course title	L	T	P	C	QP
BCVPE7031	**ADVANCED DESIGN OF CONCRETE STRUCTURES**	3	-	-	3	

CEO-1- To understand the design concept of various structures and detailing of reinforcements

CEO-2- To understand the design of underground and elevated liquid retaining structures

CEO-3- To study the design of material storage structures

CEO-4- To know the effect of temperature on concrete structures

CEO-5 To study the design of bridges subjected to IRC loading

Pre-Requisites (If any) –

Course Outcomes

CO1	Design cantilever and counter fort retaining walls
CO2	Design underground and elevated water tanks
CO3	Design bunkers and silos
CO4	Ensure serviceability criteria for reinforced concrete structural elements
CO5	Analysis and design of raft foundation, strip footing and pile caps

Unit:1 **(10 Hours)**

Introduction to earthquake design and detailing, cyclic behaviour of concrete and reinforcement, significance of ductility, design and detailing for ductility, codal provisions, simple problems based on above concept, computation of earthquake forces on building frames using seismic coefficient method as per IS 1893-2002

Unit:2 **(9 Hours)**

Retaining walls, various forces acting on retaining wall, stability requirement, design of cantilever and counterfort retaining walls.

Design of water tanks, design requirements, design of tanks on ground, underground and elevated water tanks.

Unit:3 **(9 Hours)**

Introduction to Prestressed concrete: Prestressing system, Pre-tensioning and post-tensioning systems, materials and codes, need for high strength steel and concrete, basic concepts, losses of prestress, analysis of beams under prestress and bending stresses.

Unit:4 **(10 Hours)**

Types of bridges, components , various types of loads and forces acting on bridges, types of IRC loading, Design of slab culverts

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Prestressed Concrete- N.Krishnaraju, TMH
2. RCC Design-B.C.Punmia,A.K.Jain& A.K Jain-Laxmi Publications

Ref. Books

3. Limit State Design-A.K.Jain, Nemchand& Bros, Roorkee
4. Advanced RCC Design-P.C.Verghese, PHI
5. Earthquake Resistant Design of Structures, Shrikhande and Agrawal, PHI

Subject code	course title	L	T	P	C	QP
BCVPE7033	**EARTHQUAKE GEOTECHNICAL ENGINEERING**	3	-	-	3	

CEO-1- Become familiar with the terminology used in geotechnical earthquake engineering

CEO-2- Understand the fundamental principles and practical methods associated with each topic

CEO-3- Appreciate the assessment, remedial and monitoring techniques in relation to seismic hazards

CEO-4- Demonstrate the ability to apply the understanding gained

Pre-Requisites (If any) –

Course Outcomes

CO1	Understand the earthquake mechanisms
CO2	Understand earthquake motion on soil properties and soil-structure interaction
CO3	Evaluate the seismic susceptibility of the ground
CO4	Design foundations, slopes and pavements for seismic loading
CO5	Ability to analyze seismic load analysis

Unit:1 **(12 Hours)**

Internal Structure of the Earth – Continental Drift and Plate Tectonics – Faults – Elastic rebound theory – Different sources of Seismic Activity – Geometric Notation – Location of Earthquakes – Size of Earthquakes.

Unit:2 **(10 Hours)**

Measurement of Dynamic Properties of soils – Field Tests – Low strain – Seismic Reflection – Seismic Refraction – Horizontal layering – Steady State Vibration – Spectral analysis of surface wave – Seismic cross hole – Down Hole – Up hole – tests – Laboratory tests – Resonance Column Test – Bender Element – Cyclic Tri-axial test.

Unit:3 **(10 Hours)**

Identification and Evaluation of Earthquake Sources – Geologic Evidence – Tectonic Evidence – Historical Seismicity – Instrumental Seismicity – Deterministic Seismic Hazard Analysis – Probabilistic Seismic Hazard Analysis.

Unit:4 **(12 Hours)**

Ground Response Analysis – One Dimensional Linear – Evaluation of Transfer Function – Uniform undamped soil on rigid rock – Uniform damped soil on Rigid Rock – Uniform damped soil on elastic rock – layered damped soil on elastic rock – Equivalent linear Approximation –

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Krammer S.L., "Geotechnical Earthquake Engineering", Prentice Hall, International Series, Pearson Education Inc and Donling Kindersley Publishing Inc. 2013

2. Roberto Villaverde, “Fundamental Concepts of Earthquake Engineering”,CRC Press Taylor & Francis Group, 2009.

Ref. Books

1. KameswaraRao, N.S.V., "Dynamics soil tests and applications", Wheeler Publishing – New Delhi, 2000.

2. KameswaraRao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998.

Subject code	course title	L	T	P	C	QP
BCVPE7042	**TALL BUILDINGS**	3	-	-	3	

CEO-1- Identify a structure's designer and location from an image.

CEO-2- Explain the social, symbolic, and scientific significance of the structure (GWB, Eiffel Tower, Hancock, and Salginatobel Bridge, etc.).

CEO-3- Explain qualitatively how the loads are transferred by the structural system to the ground.

CEO-4- Perform simple calculations to determine the forces in the main structural members.

Pre-Requisites (If any) –

Course Outcomes

CO1	Critically examine current trends in growth of tall buildings and future urban habitats including the principles of green buildings.
CO2	Explain hybrid structural systems widely used in tall buildings and conduct conceptual design
CO3	Model tall buildings for analysis.
CO4	Evaluate wind sensitivity, user comfort and dynamic response.
CO5	Complete a conceptual design of lateral and gravity load resisting systems

Unit:1 **(10 Hours)**

Development of High Rise Structures - General Planning Considerations - Design philosophies - Materials used for Construction - High Strength Concrete - High Performance Concrete – Self Compacting Concrete - Glass - High Strength Steel

Unit:2 **(10 Hours)**

Gravity Loading - Dead Load - Live Load - Live load reduction technique - Impact Load - Construction Load - Sequential Loading. Lateral Loading - Wind load - Earthquake Load. Combination of Loads.

Unit:3 **(9 Hours)**

Factors affecting growth, Height and Structural form. High rise behaviour of Various structural systems - Rigid frames, braced frames, In filled frames, shear walls, coupled shear walls, wall frames, tubular structures, cores, outrigger - braced and hybrid mega systems. Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction,

Unit:4 **(10 Hours)**

Analysis for member forces, drift and twist, computerized general three dimensional analysis. Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Bryan Stafford Smith, Alex coull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc., 1991.
2. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 2011.

Ref. Books

1. Lin.T.Y, StotesBurry.D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 1988.
2. Lynn S.Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 1986.
3. Wolfgang Schueller "High Rise Building Structures", John Wiley and Sons, New York 1977.

Subject code	course title	L	T	P	C	QP
BCVPE7041	**ESTIMATION COSTING AND PROFESSIONAL PRACTICE**	3	-	-	3	

CEO-1- To know the importance of preparing the types of estimates under different conditions .

CEO-2- To know about the rate analysis and bill preparations

CEO-3- To study about the specification writing

CEO-4- To understand the valuation of land and buildings .

Pre-Requisites (If any) –

Course Outcomes

CO1	To know the importance of preparing the types of estimates under different conditions
CO2	To comprehend detailed report on estimation and valuation process
CO3	To apply logical thoughts and prepare the rate analysis and bills
CO4	To analyze and synthesize cost effective approach for civil engineering projects.
CO5	To evaluate the cost of expenditure and prepare a detailed rate analysis report

Unit:1 **(10 Hours)**

Quantity estimation:

Principles of estimation, methods and units, Estimation of materials in buildings, Culverts and bridges.

Unit:2 **(10 Hours)**

Principles of general and detailed specification for various types building works. Analysis of rates, description, Prime cost, Schedule rates, Analysis of rates for various types of works. Estimate of R.C.C and Steel works, Scheduling, Slab, beam, column

Unit:3 **(9 Hours)**

Estimation of Road – earthwork fully in banking, cutting, partly cutting & partly filling. Detailed estimate for WBM, Bituminous road. Valuation, rent fixation, tenders, contracts, accounting procedure, measurement book, stores, cost & quality control, PWD & CPWD practice, Software Applications for Estimation of Buildings.

Unit:4 **(10 Hours)**

Network techniques, Introduction to CPM/ PERT methods and their use in project planning construction schedules for jobs, materials equipments, labour and finance.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

Ref. Books:

Estimating and Costing in Civil Engineering Theory & Practice, B.N. Dutta, UBS Publishers
PERT and CPM, L.S. Sreenath, East West Press
Civil engineering contracts and estimates by B.S. Patil, University Press.

Subject code	course title	L	T	P	C	QP
BCVOE7051	**MUNICIPAL SOLID WASTE MANAGEMENT**	3	-	-	3	

Course Outcomes	
Pre-Requisites (If any) –	
CO1	Explain municipal solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies.
CO2	Outline sources, types and composition of solid waste with methods of handling, sampling and storage of solid waste.
CO3	Select the appropriate method for solid waste collection, transportation, redistribution and disposal.
CO4	Describe methods of disposal of hazardous solid waste.
CO5	Ability to understand the treatment procedure of solid wastes

Unit:1 **(10 Hours)**

Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – Municipal solid waste (M&H) rules – integrated management-Public awareness; Role of NGO's.

Unit:2 **(8Hours)**

On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling.

Unit:3 **(12 Hours)**

Methods of Residential and commercial waste collection – Collection vehicles – Manpower– Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems- solving.

Unit:4 **(10 Hours)**

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor– Dumpsite Rehabilitation

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. "Solid. Wastes: Engineering Principles and Management Issues". McGraw Hill, New York, 1993.
2. Vesilind, P.A. and Rimer, A.E., "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981

Ref. Books

1. Government of India, "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, New Delhi, 2000.
2. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001

Subject code	course title	L	T	P	C	QP
BCVOE7052	**DISASTER MANAGEMENT**	3	-	-	3	

Course Outcomes	
Pre-Requisites (If any) –	
CO1	To increase the knowledge and understanding of the disaster phenomenon and, its factors.
CO2	Understand the relationship of hazard, risk and vulnerability
CO3	To obtain the skills in role of education and training in disaster prevention.
CO4	To ensure skills in post disaster management activities
CO5	To get the knowledge in understanding various prone zones in India

Unit:1 **(8Hours)**

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

Unit:2 **(10 Hours)**

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

Unit:3 **(10 Hours)**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, Programmes and legislation –

Unit:4 **(10 Hours)**

Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]

Ref. Books

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

Subject code	course title	L	T	P	C	QP
BCVOE7053	**CONSTRUCTION PLANNING AND SCHEDULING**	3	-	-	3	

Course Outcomes

Pre-Requisites (If any) –

CO1	Outline the knowledge of construction contracts, tenders and deposits.
CO2	Plan construction organization, construction planning and scheduling for projects.
CO3	Infer the knowledge of networks PERT, CPM and crashing.
CO4	Estimate different types of resources and their optimization in projects.
CO5	Explain about quality management, safety, construction disputes and legislation.

Unit:1 **(8Hours)**

Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

Unit:2 **(10 Hours)**

Scheduling procedures and techniques, cost control, monitoring and accounting, quality control and safety during construction, organization and use of project information.

Introduction to Construction Management - Project Organization – Construction Economics – Economic Decision Making - Time value of money - cash flow diagrams - Evaluation Alternatives - Effect of Inflation on cash flow - Evaluation of Public Projects.

Construction contract – contract document - classification of engineering contract - bidding process - CPWD contract conditions - FIDIC form contract agreement – subcontracting - earnest money deposit - security deposit - arbitration.

Unit:3 **(8 Hours)**

Basic concepts of resource management-class of labour - labour productivity - Classification construction equipment - selection of construction equipment - methods of calculating depreciation – replacement model - material management functions - inventory management -project cost management.

Unit:4 **(10 Hours)**

Construction quality - inspection, quality control and quality assurance - total quality management - quality gurus and their teachings - cost of quality - ISO standards - conquas - audit - evaluation of safety - accident causation theories - foundation of a major injury - health and safety act and regulations - cost of 143 CE-Engg&Tech-SRM-2013 accidents - role of safety personnel - causes of accidents -principles of safety - safety and health management system.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

Ref. Books

1. Calin M. Popescu, ChotchaiCharoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.
2. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, McGrawHill Publishing Company, New Delhi, 1998.

8TH SEMESTER

S. No.	Course category	Subject Code	Subjects	L	T	P	Credits
1	PE	BCVPE8011	Town planning	3	-	-	3
	PE	BCVPE8012	Computer Aided Design of Structures				
	PE	BCVPE8013	Repair and Rehabilitation of Structures				
2	PE	BCVPE8021	Ground Improvement Techniques	3	-	-	3
	PE	BCVPE8022	Finite Element Techniques				
	PE	BCVPE8023	Construction Planning and Scheduling				
3	OE	B**OE8031	Open Elective - 4	3	-	-	3
	OE	B**OE8032	Open Elective - 4				
	OE	B**OE8033	Open Elective - 4				
Sessional							
4	PC	BCVPC8110	Comprehensive VIVA	-	-	4	2
5	PC	BCVPC8120	Seminar	-	-	4	2
6	PC	BCVPC8130	Major project/ Industrial project /Startup training cum project	-	-	12	6
Total							**19**

Subject code	course title	L	T	P	C	QP
BCVPE8011	**TOWN PLANNING**	3	-	-	3	

CEO 1- To understand the trend of urbanization and planning process

CEO 2- To study about various types of plans

CEO 3- To study about the planning principles

CEO4- To know how to implement the plan and financing for plan

CEO5- To know about the urban development control regulations

Pre-Requisites (If any) –

Course Outcome

CO1	To understand the human factors in traffic engineering design
CO2	To design the cross-section and alignment of highway
CO3	To use an appropriate traffic flow theory for traffic characteristics.
CO4	To comprehend the capacity and signalized intersection analysis.
CO5	To analyze the origin of town

Unit:1 **(12 Hours)**

Principles of architectural design –primary elements, form, space, organization, circulation, proportion and scale, ordering principles. Functional planning of buildings: Planning, designing and construction, General building requirements, Permit and Inspection (as per the National building Code)

Unit:2 **(10 Hours)**

Town Planning ; Evolution of towns : History and trends in town planning:-origin and growth, Historical development of town planning in ancient valley civilizations; Objects and necessary of town planning; Surveys and analysis of a town

Unit:3 **(10 Hours)**

New Concepts in town planning : Garden city movement, Linear city and Satellite city concepts, Neighborhood Planning.

Unit:4 **(9 Hours)**

Planning Principles, Practice and Techniques: Elements of City plan, Estimating future needs, Planning standards, Zoning:- its definition, procedure and districts, height and bulk zoning, F.A.R., Master Plan; Concepts of urban planning , design and landscaping.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Town Planning, B. Charotar Publications. rangawala

Ref. Books

1. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design - C B S publishers.
2. D. K. Francis Ching, Architectures: Form, Space and Order, John Wiley.

Subject code	course title	L	T	P	C	QP
BCVPE8012	**COMPUTER AIDED DESIGN OF STRUCTURES**	3	-	-	3	

CEO 1- To learn the software developing skills for structural design

CEO 2- To understand the computing techniques in the field of transportation

CEO 3- To gain knowledge in networking and flowcharts in water resources

CEO4- To understand the computing skills in the field of geotechnical engineering

CEO5- To study the different software packages for analysis and design

Pre-Requisites (If any) –

Course Outcomes

CO1	Students can create 3D models of engineering objects, engineering drawings with different views, and an assembly of the objects that make up engineered systems, using a CAD system
CO2	Obtain a basic understanding of various engineering materials and the manufacturing techniques used to process these materials into useful products
CO3	Students are able to understand engineering drawings with different views, including orthographic views, hidden lines and cross sectional views, and the representations of tolerances and surface finish on engineering drawings
CO4	Students develop an awareness of CAM and rapid prototyping, and the capabilities of these processes
CO5	Students are able to use the cumulative distribution of the normal distribution to predict probabilities in the context of dimensional tolerances

Unit:1 **(12 Hours)**

Fundamental reason for implementing CAD - Software requirements – Hardware components in CAD system – Design process - Applications and benefits.

Unit:2 **(12 Hours)**

Graphic Software – Graphic primitives - Transformations - 2 Dimensional and 3 Dimensional transformations – Concatenation - Wire frame modeling - Solid modeling - Graphic standards - Drafting packages – Auto CAD.

Unit:3 **(8 Hours)**

Principles of structural analysis - Fundamentals of finite element analysis - Concepts of finite elements – Stiffness matrix formulation – Variational Method – Weighted residual method – Problems – Conditions of convergence of functions – Analysis packages and applications.

Unit:4 **(10 Hours)**

Principles of design of steel and RC structures - Beams and Columns - Applications to simple design problems - Optimization techniques - Algorithms - Linear programming.

Introduction to artificial intelligence - Knowledge based expert systems – Applications of KBES- Rules and decision tables - Inference mechanisms - simple applications

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books :

1. Groover M.P. and Zimmers E.W. Jr., “CAD/CAM, Computer Aided Design and Manufacturing”, Prentice Hall of India Ltd, New Delhi, 1993.
2. KrishnamoorthyC.S.Rajeev S., “Computer Aided Design”, Narosa Publishing House, New Delhi, 1993

Ref. Books:

1. Harrison H.B., “Structural Analysis and Design”, Part I and II Pergamon Press, Oxford, 1990.
2. Rao S.S., “Optimisation Theory and Applications”, Wiley Eastern Limited, New Delhi, 1977.

Subject code	course title	L	T	P	C	QP
BCVPE8013	**REPAIR AND REHABILITATION OF STRUCTURES**	3	-	-	3	

CEO 1- To learn various distress and damages to concrete and masonry structures

CEO 2- To understand the importance of maintenance of structures

CEO 3- To study the various types and properties of repair materials

CEO4- To assess the damage to structures using various tests

CEO5- To learn various repair techniques of damaged structures, corroded structures

Pre-Requisites (If any) –

Course Outcomes

CO1	Assess strength and materials deficiency in concrete structures
CO2	Suggest methods and techniques used in repairing / strengthening existing concrete structures
CO3	Apply Non Destructive Testing techniques to field problems
CO4	Apply cost effective retrofitting strategies for repairs in buildings
CO5	Study on causes of building damage and deterioration

Unit:1 **(10 Hours)**

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

Unit:2 **(10 Hours)**

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness

Unit:3 **(9 Hours)**

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

Unit:4 **(12 Hours)**

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – DEMOLITION TECHNIQUES - Engineered demolition methods – Case studies.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 1991.
2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

Ref. Books

1. ShettyM.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2008.
2. DovKominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001 Ravishankar.K.,Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.

Subject code	course title	L	T	P	C	QP
BCVPE8021	**GROUND IMPROVEMENT TECHNIQUES**	3	-	-	3	

CEO 1- To introduce engineering properties of soft, weak and compressible deposits, principles of Treatment for granular and cohesive soils and various stabilization techniques.

CEO 2- To bring out concepts of reinforced earth

CEO 3- Applications of geotextiles in various civil engineering projects.

Pre-Requisites (If any) –

Course Outcomes

CO1	Identify ground conditions and suggest method of improvement
CO2	Design and assess the degree of improvement
CO3	Understand the principles of soil reinforcement and confinement in engineering constructions
CO4	Design reinforced soil structures
CO5	Ability to analyze the ground water conditions.

Unit:1 **(10 Hours)**

Introduction, Necessity of ground improvement, Dewatering, methods, Analysis and design of dewatering systems. Grouting types, Properties, Method of grouting, Ground selection and control

Unit:2 **(10 Hours)**

Compaction, Methods of compaction, Engineering properties of compacted soil, Field compaction and its control.

Unit:3 (8 Hours)

Soil stabilization, Use of chemical additives, Stone columns, Principle, design and method of installation

Unit:4 **(9 Hours)**

Reinforced earth, Concept, Materials, Application and design, Use of geo-synthetics and geo-cells in construction work.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

Ref. Books

1. Grond improvement techniques by P.P.Raj, Laxmi Publications. .
2. Foundation Design and Construction, M.J. Tomlinson

Subject code	course title	L	T	P	C	QP
BCVPE8022	**FINITE ELEMENT TECHNIQUES**	3	-	-	3	

CEO 1- To provide the fundamental concepts of the theory of the finite element method

CEO 2- To develop proficiency in the application of the finite element method (modeling, analysis, and interpretation of results) to realistic engineering problems through the use of a major commercial general-purpose finite element code.

CEO 3- To learn the theory and characteristics of finite elements that represent engineering structures.

CEO4- To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.

CEO5- Learn to model complex geometry problems and solution techniques

Pre-Requisites (If any) –

Course Outcomes

CO1	Understand the fundamental concepts of the Finite Element Method (FEM).
CO2	Apply the basic properties, behavior and usage of different types of finite elements.
CO3	Create Finite Element models and solve typical Civil Engg. Problems using FEM.
CO4	Interpret and evaluate the quality of the results of FE simulations using Software.
CO5	to understand the application and use of the FE method for heat transfer problems.

Unit:1 **(12 Hours)**

Introduction - Basic Concepts of Finite Element Analysis - Introduction to Elasticity - Steps in Finite Element Analysis - Virtual Work and Variational Principle - Galerkin Method- Finite Element Method: Displacement Approach - Stiffness Matrix and Boundary Conditions

Unit:2 **(12 Hours)**

Natural Coordinates - Triangular Elements - Rectangular Elements - Lagrange and Serendipity Elements - Solid Elements -Isoperimetric Formulation - Stiffness Matrix of Isoperimetric Elements Numerical Integration: One, Two and Three Dimensional

Unit:3 **(12 Hours)**

Stiffness of Truss Members - Analysis of Truss - Stiffness of Beam Members - Finite Element Analysis of Continuous Beam - Plane Frame Analysis - Analysis of Grid and Space Frame.

Unit:4 **(12 Hours)**

Constant Strain Triangle - Linear Strain Triangle - Rectangular Elements -Numerical Evaluation of Element Stiffness -Computation of Stresses, Geometric Nonlinearity and Static Condensation Ax symmetric Element -Finite Element Formulation of Axisymmetric Element -Finite Element Formulation for 3 Dimensional Elements Plate Bending Problems - Finite Elements for Elastic Stability - Finite Elements in Fluid Mechanics -Dynamic Analysis

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Chandrupatla, T.R., and Belegundu, A.D., “Introduction to Finite Element in Engineering”, Third Edition, Prentice Hall, India, 2003.
2. Krishnamoorthy C. S. ,"Finite Element Analysis Theory and Programming", Tata McGraw Hill Education, 1994

Ref. Books

1. Reddy J.N., “An Introduction to Finite Element Method”, McGraw-Hill, Intl. Student Edition, 1985.
2. Zienkiewics, “The finite element method, Basic formulation and linear problems”, Vol.1, 4th Edition, McGraw-Hill, Book Co., 1987

Subject code	course title	L	T	P	C	QP
BCVPE8023	**CONSTRUCTION PLANNING AND SCHEDULING**	3	-	-	3	

CEO 1- To graduate a student who has strong construction related communication skills including

CEO 2- To graduate a student who knows how to interact with fundamental and construction specific software

CEO 3 To graduate a student who uunderstands the project development process and the fundamentals of architecture

CEO4- To graduate a student who can utilize basic structural concepts to analyze engineering design problems.

CEO5- To graduate a student who has demonstrated the ability to identify and analyze problems commonly encountered by construction managers, and to solve them

Pre-Requisites (If any) – The Construction Industry

Course Outcomes

CO1	Outline the knowledge of construction contracts, tenders and deposits.
CO2	Plan construction organization, construction planning and scheduling for projects.
CO3	Infer the knowledge of networks PERT, CPM and crashing.
CO4	Estimate different types of resources and their optimization in projects.
CO5	Explain about quality management, safety, construction disputes and legislation.

Unit:1 **(12 Hours)**

Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

Unit:2 **(10 Hours)**

Scheduling procedures and techniques, cost control, monitoring and accounting, quality control and safety during construction, organization and use of project information.

Introduction to Construction Management - Project Organization – Construction Economics – Economic Decision Making - Time value of money - cash flow diagrams - Evaluation Alternatives - Effect of Inflation on cash flow - Evaluation of Public Projects.

Construction contract – contract document - classification of engineering contract - bidding process - CPWD contract conditions - FIDIC form contract agreement – subcontracting - earnest money deposit - security deposit - arbitration.

Unit:3 **(12 Hours)**

Basic concepts of resource management-class of labour - labour productivity - Classification construction equipment - selection of construction equipment - methods of calculating depreciation – replacement model - material management functions - inventory management -project cost management.

Unit:4 **(10 Hours)**

Construction quality - inspection, quality control and quality assurance - total quality management - quality gurus and their teachings - cost of quality - ISO standards - conquas - audit - evaluation of safety - accident causation theories - foundation of a major injury - health and safety act and regulations - cost of 143 CE-Engg&Tech-SRM-2013 accidents - role of safety personnel - causes of accidents -principles of safety - safety and health management system.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

Ref. Books

1. Calin M. Popescu, ChotchaiCharoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.
2. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, McGrawHill Publishing Company, New Delhi, 1998.

Subject code	course title	L	T	P	C	QP
BCVPE8013	**REPAIR AND REHABILITATION OF STRUCTURES**	3	-	-	3	

Course Outcomes

Pre-Requisites (If any) –

CO1	Assess strength and materials deficiency in concrete structures
CO2	Suggest methods and techniques used in repairing / strengthening existing concrete structures
CO3	Apply Non Destructive Testing techniques to field problems
CO4	Apply cost effective retrofitting strategies for repairs in buildings
CO5	Study on causes of building damage and deterioration

Unit:1 **(10 Hours)**

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration

Unit:2 **(8 Hours)**

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness

Unit:3 (10 Hours)

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

Unit:4 **(10 Hours)**

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – DEMOLITION TECHNIQUES - Engineered demolition methods – Case studies.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 1991.
2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

Ref. Books

1. ShettyM.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2008.
2.DovKominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001 Ravishankar.K., Krishna moorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.

Subject code	course title	L	T	P	C	QP
BCVOE8032	**REMOTE SENSING TECHNIQUES AND GIS**	3	-	-	3	

Course Outcomes

Pre-Requisites (If any) –

CO1	Retrieve the information content of remotely sensed data
CO2	Analyze the energy interactions in the atmosphere and earth surface features
CO3	Interpret the images for preparation of thematic maps
CO4	Apply problem specific remote sensing data for civil engineering applications
CO5	To analyze the radiation using remote sensing

Unit:1 **(12 Hours)**

Remote sensing- introduction, physics of remote sensing- electromagnetic radiations and their characteristics, thermal emissions, multi-concept in remote sensing, remote sensing satellites and their data products, sensors and orbital characteristics, spectral reflectance curves for earth surface features, methods of remotely sensed data interpretation- visual interpretation, concept of FCC, digital image processing- digital image and its characteristics, satellite data formats, image rectification and restoration, image enhancement- contrast manipulation, spatial feature manipulation, multi-image manipulation

Unit:2 **(8 Hours)**

Fundamentals of GIS: introduction, definition of GIS, evolution of GIS, roots of GIS, definition, GIS architecture, models of GIS, framework for GIS, GIS categories, map as a model, spatial referencing system, map projections, commonly used map projections, grid systems, cartographic symbolization

Unit:3 **(10 Hours)**

Data management, models and quality issues: conceptual models, geographical data models, data primitives, data types - raster and vector approach, digital terrain modeling , approaches to digital terrain data modeling , acquisition of digital terrain data, data modeling and spatial analysis, sources of geographical data, data collectors and providers, creating digital data sets, data presentation, data updating, data storage

Unit:4 **(8 Hours)**

GIS data processing, analysis and visualization: raster based GIS data processing, vector based GIS data processing, human computer interaction and GIS, visualization of geographic information, principles of cartographic design in GIS, generation of information product, image classification and GIS, visual image interpretation, types of pictorial data products, image interpretation strategy, image interpretation process.

T**eaching Method(s):** Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

1. Remote Sensing and GIS, Basudeb Bhatta, Oxford University Press
2. Remote Sensing And GIS, M.A. Reddy, B.S. Publication, Hyderabad

Ref. Books

1. Fundamental of Remote Sensing by G. Joseph, Universities Press
2. Introduction Of GIS, Kang-Tsung Chang, Mcgraw-Hill
3. GIS, N. Panigrahi, Universities Press

Subject code	course title	L	T	P	C	QP
BCVOE8033	**MODERN CONSTRUCTION MATERIALS**	3	-	-	3	

Course Outcomes

Pre-Requisites (If any) –

CO1	Comprehensively explain and critique engineering principles used in advanced materials behaviour.
CO2	Appraise the use of advanced materials as they affect the design process and adapt techniques in the use of advanced materials to create novel solutions to a wide range of problems.
CO3	Constructively evaluate and endeavor to improve health and safety issues as they relate to the use of materials.
CO4	Explain and debate with technical and policy based evidence, complex sustainability and environmental issues related to the use of materials and design strategies and procedures which take them into account
CO5	Identify and astutely assess risks and apply risk assessment and mitigation strategies and techniques as they relate to the use of advanced materials.

Unit:1 **(10 Hours)**

Fresh concrete and its rheology. Mechanical, deformational behavior and microstructure of hardened concrete. Creep and shrinkage. Testing of concrete. mix design and properties of concrete; High strength concrete; High density and light weight concretes; admixtures

Unit:2 **(10 Hours)**

Industrial waste materials in concrete, their influence on physical and mechanical properties and durability of concrete, Concreting under extreme weather conditions, High strength concrete. Changes in concrete with time, Corrosion of concrete in various environments. Corrosion of reinforcing steel. Ferro-cement, material and properties.

Unit:3 **(8 Hours)**

Foams and light weight materials, fibre reinforced concrete. Types of fibres, workability, mechanical and physical properties of fibre reinforced concrete. Polymers in Civil Engineering, Polymers, fibres and composites,

Unit:4 **(8 Hours)**

Fibre reinforced plastic in sandwich panels, modeling. Architectural use and aesthetics of composites. Adhesives and sealants. Structural elastomeric bearings and resilient seating. Moisture barriers, Polymer foams and polymers in Building, Polymerconcrete composites.

Teaching Method(s): Chalk & Board/ PPT/Video Lectures/ MOOC/ Internship/Industry Guest Lecture/ Invited Guest lecture/ Demonstration. etc.(can be chosen one or many)

Text Books

Neville A.M.,'Properties ofconcrete',3rd ed.,1985, ELBSLea F.M.,
Chemistry of cement and concrete', 3rd ed.,1970, Edward Arnold Proceedings of recent seminars etc.and journals.

Ref. Books: