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Shri Ramdeobaba College of Engineering and Management, Nagpur

SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR–440013

An Autonomous College affiliated to
RashtrasantTukadojiMaharajNagpur University,
Nagpur, Maharashtra (INDIA)

NEP BASE PROGRAMME SCHEME & SYLLABI

2023–2024 - I Year

2024-2025 - II Year

2025-2026 - III Year

2026-2027 - IV Year

B.Tech. (CIVIL ENGINEERING)

Shri Ramdeobaba College of Engineering and Management, Nagpur.
Department of Civil Engineering
Teaching and Evaluation Scheme B.Tech (Civil Engineering) NEP-2020 based
To be implemented from Session: 2023-24

Semester – I

Course Code	Category	Name of Course	Lecture	Tutorial	Practical	Credits	Theory Course				Practical Course	
							CA	ESE	Total	ESE Duration	LA-1	LA-2
PHT 1004	BSC-T	Physics for Civil Engineering	2	1	0	3	50	50	100	3	0	0
PHP 1004	BSC-P	Physics for Civil Engineering Lab	0	0	2	1	0	0	0	0	25	25
MAT1001	BSC-T	Applied Mathematics-I	2	1	0	3	50	50	100	3	0	0
MAP1001	BSC-P	Computation Mathematics Lab	0	0	2	1	0	0	0	0	25	25
CET1001	PCC-T	Infrastructure Components	1	0	0	1	50	0	50	0	0	0
CET1002	ESC-T	Basics of Surveying	2	0	0	2	50	50	100	2	0	0
CEP1002	ESC-P	Basics of Surveying Lab	0	0	2	1	0	0	0	0	25	25
CET1003	PCC-T	Building Services	2	0	0	2	50	50	100	2	0	0
CEP1004	VSEC	Conceptual Drawing and Drafting	0	0	4	2	0	0	0	0	25	25
HUT1002	AEC-T	English for Professional Communication	2	0	0	2	50	50	100	2	0	0
HUP1002	AEC-P	English for Professional Communication Lab	0	0	2	1	0	0	0	0	25	25
HUP1003-1 to HUP1003-10, PEP0001-21-22 and CHP0001-31-32*	CC-P	Liberal/Performing Art	0	0	2	1	0	0	0	0	25	25
HUT1004	VEC	Foundation course in Universal Human Values	1	0	0	1	50	0	0	0	0	0
			12	**2**	**14**	**21**	**350**	**250**	**550**	**12**	**150**	**150**

*List of Liberal/Performing Art coursesis enclosed

Shri Ramdeobaba College of Engineering and Management, Nagpur

DepartmentofCivil Engineering

SyllabusandSchemeforLiberal/Performingartsbasket

Sr. No.	Course Code	Course Name	Sem	Hours/week	Credits	Maximum marks	Department
						Continuous Evaluation	
1)	HUP0001-1	Fundamentals of Indian Classical Dance: Bharatnatayam	I/II	2	1	50	Humanities
2)	HUP0001-2	Fundamentals of Indian Classical Dance: Kathak	I/II	2	1	50	Humanities
3)	HUP0001-3	Introduction to Digital Photography	I/II	2	1	50	Humanities
4)	HUP0001-4	Introduction to Japanese Language and Culture	I/II	2	1	50	Humanities
5)	HUP0001-5	Art of Theatre	I/II	2	1	50	Humanities
6)	HUP0001-6	Introduction to French Language	I/II	2	1	50	Humanities
7)	HUP0001-7	Introduction to Spanish Language	I/II	2	1	50	Humanities
8)	HUP0001-8	Art of Painting	I/II	2	1	50	Humanities
9)	HUP0001-9	Art of Drawing	I/II	2	1	50	Humanities
10)	HUP0001-10	Nature camp	I/II	2	1	50	Humanities
11)	PEP0001-21	Disaster Management through Adventure Sports	I/II	2	1	50	Physical Education
12)	PEP0001-22	Self-defense Essentials and Basics Knowledge of Defense forces	I/II	2	1	50	Physical Education
13)	CHP0001-31	Art of Indian traditional cuisine	I/II	2	1	50	Chemistry
14)	CHP0001 -32	Remedies by Ayurveda	I/II	2	1	50	Chemistry

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Semester-II

Course Code	Category	Name of Course	Lecture	Tutorial	Practical	Credits	Theory Course				Practical Course	
							CA	ESE	Total	ESE Duration	LA-1	LA-2
CHT2001	BSC-T	Engineering Chemistry for Civil Engineers	2	0	0	2	50	50	100	2	0	0
CHP 2001	BSC-P	Engineering Chemistry for Civil Engineers Lab	0	0	2	1	0	0	0	0	25	25
MAT2001	BSC-T	Applied Mathematics-II	2	1	0	3	50	50	100	3	0	0
CET2001	ESC-T	Construction Materials	3	0	0	3	50	50	100	3		
CEP2001	ESC-P	Construction Materials Lab	0	0	2	1	0	0	0	0	25	25
CET2002	ESC-T	Engineering Mechanics	3	1	0	4	50	50	100	3	0	0
CET2003	ESC-T	Programming for Civil Engineers	2	0	0	2	50	50	100	2		
CEP2003	VESC	Application of python in Civil Engineering	0	0	2	1	0	0	0	0	25	25
HUT2001	IKS-T	Foundation literature of Indian civilization	2	0	0	2	50	50	100	2	0	0
PET2001	CC-T	Yoga/SportsRecreation	1	0	0	1	50	0	50	0	0	0
PEP2001	CC-P	Yoga/SportsRecreation	0	0	2	1	0	0	0	0	25	25
			15	**2**	**8**	**21**	**350**	**300**	**650**	**15**	**100**	**100**

Exit Option

Option 1	Infrastructure/Real Estate/Industry Internship (1 Month)	0	0	0	8	Industry Internship completion certificate along with report
Option 2	Mini Project with report(1 Month)	0	0	0	8	Mini project report to be assessed by supervisor

Shri Ramdeobaba College of Engineering and Management, Nagpur.

Department of Civil Engineering Teaching and Evaluation Scheme B.Tech (Civil Engineering) NEP-2020 based

To be implemented from Session: 2024-25

Semester-III

Course Code	Category	Name of Course	Lecture	Tutorial	Practical	Credits	Theory Course				Practical Course	
							CA	ESE	TOTAL	ESE Duration	LA-1	LA-2
CET3001	PCC-T	Fluid Mechanics I	3	0	0	3	50	50	100	3	0	0
CEP3001	PCC-P	Fluid Mechanics I	0	0	2	1	0	0	0	0	25	25
CET3002	PCC-T	Geotechnical Engineering	3	0	0	3	50	50	100	3	0	0
CEP3002	PCC-P	Geotechnical Engineering	0	0	2	1	0	0	0	0	25	25
CET3003	PCC-T	Solid Mechanics	3	0	0	3	50	50	100	3	0	0
CEP3003	PCC-P	Solid Mechanics	0	0	2	1	0	0	0	0	25	25
CET3004	PCC-T	Concrete Mix Design	1	0	0	1	25	25	50	1	0	0
CETM3005	MDM-T	Basic of Electrical Engineering	2	0	0	2	50	50	100	2	0	0
CET2980	OE-T	Open Elective - I	2	0	0	2	50	50	100	2	0	0
CET3006	MGMT-T	Finance Management for Civil	2	0	0	2	50	50	100	2	0	0
CEP3007	FP-P/VEC-T	Mini Project	0	0	4	2	0	0	0	0	25	25
			16	**0**	**10**	**21**	**400**	**400**	**800**	**16**	**100**	**100**

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Teaching and Evaluation Scheme B.Tech (Civil Engineering) NEP-2020 based
To be implemented from Session: 2024-25
Semester-IV

Course Code	Category	Name of Course	Lecture	Tutorial	Practical	Credits	Theory Course				Practical Course	
							CA	ESE	TOTAL	ESE Duration	LA-1	LA-2
CET4001	PCC-T	Structural Analysis	3	0	0	3	50	50	100	3	0	0
CEP4001	PCC-P	Structural Analysis	0	0	2	1	0	0	0	0	25	25
CET4002	PCC-T	Environmental Engineering - I	3	0	0	3	50	50	100	3	0	0
CEP4002	PCC-P	Environmental Engineering - I	0	0	2	1	0	0	0	0	25	25
CET4003	PCC-T	Reinforced Concrete Structures	3	1	0	4	50	50	100	3	0	0
CETM4004	MDM-T	Automation in Civil Engineering	2	0	0	2	50	50	100	2	0	0
CET2990	OE-T	Open Elective - II	3	0	0	3	50	50	100	3	0	0
CEP4005	VSEC-P	Drawing Assessment & calculation	0	0	2	1	0	0	0	0	25	25
CET4006	AEC-T	Technical Report Writing	1	0	0	1	50	0	50	0	0	0
CET4007	MGMT-T	Contracts Accounts and Work Management	2	0	0	2	50	50	100	2	0	0
			17	**1**	**6**	**21**	**350**	**300**	**650**	**16**	**75**	**75**

Option 1	Infrastructure/Real Estate/Industry Internship (1 Month)	0	0	0	8	Industry Internship completion certificate along with report
Option 2	Mini Project with report (1 Month)	0	0	0	8	Mini project report to be assessed by supervisor

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To be implemented from Session: 2025-26

Semester-V

Course Code	Category	Name of Course	Lecture	Tutorial	Practical	Credits	Theory Course				Practical Course	
							CA	ESE	TOTAL	ESE Duration	LA-1	LA-2
CET5001	PCC-T	Transportation Engineering	3	0	0	3	50	50	100	3	0	0
CEP5001	PCC-P	Transportation Engineering	0	0	2	1	0	0	0	0	25	25
CET5002	PCC-T	Foundation Engineering	3	0	0	3	50	50	100	3	0	0
CET5003	PCC-T	Environmental Engineering - II	3	0	0	3	50	50	100	2	0	0
CEP5003	PCC-P	Environmental Engineering - II	0	0	2	1	0	0	0	0	25	25
CET5004	PCC-T	Advanced Construction Materials	1	0	0	1	25	25	50	1	0	0
CET5005	PEC-T	Program Elective - I	3	0	0	3	50	50	100	3	0	0
CEP5005	PEC-P	Program Elective - I	0	0	2	1	0	0	0	0	25	25
CETM5006	MDM-T	recent trends in civil engineering	2	1	0	3	50	50	100	3	0	0
CET3980	OE-T	Open Elective - III	3	0	0	3	50	50	100	2	0	0
			18	**1**	**6**	**22**	**350**	**350**	**700**	**18**	**75**	**75**

Program Elective – I (T&P)

CET5005-1/CEP5005-1	Advanced Construction Techniques	CET5005-2/CEP5005-2	Water and Waste water Treatment	CET5005-3/CEP5005-3	Advanced Structural Analysis	CET5005-4/CEP5005-4	Ground Improvement
CET5005-5/CEP5005-5	Railway Engineering						

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Semester-VI

Course Code	Category	Name of Course	Lecture	Tutorial	Practical	Credits	Theory Course				Practical Course	
							CA	ESE	TOTAL	ESE Duration	LA-1	LA-2
CET6001	PCC-T	Estimating & Costing	3	0	0	3	50	50	100	3	0	0
CET6002	PCC-T	Design of Steel Structures	2	1	0	3	50	50	100	3	0	0
CET6003	PCC-T	Fluid Mechanics - II	3	0	0	3	50	50	100	2	0	0
CEP6003	PCC-P	Fluid Mechanics - II	0	0	2	1	0	0	0	0	25	25
CET6004	PEC-T	Program Elective - II	3	0	0	3	50	50	100	3	0	0
CEP6004	PEC-P	Program Elective - II	0	0	2	1	0	0	0	0	25	25
CET6005	PEC-T	Program Elective - III	4	0	0	4	50	50	100	3	0	0
CETM6006	MDM-T	Remote Sensing & GIS	2	0	0	2	50	50	100	2	0	0
CEP6007	VSEC-T	Computed Aided Design in Civil Engineering	0	0	4	2	-	-	-	0	25	25
			18	**0**	**8**	**22**	**350**	**350**	**700**	**16**	**75**	**75**

Exit Option

Option 1	Infrastructure/Real Estate/Industry Internship (1 Month)	0	0	0	8	Industry Internship completion certificate along with report
Option 2	Minor Project with report (1 Month)	0	0	0	8	Mini project report to be assessed by supervisor

Program Elective – II (T&P)

CET6004-1/CEP6004-1	Design of Concrete Structure	CET6004-2/CEP6004-2	Environmental Impact Assessment	CET6004-3/CEP6004-3	Pavement Design	CET6004-4/CEP6004-4	Geotechnical Explorations
CET6004-5/ CEP6004-5	Sustainable Construction Materials	CET6004-6/ CEP6004-6	Water Transmission & Distribution System				

Program Elective – III (T)

CET6005-1	Advanced Concrete Technology	CET6005-2	Solid Waste Management	CET5005-3	Urban Transportation Planning	CET5005-4	Reinforced Earth
CET6005-5	Energy Efficient Buildings	CET6005-6	Integrated Water Resources Management				

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Semester-VII

2024-2025 (Proposed) to be discuss in BoS

Course Code	Category	Name of Course	Lecture	Tutorial	Practical	Credits	Theory Course				Practical Course	
							CA	ESE	TOTAL	ESE Duration	CA	ESE
CET7001	PCC-T	Hydrology and Water Resources	3	0	0	3	50	50	100	3	0	0
CET7002	PCC-T	Construction Engineering & Management	3	0	0	3	50	50	100	3	0	0
CET7003	PEC-T	Program Elective - IV	3	0	0	3	50	50	100	3	0	0
CEP7003	PEC-P	ProgramElective - IV	0	0	2	1	-	-	-	0	50	50
CET7004	PEC-T	ProgramElective - V	3	0	0	3	50	50	100	3	0	0
CET7005	PEC-T	Program Elective - VI	3	0	0	3	50	50	100	3	0	0
CETM7006	MDM-T	Metro Rail TransportationDesign and Construction	2	0	0	2	50	50	100	2	0	0
CEP7007	VEC/ Project-P	Minor Project	0	0	8	4	0	0	0	0	50	50
			17	**0**	**10**	**22**	**300**	**300**	**600**	**17**	**50**	**50**

Program Elective – IV (T&P)

CET7003-1/CEP7003-1	Contracts Management	CET7003-2/CEP7003-2	Earth and Rockfill Dams	CET7003-3/CEP7003-3	Earthquake Resistant Design of RCC Structures	CET7003-4/CEP7003-4	Industrial Waste Water Treatment
CET7003-5/ CEP7003-5	Traffic Engineering and Management	CET7003-6/ CEP7003-6	Open Channel Hydraulics				

Program Elective – V (T)

CET7004-1	Airport Planning and Design	CET7004-2	Special Geotechnical Constructions	CET7004-3	Industrial Structures	CET7004-4	Air Pollution & Control
CET7004-5	Digital Technologies for Civil Engineers	CET7004-5	Watershed Conservation and Management				

Program Elective – VI (T)

CET7005-1	HighwayConstruction AndManagement	CET7005-2	AdvancedGeotechnical Engineering	CET7005-3	Bridge Engineering	CET7005-4	Environmental System Modeling
CET7005-5	NumericalMethodforCivil Engineers	CET7004-5	Climate Change & Mitigation				

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Department of Civil Engineering

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Semester-VIII

2024-2025 (Proposed) to be discuss in BoS

Course Code	Category	Name of Course	Lecture	Tutorial	Practical	Credits	Theory Course				Practical Course	
							CA	ESE	TOTAL	ESE Duration	CA	ESE
Option 1 - Project												
CEP8001	VEC/ Project-P	Major Project	0	0	12	6	0	0	0	0	100	100
CET8002	PCC-T	Retrofitting & Rehabilitation of Civil Infrastructure	3	0	0	3	50	50	100	3	0	0
CET8003	PCC-T	Irrigation Engineering	3	0	0	3	50	50	100	3	0	0
Option 2 – Industry Internship												
CEP8004	II-P	Industry Internship	0	0	24	12	0	0	0	0	100	100
Option 3 - Research Internship												
CEP8005	RI-P	Research Internship	0	0	18	9	0	0	0	0	100	100
CET8006	PCC	MOOC/Classwork suggested by Supervisor	3	0	0	3	50	50	100	3	0	0
Option 4 - TBI Internship												
CEP8007	TBI	TBI Internship	0	0	24	12	0	0	0	0	100	100
			0	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**100**	**100**

Breakup of Semester wise Credits

Semester	Lecture	Tutorial	Practical	Credits
1	12	2	14	21
2	15	2	8	21
3	16	0	10	21
4	17	1	6	21
5	16	3	6	22
6	16	2	8	22
7	17	0	10	22
8	0	0	24	12
Total	**109**	**10**	**86**	**162**

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CET5001 Course Name: Transportation Engineering

L :3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcome

After the completion of the course in Transportation Engineering, the student should be able to:

1. Define and describe different objectives and requirements of Highway Development and Planning,Alignments.
2. Explain,Discriminate and Design variousGeometric Features ofHighways.
3. Understand, analyse, apply and evaluate the tests on Highway materials, construction methodsanddesignthecomponentsofPavements,
4. Understand, analyse, apply and evaluate the parameters of Traffic Engineering.

Unit I

Highway Development & Planning

Principles of Highway planning, Road development in India, Classification of roads, network patterns,Planning,Surveys.HighwayAlignment:Requirements,EngineeringSurveys.

Unit II

Highway Geometric Design

Cross Section elements, carriageways, camber, stopping & overtaking sight Distances, Horizontal alignment- Curves, design of super elevation, widening,transition curves, vertical curves.

Unit III

Pavement Design

Types of pavements & characteristic, Design parameters, Axle & Wheel load, tyre pressure, ESWL for dual Wheels, repetitions, Group Index & IRC method of flexible pavement design. Analysis of load &
temperaturestressesofrigidpavement,joints.

Unit IV:

Highway Construction materials, methods & Maintenance

Highway Materials: Properties of sub grade and pavement component materials, Tests on subgradesoils, aggregates and bituminous materials. Application of Geosynthetics, Earthen/Gravel road, Water Bound Macadam, Wet Mix macadam, Bituminous pavement,

Cement Concrete pavement. Pavement failures, maintenanceandstrengtheningmeasures.

Unit V

Traffic Engineering

Traffic characteristics (Road User, Driver and Vehicular characteristics), Traffic Studies (Volume studies, speed studies, parking studies and accident studies), Traffic Safety (Causes and types of accidents, Use of intelligent transportation system), Traffic controls (Road markings, Traffic signs,traffic signals)

TextBooks:

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised, 10th Edition,Nem
Chand&Bros,2017
2. Kadiyalai,L.R.,'TrafficEngineeringandTransportPlanning',KhannaPublishers.
3. ParthaChakrabortyandAnimeshDas ' Principles ofTransportationEngineering,PHILearning,
4. SrinivasaKumar, R,TextbookofHighwayEngineering,UniversitiesPress, 2011.

ReferenceBooks

1. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition,2009.
2. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski, 'Principles of Highway Engineeringand
TrafficAnalysis',4thEdition,JohnWiley
3. IRCCodes

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CEP5001 Course Name: Transportation Engineering Lab

L : Hrs., P : 2 Hrs., Per Week Credits: 1

Course Outcomes

On successful completion of the course students will be able to;

1. Determine the various properties of aggregates
2. Determine the various properties of bitumen
3. Determine the various properties of soil subgrade

TestonSoil

1. CBRTest
2. AASHOClassification
3. TestonStabilizedsoil

Test on Aggregate

1. SpecificGravity&WaterAbsorption
2. CrushingValue test onAggregate
3. AbrasionValuetestonAggregate
4. Impact Value test on Aggregate

Test on Bitumen

1. Penetration Test
2. Softening Point Test
3. Ductility Test
4. Specific gravity of bitumen

Study experiments

1. BituminousMixDesign
2. Road Construction Machineries
3. Stripping Test onBituminous Mix

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CET5002 Course Name: Foundation Engineering
L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcomes

On successful completion of the course students will be able to,

1. Plan the Geotechnical exploration program for major civil engineering structure.
2. Analyze the stability of slopes and solve the field problems.
3. Predictthe earth pressure on the resisting structures.
4. Understand various geotechnical designs and select type of foundations.
5. Studythevarioustechniquesofgroundimprovementandapplythemonfield.

UnitI

Geotechnical Exploration

Principle methods of subsurface exploration, IS 1892, geophysical methods, open pits and shafts, typesof boring, number, location and depth of boring for different structures, types of soil samples andsamplers.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,pressuremetertest.

Unit II

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.. Graphicalconstruction by Culmann for simple cases of wall- soil system for active pressure condition. Conceptofreinforcedearthretainingwall.

UnitIII

StabilityOf Slopes

Causes and types of slope failure, stability analysis of infinite slopes and finite slopes, center of critical slipcircle, 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,conceptofsoilnailing.

Unit IV

Shallow Foundation

Different types of shallow foundation and modes of failure. Bearing capacity of soil By Terzaghi's theory, Design criteria and codal provisions. Effect of water table on bearing capacity,

correction factor for shape and depth of footing. Bearing capacity estimation on sand and clays from N-value, factor affecting bearing capacity. Settlement of shallow foundation: elastic and consolidation settlement, differential settlement, control of excessive settlement. Proportioning the footing for equal settlement. Plate load test: Procedure, interpretation for bearing capacity and settlement prediction, limitations, IS code method.

Unit V

Pile Foundations

Classification of piles, constructional features of cast-in-situ & pre-cast concrete piles. Pile driving methods. Load transfer mechanism of axially loaded piles. Pile capacity by static formula & dynamic formulae. Pile load test and interpretation of data, group action in piles, spacing of piles, negative skin friction and its effect on pile capacity, general feature of under reamed piles. Settlement of pile group, Introduction to IS2911.

Unit VI

Ground Improvement

Introduction to different methods of ground improvement.

Text Book

1. Basic and Applied soil Mechanics by Gopal Ranjan & A.S. Rao, New Edge Int. Ltd. (2004)
2. Foundation analysis and design by Bowles J. E., McGraw Hill International publishing (1995)
3. Soil Mechanics in Theory and Practice by Alam Singh, Asia Publisher and Dist. (1975 & later).
4. Geotechnical Engineering : A practical problem solving approach by Sivakugan N., Das B. M., Cengage Learning, 2011

Reference

1. Advanced Foundation Engineering: V. N. S. Murthy, CBS Publications (2007)
2. Principles of Foundation Engineering: B. M. Das, Cengage Publications (2011)
3. Foundation Engineering Manual : By N. V. Nayak
4. NPTEL Course
5. IS codes

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CET5003 Course Name: Environmental Engineering-II

L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcomes

The students would be able to,

1. Describe and explain the necessity of wastewater treatment along with the basic knowledge of collection methodology, treatment processes and disposal methods.
2. Apply the knowledge of various principles, theories and equations in process analysis and in the design of various components of sewerage system.

Unit I

General Aspects of waste water treatment : Necessity of treatment, classification of waste water, grey water and black water, system of sanitation, patterns of sewage collection systems. Estimation of storm water and sanitary waste water.

Conveyance of sewage : Types, shapes, hydraulic design of sewer.

Unit II

Laying of sewer : Procedure for laying of sewer to grade, testing of sewer line.

Sewer Appurtenances : Manhole, street inlets, storm water overflows, inverted syphons, flushing, ventilation, drop manhole, lamp hole and catch basin.

House plumbing systems : Ideal requirements of HPS, types of HPS, types of pipes used in HPS, traps and its types, anti-syphonage.

Unit III

Characteristics of sewage : Physical, chemical and biological characteristics of wastewater and its significance, BOD rate constant, BOD equation and its application to simple analysis.

Disposal of wastewater : Disposal standards, disposal by dilution, disposal by land treatment along with their advantages and disadvantages.

Unit IV:

Wastewater treatment : Wastewater treatment flow sheet and its site selection, preliminary and primary treatment - Screens, Grit chambers, Primary Settling Tank (including simple design).

Unit V

Secondary treatment : Types of secondary treatment, principle of biological treatment, aerobic and anaerobic treatment processes, activated sludge process and trickling filter.

Treatment of sludge : Principle and necessity of sludge treatment, sludge digestion, sludge drying beds.

Unit VI

Rural sanitation : Pit privy, aqua privy, twin pit toilets bio-gas recovery. Septic tank including soak pit, (including design problem), sullage (Grey water) collection, treatment and disposal, Faecal sludge management.

Introduction to Reuse of Waste Water and Case Studies : Introduction to MBR SBR and constructed wet lands. General idea about various unit operations and treatment processes.

Text Books

1. B.C.Punmia," Waste Water Engineering" - Laxmi Publication
2. G.S.Birdie, "Water Supply & Sanitary Engineering"- Dhanpat Rai Publ. Company (P) Ltd.
3. S.J. Arceivala waste water treatment.

Reference

1. S. K. Garg " Environmental Engineering Vol-II (Khanna Publication)
2. CPHEEO manual on sewerage and sewage treatment
3. Metcalf and Eddy "waste water treatment"

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CEP5003 Course Name: Environmental Engineering-II Lab

L : Hrs., P : 2 Hrs., Per Week Credits: 1

Course Outcomes:

The student would be able to:

1. Understand and evaluate the significance of various characteristics of wastewater along with the knowledge of disposal standards
2. Analyze various characteristics of wastewater.
3. Understand the necessity of wastewater treatment.
4. Analyze and interpret experimental data obtained from wastewater samples and suggest the type of treatment required for its safe disposal.
5. Remember and understand various principles and instruments used in wastewater analysis.,

PRACTICALS:

Minimum Eight Experiments

1. To determine oil & grease content of a given wastewater sample using separating funnel
2. To determine optimum coagulant dosage using Jar test apparatus
3. To determine of TDS of given sample using TDS meter
4. To determine moisture content of given sample as per IS 1350:1984 (BIS 1984).
5. To determine ash content and volatile matter and fixed carbon content of given sample as per IS 1350:1984 (BIS 1984).
6. To determine sludge volume index (SVI) in the given wastewater sample.
7. To determine calcium and magnesium ions present in the given sample.
8. To determine Mixed liquor suspended solids and mixed liquor volatile suspended solids of a given wastewater sample.
9. To determine the Biochemical oxygen demand (BOD) of a given wastewater sample.
10. To study the determination of Chemical Oxygen Demand (COD) of a given wastewater sample
11. To determine percentage of available chlorine in given sample containing bleaching powder.
12. To determine sulphates using spectrophotometer.
13. To determine turbidity of a solution using Nepheloturbidimeter.

Text Books :

1. B.C.Punmia," Waste Water Engineering" - Laxmi Publication
2. G.S.Birdie, "Water Supply & Sanitary Engineering"- Dhanpat Rai Publishing Company (P)
Ltd.

3. Metcalf & Eddy, “Wastewater Engineering: Treatment and Resource Recovery” Publisher:
McGraw Hill.
4. S.J. Arceivala, “Wastewater Treatment and Disposal”, Marcel Dekker,1981.
5. Fair G M, Geyer J C and Okun, “Water and Wastewater Engineering”, Vol II, JohnWiley Publications, 1969

Reference Books:

1. Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water works Association, Water Environment Federation.
2. Civil Engineering Department, RCOEM, Laboratory Manual.
3. CPHEEO manual on sewerage and sewage treatment.
4. IS 3025: 1987 Methods of sampling and test (physical and chemical) for water and wastewater.

Shri Ramdeobaba College of Engineering and Management

Department of Civil Engineering

Syllabus for Semester B.Tech V

Course Code: CET5004 Course Name: Advanced Construction Materials

L : 1 Hrs., P : Hrs., Per Week Credits: 1

The students will be able to

1. classify and select advance construction materials on the basis oftheir properties.
2. The students will be able to identify and suggest ceramic and polymeric materials for improvement in functional performance of building components.
3. The students will be able to demonstrate the use of industrial by-products and waste in new building materials.
4. The students will be able to explore use of new construction chemicals and repairing methods.

Unit I

Construction Materials : Classifications, selection criteria for construction materials. Materials engineering concept: Consideration of physical, Mechanical, thermal, and other Properties. Nature of materials.

Laboratory measuring devices : Introduction of Dial gauge, LVDT, strain gauge, proving ring, load cell

Unit II

Ceramic Materials : Mechanical, thermal and electrical properties. Processing of ceramic, classification, refractories, glass, uses and application

Polymeric Materials : Plastic as engineering material, Thermoplastics, Thermosetting plastic, Elastomers. Properties, additives and compounding of polymers, methods of processing of polymers, uses and application, Scope of polymers in civil engineering

Unit III

Ferro-cement, Fibre reinforced concrete, high performance concrete, special types of concretes. Stucco plaster, new construction materials e.g. cladding, false ceiling and panelling, etc.

Unit IV

Composites : requirements, classification, microscopic composites, macroscopic composites, their applications and properties. Thermal performance of materials and insulating materials

Acoustics and sound proofing methods and materials

UnitV

Engineering wood products

Use of waste products and industrial by-products: Fly ash, micro-silica, GGBFS and other mineral products

Geo-textiles and geo-synthetics, geogrids

Unit VI

Construction Chemicals : Property modifiers, materials for repair and retrofitting, water proofing material and process of construction,

References:

1. Engineering materials: Polymers, Ceramics and composites, Bhargava A K, PHI Publications, Second edition, 2012
2. Materials for Civil and Construction engineers, Michael S Mamlouk, John P Zeniewski, Pearson
Publications, Third edition, 2014
3. Engineering Materials, Rangawala S.C., Chortor Publications
4. Building Materials, S.K. Duggal, New Age International Publications, Fourth edition, 2012
5. Building Materials Technology Structural Performance & Environmental Impact, L. Reed Brantley, Ruth T. Brantley, McGraw Hill Inc Publications
6. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
7. Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro,McGrawHill,

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CET5005-1 Course Name: Advanced Construction Techniques

L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Objectives

1. To share overview of latest concrete construction methods.
2. To make the students understandable of various methods of handling and placing of concrete.
3. To make the students familiar with the construction techniques in marine environment.
4. To make students aware about the quality and safety measures in construction works.

Course Curriculum

Concrete Construction Methods,Formwork Design and Scaffolding; Slip Forms and other moving forms; Pumping of Concrete; Grouting and Mass Concreting Operations(roller compacted concrete); Ready-Mix Concrete; Various Methods of Handling and Placing Concrete, Accelerated curing, Hot and cold weather concreting, Under water concreting, Prestressing. Steel and Composite Construction Methods, Fabrication and erection of structures including heavy structures, Prefab construction, Industrialized construction and Modular coordination. Special Construction Methods, Construction in Marine Environments, High Rise Construction, Bridge Construction including Segmental Construction, Incremental Construction and Push Launching Techniques; Geosynthetics; Safety, Quality Measures and Reliability

Course outcomes

1. To get overview of latest concrete construction methods.
2. An understanding of various methods of handling and placing of concrete.
3. Understand the construction techniques in marine environment.
4. To make aware the quality and safety measures in construction works.

Text and Reference Books:

1. Neville A M and Brooks J J, “Concrete Technology” Pearson Education Asia, Singapore, 1994.

2. Neville A M, “Properties of Concrete” Pearson Education, New Delhi, 2004.

3. Peurifoy R L, “Construction Planning, Equipment and Methods” McGraw Hill Ltd., New York, 2002.

Shri Ramdeobaba College of Engineering and Management
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Syllabus for Semester B.Tech V

Course Code: CEP5005-1 Course Name: Advanced Construction Techniques Lab

L : Hrs., P : 2 Hrs., Per Week Credits: 1

Lab Assignment:

1. Prepare a detailed drawing for Pre cast members like beam, columns
2. Prepare a detailed drawing for PEB structures.
3. Prepare a detailed drawing for composite structures.
4. Prepare a detailed drawing for silp formwork
5. Prepare a detailed drawing for any Trenchless Technology civil engineering project.

   Detailed project on any one topic pre cast/PEB/Composite structure.

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Course Code: CET5005-2 Course Name: Water and Waste Water Treatment

L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcomes

The students would be able to,

(Elective - IV) Total Credits : 01

1. Describe and explain the necessity of water treatment along with the knowledge of various treatment processes, principles, analysis, design parameters and also able to design of various units of water treatment plant.
2. Describe and explain the necessity of waste water treatment, along with the knowledge of various treatment processes, principles, analysis, disposal methodology, design parameters and also able to design of various units of waste water treatment plant.

Unit - I

Necessity of Water treatment and Aeration : Necessity of water treatment, various treatment processes used in water, flowsheet of treatment plant and site selection for treatment plant.

Gas transfer and Aeration : Gas transfer phenomenon, two film theory of gas transfer. Objective of aeration, types aerators, time of exposure of gravity aerator, design of cascade aerator and design parameters of spray aerator.

Unit - II

Sedimentation with Coagulation : Mixing devices and Flocculation : Necessity and various types of rapid and slow mixing devices, design parameters and design of baffle mixing and flash mixer. Mechanisms of flocculation, types of flocculation, theory of removal of colloidal particles, design parameters and design flocculator.

Sedimentation : Principles sedimentation, types of settling, analysis of discrete and flocculant settling design parameters and design sedimentation tank and clariflocculator

Unit - III

Filtration and Disinfection : Filtration: mechanism of filtration, Theory of rapid sand filters, filter media specifications, selection of filter sand from an available stock sand, design of rapid sand filters.

Disinfection : Method of disinfection, types of disinfectants, disinfecting action of chlorine and various forms of application of chlorine, ionization reaction, Chick's law of

disinfection, breakpoint chlorination, , factors affecting efficiency of chlorination.

Unit - IV

Characteristics of waste water and disposal methodology : Various characteristics of waste water, BOD curve and its analysis, determination of BOD rate constant by Least square method and Thomas graphical method. Disposal of sewage effluent by dilution and by land treatment. Self-purification curve, Streator - Phelps's equation of analysis of oxygen sag curve. Various methods of application of sewage effluent for land treatment.

Unit - V

Preliminary and Primary treatment : Treatment Methods: Waste water treatment flow sheet, preliminary and primary treatment units, design parameters and design of screen and girt chamber. Analysis of sedimentation, design parameters and design of primary settling tank.

Unit - VI

Secondary Treatment : Biological unit processes: principles of biological treatment processes, activated sludge process and its types, trickling filter and its types, process design calculations of activated sludge process and trickling filters. Sludge treatment: aerobic and anaerobic digestion and sludge drying beds.

Text Books

1. Wastewater Engineering by Metcalf & Eddy – Tata McGraw Hill
2. Water supply Engineering Vol-I & Waste water Engineering Vol-II by B.C. Punmia—Laxmi Publication

References

1. CPHEEO Manual of water supply & treatment
2. CPHEEO Manual on Sewerage & sewage treatment.
3. Water treatment by A.G. Bhole –IWWA Publication
4. Water supply & Sewage by M.S. Macghee, -- Tata McGraw Hill

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Syllabus for Semester B.Tech V
Course Code: CEP5005-2 Course Name: Water and Waste Water Treatment Lab
L : Hrs., P :2 Hrs., Per Week Credits: 1

Course Outcomes

The students would be able to,

1. To design the various units of water treatment plant by applying the knowledge of the of various design parameters.
2. To design the various units of waste water treatment plant by applying the knowledge of the of various process parameters.

Students should submit Minimum Ten assignments from the following list.

1. Design of cascade aerator
2. Design of flash mixer
3. Design of rectangular flocculator
4. Design of circular flocculator
5. Design of rectangular sedimentation tank
6. Design of circular sedimentation tank
7. Design of circular clariflocculator
8. Design of Rapid Sand Filter
9. Design of bar screen
10. Design of grit chamber
11. Design of Primary sedimentation tank
12. Process parameters determination of Activated sludge process
13. Process Parameter determination of Trickling filter
14. Analysis of Oxygen Sag curve.

References

1. CPHEEO Manual of water supply & treatment
2. CPHEEO Manual on Sewerage & sewage treatment.
3. Wastewater Engineering by Metcalf & Eddy – Tata McGraw Hill
4. Water supply Engineering Vol-I & Waste water Engineering Vol-II by B.C. Punmia—Laxmi Publication

Shri Ramdeobaba College of Engineering and Management
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Syllabus for Semester B.Tech V

Course Code: CET5005-3 Course Name: Advanced Structural Analysis
L :3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcome

On completion of the course students will be able to;

1. know the deflected shape of structures for understanding response due to various loads.
2. analyze the beam and frames for vertical and horizontal loads and draw SFD and BMD.
3. calculate forces in members of truss due to load by stiffness method.
4. analyze the non-prismatic beam for understanding its behavior

Syllabus

Kani's method applied to symmetrical and unsymmetrical frames with sway (Upto one bay two storey)
Approximate Method structural analysis for multistoried frames with lateral loads (portal and cantilever method), Approximate methods for vertical loads i.e. Substitute method etc. (Max three bay three storeys)
Analysis of non-prismatic fixed beams by **Column analogy Method,** Application to beams, Calculations of stiffness factors and carryover factors for non-prismatic member.

Introduction to **Flexibility Method** of structural analysis, influence coefficients, Choice of base determinate structure and redundant forces, compatibility equations and solution of simple beam problems with sinking effect, up to 3 degree of indeterminacy.

Basic concept, Degree of Freedom. Formulation of elemental/local stiffness matrix and global stiffness matrix for **Plane Truss.** Transformation Matrix, Assembly of Global/ Structural stiffness matrix up to (8x8).

Formulation of element/local **Stiffness Matrix** and global stiffness matrix for beam members (without axial deformations) for **Continuous Beams**, Assembly of global/ structural stiffness matrix, Member load matrix due to various type of loading, Assembly of global/ structure load matrix up to Three Elements. Solution to problems with maximum degree of freedom Three.

Formulation of element/ local Stiffness Matrix and global stiffness matrix for **Plane frame** members (without axial deformations), Transformation matrix Assembly of global/ structural stiffness matrix, Member load matrix due to various type of loading, temperature, Assembly of global/ structural load matrix. Solution to Plane frame problems with maximum degree of freedom three.

References

1. Timoshenko S. P.; &Young D.H. “Theory of Structures; International edition”, McGraw Hill,1965.
2. C.S.Reddy“Basics Structural Analysis” McGraw Hill3rd edition 2010
3. Ghali, A.; & Neville A. M. “Structural Analysis A Unified Classical and Matrix Approach (4th Edition)”, E & FN SPON; Van Nostrand Reinhold, 1997.
4. Wang, C. K. “Indeterminate Structures”, Prentice Hall of India; 2000.
5. Schodek, D.L. “Structures (4th Edition)”, McGraw Hill International editions; 1983.
6. Meghre, A.S.; &Deshmukh, S.K. “Matrix Methods of Structural Analysis (1st Edition)”, Anand; CharotarPubls, 2003.
7. Weaver J.M.; & Gere, W. “Matrix Analysis of Framed Structures (3rd edition)”, Van Nostrand Reinhold; New York, 1990.
8. Jain, O.P. & Arya, A.S. “Theory and Analysis of Structures; Vol. I & II”, Nemchand Brothers; Roorkee.
9. KrishnamurthyD., “Theory of Structures”, J.K. Jain Brothers, 1976.
10. RajsekaranS.,Shankarasubramanian G. “Computational of StructuralMechanics”, Prentice Hallof India Pvt. Ltd., New Delhi, 2001.
11. P.N.Godbole,R.S.Sonparote, S. U. Dhote. “Matrix methods of Structural Ananlysis”, PHI learning PvtLtd.publishers
12. G.S. Pandit& S.P. Gupta. “Structural Analysis-Matrix Approach”, Tata McGraw Hill PublishingCo. Ltd

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CEP5005-3 Course Name: Advanced Structural Analysis Lab

L : Hrs., P : 2 Hrs., Per Week Credits: 1

Course Outcomes

The students would be able to:

1. Analyze determinate and indeterminate structures using classical and matrix methods.
2. Apply approximate and stiffness methods for analyzing multi-storey, multi-bay building frames under different loading conditions.
3. Develop and assemble stiffness matrices for trusses, beams, and frames for structural analysis.
4. Perform manual and software-based analysis of beams, trusses, and frames with various loads and boundary conditions.

Students should submit Minimum Eight assignments from the following list:

1. Analysis of symmetrical portal frame (one-bay, two-storey) using **Kani's Method (non-sway)** and verify by Software.
2. Analysis of unsymmetrical frame (one-bay, two-storey) with sway using **Kani's Method (Sway)**and verify by Software.
3. Analysis of a non-prismatic fixed beam using **Column Analogy Method**and verify by Software.
4. **Flexibility method** analysis of a continuous beam with support sinking (up to 3 degrees of indeterminacy)and verify by Software.
5. Analysis and findlocal and global stiffness matrices, global laod matrices for **Plane Truss**and verify by Software.
6. Manual analysis of a **continuous beam** using stiffness method, including assembly of stiffness and load matricesand verify by Software.
7. Manual analysis of a **continuous beam** using Direct stiffness method, including assembly of stiffness and load matrices and verify by Software.
8. Manual analysis of a **plane frame** using stiffness method considering member loads and verify by Software.
9. Manual analysis of a **plane frame** using Direct stiffness method considering member loads and verify by Software.
10. Modeling and analysis of a portal frame using software (STAAD.Pro/ETABS/SAP2000) and validation with manual results.

References

1. **Matrix Methods of Structural Analysis** – William Weaver & James M. Gere
2. **Advanced Structural Analysis** – Devdas Menon, Narosa Publishing
3. **Structural Analysis Vol. I & II** – R.C. Hibbeler, Pearson
4. **Structural Analysis** – C.K. Wang, Charles G. Salmon
5. **ETABS / STAAD.Pro / SAP2000 Software Manuals and Help Files**
6. **IS: 456–2000** – Code of Practice for Plain and Reinforced Concrete

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CET5005-4 Course Name: Ground Improvement
L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcomes

On successful completion of the course students will be able to,

1. Identify problematic soils and their associated issues.
2. Understand the various ground improvement techniques.
3. Propose suitable remedial techniques and their design.

Introduction to ground improvement techniques : Concepts and essential requirements of ground improvement, classification of ground improvement techniques, economic considerations and suitability.

Compaction and Consolidation :Equipments and control of field compaction, surface compaction and deep compaction, vibrofloatation. Preloading and static loads and by vacuum, accelerated consolidation by sand drains, free strain and equal strain cases, design of sand drain layout.

Stabilization : Methods of stabilization, mechanical stabilization, organic and inorganic stabilizing agents and their characteristics - lime, cement, lime, flyash, bitumen and chemicals.
Grouting : Materials and methods of grouting, grout volume and grouting pressure, grout requirements and tests, grouting of rock foundation of dams.
Reinforced earth and Geotextiles : Basic theory of reinforced earth, materials, method, application and design of reinforced earth, characteristics of reinforced earth masses; geotextiles, geogrids and geosynthetics, their basic features, functions and applications.

Stone columns : Application, layout feature, procedures of installation, vibrofloat and rammed stone column, unit cell concept, load transfer mechanism, settlement in stone column, methods of improving the effectiveness of stone column, Design for stone column layout for intended requirements.

Text Book

1. Ground Improvement Techniques : P. P. Raj, Prentic Hall of India (2005)
2. Engineering Principles of Ground Modification : M.R. Housmann, McGraw Hill (1990)
3. Principles of Foundation Engineering: Braja M. Das, Cengage Learning Publications (2011)

References

1. Constructional and Geotechnical Methods in Foundation Engineering : R.M. Koerner, McGraw Hill (1985)

2. Design and Construction of Stone Column: FHWA Report No. Rd 83/026, (1983)
3. Advanced Foundation Engineering: V. N. S. Murthy, CBS Publications (2007)
4. NPTEL Course on Ground Improvement
5. Foundation Engineering Manual : Nayak N. V., Dhanpat Rai Publications (2009)

Shri Ramdeobaba College of Engineering and Management
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Course Code: CEP5005-4 Course Name: Ground Improvement Lab

L : Hrs., P : 2 Hrs., Per Week Credits: 1

Outcomes:

1. Student will have an ability to suggest suitable ground improvement techniques.

2. Student will have an ability to design and layout of propose techniques.

The term work shall consist of analysis and design for any THREE of the following design assignments to be carried out by each student individually (with different data).

1. Design of sand layout in soft compressible clay deposit for required (accelerated) rate of consolidation.

2. Design of a reinforced earth retaining wall.

3. Design of stone column layout (using conventional incremented fill material or cemented granular fill material) for intended degree of improvement in safe load carrying capacity of soft soil ground.

4. Analysis and design of skirted stone columns.

The work shall be submitted in the form of a journal and shall be assessed by concerned teacher/s through viva-voice examination

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CET5005-5 Course Name: Railway Engineering
L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcome

1. Students should be able to explain and describe various terms in railway engineering
2. Students should be able to Explain, Discriminate and design various geometric features of railway track.
3. Students should be able to Define and describe the construction and maintenance steps of railway track.

UNIT - I

Railway track gauge, alignment of railway lines, engineering surveys construction of new lines, tracks and track stresses

UNIT - II

Rails, sleepers; ballast; subgrade and formation, rack fittings and fastenings, creep of rails, geometric design of track, curves and super-elevation

UNIT - III

Points and crossings, track junctions and simple track layouts; rail joints andwelding of rails; track maintenance, track drainage

UNIT - IV

Modern methods of track maintenance, rehabilitation and renewal of track; tractive resistance and power, railway stations and yards; Railway tunnelling; signalling and interlocking; maintenance of railways and high speed trains.

Text Books

1. Railway Engineering: Saxena and Arora, DhanpatRai& Sons
2. Railway Engineering :Rangawala

Reference Books

1. Railway Tracks Engineering: J.S.Mundrey, Tata McGraw-Hill Publishing

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech V

Course Code: CEP5005-5 Course Name: Railway Engineering Lab

L : Hrs., P : 2 Hrs., Per Week Credits: 1

Course Outcomes (COs)

By the end of this laboratory course, students will be able to:

CO1: Identify and explain the function of various components of the permanent way (rails, sleepers, ballast, fittings, etc.).

CO2: Conduct field measurements of track geometry including gauge, cross level, and superelevation, and interpret the results.

CO3: Perform and interpret material tests on rail and ballast to assess their suitability for use in railway track systems.

CO4: Demonstrate knowledge of track laying methods, turnout components, and signaling/interlocking systems.

CO5: Apply surveying techniques to set out railway curves and alignments accurately on the field.

Course Content

1. **Study of Permanent Way Components**
   - Rails, sleepers, ballast, and subgrade materials
   - Types and functions
2. **Track Geometry Measurements**
   - Measurement of gauge, cross levels, superelevation, and curvature
3. **Material Testing**
   - Hardness test on rail samples
   - Sieve analysis and crushing/impact/abrasion tests on ballast
4. **Design and Layout of Turnouts**
   - Study of switches, crossings, and turnout geometry
5. **Signaling and Interlocking**
   - Types of railway signals
   - Block signaling and interlocking concepts
6. **Railway Track Surveying**
   - Alignment and levelling
   - Curve setting, including transition curves
7. **Track Laying and Maintenance Tools**
   - Demonstration of tools used for track construction and maintenance
   - Methods of track laying and inspection
8. **Study of Rail Fastenings**
   - Fish plates, bolts, spikes, elastic fasteners
9. **Model Demonstrations (if available)**
   - Working models of level crossings, interlocking, or signaling

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Course Code: CETM5006 Course Name: recent trends in civil engineering
L : Hrs., P : 2 Hrs., T: 1 Per Week Credits: 3

Course Objectives: The main aim of this course is to provide the knowledge about latest development and ongoing in construction industry.

Course Outcomes: After completion of the course, students will have knowledge on:
- Emerging trends in ground improvement and recent improvements in concrete
- Building information modelling in construction
- Current trends in Water Resources and Modern Construction Practices
- Recent trends in environmental engineering.

UNIT I

Building information modeling (BIM)
Introduction, BIM in Construction Management, Interpretation of BIM, Benefits of BIM, Virtual Prototyping of Models, Collaboration and Information Management, Potential of BIM enabled Models.

UNIT II

Zero energy building, Green building, Mass housing-precast housing, prefab homes, pre-engineering building, Solar Paints, Building Integrated Photovoltaic (BIPV), Earthquake Resisting Controls-Isolation Dissipation

UNIT III

Emerging trends in ground improvement
Ground improvement techniques-Advanced piling techniques Stone Column, Vibro Floatation, Micro Piles, Soil Nailing, Vertical drains-Sand Drains, Pre-Fabricated Vertical Drains, Thermal Methods- soil heating and soil freezing.

UNIT IV

Current Trends in Road construction: alternative Road Materials, Geo-synthetics, Noise-reducing asphalt, Porous Pavement, Plastic application in Roads.

REFERENCES:

1. "Construction Equipment and its Planning and Applications", Mahesh Varma, Metropolitan Book Co. (P) Ltd., New Delhi. India.

2. "Construction Machinery and Equipment in India". (A compilation of articles Published in Civil Engineering and
3. "Construction Review" Published by Civil Engineering and Construction Review,New Delhi, 1991.
4. Sharma S.C. "Construction Equipment and Management", Khanna Publishers, Delhi, 1988
5. Peurifoy RL, "Construction Planning, Equipment and Methods", Mc Graw Hill
6. James F Russell, "Construction Equipment", Prentice Hall
7. "Current Literature"

Shri Ramdeobaba College of Engineering and Management
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Syllabus for Semester B.Tech VI

Course Code: CET6001 Course Name: Estimation & Costing

L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcomes

The students should be able to,

1. Read the drawings, understand the details, identify the appropriate items and calculate the quantity of items involved in civil Engineering work including earthwork of road / canal and reinforcement of RCC members by applying the basic principles of computation.
2. Prepare approximate and detailed estimate of load bearing & framed structure and various civil engineering works. Evaluate the financial aspect of project.
3. Draft the specifications of various items involved in civil engineering works considering the object, type and principles of specification. Analyze the unit rate of item referring the specification of item and local or regional current market rates of materials and labors.
4. Prepare contract documents, float tender and select proper agency for execution of work according to types of contract. Supervise the work, prepare bills and maintain the accounts of works. Collect logical information and evaluate the present fair value of property for various purpose of valuation& Fixation of standard rent.

UNIT I

 Definition and Purpose of estimate, Mode and Unit of measurement of various items as per IS1200 , Work charge establishment, Contingencies, PWD as construction agency, Technical sanction, Administrative approval, Price escalation, Current schedule of rates .

 Types of estimate, Objective, use and methods of approximate estimate, Estimate of earthwork of road & canal.

 Detailed estimate of RCC members with detailed calculation of reinforcement and bar bending Schedule.

UNIT II

 Methods of detailed estimateDetailed estimate of building for RCC framedtructure.

UNIT III

 Contract, Contract documents, essentials of contract, major conditions of contract & clauses, Types of contract with advantage & disadvantage and its suitability, Earnest money and Securityeposit.

Tender notice, Tender documents, Types of tender, Acceptance and rejection of tender, unbalanced tender, Pre-qualification & Post qualification of contractor, Drafting of short tender notice, Liquidated damage,rbitration.

UNIT IV

 Specification definition, Objectives, Principles of writing specification, Sources of information, Types of specifications, developing and drafting of details specifications of important items of building and roadorks.

 Rate Analysis: Definition, Purpose, factors affecting, Task works per day, Rate analysis of important items of work. Comparison of analyzed rates with CSRates.

UNIT V

 Valuation: Purpose, Factor affecting, Cost, price & value, Definition of various values used, Freehold & lease hold property, Methods of valuation of property, valuation of residential building

 Outgoing, gross income, net income, sinking fund, rent fixation, obsolescence, depreciation and its methods .capitalized value , yearurchase.

NOTE : Questions based on unit I and unit II are compulsory and set for 15 marks each. Remaining three questions set on units III, IV and V with internal choice for 10 marks each. Duration of question paper is 4 hours.

Text Books

 M. Chakraborti ,Estimating, costing, specification and valuations in civil engineering, edition 2010 and latest,UBS publication culcutta.

References

 B. N. Dutta , Estimating and costing ,Publisher S. Dutta & company lucknow, Feb 1999 edition. UBS publisher distributors Ltd, 5, Ansari road ,Newelhi.

 S. P. Chandola&V.N.Vazirani, Estimating and costing , Edition 2010 and latest , khanna Publishers, 2-B, Nath market, Naisarak,elhi.

 S.C. Rangwala Estimating Costing and valuation , edition 2011, Charotar publishing house, opposite Amul dairy, Court roadAnand.

 D. D. Kohli ,.Estimating costing and accounts (civil), 10th edition, S Chand andompany.

 Roshan Namavati ,Valuation of Real Properties

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech VI

Course Code: CET6002 Course Name: Design of Steel Structures
L : 1 Hrs., P : Hrs., T: 1 Per Week Credits: 3

Course Outcomes
On completion of the course, the students will be able to:
1. Learn the analysis and design methods of structural steel
2. Understand the fundamentals of structural steel fasteners and connections
3. Analyze steel structures and their members, under the action of different loads
4. Design of simple structural steel connections and elements of steel structures like tension members, compression members, beams and columns

Unit I
Steel as a structural material, various grades of structural steel, properties, various rolled steel sections and their properties, Introduction to IS 800:2007,808,816,875 etc, Design philosophies, Plate(Local) buckling, Classification of cross-sections (flexure).
Structural Steel Fasteners: Introduction, Behavior of bolted and welded connections (types, designations, properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld, Efficiency of joints, Design of simple, bolted and welded connections.

Unit II
Design of axially loaded members (a) Tension members: Introduction, Net area, Shear-lag.
(b) Compression members: Introduction, Euler's buckling theory, Classification of cross-sections (buckling), Imperfection factor.
Analysis of roof truss of an industrial building : Introduction to different components of industrial shed, types of trusses, assessment member forces under various loads (dead load, live load and wind load).

Unit III
Design of simple beams: Introduction, Flexural behaviour of beams which does not undergo lateral buckling, Flexural behaviour of beams which undergo lateral buckling, Shear behaviour, Web buckling and Crippling, Design strength in bending, Design strength in shear, Limit state serviceability – Deflection, Introduction to plate girder.

Unit IV
Design of columns: Introduction, Design of axially loaded rolled sections, built up columns, laced and battened columns, Column base: slab base and gusseted base under axial loads.

Text Books

1. Design of steel structures by N. Subramanian (Using IS: 800-2007) Publisher: Oxford University Press, India
2. Limit State Design of Steel Structuresby S. K. Duggal Publisher: Tata Mc Graw Hill
3. Limit State Design of Steel Strucutres : Based on IS: 800-2007 by Dr. Ramchandra, Virendra Gehlot Scientific Publishers
4. Design of steel structures by K. S. Sairam Publisher: Pearson Education

References

1. McCormac, J. C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
2. Galambos, T.V., Lin, F.J., Johnston, B.G., Basic Steel Design with LRFD, Prentice Hall, 1996
3. Steel Design Manual by ELBS Publications
4. Salmon, C.G. and Johnson, J.E., Steel Structures: Design and Behavior, 3rd Edition, Harper & Row, Publishers, New York, 1990.

Shri Ramdeobaba College of Engineering and Management
Department of Civil Engineering
Syllabus for Semester B.Tech VI

Course Code: CET6003 Course Name: Fluid Mechanics- II
L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcomes
The students would be able to :

1. Understand and describe various principles of flow through pipes, open channel and centrifugal pumps.
2. Apply basic principles of flow in pipes and open channel to solve fluid flow problems in steady state condition.
3. Analyse and design various components of fluid flow system and comparison of possible solutions.
4. Compare and interpret the data / information/concepts/principle and used for solving incompressible fluid flow problems in steady state condition.

Unit I : Flow through Pipes
Hydraulically smooth and rough pipe; frictional resistance to flow; Darcy-Weisbach& Hazen-William equation, moody's diagram. Hydraulic gradient line and Total energy gradient line.

Unit II :
Pipes in series and parallel, branched pipe Water hammer pressure, three reservoir problem, flow through siphon; Concept of drag lift and its simple application.

Unit III : Flow through Open Channel
General : Introduction to open channel flow; Types of channel , Geometrical properties, Types of flow in open channel, Chezy's equation; Manning's equation; determination of discharge; normal depth; most economical channel section.

Unit IV
Uniform Flow : Basics.- continuity, energy and momentum equations, Characteristics of uniform flow, computations of uniform flow.
Non uniform flow (Critical Flow) : Basics and computations; Applications of specific energy concept, specific energy curve, gradual transition of channels, humps, width restrictions.

UNIT V
Gradually Varied Flow (GVF): Introduction to GVF; Equation of gradually varied flow; analysis of GVF: Classification and characteristics of surface profiles; Computations of water surface profile using direct step method.

Rapidly Varied Flow (RVF):, theory and classification of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular channel. Length, height and application of hydraulic jump. Energy dissipation.

UNIT VI

Dimensional analysis: Definition and use, fundamentals and derived dimensions, methods, application of methods to develop relationship in variables. Dimensionless numbers and its significance

Theory of model : Similitude, geometric, kinematic and dynamic similarities, Reynolds and Froude number law its significance.

Text Books

1. Hydraulics and fluid mechanics including Hydraulic machines by Dr. P. N. Modi and S. M. Seth, Latest edition, Standard book house (2002).
2. Theory and application of fluid mechanics by K Subramanya ,Tata McGraw Hill Publishing Company Ltd New Delhi.
3. A textbook of Fluid Mechanics & Hydraulic Machines by R. K. Bansal.

Reference

1. Fluid Mechanics & Hydraulic Machines by S. C. Gupta, Darling Kindersley (I) pvt. Ltd. Pearson lieensee, Nodia, UP.
2. Fluid Mechanics – Fundamentals and applications by Yunuscengel, Jhon M Cimbala, Tata McGraw Hill Publishing Company Ltd New Delhi, latest edition/ reprint.
3. Open Channel Hydraulics by V. T. Chow.

Shri Ramdeobaba College of Engineering and Management

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Syllabus for Semester B.Tech VI

Course Code: CEP6001 Course Name: Fluid Mechanics-II Lab

L : Hrs., P : 2 Hrs., Per Week Credits: 1

Course Outcomes

The students would be able to,

1. Describe the process of experimentation. Handle and operate the equipments according to its working principle.
2. Plan and conduct the experiments in accordance with the objectives.
3. Determine important parameters, coefficients of equipments and interpret the experimental observations.
4. Analyze and compare the experimental and theoretical / analytical observations.

List of Practical's

Minimum 8 of the following

1. Determination of Manning's constant for open channel.
2. Determination of Chezy's constant for open channel.
3. Developing specific energy diagram for a rectangular channel.
4. Study of GVF profiles.
5. Determination of spillway constant.
6. Analysis of branch network using software like water GEMS, EPANET for pipe flow
7. Analysis of rectangular / trapezoidal section.
8. Three reservoir problem
9. Determination of height of hump for critical flow. (transition of channel)
10. Determination of friction factor in flow through GI pipe
11. Any other experimental employing self learning and other tools.

Note: Use of python in all or any relevant practical is desirable.

Shri Ramdeobaba College of Engineering and Management
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Syllabus for Semester B.Tech VI

Course Code: CET6004-1 Course Name: Design of Concrete Structure
L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcomes
On completion of the course, the students:

1. Will demonstrate the ability to understand the behaviour and modes of failure of reinforced concrete members such as slabs, biaxially bent columns, footings (single and combined) and retaining walls etc.
2. Will demonstrate the ability to analyze and design reinforced concrete members such as slabs, biaxially bent columns, footings (single and combined) and retaining walls etc.
3. Will demonstrate the ability to relate the knowledge and design skills taught in class to real world problems & implement the technique in designing.

Unit - I
Design of RCC two way slab with various end conditions using with IS code coefficient.

Unit - II
Design of RCC retaining wall (Cantilever / Counterfort)

Unit - III
Analysis and design of columns subjected to biaxial moments, design of long columns

Unit - IV
Design of isolated footings for uniaxial and biaxial bending for square, rectangular and circular columns

Unit - V
Design of combined footing (Rectangular footing / Trapezoidal footing)

Unit - VI
Design of raft foundation

Reference Books
1. Illustrated Design of Reinforced Concrete Buildings, V. L. Shah and S. R. Karve, 9th Edition, Standard PublisherDistrinbuters.

2. Reinforced Concrete Design,S. Sinha, 3rd Edition, Tata McGraw Hill Publications.
3. Fundamentals of Reinforced Concrete Design, M. L. Gambhir, 1st Editions, PHI Learning Pvt. Ltd.
4. Limit State Design of Reinforced Concrete, P. C. Varghese, 2nd Edition, PHI Learning Pvt. Ltd.
5. Reinforced Concrete Design, D. Menon andS. Pillai, 3rd Edition, Tata McGraw-Hill publications
6. Limit State Design of Reinforced Concrete (As per IS 456:2000), Dr. B. C.Punmia, A.K. Jain and Dr. A. K. Jain, 1st Edition, Laxmi publications.
7. Reinforced Concrete: Limit State Design, Ashok K. Jain, 7th Edition, Nem Chand and Brothers Publishers.
8. Design of Foundation Systems: Principles and Practices, Nainan P. Kurian, 3rd Edition, Alpha Science International Publisher.
9. Practical Design of Reinforced Concrete Structures, Karuna Moy Ghosh, 1st Edition, PHI Learning Pvt. Ltd.
10. Limit State Theory and Design of Reinforced Concrete, Dr. V. L. Shah and Dr. S. R. Karve, 8th Edition, Structures Publications

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Course Code: CEP6004-1 Course Name: Design of Concrete Structure Lab

L : Hrs., P : 2 Hrs., Per Week Credits: 3

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1. To make the students familiar with the use of relevant Indian Standard specifications applicable to design of steel structures.
2. To prepare detail drawings of different components of RCC buildings.

Course Curriculum

Structural Drawings/Reinforcement detailing of

- R.C.C. Footings
- Beams curved in plan
- Domes
- Staircases
- Retaining Walls
- Water Tanks

Course outcomes

1. Use of relevant Indian Standard specifications applicable to design of steel structures.
2. Prepare detail drawings of industrial building, steel foot bridge and railway bridge.

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Course Code: CET6004-2 Course Name: Environmental Impact Assessment
L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course outcomes
At the end of this course students will demonstrate the ability to carry out;
1. Environmental impact and risk analysis.
2. Life cycle assessment

Unit - I
Introduction : Evolution of EIA; EIA at project; Regional and policy levels; EIA process in India and other countries; EIA methodologies; Screening and scoping criteria; Rapid and Comprehensive EIA

Unit - II
EIA methodologies : Baseline data collection; Prediction and assessment of impacts on physical, biological and socio-economic environment .Environmental health Impact assessment

Unit - III
Methods of Impact Analysis : Environmental clearance procedure in India ,Cost benefit analysis& its dimensions, Environmental audit, Role of GIS in EIA-base line study , risk assessment & management,

Unit - IV
Environmental Risk Analysis, Fundamentals of hazards, exposure & risk assessment, Basic Steps in risk management- hazard identification, exposure assessment & risk characterization, Quantified risk assessment for industrial accidents, Design of risk management program , Risk assessment application to environment management problems.

Unit - V
Life cycle assessment, stages in LCA of a product, energy and resource balance, Environmental management systems

Text Books:
1. A.Chadwick, Introduction to Environmental Impact Assessment, Taylor & Francis, 2007.
2. Larry, W. Canter, Environmental Impact Assessment, McGraw Hill Inc. Singapore, 1996.

3. Rau, GJ. And Wooten, C.D., Environmental Impact Analysis Handbook, McGraw Hill 1980
4. CPCB, MoEFCC guidelines for EIA

Reference Books

1. R.Therirvel, E. Wilson, S. Hompson, D. Heaney, D.Pritchard, Strategic Environmental Assessment Earthscan, London, 1992.
2. A.Gilpin, Environmental Impact Assessment-Cutting edge for the 21st century, CUP, London,1994.
3. Paul, A Erickson, A Practical Guide to Environmental Impact Assessment, Academic Press,1994.
4. Suresh, K.D., Environmental Engineering and Management, SK Kataria Publishers, New Delhi,2002.
5. Gupta, K.R., Environmental Legislation of India, Atlantic Publishers, 2006.

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Course Code: CEP6004-2 Course Name: Environmental Impact Assessment Lab

L : Hrs., P :2 Hrs., Per Week Credits: 1

Course outcomes:

At the end of this course:

1. The students will be able to analyze the impact on environment due to developmental activities.
2. The students will be able to undergo life cycle assessment
3. The students will be able to formulate an EIA for a new developmental project.
4. The students will be able to formulate an EIA for a re-developmental project.
5. The students will be able to understand the procedure of environmental clearance and environmental audit.

List of Practical's:

Minimum 4 of the following:

1) EIA clearance procedure adopted in India.
2) EIA for a new developmental project.
3) EIA for a re-developmental project.
4) Project Life cycle Assessment.
5) EIA Audit report for a project.

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Course Code: CET6004-3 Course Name: Pavement Design

L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course outcomes:

The student can understand, analyze, apply and evaluate various parameters required in the design of flexible and rigid pavement of highway and airfield pavements.

2. They can analyze, apply and evaluate the analysis of flexible and rigid of highway and airfield pavements.

3. They can analyze, apply and evaluate the design of flexible and rigid of highway and airfield pavements.

4. Understand and perform field test for pavement distress measurements and design For the strengthening of pavements.

Unit I [06 Hours]

General: Types and component parts of pavements, Factors affecting design and performance of pavements.

Design parameters: Design wheel load, Standard axle load and wheel assemblies for road vehicles. Under carriage system of aircraft. Tyre and contact pressure, contact area, imprints, computation of ESWL for flexible and rigid pavements. ESWL of multiple wheels, repeated loads and EWL factors. Pavement behaviour under transient traffic loads. airport traffic areas, Serviceability concept.

Unit II [06 Hours]

Analysis of flexible pavement : Stress, strain, deflection analysis one layer system by Boussinesq's. Burmister's two layer theory, three layer and multi-layer theories; wheel load stresses, Layer equivalent concepts.

Analysis of Rigid pavement : Stress and deflections for rigid pavements due to load and temperature, influence charts Wheel load stresses, warping stresses, frictional stresses, combined stresses.

Unit III [07 Hours]

Highway Flexible pavement design : Empirical, semi-empirical and theoretical approaches, Triaxial (Kansas state method), Design using the latest IRC code, AASHTO method of design.

Unit IV [07 Hours]

Highway Rigid pavement design : Design of CC pavement for roads and runways as per IRC latest code, design of joint details for longitudinal joints, contraction joints and expansion joints, PCA and AASHTO methods.

Unit V [06 Hours]

Airfield flexible pavement design : Mcleod (Canadian method), FAA, US Corps of engineering, CBR.

Airfield rigid pavement design : Definitions of ACN, PCN, LCN, Calculation of LCN value, Ultimate load analysis and yield lines patterns method, FAA, PCA & LCN methods.

Unit VI [06 Hours]

Pavement testing and evaluation : Pavement Failures in both Flexible Pavement & Rigid Pavement - types and causes, condition surveys and surface evaluation for unevenness, rut depth, profilometers, bump integrators, falling weight deflectometer.

Failures of pavements : Causes and remedies, maintenance and rehabilitation of pavements.

Strengthening of pavements : Benkleman beam deflection study.

Text Books

1. Pavement Design by Srinivasa Kumar, R, Orient Black Swan, 2013.
2. Pavement Evaluation and Maintenance Management System by Srinivasa Kumar, R, Universities Press (India) Private Limited
3. Pavement Analysis and Design by Yang H. Huang 2nd Edition, Pearson Education, Inc., Pearson Prentice Hall Company.
4. Airport Engineering by G Venkatappa Rao, Tata McGraw -Hill Publishing Company Ltd.
5. IRC-37: (Latest Code) Guide lines for Design of Flexible Pavement
6. IRC-58: (Latest code) Guide lines for Design of Plain Jointed Rigid Pavement for highways

References

1. Principles of Pavement Design by H.J.Yoder and Witczak, John wiley and sons.
2. Pavement Engineering: Principles and Practice, Third Edition Book by Rajib Basu Mallick and Tahar El-Korchi Publisher: CRC press, Taylor and Francis
3. Airport Engineering by Khanna and Arora, Nemchand & Brothers.
4. Highway Engineering by Khanna O.P, Justo C.G., Nem Chand Publishers
5. MOST Specifications for Road and Bridge Works, 1994 (Third Revision)
6. NPTEL Course on Pavement Design.

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Course Code: CEP6004-3 Course Name: Pavement deign Lab

L : Hrs., P :2 Hrs., Per Week Credits: 1

Design 0f Highway Flexible pavement : IRC & AASHTO Method

Design of Highway Rigid pavement : : IRC & AASHTO Method

Analysis 0f Highway Flexible pavement : software base

Analysis of Highway Rigid pavement : : software base

Shri Ramdeobaba College of Engineering and Management
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Syllabus for Semester B.Tech VI

Course Code: CET6004-4 Course Name: Geotechnical Explorations

L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcomes

1. Students will able to identify and determine the properties of soil.
2. Students will understand the principles of exploration, Methods of exploration,
3. Students will analyses the advance methods of exploration.
4. Students will able to undertake various field techniques and its interpretations.
5. Students will able to prepare the geotechnical exploration report.

Unit I

IMPORTANCE AND OBJECTS OF GEOTECHNICAL EXPLORATION:

Principle methods of subsurface exploration as per IS 1892, Methods of open exploration its suitability. Types of borings, selection of suitable boring method; stabilization of boreholes; number, location and depth of boring for different structures, Types of soil samples & their suitability, precautions in sampling, parameter for sampler design,
Planning of subsurface exploration program for major civil engineering projects

Unit II

INDIRECT METHODS OF EXPLORATION:

Seismic refraction method, electrical resistivity method, qualitative and quantitative interpretation of test results, limitations.

Unit III

FIELD INVESTIGATION (Sampling Method):

Standard Penetration test as per IS2131, Static Cone and dynamic cone penetration tests as per IS 4669.3, interpretation of test results and correlations for obtaining design soil parameters of cohesive and cohesion less soil. Determination of bearing capacity by above criteria.

Unit IV

FIELD INVESTIGATION (In-situ Method):

Field vane shear test, Plate load test as per IS 1888, Pressure meter test – Principle, equipment, use & interpretation of results.

Unit V
ROCK TESTING
Test conducted on rocks, Core, RQD, underwater sampling,
Soil survey and Mapping: methods of soil survey introduction of remote sensing.

Unit VI
REPORT & INSTRUMENTATION
Sub-surface Investigation Report: Salient features and boring logs; boring and sampling records handling
Advance Equipment's used in boring and samplings.

Text Books:
1. Basic and Applied soil mechanics: Gopal Ranjan & A.S. Rao, New Edge International Ltd., (2004)
2. Soil Mechanics and Foundation Engineering: K.R. Arora, Standard Publisher and Distributor, 1989 and later.
3. Foundation Analysis & Design: Bowles, J.E., McGraw Hill (1996)
4. . J. E. Bowles, "Foundation Analysis and Design", McGraw Hill Companies, 1997.
5. M. D., Desai, "Ground Property Characterization from In-Situ Testing", Published byIGS-Surat Chapter,2005.
6. M. J., Hvorslev, "Sub-Surface Exploration and Sampling of Soils for Civil Engineering Purposes", US Waterways Experiment Station, Vicksburg, 1949.

Reference books:
1. Soil Mechanics in Theory and Practice: Alam Singh, Asia Publisher and Distributor, 1975
2. Advanced Foundation Engineering: Murthy VNS, CBS publishing, (2007)
3. Foundation Engineering Handbook: Fang, H.Y., CBS publishing, (2004)
4. IS 1892, IS 2131, IS 4669.3, IS 1888 Codes,

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Course Code: CEP6004-4 Course Name: Geotechnical Explorations Lab

L : Hrs., P :2 Hrs., Per Week Credits: 1

Course Outcomes: At the end of successful completion of the course, students will be able;

1. Student will have an ability to perform different laboratory investigations on soil.
2. Students will able to conduct various field test and its applications related to geotechnical engineering.
3. Student will have an ability to determine the various index and engineering properties.

List of Experiments

1. Laboratory test on C- soil
2. Consolidation Test
3. Swell Pressure Tests
4. Field tests any Two from the following
   i) Standard penetration test.\
   ii) Static Cone Penetration test
5. Plate Load test (Demonstration)
6. Pressure meter test
7. Preparation of Detail soil Investigation Report.

Reference

Das, B.M., Soil Mechanics Laboratory Manual, Oxford University Press, Sixth Ed.

Relevant IS, British and ASTM Standards

Shri Ramdeobaba College of Engineering and Management
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Course Code: CET6004-5 Course Name: Sustainable Construction Materials

L : 3 Hrs., P : Hrs., Per Week Credits: 3

COURSE OBJECTIVE:

This course introduces the concepts of sustainability in civil engineering and role construction materials play in developing green infrastructure.

Unit 1.

Introduction to Sustainability: Definition of Sustainability, Resources and Reserves in Construction Materials, Greenhouse Effect and Global Warming, Carbon Footprint of Materials and Calculations.

Unit 2.

Embodied Energy of Materials and Calculations: Life Cycle Assessment and Cost Analysis, Sustainability Rating Systems.

Unit 3.

Sustainability Implications in Construction Materials: Sustainability Issues in Cement and Concrete Materials, Sustainability Issues in Asphalt Materials.

Unit 4.

Sustainability Issues in Metals: Sustainability Issues in Wood, Sustainability Issues in Glass, Sustainability Issues in Masonry.

Unit 5.

Sustainability in Alternate Construction Materials: C& D Waste Management Practices, Case Studies and Student Presentations.

COURSE OUTCOMES:

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

1. Understand the limitations of construction techniques and energy efficient construction.
2. Analyze productivity and economics in construction techniques.

3. Understand reliable proportioning concepts in construction techniques.
4. Implement modular construction practices and sustainable material.

Reference Books:

1. Design and Control of Concrete Mixtures, Kosmatka, S.H. and Wilson, M.L., 16th Edition, Portland Cement Association, 2015
2. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blakwell Publishing.
3. Anastas, P. T., Warner, J. C. Green Chemistry: Theory and Practice, Oxford University Press Inc., New York, 1998.
4. Matlack, A. S. Introduction to Green Chemistry Marcel Dekker: New York, NY, 2001

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Course Code: CEP6004-5 Course Name: Sustainable Construction Materials Lab

L : Hrs., P : 2 Hrs., Per Week Credits: 1

Experiment work to assess the sustainability of industrial byproducts & other products materials in different mix proportion in civil engineering projects.

1. **flyash**
2. **Slag**
3. **Glass fibres**
4. **Any other waste materials.**

Shri Ramdeobaba College of Engineering and Management
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Course Code: CET6004-6 Course Name: Water Transmission &Distrubution System

L : 3 Hrs., P : Hrs., Per Week Credits: 3

Course Outcomes:

The students would be able to,

1. Describe and explain the importance of various parameters involved in the study of WDS including analysis of various components of water supply systems.
2. Elaborate and discuss the hydraulic and economic principles with its application to component design in water distribution networks.
3. Apply knowledge in formulating the mathematical equations, models and obtaining the solutions.
4. Explain and discuss various methods of analysis of water distribution networks.
5. Design and evaluation of various components of water distribution networks, size of service reservoirs, design of pumping main. Concept of optimization of branched and looped water distribution networks.

Unit I

General Hydraulic Principles: Frictional head loss in pipes, different formulae, minor head loss in pipes, equivalent pipe.

Reservoir Pumps and Valves: Impounding reservoir, Service and balancing reservoir, three reservoir system, Multi reservoir system, pumps and pump co-ordinations, Types of valves, Analysis of reservoir system with checks valves and pressure reducing valves.

Unit II

Analysis of Water Distribution Networks: Types and parameters, Parameter relationship, Analysis of network using Hardy Cross method, Newton Raphson method and linear theory method, Introduction of gradient method and Dynamic analysis.

Unit III

Node Flow Analysis (NFA): Difference between Node Head and Node Flow Analysis, Necessity of NFA, Bhave's approach- Node classification, node category compatibility, NFA theory. Introduction to other NFA methods- Germanopolus approach, Wagner et. al

approach, Gupta and Bhave's approach.

Unit IV

Reservoir capacity: Estimation of minimum required reservoir capacity. Design of pumping main: Optimal design of pumping main considering pipe diameter as continuous and discrete **variable.**

Unit V

Design of Water Distribution Networks: Design of single source branching networks using critical path method, number of branching, configuration of looped networks using Graph Theory principles, selection of branching configuration using path concept and minimum spanning tree concept. Design of single source looped networks using critical path method.

Unit VI

Optimal Design of Water Distribution Networks: Cost Head Loss Ratio (CHR) method- CHR criterion, Problem formulation, CHE methodology for single source branching networks other optimization methodologies.

Text books:

1. Bhave P. R. and Gupta R. (1991), "Analysis of flow in water distribution networks", Technomic Publishing Co. Lancaster, Pennsylvania, USA.
2. Bhave P. R, "Design of Water Distribution Networks" Technomic Publishing CO. Lancaster, Pennsylvnia, USA.

Reference Books:

1. Jeppaon R.W. (1977), "Analysis of Flow in Pipe Networks'' Ann Arbor Science. Ann Arbor Michigan, USA.
2. Walski. T.M. (1984),'' Analysis of flow in water distribution networks'' Technomic Publishing CO. Lancaster, Pennsylvnia, USA.

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Course Code: CEP6004-6 Course Name: Water Transmission &Distrubution System Lab

L : Hrs., P :2 Hrs., Per Week Credits: 1

Course Outcomes:

The students would be able to,

1. Describe, explain and apply the various analytical methods in the study of WDS including analysis of various components of water supply systems.
2. Elaborate and discuss the hydraulic and economic principles with its application to component design in water distribution networks.
3. Apply knowledge in formulating the mathematical equations, models and obtaining the solutions.
4. Carry out analysis of water distribution networks.
5. Design and evaluation of various components of water distribution networks with the application of Concept of optimization in branched and looped water distribution networks.

List of Practical's:

Minimum 8 of the following

1. Equation Formulations for the analysis and design of network.
2. Water distribution network analysis by Hardy cross method.
3. Water distribution network analysis by Newton Raphson method.
4. Water distribution network analysis by linear theory method.
5. Water distribution network analysis by Gradient method.
6. Node flow analysis for Water distribution network.
7. Design of water distribution network using critical path method.
8. Design of water distribution network using cost head loss ratio method.
9. Design of water distribution network using software TORA of Linear programming technique.
10. Design/ analysis of water distribution network with the application of software like Loop, Branch, EPANET, Water GEMS or Water CAD.
11. Conversion of Loop network into branch network using minimum spanning tree concept / Path length concept / Graph theory.

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Syllabus for Semester B.Tech VI
Course Code: CET6005-1 Course Name: Advanced Concrete Technology
L : 4 Hrs., P : Hrs., Per Week Credits: 4

Course Outcome

1. The students will be able to understand the microstructure of the hydration product of cement.
2. The students will be able to analyse and interpret fresh and hardened properties of concrete.
3. The students will be able to demonstrate different types of concrete with its properties and uses.
4. The students will be able to explore to use methods for concrete mix design with quality control approach.

Unit I

Structure of Concrete : Introduction, Structural Levels, Structure of Concrete in Nanometer Scale: C – S – H Structure, Transition Zone in Concrete, Micro-structural Engineering

Unit II

Fresh Concrete : chemical and physical processes of hydration and interaction; Admixtures: Review of types and classification; chemical composition; origin and manufacture; actions and interactions; usage; effects on properties of concretes, methods of test; applications.

Rheology of concentrated suspensions, pastes, mortars and concretes; workability, segregation and bleeding. Theory and principles governing the correct placing and compaction of concrete.

Unit III

Hardened Concrete: Strengths of Hardened Concrete, Stress – Strain Relationship and Constitutive Equations, Dimensional Stability—Shrinkage and Creep, Durability Impact, Dynamic and fatigue behaviour of concrete, behaviour of concrete under fire.

Unit IV

Fiber-Reinforced Cementatious Composites, High-Strength Cementatious Composites, Polymers in Concrete, Shrinkage-Compensating Concrete, Self-Compacting Concrete, Engineered Cementatious Composite, High-Volume Fly Ash Concrete, Structural Lightweight Concrete, high grade concrete

Unit V

Concrete Fracture Mechanics: Introduction, Linear Elastic Fracture Mechanics, The Crack Tip Plastic Zone, Crack Tip Opening Displacement, Fracture Process in Concrete.

Non Destructive Testing : Rebound hammer, UPV and core test (method of testing, calculation of output and the interpretation of results)

Unit VI

Concrete mix design, Basic considerations and choice a mix proportions, various methods of mix designs including IS Code method.

Quality control and quality assurance of concrete, selection of control procedures, Measures of dispersion, Acceptance criteria, Quality management in concrete construction, probability and sampling theory, tests of significance, curve fitting and regression, repeatability and reproducibility, control charts. Role and limitations of statistics in concrete technology.

References

1. Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill, 2006.

2. Orchard D.F., Concrete Technology -Vol I., Applied Science Publishers (Fourth Edition) 1979.

3. Neville A.M and J.J. Brook; Properties of Concrete, Addison Wesley 1999.

4. Advance Concrete Technology by Zongjin Li, Published by John Wiley & Sons, Inc., Hoboken, New Jersey.

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Course Code: CET6005-2 Course Name: Solid Waste Management
L : 4 Hrs., P : Hrs., Per Week Credits: 4

Course Outcomes
The students would be able to;
1. Explain and describe various sources, characteristics, processing methods and disposal methods of solid waste.
2. Identify and explain necessity of solid waste management, its components and various rules and legislation.

Unit-I
Introduction to solid waste management: necessity, functional elements of solid waste management, Organization structure, Impact of solid waste on environment, MSW rules 2016, Construction and demolition (C&D) waste management rule 2016, Swachh Bharat mission, PPP model.

Unit-II
Characteristics of solid wastes : Classification, sources, composition, quantity, Factors affecting the quantity and per capita contribution of solid waste. Physical and chemical characteristics, sampling and analysis of solid waste.

Unit-III
Segregation, Collection and transportation of solid waste : Segregation methods, methods of collection, equipment's used for collection and transportation of solid waste. Transfer stations and its economic use. Estimation of truck capacity, vehicles routing

Unit-IV
Solid waste processing : Methods of processing like Salvaging, pyrolysis, RDF, biogas recovery, choice of methods and merits and demerits of various processing methods.

Unit-V
Solid waste management : Composting, Principles, methods of composting, factors affecting composting. Design of composting pit, vermi composting.
Sanitary land filling : Site requirement, methods, leachate management. Solid waste mining, design of landfills, bio-gas, bio-mining, fire hazards.
Incineration : Principles, types, merits and demerits.

Text Books

1. Bhide A.D. and Sundaresan B.B. Solid wastemanagement in developing countries by (INSDOC,New Delhi)
2. Sasikumar K. and Gopi Krishna S. Solid waste management, PHI learning pvt ltd, Delhi
3. Bhatia H. S. Environmental Pollution and Control, Galgotia publication, Delhi

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Course Code: CET6005-3 Course Name: Urban Transporation Planning
L : 4 Hrs., P : Hrs., Per Week Credits: 4

Course Outcomes

The students will be able to;

1. Explain the characteristic of urban transportation, structure of urban transportation and classification of urban roads.
2. Describe the objectives of transportation planning, data collection for planning and environmental impact analysis.
3. Explain the process of travel demand forecasting & need for interaction in different modes of transportation.
4. Describe the use of intelligent Transport System and need to accommodate non-motorized transports.

Unit I [06 Hours]

Urbanization and Transportation: Importance of urban area, Structure of urban area, urban design, use of road space, classification of urban roads.

Unit II [06 Hours]

Urban Transportation Characteristics : Factors influencing transportation needs, transportation demand, type of trips, mode of travel, urban transportation scene in India. Road congestion, impact of transport on environment.

Unit III [07 Hours]

Urban Transportation Planning Process : Urban transportation planning objectives, urban transportation system, urban transportation planning process, data collection, surveys for data collection, environmental impact analysis.

Unit IV [08 Hours]

Travel Demand Forecasting : Trip generation and attraction analysis, trip distribution models, model split analysis, route assignment analysis.

Unit V [06 Hours]

Public Transportation : Bus transport characteristics, bus route planning, performance indicator, types of rail transit, rail transit system development in Indian cities, Integrated Transport System, Modes of Integrated transport systems.

Unit VI [07 Hours]

Innovations in Urban Transportation : Need for innovative approaches, track guided bus, BRT, GIS, ITS, functional areas of ITS. Non-motorized Urban Transportation : Importance of pedestrian facilities, sidewalks, PUP & POB, bicycle facility planning, types of bicycle facilities, bicycle network planning, bicycle parking, cycle - rickshaws.

Text Books

1. Traffic Engineering and Transport Planning: L R Kadiyali, Khanna Publishers.
2. Urban Transportation: D. J. Victor & S. Ponnuswamy, Tata McGraw – Hill

References

1. Transport Planning and Traffic Engineering: C A O' Flaherty, BUTTER WORTH-HEINEMANN
2. Urban Development and Sustainable Transport P. Anbalagan, Bookwell Publications
3. Urban Transportation Planning 2nd Edition by Michael Meyer, Eric Miller, McGraw - Hill

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Course Code: CET6005-4 Course Name: Reinforced Earth

L : 4 Hrs., P : Hrs., Per Week Credits: 4

Course outcomes:

After studying this course, students will be able to:

1. identify, formulate reinforced earth techniques that are suitable for different soils and in different structures;
2. understand the laboratory testing concepts of Geosynthetics
3. design RE retaining structures and Soil Nailing concepts
4. Determine the load carrying capacity of Foundations resting on RE soil bed.
5. asses the use of Geosynthetics in drainage requirements and landfill designs

1 Basics of Reinforced Earth Construction

Basics of Reinforced Earth Construction:

Definition, Historical Background, Components, Mechanism and Concept, Advantages and Disadvantage of reinforced earth Construction, Sandwich technique for clayey soil.

Geosynthetics and Their Functions:

Historical developments, Recent developments, manufacturing processwoven&non-woven, Raw materials – Classification based on materials type – Metallic and Non-metallic, Natural and Man-made, Geosynthetics

Properties and Tests on Materials Properties –

Physical, Chemical, Mechanical, Hydraulic, Endurance and Degradation requirements, Testing & Evaluation of properties

2 Design of Reinforced Earth Retaining Walls

Design of Reinforced Earth Retaining Walls:

Concept of Reinforced earth retaining wall, Internal and external stability, Selection of materials, Typical design problems

Soil Nailing Techniques:

Concept, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, Construction sequence, Components of system, Design aspects and precautions to be taken

3 Design of Reinforced Earth Foundations

Design of Reinforced Earth Foundations:

Modes of failure of foundation, Determination of force induced in reinforcement ties – Location of failure surface, tension failure and pull out resistance, length of tie and its curtailment, Bearing capacity improvement in soft soils, General guidelines.

4 Geosynthetics for Roads and Slopes

Geosynthetics for Roads and Slopes:

Roads - Applications to Temporary and Permanent roads, Role of Geosynthetic in enhancing properties of road, control of mud pumping, Enhancing properties of subgrade, Design requirements Slopes – Causes for slope failure, Improvement of slope stability with Geosynthetic, Drainage requirements, Construction technique. Simple Numerical Stability Checking Problems on Reinforced Slopes

5 GEOSYNTHETICS - FILTER, DRAIN AND LANDFILLS

GEOSYNTHETICS - FILTER, DRAIN AND LANDFILLS:

Filter & Drain – Conventional granular filter design criteria, Geosyntheticfilter design requirements, Drain and filter properties, Design criteria – soilretention, Geosynthetic permeability, anticlogging, survivability and durability (No Numerical Problems) Landfills – Typical design of Landfills – Landfill liner & cover, EPA Guidelines, Barrier walls for existing landfills and abandoned dumps (No Numerical Problems)

Text Books:

1. Koerner. R.M, “Design with Geosynthetics”, Prince Hall Publications

2. Koerner. R.M. &Wesh, J.P, “Construction and Geotechnical Engineering using synthetic fabrics”, Wiley Inter Science, NewYork,.

3. SivakumarBabu G. L., “An introduction to Soil Reinforcement and Geosynthetics”, Universities Press, Hyderabad

4. Swami Saran, “Reinforced Soil and its Engineering Applications”, I. K. International Pvt. Ltd, New Delhi

5. Venkattappa Rao, G., & Suryanarayana Raju., G. V.S, “Engineering with Geosynthetics”, Tata McGraw Hill publishing Company Limited., New Delhi.

Reference Books:

1. Jones, “Earth reinforcement and Soil structure”, CJEP Butterworths, London

2. Ingold, T.S. & Millar, K.S, “Geotextile Hand Book”, Thomas, Telford, London.

3. Hidetoshi Octial, Shigenori Hayshi& Jen Otani, “Earth Reinforcement Practices”,Vol. I, A.A. Balkema, Rotterdam

4. Bell F.G, “Ground Engineer’s reference Book”, Butterworths, London

5. Ingold, T.S, “Reinforced Earth”, Thomas, Telford, London.

6. Sarsby R W- Editor, “Geosynthetics in Civil Engineering”, Woodhead Publishing Ltd & CRC Press, 2007

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Course Code: CET6005-5 Course Name: Energy Efficient Buildings

L : 4 Hrs., P : Hrs., Per Week Credits: 4

Course Outcomes

1. The students will be able to exhibit the understanding of the concept and theoretical background of energy efficient building.
2. The students will be able to prepare preliminary designs of building considering sun path diagram.
3. The students will be able to know the various natural and artificial lightening system,
4. The students will be able to know the various energy efficient building materials.
5. The students will be able to identify the green rating systems and its components.
6. The Students will be able to understand the working of renewable energy resource.

Unit - I

Solar energy fundamentals & practices in building design- solar astronomical relations and radiation physics and measurements. Elements of design of energy efficient building, Climate responsive process of design, Climate responsive process of design. Sun Path Digram

Unit - II

Heating and ventilation design: Human thermal comfort, climatological factors, material specifications and heat transfer principles Heat loss from buildings, design of insulators.

UNIT-III

Thermal performance evaluation for energy efficient materials. Advances in construction components pertaining to thermal comfort in building.
Various wall treatments to the existing structures. Passive cooling features.

Unit - IV

Energy efficient lighting system design: Basic terminologies and standards, Day lighting and artificial lighting design, auditing. Design of artificial ventilation system.
Natural lightening systems types.

Unit - V

Renewable energy sources: Solar and wind. Simple design calculations. Advances in computational energy conservation- implementation of computer energy simulation programs into building designs. e.g. TRNSYS, Design Builder etc. 195 Building Code

Unit VI

Norms of Energy Conservation Building code. Introduction to Green Rating Systems. Its factors. Any Case study for green certified building.

Text Books

1.Ministry of Power, Energy Conservation Building Code 2018, Revised Version, Bureau of Energy Efficiency, 2018, https://beeindia.gov.in/ news-events/energy-conservation-building-code-rules2018

2. Handbook of functional requirement of buildings, SP: 41:1987.

3. Indian Building Congress, Practical Handbook on Energy Conservation in Buildings, 1 st ed. Nabhi Publication, 2008.

4. Energy and the Environment JM Fowler, McGraw Hill, New York, 2nd Ed 1984

Reference Books

1. Climate responsive architecture (A design hand book for energy efficient buildings), Arvind Krishnana, Simos Yannas, Nick Baker, S V Szokolay Mc Graw hill Education, Seventh reprint, 2013

2. Renewable Energy and Environment -A Policy Analysis for India H, Ravindranath, K Usha Rao, B Nataraja n, P Monga Tata McGraw Hill, 2000 3. http://www.trnsys.com/ 4. https://designbuilder.co.uk/

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Course Code: CET6005-6 Course Name: Integrated Water Resoures Management
L : 4 Hrs., P : Hrs., Per Week Credits: 4

Course Outcomes

The students would be able to;

1. Explain the principles, need, and scope of Integrated Water Resources Management (IWRM).
2. Analyze the hydrological cycle and assess water availability for various sectors.
3. Evaluate institutional frameworks, stakeholder participation, and governance in IWRM.
4. Design sustainable water management plans incorporating economic, social, and environmental aspects.
5. Examine case studies to understand the application and challenges of IWRM in real-world scenarios.

Unit I

Introduction to IWRM: Definition, principles, and evolution of IWRM, Water crisis: global and regional issues, IWRM as a tool for sustainable development, Key components: water demand, supply, quality, and governance.

Unit II

Hydrology and Water Availability: Water cycle, surface water and groundwater systems, Water balance and basin-level management, Climate change impacts on water resources, Water quality parameters and monitoring.

Unit III

Institutional and Legal Framework: Policy and legal frameworks in water management, Role of stakeholders: government, community, private sector, Gender and equity in water access, International water treaties and trans-boundary water management.

Unit IV

Tools and Techniques for IWRM: Water auditing and budgeting, Decision support systems, remote sensing, and GIS, Economic valuation of water resources, Demand-side and supply-side management strategies.

Unit V

Case Studies and Applications: National and international IWRM case studies, River basin management, Water conflict resolution and participatory approaches, Urban water management and climate resilience

Text Books

1. Biswas, Asit K. – Integrated Water Resources Management: A Reassessment, Springer, 2004.
2. Mays, Larry W. – Integrated Urban Water Management: Arid and Semi-Arid Regions, CRC Press, 2009.

3. Loucks, Daniel P. and van Beek, Eelco – Water Resource Systems Planning and Management, Springer, 2005.
4. Varis, Olli et al. – Integrated Water Resources Management: Theories and Practices, Taylor & Francis, 2008.
5. Savenije, H. H. G. and van der Zaag, P. – Integrated Water Resources Management: Concepts and Issues, Physics and Chemistry of the Earth, 2008.

Reference Books

1. Global Water Partnership (GWP) – Integrated Water Resources Management, TAC Background Papers, GWP, 2000.
2. UNESCO – Integrated Water Resources Management in Action, UNESCO Publishing, 2009.
3. Cech, Thomas V. – Principles of Water Resources: History, Development, Management, and Policy, Wiley, 2010.

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Course Code: CETM6006 Course Name: Remote Sensing & GIS

L : 2 Hrs., P : Hrs., Per Week Credits: 2

Course Objectives:

- Apply principles of Remote sensing and GIS to collect, map and retrieve spatial information.
- Plan, assess and evaluate natural and manmade systems using geospatial models and methods
- Use geospatial tools and techniques for hazard mitigation and resource planning.
- Pursue research and develop capabilities to handle multi-disciplinary field projects
- Work in teams and demonstrate leadership skills with professional ethics.

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

- Identify specific data and methodologies for effective mapping and evaluation of natural resources
- Develop geospatial models and tools to address the social and engineering problems
- Apply geospatial technologies for hazard mitigation and management
- Design multi-criteria geospatial systems for decision making process

UNIT I

Aerial Photography and Photogrammetry: Basic principles, photographic systems, visual interpretation and mapping, ground truth verification, radiometer and its application.

Basic Concepts of Remote Sensing: Idealized remote sensing system, physics of remote sensing, electromagnetic spectrum, black body concept, atmospheric windows, geometry of scanners, CCD arrays and platforms, history of space imaging characteristics of space platform like LANDSAT, SPOT, IRS etc. characteristics of sensors like MSS, TM, LISS – I and II, outputs from various sensors.

UNIT II

Classification of Digital Data and Information: Supervised, unsupervised, extraction procedure for different applications and terrain evaluation, thematic interpretation, transfer of interpreted thematic information to base map, ground verification.

UNIT III

Application of Remote SensingGeology and Geohazards: geological structures, landforms, topography, rocks. Identification of minerals and ore deposits.Identification of zones prone to landslide, earthquake, tsunami, avalanche, soil creep, beach erosion, land subsidence etc.

Hydrological hazards: flood forecasting, flood inundation mapping, risk zoning, reservoir sedimentation, fluvial geomorphology and environmental appraisal, snow melt initiation, drought, water quality and soil moisture,

Urban and regional planning: mapping for monitoring urban growth and changes, urban land use/land cover mapping, land degradation, deforestation, desertification

UNIT IV

Fundamentals of Geographic Information Systems Database concept, data types, data structures and models, coordinate systems and geo-referencing, concept of map projections, interpolation techniques, geo-spatial analysis and modeling.

Applications of Geographic Information Systems Applications of GIS in flood study, water resources assessment and management, ground water potential modeling, basin erosion, sedimentation, land-use/ land-cover study, spatial water quality analysis, vulnerability assessment, hazard zoning and risk assessment, forecasting etc.

Text Books

1. Paul R Wolf, Elements of Photogrammetry, McGraw Hill.
2. Lillesand and Kiefer, Remote sensing and Image Interpretation, John Wiley and Sons.
3. Ravi R Gupta, Remote Sensing Geology, Springer
4. Floyd F Sabins, Remote Sensing Principles and Interpretation, WH Freeman and Co.
5. John R Jenson, Introductory Digital Image Processing, Prentice Hall.

Reference Books:

1. Burrough P A, Principles of Geographical Information System for Land Resource Assessment, Oxford University Press.
2. Bonham-Carter G F, Geographic information systems for geoscientists modelling with GIS (1995) Pergamon.
3. AlardMeijerink
4. Hall M K, Schaller C J, Walker C S, and Kendal L P, Exploring Water Resources: GIS Investigations for the Earth Sciences (2002), Brooks Cole

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Course Code: CEP6007 Course Name: Computed Aided Design in Civil Engineering

L : Hrs., P : 4 Hrs., Per Week Credits:

Design/Analysis based on softwares like

STAAD-Pro

Abaqus

Geo5

Other related software.

MDM (Multi Disciplinary Minor) courses

1) Understanding Civil Infrastructure**:This course focuses on explaining the fundamental elements of infrastructure such as roads, bridges, buildings, dams, and utilities, and their roles in society.**

Module-I

Importance of Civil engineering in infrastructure development of the country.
Introduction to types of buildings as per NBC, Selection of site for buildings, Components of a residential building and their functions, Introduction to Industrial buildings and types.
Building Planning – Basic requirements, elements, introduction to various building area terms, computation of plinth area, carpet area.

Module-II

Building Construction – Foundations, Classification, Bearing Capacity of Soil and related terms (definition only), Masonry Works – classifications, definition of different technical terms, Brick masonry – types, bonds, general principle, Roofs – functional requirements, basic technical terms, roof covering material, Floors – function, types, flooring materials (brief discussion), Plastering and Painting – objectives, types, preparation and procedure of application. Finishing, Services and Special constructions
Wall Finishes: Plastering, pointing, distempering and painting: Purpose, methods, defects and their solutions. Vertical communication: Stairs: Terminology, requirements of good staircase,

Module-III

Other Infrastructure – Introduction to highway, types of highways, various other modes of transportation.

Module-IV

Water Supply Engineering – Introduction, different types of hydraulic structures, dam and weirs, types of dam, purpose and functions.

Text Books:
1. Basic Civil engineering, Gopi, S., Pearson Publication
2. Basic Civil Engineering, Bhavikatti, S. S., New Age.
Reference Books:
3. Construction Technology, Chudley, R., Longman Group, England
4. Basic Civil and Environmental Engineering, C.P. Kausik, New Age.
5. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application

2) Construction materials and technology: **Understanding construction materials and technology for civil engineers to design, construct, and maintain infrastructure that meets quality, safety, and sustainability requirements.**

Module-I

Basic Building Materials I

Aggregate: Classification, Physical and mechanical properties,

Bricks and Masonry Blocks: Types, properties and field and laboratory tests to evaluate quality Lime: classification, properties Cement: types, Portland cement:

fly ash: properties and use in manufacturing of bricks and cement.

Module-II

Mortar: Types and tests on mortars.

Concrete: Production, mix proportions and grades of concrete,

fresh, mechanical and durability properties of concrete, factors affecting properties of concrete, tests on concrete,

Module-III

Basic Building Materials II

Building stone: classifications, properties and structural requirements; Wood and Wood products: introduction to wood products- veneers, plywoods,

Metals: Steel: Important properties and uses of Iron (Cast iron, wroght iron and steel), Important tests on steel rebar,

Glass: types and uses,

Module-IV [other Materials]

paint: types, distemper, varnish, Adhesive: Types, Bitumen: types, properties and tests.

Reference Books:

1. A Text-Book of Building Construction, S.P.Bindra and S.P.Arora, Dhanpat Rai Publications
2. Building Materials and Construction, Jena and Sahu, Mc. Graw Hill.
3. Materials for Civil and Construction Engineers, Mamlouk and Zaniewski, Pearson
4. Building Materials and Building Construction, by P C Verghese
5. Building Construction, by B. C. Punmia, , Laxmi Publicaton

3) **Green Building construction, green building principles entails using environmentally friendly materials, optimizing energy efficiency,**

implementing renewable energy systems, and managing water resources efficiently.

Module-I

Solar energy fundamentals & practices in building design- solar astronomical relations and radiation physics and measurements. Elements of design of energy efficient building, Climate responsive process of design, Climate responsive process of design. Sun Path Diagram

Module-II (HVAC)

Heating and ventilation design: Human thermal comfort, climatological factors, material specifications and heat transfer principles Heat loss from buildings, design of insulators.

Thermal performance evaluation for energy efficient materials. Advances in construction components pertaining to thermal comfort in building. Various wall treatments to the existing structures. Passive cooling features.

Module-III

Energy efficient lighting system design: Basic terminologies and standards, Day lighting and artificial lighting design, auditing. Design of artificial ventilation system. Natural lightening systems types.

Module-IV

Renewable energy sources: Solar and wind. Simple design calculations. Advances in computational energy conservation- implementation of computer energy simulation programs into building designs. e.g. TRNSYS, Design Builder etc. 195 Building Code
Norms of Energy Conservation Building code. Introduction to Green Rating Systems. Its factors. Any Case study for green certified building.

Text Books 1.

1. Ministry of Power, Energy Conservation Building Code 2018, Revised Version, Bureau of Energy Efficiency, 2018, https://beeindia.gov.in/ news-events/energy-conservation-building-code-rules2018
2. Handbook of functional requirement of buildings, SP: 41:1987.
3. Indian Building Congress, Practical Handbook on Energy Conservation in Buildings, 1 st ed. Nabhi Publication, 2008.
4. Energy and the Environment JM Fowler, McGraw Hill, New York, 2nd Ed 1984
Reference Books
4) **Construction Engineering &Processes: Construction** Engineering & Processes involves efficient project planning, sanctioning execution, and management to deliver structures that meet quality standards within budget and time constraints.

Module-I

Specifications building accessories like plumbing, flooring & roofing materials etc in buildings.

Module-II

Types of steel section/steel pipes used in building, Methods of approximate estimate of buildings.

Module-III

Contract, Types of contracts, Tender notice, EMD, SD, Techno commercial condition of Contract.

Module-IV

Construction projects: their methods of execution; role of client and contractor. Construction Planning, Project planning. CPM, PERT and Line of Balancing Techniques

Text Books:

1.B. N. Dutta , Estimating and costing ,Publisher S. Dutta & company lucknow, Feb 1999 edition. UBS publisher distributors Ltd, 5, Ansari road ,Newelhi.
2.S. P. Chandola&V.N.Vazirani, Estimating and costing , Edition 2010 and latest , khanna Publishers, 2-B, Nath market, Naisarak,elhi.
3. S.C. Rangwala Estimating Costing and valuation , edition 2011, Charotar publishing house, opposite Amul dairy, Court roadAnand

4. F. Hall, Roger Greeno, Building Services Handbook: Incorporating Current Building and Construction Regulations.