Auto 5th

Priyadarshini J. L. College of Engineering
An Autonomus Institute, Affiliated to RTM Nagpur University, Nagpur

Department of Civil Engineering
Scheme of Teaching & Examination
Fifth Semester for B-Tech Programe (NEP)

Scheme :- BTECH/CE/NEP-24/RO

Fifth Semester

Sr. No.	Type of Course	Credits as per Category	Course Code	Course Title	Teaching Scheme (Clock Hours/ Week)			Credits	Maximum Marks			Minimum Marks			End Semester Exam Duration (Hrs)
					L	T	P		Continuous Evaluation	End Semester Exam	Total Marks	Continuous Evaluation	End Semester Exam	Total Marks	
1	PCC	10	CE501T	Design of Reinforced Cement Concrete Structures	3	0	0	3	40	60	100	---	15	45	4
2			CE502T	Transportation Engineering	3	0	0	3	40	60	100	---	15	45	3
3			CE503T	Environmental Engineering	3	0	0	3	40	60	100	---	15	45	3
4			CE503P	Environmental Engineering Lab	0	0	2	1	25	25	50	---	---	25	---
5	PEC	4	CE504T	Program Elective-I Refer Program Elective Basket	3	0	0	3	40	60	100	---	15	45	3
6			CE504P	Program Elective-I Lab Refer Program Elective Basket	0	0	2	1	25	25	50	---	---	25	---
7	MDM	4	CSE / AI / ETC / EE / 505T	Branch wise Course (CSE / AI / ETC / EE)	3	0	0	3	40	60	100	---	15	45	3
8			CSE / AI / ETC / EE / 505P	Branch Wise Course (CSE / AI / ETC / EE)	0	0	2	1	25	25	50	---	---	25	---
9	OE	2	CE506T	Open Elective - III (Refer OE Basket)	2	0	0	2	20	30	50	---	8	23	2
				Total =	17	0	6	20			700				

NOTE:- 1. Refer Annuxure - I for MDM Courses - CSE / AI / ETC / EE / 505T, 505P

Abbreviations:-

L- Lecture, T- Tutorial, P- Practical

PCC - Programme Core Course,PEC- Programme Elective Course, MDM - Multidisciplinary Minor, OE- Open Elective other than program.

Multidisciplinary Minor			
Sr. No.	Category	Course Code	Course Name
1	MDM	CE505T	Building Construction and Elementary Building Drawing
2	MDM	CE505P	Building Construction and Elementary Building Drawing Lab

Open Elective - III			
Sr. No.	Category	Course Code	Course Name
1	OE	CE506T	Road Safety and Traffic Management

Programme Elective Basket			
Sr. No.	Category	Course Code	Course Name
1	PEC- I	CE504TA	Structural Analysis-II
		CE504PA	Structural Analysis-II Lab
2		CE504TB	Geotechnical Engineering - II
		CE504PB	Geotechnical Engineering - II Lab
3		CE504TC	Advanced Construction Materials
		CE504PC	Advanced Construction Materials Lab

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DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS OF THIRD YEAR BACHELOR OF TECHNOLOGY

SEMESTER V

COURSE :-DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES

COURSE CODE:- CE501T

Hours/ Week	Credits	Duration of End Sem Exam	Continous Evaluation	End Sem Exam	Total Marks
3 Hrs	3	4Hrs	40	60	100

Course Objectives:

1.	To understand phenomenons of design concepts and learning various codes related to RCC design.
2.	To understand the structural behavior of steel and concrete.
3.	To apply conventional methods for design structural components of building.

Course Outcomes:

After completion of the course, the student will be able to

CO1	Understand the fundamental concepts of working stress method as per IS 456- 2000 and pre-stressed concrete method.
CO2	Design RCC elements for flexure, shear, and bond using limit states.
CO3	Analyze and design short columns using IS 456-2000 for axial and uniaxial loads.
CO4	Design one-way slabs and continuous beams using IS coefficients.
CO5	Design simply supported two-way slab and footing as per IS 456-2000.

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SYLLABUS

UNIT – I	**(7 Hours) (12 Marks)**
Introduction to the Working Stress Method of RCC design. Basic concept in design for flexure, assumptions, design constants. Analysis of the rectangular section. (Balanced, under–reinforced and over– reinforced sections). **Introduction to Prestress Concrete:** Properties of high-grade materials, concepts of prestress concrete, method of pre-stressing, losses in pre-stressing. Various systems for pre-stressing with particular reference to Freyssinet, Magnel Blatton and Giffod Udall system	
UNIT – II	**(8 Hours) (12 Marks)**
Introduction to Limit State Design: Concept of probabilistic design and limit state design. Characteristic values, partial safety factors, stress strain relationship stress block parameters, failure criteria, types and properties of reinforcement, limit state of Serviceability and limit state of collapse, Limit states of durability **Limit state of collapse in flexure:** Analysis and design of singly reinforced rectangular section, Analysis & design of the Tee & L- beam section. **Limit state of Collapse in Shear & Bond:** Design of beam for shear, shear span, post cracking resistance, shear mechanism approach, shear failure modes and collapse loads, interaction of shear, flexure and axial force, Check for bond.	
UNIT – III	**(7 Hours) (12 Marks)**
Limit state of collapse in compression Analysis and design of short axially loaded column. Columns subjected to uniaxial bending, use of interaction curves.	
UNIT – IV	**(7 Hours) (12 Marks)**
Design of one-way simply supported single span slab, cantilever slabs, continuous slab and continuous beam with IS coefficients.	
UNIT –V	**(7 Hours) (12 Marks)**
Design of rectangular pad, slopped footing for axial load. Design of Simply supported Two-way slab.	

List of Books:

Text Books:

1. Limit State design of Reinforced Concrete, P.C.Varghese, 2nd Edition, PHI Learning Pvt Ltd, 2006.
2. Design of Reinforced Concrete, M.L.Gambhir, 4th Edition, PHI Learning Pvt Ltd, 2011.
3. Fundamental of Reinforced Concrete Design, M.L.Gambhir, 5th Edition, PHI Learning Pvt Ltd, 2011.

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SYLLABUS OF THIRD YEAR BACHELOR OF TECHNOLOGY

SEMESTER V

COURSE :-TRANSPORTATION ENGINEERING **COURSE CODE: CE502T**

Hours/ Week	Credits	Duration of End Sem Exam	Continous Evaluation	End Sem Exam	Total Marks
3 Hrs	3	3 Hrs	40	60	100

Course Objectives:

1.	To provide the knowledge regarding transportational technologies, administrative set-up, development plans and highway organisations.
2.	To know the importance of the alignment of highway and design of the cross section elements of pavement
3.	To provide the students the knowledge regarding pavement material characteristics and pavement design
4.	To provide the fundamentals and information of Railway Engineering.
5.	To provide the fundamentals and information of Airport Engineering.

Course Outcomes:

After completion of the course, the student will be able to

CO1	Define and describe different objectives and requirements of highway development and planning
CO2	Explain highway alignment, discriminate and design various geometric features of highways pavement
CO3	Understand, analyze, apply and evaluate the parameters of pavement materials and pavement design.
CO4	Explain the various terms in railway engineering , discriminate and design various geometric features of railway track.
CO5	Design an airport layout by inntegrating aricraft characteristics, runway orintation and length requirments and terminal areafacilities to ensure safe and efficient operations.

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SYLLABUS:

UNIT I	**(7 Hours) (12 Marks)**
Introduction: Transportation technologies, Modes of transportation, Transportation coordination, Transportation administrative set-up in India, **Highway development:** Rural Road Development Plan, Highway Organizations (MoRTH, IRC, CRRI, NHAI, NRRDA, CIRT)	
UNIT II	**(8 Hours) (12 Marks)**
Highway Alignment: Ideal Alignment, Factors controlling alignment, Engineering surveys for highway location. **Highway Geometric Design:** Cross-Section elements (Boundary lines, right-of way, carriageway width, Shoulder, Camber, Kerbs), surface characteristics, Sight distance Considerations (SSD, OSD,ISD), Design of horizontal curves including transition, extra widening, Design of vertical curves.	
UNIT III	**(7 Hours) (12 Marks)**
Material characteristics: AASHO subgrade soil classification, CBR test, Abrasion test **Pavement Design:** Types of Pavements and their comparison, Factors affecting design, Stresses in flexible and rigid pavement, Types of joints in pavement, Pavement distresses, remedies and methods	
UNIT IV	**(7 Hours) (12 Marks)**
Railway Engineering: Permanent way, Ideal permanent way, Gauges in railway tracks, Functions of rail, Sleeper and Ballast, Traction and resistances, Cant, negative cant and cant deficiency, Types of turnouts and functions of its components	
UNIT V	**(7 Hours) (12 Marks)**
Airport Engineering: Aircraft Characteristics, Airport site selection, Runway orientation, Basic runway length and corrections, Terminal area and facilities, Aircraft parking, configuration and system, Aprons, Hangers	

List of Books:

Text Books:

1. Highway Engineering by Khanna, S.K., Justo, C.E.G and Veeraragavan.
2. Traffic Engineering and Transport Planning by L R kadiyali.
3. Textbook of Highway Engineering by Srinivasa Kumar.

IS code:

1. IRC Standards (IRC 37 and IRC 58).
2. Bureau of Indian Standards (BIS) Publications on Highway Materials.
3. Specifications for Road and Bridges, MORTH (India).

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DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS OF THIRD YEAR BACHELOR OF TECHNOLOGY,

SEMESTER V

COURSE :- ENVIRONMENTAL ENGINEERING **COURSE CODE: CE503T**

Hours/ Week	Credits	Duration of End Sem Exam	Continuous Evaluation	End Sem Exam	Total Marks
3 Hrs	3	3Hrs	40	60	100

Course Objectives:

1.	The course will provide students knowledge regarding the sources of water, water demands, population forecasting, characteristics, standards of drinking water.
2.	To prepare students to analyze, plan and design of various phases of water supply systems and waste water treatment.
3.	To provide the students the knowledge regarding the various characteristics of water, waste water estimation of the quantity of water.
4.	The course will provide students with fundamentals of air pollution and solid waste management, climate change, geo environment and sustainable resource management.

Course Outcomes:

After completion of the course, the student will be able to

CO1	Have knowledge of characteristics of water,drinking water standards and necessity of treatment.
CO2	Design various units of conventional water treatment plant.
CO3	Understand the characteristics of waste water, necessity of treatment, types of treatment processes.
CO4	Equip with the basic knowledge related to design of waste water treatment.
CO5	Understand of significance of air pollution, solid waste , climate change, Geo-environment etc.

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SYLLABUS:

UNIT I	**(8 Hours) (12 Marks)**
Introduction: Basics of water supply scheme, Water Demand, population forecasting methods, Sources of water & intake structures. **Conveyance of water:** Types of pipes, joints, fittings, valves & appurtenances. **Water quality:** characteristics of water, Standards of drinking water. (WHO 2011, CPHEOO, IS 10500-2016). **Water Treatment:** Objective of water treatment, flow sheet of conventional water treatment plant. **Sedimentation**: Principles, types of setting basins, inlet and outlet arrangements, simple design of sedimentation tank.	
UNIT II	**(7 Hours) (12 Marks)**
Coagulation and Flocculation: Definition, Principles, types of coagulants, coagulant doses, types of mixing and flocculation devices, Clariflocculators. **Filtration:** Mechanism of filtration Types of filters-RSF, SSF, Pressure filters, sand specification, operational problems.Simple design of SSF and RSF, Membrane filtration technique of water treatment. **Disinfection:** Purpose, Mechanism, disinfectants, disinfection by chlorination. Type of chlorination. **Distribution systems:** Requirements & methods of distribution systems with layouts	
UNIT III	**(7 Hours) (12 Marks)**
General Introduction: Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water, Problems on quantity estimation. **Sewer:** Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.), **Construction of sewer** - Shoring, Trenching and laying to grade. Sewer materials, Sewer Appurtenances, Sewage pumping - location of pumping station. Sewer testing and maintenance. **Characteristics:** Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant (Problems)	
UNIT IV	**(7 Hours) (12 Marks)**
Preliminary & Primary Treatments: Sewage treatment flow sheet, site selection for sewage treatment plant. Preliminary and primary treatments - Screens, Grit chambers, oil & grease removal, Primary settling tank (Only working principles) **Secondary treatments** - Principle of Biological Treatment, bacterial growth curve, Activated sludge process, trickling filter, sequence batch reactors, oxidation ponds (Only working principles) **Sewage Disposals**: Indian Standard for disposal, Methods of disposal, Sewage farming, self-purification of stream (Streeter Phelp's equation, Oxygen sag curve). Recycle & reuse of sewage (Zero discharge concept). Sludge digestion process, sludge drying beds. **Rural sanitation:** Pit privy, aqua privy, bio-gas recovery, Septic tank- soak pit (Only working principles). Sullage collection and disposal	

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UNIT V	(7 Hours) (12 Marks)
Introduction of air pollution and municipal solid waste, climate change, geo environment, environmental management system and sustainable resource management.	

List of Books:

Text Books:

1. Waste Water Treatment for Pollution Control and Reuse. Soli J. Arcelvala, Tata Mcgraw Hill, 2008.
2. Water Supply Engineering, Environmental Engineering Vol.-I, Dr. P.N. Modi, Standard Publication.
3. Water Supply Engineering, Environmental Engineering Vol.-II, Dr. P.N. Modi, Standard Publication.
4. Design of Water Treatment Plant, Dr. A.G. Bhole, IWWA, Nagpur centre.

Reference Books:

1. Environmental Engineering Vol- I & II, Dr. B.C. Punmia, Laxmi Publication.
2. Water and Waste Water Treatment, Disposal And reuse, Metcalf and Eddy, Tata McGraw Hill.

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DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS OF THIRD YEAR BACHELOR OF TECHNOLOGY,

SEMESTER V NEP

COURSE :- Environmental Engineering Lab COURSE CODE: CE503P

Hours/ Week	Credits	Continuous Evaluation	End Sem Exam	Total Marks
2 Hrs	1	25	25	50

1) **The practicals are based on theory subject of Advanced Geotechnical Engineering and CO's.**
2) **Minimum 08 practicals, from the list given below shall be performed:**
3) **Any one practical may be performed using virtual lab.**

List of Experiments
1. Determination of pH 2. Determination of Conductivity 3. Determination of Turbidity 3. Determination Chlorides 4. Determination of Solid's (Suspended & dissolved) 6. Determination of Acidity and alkalinity 7. Determination of Dissolved Oxygen 8. Determination of Available Chlorine 9. Determination of Residual Chlorine 10. Jar Test(optimum dose of coagulant) 11. Only demonstration of COD, BOD. 12. Bacteriological Plate count and MPN tests 13. Design of Water treatment unit or waste water treatment unit (Any **Two Units** as per CPHEEO manual) 14. Brief Report on visit to water and waste water treatment plant.

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DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS OF THIRD YEAR BACHELOR OF TECHNOLOGY,

PROGRAM ELECTIVE COURSE-I

SEMESTER V

COURSE :- STRUCTURAL ANALYSIS-II **COURSE CODE: CE504TA**

Hours/ Week	Credits	Duration of End Sem Exam	Continues Evaluation	End Sem Exam	Total Marks
3 Hrs	3	3 Hrs	40	60	100

Course Objectives:

1.	To introduce advanced structural analysis methods including Flexibility, Stiffness, and Column Analogy methods.
2.	To analysis multistoried frame structures using approximate methods.
3.	To analysis the structural elements by plastic analysis.
4.	To introduce finite element methodand its concepts.
5.	To provide knowledge of structural dynamics.

Course Outcomes:

After completion of the course, the student will be able to

CO1	Analyze indeterminate structures using flexibility, stiffness, and column analogy methods.
CO2	Use the approximate method for analysis of multi-storied frame structures.
CO3	Understand the fundamentals of plastic analysis.
CO4	Sympathize the concepts related to finite element method.
CO5	Interpret the concepts related to structural dynamics.

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SYLLABUS

UNIT – I	**(7 Hours) (12 Marks)**
Introduction to Flexibility Method up to two DOF. Analysis of Grid Member using Stiffness Method. Column Analogy Method – Application to fixed beams, Stiffness and carryover factor.	
UNIT – II	**(8 Hours) (12 Marks)**
Approximate method: Analysis of multi-stored frame, portal frames, cantilever and substitute frame methods. (max. three bay three storey).	
UNIT – III	**(7 Hours) (12 Marks)**
Plastic analysis: Concepts, Plastic hinges, mechanism, Shape factors, upper and lower bound theorem. Plastic analysis for simple beam and simple portal frames	
UNIT – IV	**(7 Hours) (12 Marks)**
Introduction to Finite Element method, basic concepts, discretization of structures, Rayleigh Ritz method for bar elements (prismatic/non prismatic), Displacement based bar elements (prismatic/non- prismatic)	
UNIT –V	**(7 Hours) (12 Marks)**
Introduction to structural dynamics, D' Alembert Principle, inertia force, equation of motion (free vibration), SDOF system, Damping, natural frequency, MDOF (up to 3 DOF), Mode shape and nodal frequency.	

List of Books:

Text Books

1. Theory of Structures by Timoshenko S. P.& Young D.H., McGraw Hill 1965.
2. Theory and Analysis of Structures, Vol. I & II, by Jain, O.P. & Arya, A.S, Nemchand Brothers, Roorkee.
3. Matrix Analysis by Wear & Gear.
4. Intermediate of Structural analysis – Wang. C.K. (McGraw Hill Book Company, 1983).
5. Structural Analysis – Punmia B.C. (Laxmi Publications).
6. Structural Analysis (Vol.-II) – S.S. BhaviKatti S. (Vikas Publishers).

References:

1. Structural Analysis : A unified Approach-D S Prakash Rao, Sangam Books Limited, London.
2. Fundamentals of Structural Analysis – Lect and Vari (Tata McGraw Hill).
3. Structural Analysis – Pandit and Gupta (Tata McGraw Hill).

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SYLLABUS OF THIRD YEAR BACHELOR OF TECHNOLOGY

PROGRAM ELECTIVE COURSE-I

SEMESTER V

COURSE :- STRUCTURAL ANALYSIS-II LAB **COURSE CODE: CE504PA**

Hours/ Week	Credits	Continuous Evaluation	End Sem Exam	Total Marks
2 Hrs	1	25	25	50

1) The practicals are based on theory subject of Structural Analysis-II and CO's.

2) Minimum 08 practicals, from the list given below shall be performed:

List of Experiments

1. Study of Structural Analysis softwares.
2. To analyze a statically indeterminate beam using the Flexibility Method (force method) and verify results on software program.
3. To verify the Column Analogy Method for analyzing a fixed beam under point loads.
4. Validation of Approximate Methods using Software program.
5. To determine the shape factor of a given cross-section.
6. To determine the collapse load and calculate the plastic hinge formation in a simply supported beam with point load.
7. To determine the collapse load and calculate the plastic hinge formation in a simply supported beam with two-point load.
8. Analysis of beam and its validation on software program.
9. Analysis of column and its validation on software program.
10. Analysis of frames and its validation on software program.
11. Analysis of two bay two storey building using software program.

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PROGRAM ELECTIVE COURSE-I

SEMESTER V

COURSE :- GEOTECHNICAL ENGINEERING - II **COURSE CODE: CE504TB**

Hours/ Week	Credits	Duration of End Sem Exam	Continues Evaluation	End Sem Exam	Total Marks
3 Hrs	3	3 Hrs	40	60	100

Course Objectives:

1.	To know the importance shear strength and stresses of soil.
2.	To impart knowledge about soil samples and ground exploration and its codal provision.
3.	To understand the the findings of earth pressure theory with its importance.
4.	To learn the basics of stability in slopes in foundation.
5.	To get information about ground improvement techniques

Course Outcomes:

After completion of the course, the student will be able to

CO1	Analyze and calculate various stresses, shear Strength distribution, seepage losses.
CO2	Plan the Geotechnical exploration program for major civil engineering structure.
CO3	Predict the earth pressure on the resisting structures.
CO4	Analyze the stability of slopes and solve the field problems.
CO5	Use appropriate ground improvement techniques in required projects

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SYLLABUS:

UNIT I	**(7 Hours) (12 Marks)**
SHEAR STRENGTH AND STRESS DISTRIBUTION Introduction, Mohr Coulomb's theory, Drainage condition. Measurement of shear strength by direct shear test, tri-axial test, unconfined compression test. Vane shear test, sensitivity. Shear strength of clay's and sands. Stress distribution in soil mass, Boussinesq's theory,point load, uniformly Loaded rectangular & circular areas, Newmark's influence chart, Equivalent point load method	
UNIT II	**(8 Hours) (12 Marks)**
GEOTECHNICAL EXPLORATION Principle methods of subsurface exploration, geophysical methods, open pits and shafts, types of boring, location and depth of boring for different structures, types of soil samples and samplers. Collection & shipments of samples, plotting of bore log and sampling record. Standard penetration test, corrections for field N- values & correlations for obtained design soil parameters,pressure meter test.	
UNIT III	**(7 Hours) (12 Marks)**
LATERAL EARTH PRESSURE Earth pressure at rest, active and passive pressure, general & local states of plastic equilibrium in soil. Rankine's and Coulomb's theories of earth pressure, Effects of surcharge, submergence. Graphical construction by Culmann for simple cases of wall- soil system for active pressure condition. Concept of reinforced earth retaining wall.	
UNIT IV	**(7 Hours) (12 Marks)**
STABILITY OF SLOPES Causes and types of slope failure, stability analysis of infinite slopes and finite slopes, center of critical slip circle, slices method and friction circle. Slopes with pore pressure consideration. Taylor's stability numbers & stability charts, method of improving stability of slopes, types, selection and design of graded filter, concept of soil nailing.	
UNIT V	**(7 Hours) (12 Marks)**
GROUND IMPROVEMENT Introduction to different methods of ground improvement.	

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List of Books:

Text Books:

1. Soil Mechanics &Foundation Engg, B.C.Punmia
2. Soil Mechanics &Foundation Engg, K.R. Arora
3. Soil Mechanics &Foundation Engg, Dr. P.N. Modi
4. Soil Mechanics &Foundation Engg, V.N.S. Murthy

References:

1. Das, B.M. (2008). Advanced Soil Mechanics. Taylor and Fracis Group, London, Second edition.
2. Powrie, W. (2002). Soil Mechanics concepts and applications. Spon Press, Taylor and Fracis Group, London, Second edition.
3. Terzaghi, K., Peck, R.B. and Mesri, G. (1996). Soil Mechanics in Engineering Practice.

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PROGRAM ELECTIVE COURSE-I

SEMESTER V

COURSE :- GEOTECHNICAL ENGINEERING - II LAB

COURSE CODE: CE504PB

Hours/ Week	Credits	Continuous Evaluation	End Sem Exam	Total Marks
2 Hrs	1	25	25	50

1) **The practicals are based on theory subject of Geotechnical Engineering - II and CO's.**
2) **Minimum 08 practicals, from the list given below shall be performed:**
3) **Any one practical may be performed using virtual lab.**

List of Experiments
1. Direct Shear Strength
2. Vane shear Strength
3. Auger Boring and Sampling
4. Standard Penetration Test
5. Plotting of bore log and sampling record
6. California Bearing Ratio (CBR) Test
7. Graphical construction by Culmann methods
8. Graphical construction by Rebhans methods
9. Tri-axial Shear Strength test,
10. Unconfined compression test
11. Study of various Samplers
12. One field visit / Site visit with report submission (Compulsory)

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PRIYADARSHINI J. L. COLLEGE OF ENGINEERING, NAGPUR
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DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS OF THIRD YEAR BACHELOR OF TECHNOLOGY,

PROGRAM ELECTIVE COURSE-I

SEMESTER V

COURSE :- ADVANCED CONSTRUCTION MATERIAL

COURSE CODE: CE504TC

Hours/ Week	Credits	Duration of End Sem Exam	Continous Evaluation	End Sem Exam	Total Marks
3 Hrs	3	3 Hrs	40	60	100

Course Objectives:

1.	To understand composition and microstructure of various materials used in civil engineering and their application.
2.	To Understand the manufacturing and types of mortars.
3.	To have knowledge engineering behavior of various materials.
4.	To know the structure of a polymeric materials used in civil construction.
5.	To understand the sustainable materials used in construction.

Course Outcomes:

After completion of the course, the student will be able to

CO1	Understand the structural, physical and long term performance of building materials used in construction.
CO2	Understand special mortars and admixtures used in Civil engineering applications.
CO3	Understand the properties of ceramic materials in construction projects.
CO4	Understand the uses of polymeric materials in construction.
CO5	Apply the knowledge of green building concept and materials on site.

Dr. M. G. Pathan

M. D. Pathan R. H. Mohankar R. H. Mohankar S. S. Brito Y. D. Chintawar

SYLLABUS:

UNIT I	(8 Hours) (12 Marks)
CONSTRUCTION MATERIAL PROPERTIES a) Classifications of Construction Materials. b) Consideration of physical, Mechanical, thermo-physical properties, Characteristics behaviour under stress. c) Selection criteria for construction materials, waste products, reuse and recycling.	
UNIT II	**(7 Hours) (12 Marks)**
MATERIALS FOR MAKING MORTAR AND CONCRETE a) Lime manufacture, properties, hardening of lime, types of lime, lime concrete uses, cement, aggregates, water, characteristics, properties and uses of Pozzolana materials b) Types of mortars, special mortars, properties and applications, admixtures	
UNIT III	**(7 Hours) (12 Marks)**
CERAMIC MATERIALS a) Classification, Refractories, glass, glass wool. b) Mechanical, thermal and electrical properties c) Fire resistance materials, Uses and application.	
UNIT VI	**(7 Hours) (12 Marks)**
POLYMERIC MATERIALS AND STEEL a) Polymerization mechanism and depolymerisation. b) Rubber and plastics, properties, effect of temperature on mechanical properties, Uses and application. c) Types of structural steels, special steel, alloy steel, stainless steel, light gauge steel.	
UNIT V	**(7 Hours) (12 Marks)**
SUSTAINABLE MATERIALS A) Green concepts in buildings, Green building materials, Green building ratings IGBC and LEED manuals – mandatory requirements. b) Rainwater harvesting &solar passive architecture. Environmental friendly and cost effective building technologies, Requirements for buildings of different climatic regions.	

List of Books:

Text Books:

1. Engineering Materials by Rangwala S.C, Chortor Publication, 1991
2. Building Material by S.K Duggal, New Age International Publication, 2006
3. The ideas of green building by A.K.Jain, Khanna publisher, 2012
4. Building Materials Technology Structural Performance & Environmental Impactby Bruntley L.R, McGraw Hill Inc.

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PROGRAM ELECTIVE COURSE-I

SEMESTER V

COURSE:- ADVANCED CONSTRUCTION MATERIAL LAB

COURSE CODE: CEE504PC

Hours/ Week	Credits	Continuous Evaluation	End Sem Exam	Total Marks
2 Hrs	1	25	25	50

1) **The practicals are based on theory subject of Construction Material and CO's.**
2) **Minimum eight practicals shall be performed from list of experiments.**
3) **Any one practical may be performed using virtual lab.**

List of Experiments

1. Introduction and Identification of various advanced construction materials
2. Study of physical, Mechanical, thermo-physical properties of advanced construction materials
3. Study of recycled materials
4. Study of different types of lime
5. Preparation of lime cement mortar
6. Study of Refractories, glass, glass wool.
7. Study of Fire resistance materials
8. Study of rubber and plastic material properties
9. Study of green building materials
10. One field visit / Site visit with report submission (Compulsory)