
 Estd - 1984	<p align="center">KONGU ENGINEERING COLLEGE (Autonomous) PERUNDURAI – 638060 INTERNAL QUALITY ASSURANCE CELL</p> <p align="center">Department of Civil Engineering BoS Meeting Minutes</p>	 CERT No. 99-100-20788 ISO 9001:2015
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MEETING No. 23**DATE** : 12-02-2022**TIME** : 10.00 AM (Online/ Offline)**Google Meet Id:** <https://meet.google.com/msc-gjnx-zbo>**The following members were present for the meeting:**

1.	Dr.P.S.Kothai, Professor, Kongu Engineering College	Chairman
2.	Dr. A. Murugappan, Professor, Department of Civil Engineering, Annamalai University,Chidambaram	Academic Council Nominee
3.	Mr. V. R. Ramkumar, Scientist – PAD Division, Indian Plywood Industries Research & Training Institute, Ministry of Environment, Forests & Climate change/GOI.	Alumni Representative
4.	Mr. S. Veeramani, General Manager, L & T Constructions	Industry Representative
5.	Dr.S.Anandakumar	Internal Member
6.	Dr.K.Nirmalkumar	Internal Member
7.	Dr.S.Krishnamoorthi	Internal Member
8.	Dr.P.Chandrasekaran	Internal Member
9.	Dr.S.Balaji	Internal Member
10.	K.Sadasivam (ADJUNCT FACULTY)	Internal Member
11.	Dr.K.Arumugam	Internal Member
12.	Dr.S.Suchithra	Internal Member
13.	Dr.T.Pradeep	Internal Member
14.	Dr.G.S.Rampradheep	Internal Member
15.	Dr.D.Ambika	Internal Member
16.	M.P.Thiyaneswaran	Internal Member

20	P.Dinesh Kumar	Internal Member
21	P.Ravichandran	Internal Member
22	R.K.Sangeetha	Internal Member
23	Dr.S.Karthikeyan	Internal Member
24	T.Karthika	Internal Member
25	N.Nandhini	Internal Member
26	T.Jeevetha	Internal Member
27	M.Arun Kumar	Internal Member
28	S.Vijayashanthi	Internal Member
29	K.Sampath Kumar	Internal Member
30	K.S.Navaneethan	Internal Member
31	S.Vinodhkumar	Internal Member
32	S.Manoj	Internal Member
33	Dr.V.Sampathkumar	Internal Member
34	N.Jothi Lakshmi	Internal Member
35	V.Naveenraj	Internal Member
36	K.Raja	Internal Member
37	S.Janani	Internal Member
38	K.Santhosh Kumaar	Internal Member
39	T.S.Mukesh	Internal Member

The following members have requested for leave of absence:

1. Dr.P.Vincent @ Venkatesan, Sr. Professor, Department of Civil Engineering, Mepco Schlenk Engineering College
2. Dr. S. S. Chandrasekar, Professor, Department of Civil Engineering, VIT, Vellore.
3. S.Venkatachalam, Assistant Professor, Department of Civil Engineering, Kongu Engineering College
4. A. Sivakumar, Assistant Professor, Department of Civil Engineering, Kongu Engineering
5. Dr.P.Kulanthaivel, Department of Civil Engineering, Kongu Engineering College

Meeting of the Civil Board:

Chairman/BoS welcomed the members and briefed on curriculum, syllabi of courses to be added and syllabi of courses to be modified under Regulation 2020 for UG & PG Programmes.

The board discussed and approved the following points as per the agenda:

Item No. 23.1: Ratification of the following items under R2018 & R2020 as given in Annexure-I.

a. Course and Syllabi for PhD Course work

The following course and its syllabus content was approved for research scholars (both internal & External) to do their Ph.D Course work examination through this research center

20PLC03-SUSTAINABLE ENVIRONMENTAL GEOTECHNICS

b. One / Two credit courses

The following one credit course and its syllabus content was approved

18VAC61- PLASTIC WASTE MANAGEMENT

c. On line courses

The following online NPTEL courses and their syllabus content were approved

S. No.	Course Code	Course Name
1.	noc20_ce12	Electronic Waste Management-Issues and Challenges
2.	noc19_ce39	GPS Surveying
3.	noc19_ce31	Integrated Waste Management for a Smart City
4.	noc20_ce31	Environmental Remediation of Contaminated Sites
5.	noc21-ar09	Role of Graft Technology in Interior-Architecture

It is resolved to ratify the above items a, b & c as given in Annexure – I.

Item No. 23.2. Approval of the curriculum, syllabi of courses to be added newly and syllabi of courses to be modified from 2nd semester to 8th semester for BE - Civil Engineering Branch under R2020 as given in Annexure-II.

The members discussed the curriculum, syllabi of courses to be added newly and syllabi of courses to be modified from 2nd semester to 8th semester for BE – (Civil Engineering Branch under R2020 as given in Annexure-II and approved the same.

Item No. 23.3. Approval of the syllabi of courses to be studied for honours degree under R2020 as given in Annexure-III.

The members discussed the syllabi of the courses to be studied for honours degree under R2020 as given in Annexure – III and approved the same.

Item No. 23.4. Approval for Value Added Courses (one / two credit courses), on-line courses with syllabi to be offered from first semester onwards, Transfer of credits from UGC & AICTE approved institutions and Credit transfer from foreign universities under R2018 & R2020 as given in Annexure-IV.

The members discussed the value added courses (one/ two credit courses), on-line courses with syllabi to be offered from first semester onwards, Transfer of credits from UGC and AICTE approved

institutions including NPTEL, SWAYAM, etc., and Credit transfer from foreign universities under R2018 & R2020 (from the year 2021-22 onwards) as given in Annexure – IV and approved the same.


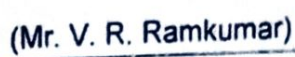




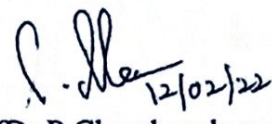


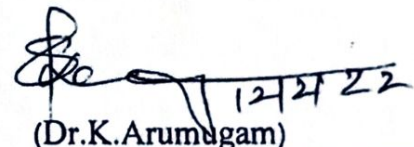

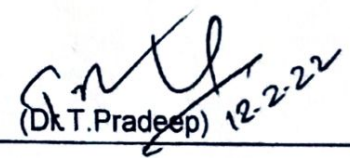
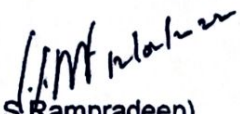



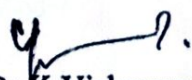

Item No. 23.5. Approval of Syllabus for PhD courses under R2020 as given in Annexure-V.

NIL

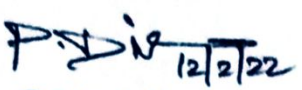
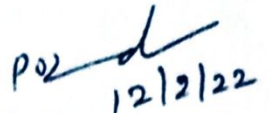

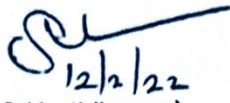







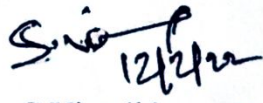
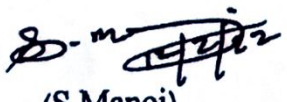







Reporting Item No. 23.6. Proctored online/ conventional examination system being followed for the November / December 2021 end semester / trimester examinations as given in Annexure-VI.

The members appreciated the proctored online/ conventional examination system being followed for the November / December 2021 end semester / trimester examinations as given in Annexure-VI.

The meeting was concluded with a vote of thanks to the members

 (Dr. A. Murugappan)	 (Mr. V. R. Ramkumar)
 (Mr. S. Veeramani)	 (Dr. S. Anandakumar)
 (Dr. K. Nirmalkumar)	 (Dr. S. Krishnamoorthi)
 (Dr. P. Chandrasekaran)	 (Dr. S. Balaji)
 (K. Sadasivam)	 (Dr. K. Arumugam)
 (Dr. S. Suchithra)	 (Dr. T. Pradeep)
 (Dr. G. S. Rampradeep)	 (Dr. D. Ambika)
 (M. P. Thiyaneswaran)	 (Dr. S. Vijayanand)
 (Dr. K. Vishnuvardhan)	 (T. Ravi Prakash)


12/2/22

 (P Dinesh Kumar)	 (P. Ravichandran)
 (R.K. Sangeetha)	 (Dr. S. Karthikeyan)
 (T. Kathika)	 (N. Nandhini)
 (T. Jeevetha)	 (M. Arun Kumar)
 (S. Vijayashanthi)	 (K. Sampath Kumar)
 (K.S. Navaneethan)	 (S. Vinodhkumar)
 (S. Manoj)	 (Dr. V. Sampathkumar)
 (N. Jothi Lakshmi)	 (K. Raja)
 (S. Janani)	 (K. Santhosh Kumaar)
 (T.S. Mukesh)	 (Dr. P.S. Kotha) Chairman/BoS

Annexure – I

Ratification items under R2018 & R2020 implemented during the academic year 2021-22 and/or previous years.

a. Course and Syllabi for PhD Course work

20PLC03-SUSTAINABLE ENVIRONMENTAL GEOTECHNICS

Programme & Branch	Civil Engineering-Ph.D.(Special Elective)	Sem.	Category	L	T	P	Credit
Prerequisite	Nil	-	Special Elective	3	0	0	3

Preamble	To acquire knowledge on the geotechnical engineering problems associated with soil contamination, safe disposal of waste, stabilization of waste, transportation of contaminant and site remediation techniques.					
Unit - I	Geotechnics and the environment:					6
Introduction to Environmental geotechnics – Environmental cycle – Sources, production and classification of waste – Causes of soil pollution – Factors governing soil – Pollutant interaction – Failures of foundations due to pollutants – Case studies.						
Unit - II	Waste physical, mechanical and hydraulic characterization:					6
Safe disposal of waste – Site selection for landfills – Characterization of landfill sites– Risk assessment – Stability of landfills – Current practice of waste disposal – Design of landfill - Monitoring facilities – Passive containment system – Leachate contamination - Hydrological consideration in landfill design – Application of geosynthetics in solid waste management – Rigid and flexible liners.						
Unit - III	Contaminant transport through porous media:					6
Contaminant transport in sub surface – Advection – Diffusion – Dispersion – Governing equations – Contaminant transformation – Sorption – Biodegradation – Ion exchange – Precipitation –Ground water pollution – Bearing capacity of compacted fills – Foundation for waste fill ground – Pollution of aquifers by mixing of liquid waste – Protection of aquifers.						
Unit - IV	Monitoring and control behavior:					6
Hazardous waste control and storage system – Stabilization/Solidification of wastes – Micro and Macro encapsulation – Absorption, adsorption, precipitation – Detoxification – Mechanism of stabilization – Organic and inorganic stabilization – Utilization of solid waste for soil improvement – Case studies						
Unit - V	Remediation of contaminated soils					6
Rational approach to evaluate and remediate contaminated sites – Monitored natural attenuation – Ex-situ and in-situ remediation – Solidification, Bio-remediation, incineration, soil washing, electro kinetics, soil heating, vitrification, bio-venting – Ground water remediation – Pump and treat, air sparging, reactive well –Case studies.						

Lecture: 45, Total: 45

TEXT BOOK:

1.	Sharma H.D. and Reddy K.R., "Geo-environmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies", 1st Edition, John Wiley & Sons, USA, 2004.
2.	Hsai-Yang Fang and Ronald C. Chaney., "Introduction to Environmental Geo-technology", 2nd Edition, CRC Press., USA, 2016.

REFERENCES:

1.	Reddi L.N. and Inyang, H. I., "Geo-environmental Engineering, Principles and Applications", 3rd Edition, Marcel Dekker, New York, 2004.
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COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Assess the causes of soil pollution and identify the factors governing soil pollutant interaction	Applying (K3)
CO2	Design landfill for safe disposal of waste	Applying (K3)
CO3	Understand the mechanism of transport of contaminants in subsoil	Applying (K3)
CO4	Suggest suitable technique for the stabilization of solid waste	Applying (K3)
CO5	Select appropriate technique for the remediation of contaminated site	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2	3									
CO2	3	2		2	3									
CO3	3	2		2	3									
CO4	3	2		2	3									
CO5	3	2		2	3									
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	30	60	-	-	-	100
CAT2	10	30	60	-	-	-	100
CAT3	10	30	60	-	-	-	100
ESE	10	30	60	-	-	-	100

* $\pm 3\%$ may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

b. One credit courses

18VAC PLASTIC WASTE MANAGEMENT

L	T	P	Credit
1	0	0	1

Preamble	This course enables the students to study the basic knowledge of plastic waste and its statistics.		
Unit - I	INTRODUCTION TO PLASTICS WASTE		
	History of Plastic-Types-Sources and production-characteristics of Plastic-classification- physical & chemical properties-resin Identification code-applications-Global Statistics.		
Unit - II	PLASTICS MATERIAL AND REGULATIONS		
	Plastic production process-manufacturing-Engineering Plastics I & II-High Performance Plastics I & II-Waste soluble plastics-Biodegradable plastics- Greener Plastics Product- Bio based Plastics-applications-Major Environmental Status in India-Development of PWM rules.		
Unit - III	IMPACT AND MANAGEMENT PRACTICES ON PLASTICS		
	Movement pathways of plastics - Impact of plastics on Marine life- Wildlife-Effect on human Health and Environment-Plastics management practices-segregation-sorting-recycling and reuse of plastics- Methods of disposal.		
Unit - IV	PLASTICS TESTING		
	Importance of testing-Standard and specifications-National and International standards- Laboratory accreditations- Identification of plastics-Testing of Mechanical properties-thermal & optical properties-Electrical-Flow properties.		

Total: 30

REFERENCES:

1.	Trevor M. Letcher, 'Plastic Waste and Recycling: Environmental Impact, Societal issues, Prevention and Solutions', Elsevier, 2020.
2.	Muralisrinivasan Natamai Subramanian, 'Plastic Waste Management', Scrivener Publishing LLC, 2019.
3.	Allen W S, 'Handbook of Plastics Technology Volume 2: Identification, Testing and Recycling of Plastics', C.B.S Publishers & Distributors, 2004

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	explain the sources and statistics of plastics	Understanding (K2)
CO2	summarize the production process of plastics and its application	Understanding (K2)
CO3	apply the importance of plastics management and recycling practices	Applying (K3)
CO4	choose the standard specification of plastics	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1			2	1					2	3	2
CO2	3	1				2	1					1	3	2
CO3	2	1	1			2	2					2	3	3
CO4	3	2	2			3	2					2	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
Theoretical Exam 1	40	60					100
Theoretical Exam 2	20	40	40				100

c. On line courses

noc19_ce39 - GPS Surveying (4 Weeks)

Course layout

Week 1 : Introduction, GPS System

Week 2 : GPS Positioning, GPS Observables

Week 3 : GPS Data Processing

Week 4 : GPS Field Surveying, GPS Field Data Processing

noc19_ce31 - Integrated Waste Management for a Smart City (12 Week)

Course layout

Week 1: Introduction to Solid Waste Management

Week 2: Municipal Solid Waste Characteristics and Quantities

Week 3: MSW Rules 2016, Swachh Bharat Mission and Smart Cities Program

Week 4: Municipal Solid Waste Collection, Transportation, Segregation and Processing

Week 5: Disposal of Municipal Solid Waste: Landfill

Week 6: Biochemical Processes and Composting

Week 7: Energy Recovery from Municipal Solid Waste

Week 8: Current Issues in Solid Waste Management and Review of MSW Management Status in First List of 20 Smart Cities in the Country

Week 9: Construction and Demolition (C&D) Waste Management - Overview

Week 10: C&D Waste – Regulation, Beneficial Reuse of C&D Waste Materials

Week 11: Electronic Waste (E-Waste) Management – Issues and Status in India and Globally

Week 12: E-Waste Management Rules 2016 and Management Challenges

noc21-ar09 - Role of Craft Technology in Interior-Architecture (8 Week)

UNIT -01

Interior- Architecture: Definition and Understanding

Craft: Definition and Understanding (Varied Perspectives on Art and Craft)

Interior-Architecture and Craft & Technology: Establishing Inter-Relationships

Interior-Architecture and Craft & Technology: Exploring Applications

Summary & Discourse

UNIT 02

Interior-Architecture: Documenting Knowledge and Skills

Traditional Knowledge Systems and the Ingenious skills of the communities

Interior-Architecture: Documenting Materials; Tools and Techniques

Traditional Knowledge Systems and the Indigenous materials; tools and techniques

Summary & Discourse.

UNIT 03

Creative and Cultural Industries: Understanding Definition; Significance and Scope

Building Crafts: Definitions; Perspectives and Frameworks

Building Crafts: Craft and Technology and its Role in Creating/Enhancing Interior-Architecture

Building Crafts; Craft and Technology and its Role in Creating/Enhancing Interior-Architecture

Summary & Discourse;

UNIT 04

Best Studies related to the Craft Sector

Case Studies from Gujarat

Case Studies from Rajasthan

Case Studies from Uttarakhand

Summary & Discourse – IV

UNIT 05

Craft and Technology in Interior Architecture: Decoding Systems

Craft and Technology in Interior Architecture; Decoding Systems

Craft and Technology in Interior Architecture: Transformation through Time

Craft and Technology in Interior Architecture; Transformation through Time

Summary & Discourse - V

UNIT 06

Overview of the Craft Sector Today

Craft Sector: Issues & Challenges

Craft Sector: Policies & Reforms

Craft Sector: Gaps

Summary & Discourse - VI

UNIT 07

Continuity and Revival: Research and Documentation Perspective

Continuity and Revival: Education and Training Perspective

Continuity and Revival: Innovation and Development Perspective

Continuity and Revival: Resource Building and Dissemination Perspective

Summary & Discourse - VII

UNIT 08

Interventions: Process Based

Interventions: Product / Design Based

Interventions: Technology Based

Interventions: Marketing / Management Based

Summary & Discourse – VIII

noc22_ce16 Environmental Remediation of Contaminated Sites (12 Weeks)

Course Layout:

Weeks 1 and 2: Introduction - Laws, Regulations and Remediation

Week 3: Risk Assessment

Weeks 4, 5, and 6: Remedial Options

Weeks 7, 8 and 9: Soils/Sediments

Weeks 10 and 11: Bioremediation & Phytoremediation

Week 12: Thermal Processes & Soil Washing

noc22-ce17 Electronic Waste Management Issues and Challenges (4 Weeks)

Course layout

Week 1: Overview of the course

Week 2: Exposure pathway of pollutants emitted from Recycling of E-Waste

Week 3: E-Waste Management Rules of India (2011 and 2016 Rules)

Week 4: E-waste Management: Case Studies and Unique Initiatives from around the World

Annexure - II

(i) Curriculum, syllabi of courses to be added newly and syllabi of courses to be modified from 2nd semester to final semester for BE/BTech (Civil Engineering Branch) under R2020

(a) List of courses newly added:

S.No.	Course Name	Semester	Regulation
01	Computer Aided Building Information Modelling Lab	5	R2020
02	Computer Aided Structural Design Laboratory – I	5	R2020
03	Computational Laboratory for Construction Management	5	R2020
04	Computer Aided Structural Design Laboratory –II	6	R2020
05	Computer Aided Structural Detailing Laboratory	6	R2020

(b) List of courses modified the syllabus content:

S.No.	Course Code & Course Name	Semester	Regulation
01	20CEL42 & Computer Aided Building Drawing Laboratory	4	R2020
02	20CEC41 & Geotechnical Engineering II	4	R2020
03	20CEC51 & Environmental Engineering	5	R2020
04	20CEC61 & Transportation Engineering	6	R2020

(c) List of courses removed:

S.No.	Course Code & Course Name	Semester	Regulation
01	20CEL41 & Geotechnical Engineering Laboratory	4	R2020
02	20CEL51 & Environmental Engineering Laboratory	5	R2020
03	20CEL52 & Transportation Engineering Laboratory	5	R2020

(d) List of courses swapped:

S.No.	Course Code(s) & Course Name(s)	Existing Semester	Swapped Semester	Regulation
01	20CET22 & Engineering Mechanics	02	03	R2020
02	20CET31 & Mechanics of Materials	03	04	R2020
03	20CSC31 & Programming in C	03	02	R2020
04	20CSC41 & Python Programming	04	03	R2020

Curriculum from 2nd semester to final semester BE - Civil Engineering Branch under R2020

SEMESTER – II									
Course Code	Course Title	Hours/ Week			Credit	Maximum Marks			CBS
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
20EGT21	Advanced Communication Skills	3	0	0	3	50	50	100	HS
20MAC21	Multivariable Calculus and Complex Analysis	3	1*	2*	4	50	50	100	BS
20PHT21	Materials Science	3	0	0	3	50	50	100	BS
20CYT21	Chemistry of Building Materials	3	0	0	3	50	50	100	BS
20CET21	Surveying and Geomatics	3	0	0	3	50	50	100	PC
20CET22/ 20CSC31	Engineering Mechanics (2020-2021) / Programming in C (2021-2022)	3	0	0/2	3/4	50	50	100	ES
Practical									
20PHL20	Physical Sciences Laboratory II	0	0	2	1	50	50	100	BS
20CEL21	Surveying Laboratory	0	0	2	1	50	50	100	PC
Total					21/22				

SEMESTER – III									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
20MAT31	Probability and Partial Differential Equations	3	1	0	4	50	50	100	BS
20CSC31/ 20CSC41	Programming in C(2020-2021) / Python Programming (2021-2022)	3	0	2	4	50	50	100	ES
20CET31/ 20CET22	Mechanics of Materials (2020-2021) / Engineering Mechanics (2021-2022)	3	1/0	0	4/3	50	50	100	ES
20CET32	Concrete Technology	3	0	0	3	50	50	100	PC
20CET33	Geotechnical Engineering I	3	0	0	3	50	50	100	PC
20CET34	Water Resources and Irrigation Engineering	3	0	0	3	50	50	100	PC
Practical / Employability Enhancement									
20CEL31	Strength of Materials Laboratory	0	0	2	1	50	50	100	ES
20CEL32	Concrete Technology Laboratory	0	0	2	1	50	50	100	PC
20MNT31	Environmental Science	2	0	0	0	100	0	100	MC
Total Credits to be earned					23/22				

SEMESTER – IV									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Cate gory
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
20MAT41	Statistics and Numerical Methods	3	1	0	4	50	50	100	BS
20CSC41/ 20CET31	Python Programming (2020-2021) / Mechanics of Materials (2021-2022)	3	0/0	2/0	4	50	50	100	ES
20CEC41	Geotechnical Engineering II	2	0	2	3	50	50	100	PC
20CET41	Fluid Mechanics and Hydraulics Engineering	3	1	0	4	50	50	100	PC
	Open Elective 1	3	0/1	0/2	4	50	50	100	PC
Practical / Employability Enhancement									
20CEL41	Fluid Mechanics and Machineries Laboratory	0	0	2	1	50	50	100	PC
20CEL42	Computer Aided Building Drawing Laboratory	0	0	2	1	50	50	100	PC
20EGL31	English for Workplace Communication Laboratory	0	0	2	1	50	50	100	HS
20GET31	Universal Human Values	2	0	0	2	100	0	100	HS
Total Credits to be earned					24				

SEMESTER – V									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Cate gory
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
20CEC51	Environmental Engineering	2	0	2	3	50	50	100	PC
20CET51	Structural Analysis	3	1	0	4	50	50	100	PC
20CET52	Design of RC Elements	3	1	0	4	50	50	100	PC
	Professional Elective I	3	0	0	3	50	50	100	PE
	Open Elective II	3	1/0	0/2	4	50	50	100	OE
Practical / Employability Enhancement									
20CEL51	Computer Aided Structural Design Laboratory - I	0	0	2	1	50	50	100	PC
20CEL52	Computer Aided Building Information Modelling Lab	0	0	2	1	50	50	100	PC
20CEL53	Computational Laboratory for Construction Management	0	0	2	1	50	50	100	PC
20GEL51/ 20GEI51	Professional Skills Training I / Industrial Training I	--	--	--	2	100	0	100	EC
Total Credits to be earned					23				

SEMESTER – VI									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Cate gory
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
20CEC61	Transportation Engineering	2	0	2	3	50	50	100	PC
20CET61	Design of Steel Structures	3	1	0	4	50	50	100	PC
20CET62	Advanced Reinforced Concrete Design	3	0	0	3	50	50	100	PC
	Open Elective III	3	0	0	3	50	50	100	OE
Practical / Employability Enhancement									
20CEL61	Computer Aided Structural Design Laboratory – II	0	0	2	1	50	50	100	PC
20CEL62	Structural Engineering Laboratory	0	0	2	1	50	50	100	PC
20CEL63	Computer Aided Structural Detailing Laboratory	0	0	2	1	50	50	100	PC
20GEL61/ 20GEI61	Professional Skills Training II / Industrial Training II	--	--	--	2	100	0	100	EC
20GEP61	Comprehensive Test / Viva	--	--	--	2	100	0	100	EC
20CEP61	Project Work I	0	0	4	2	100	0	100	EC
Total Credits to be earned					22				

SEMESTER – VII									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
20GET71	Engineering Economics and Management	3	0	0	3	50	50	100	HS
20CET71	Estimation and Quantity Surveying	3	0	0	3	50	50	100	PC
	Professional Elective II	3	0	0	3	50	50	100	PE
	Professional Elective III	3	0	0	3	50	50	100	PE
	Professional Elective IV	3	0	0	3	50	50	100	PE
	Professional Elective V	3	0	0	3	50	50	100	PE
Practical / Employability Enhancement									
20CEP71	Project Work II Phase I	0	0	6	3	100	0	100	EC
Total Credits to be earned					21				

SEMESTER – VIII									
Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
	Open Elective IV	3	0	0	3	50	50	100	OE
	Professional Elective VI	3	0	0	3	50	50	100	PE
Practical / Employability Enhancement									
20CEP81	Project Work II	---	---	14	7	50	50	100	EC
Total Credits to be earned					13				

Total Credits: 169

Syllabi for the courses mentioned in above items (a) and (b) under R2020

20CEL51 - Computer Aided Structural Design Laboratory – I

(IS 456:2000, IS 3370:2009, SP 16, IS 800:2007, SP 06, IS 875 and SP 38 are permitted)

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	Structural Analysis & Design of RC Elements	5	PC	0	0	2	1
Preamble	This course gives knowledge about how to analyze and design the various components of the different types of the structure using ETABS software						

List of Exercises / Experiments:

1.	Introduction & Modelling of different types of elements
2.	Load and load combinations
3.	Analysis and design of beams
4.	Analysis of single storied frame
5.	Design of single storied frame structural elements
6.	Analysis of multi- storied frame
7.	Design of multi- storied frame structural elements (Design of slabs & beams)
8.	Design of multi- storied frame structural elements (Design of columns & footings)
9.	Analysis of plane truss
10.	Analysis of space truss

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	ETABS
2.	Lab Manual
3.	S.N.Sinha, reinforced concrete design, Tata Mcgraw hill education, 2018

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	analyze the different types of structures	Analyzing (K4), Manipulation (S2)
CO2	analyze and design of reinforced concrete elements	Analyzing (K4), Manipulation (S2)
CO3	analyze the steel structures	Analyzing (K4), Manipulation (S2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1	3		1	1			2	3	3
CO2	3	3	1	3	1	3		1	1			2	3	3
CO3	3	3	1	3	1	3		1	1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

20CEL52 - Computer Aided Building Information Modelling Lab

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	Nil	5	PC	0	0	2	1
Preamble	To impart knowledge about modelling software in construction						

List of Exercises / Experiments:

1.	Introduction and building components
2.	Building Components – Walls, Doors, Windows and Roofs
3.	Building Components – Floors, Staircase and Ramp
4.	3-D elevation for single storied building (output with Plan, Section and elevation rendering)
5.	3-D elevation for multi storied building (output with Plan, Section and elevation rendering)
6.	3-D Framed Structure (with Foundation, Columns, Beams, Slabs and Wall)
7.	Building walk through model
8.	Single storied building documentation and quantity take off
9.	Multi storied building documentation and quantity take off
10.	Construction schedule for a multi storied building
11.	Slab and Beam Detailing
12.	Column and Footing Detailing

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual
2.	Autodesk Revit
3.	Carl S Chattfield and Timothy D Johnson, "Microsoft Project 2016 Step by Step", 1st Edition, Pearson Publication, 2016.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	apply the building components effectively in 3D modelling for a building system	Applying (K3), Manipulation (S2)
CO2	prepare the 3-D elevation and framed structure detailing for a building system	Analyzing (K4), Manipulation (S2)
CO3	compute material quantity and construction duration for a building system	Analyzing (K4), Manipulation (S2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	3			1	2		2	3	3
CO2	3	3	2	2	2	3			1	2		2	3	3
CO3	3	3	2	2	2	3			1	2		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	Nil	5	PC	0	0	2	1
Preamble	To impart knowledge about modelling software in construction						

1.	Introduction to Project Management tools for construction Projects
2.	Assigning Calendars to Project and its Activities
3.	Prepare Network diagram for a Construction Project using CPM – Single storey Building
4.	Prepare Network diagram for a Construction Project using CPM – Multi-Storey Building
5.	Prepare Network diagram for a Construction Project using PERT – Single storey Building
6.	Prepare Network diagram for a Construction Project using PERT – Multi-Storey Building
7.	Defining and Assigning of Resources
8.	Levelling and Resource Management
9.	Cost analysis of a Construction Project
10.	Tracking of a Construction Project (Include the application of BIM in construction Management)
11.	Management of Multiple Construction Projects
12.	Report Preparation

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual
2.	Microsoft Project
3.	Carl S Chattfield and Timothy D Johnson, "Microsoft Project 2016 Step by Step", 1st Edition, Pearson Publication, 2016.

**BT Mapped
(Highest Level)**

CO1	prepare network diagram for a Construction project using CPM & PERT	Applying (K3), Manipulation (S2)
CO2	allocate resources for construction projects	Applying (K3), Manipulation (S2)
CO3	prepare various reports for a building system	Applying (K3), Manipulation (S2)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	3			1	2		2	3	3
CO2	3	3	2	2	2	3			1	2		2	3	3
CO3	3	3	2	2	2	3			1	2		2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

20CEL61 - Computer Aided Structural Design Laboratory –II

20CEL63 - Computer Aided Structural Detailing Laboratory
(Use of IS 456:2000, SP 16, SP 34, IS 800:2007, and SP 38 code books are permitted)

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	Design of RC elements & Design of Steel Structures	5	PC	0	0	2	1
Preamble	This course gives knowledge about how to detailing the various components of the structure using TEKLA STRUCTURES software						

List of Exercises / Experiments:

1.	Detailing of one-way simply supported slab & one-way continuous slab
2.	Detailing of two-way simply supported slab & two-way continuous slab
3.	Detailing of flat slab
4.	Detailing of beams & columns
5.	Detailing of isolated footing
6.	Detailing of combined footing
7.	Detailing of simple steel connections
8.	Detailing of steel beam to beam connection
9.	Detailing of steel beam to column connection
10.	Detailing of steel column base
11.	Detailing of steel seated connection
12.	Detailing of simple steel truss connections

Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Tekla structures
2.	Krishnaraju N., Structural Design & Drawing - Reinforced Concrete and Steel, 3 rd Edition, University Press (India) Ltd., Hyderabad, 2014.
3.	Punmia B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Comprehensive Design of Steel Structures, 2 nd Edition, Laxmi Publications Pvt. Ltd., 2012

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	detailing the flexural members	Analyzing (K4), Manipulation (S2)
CO2	detailing the column and footings	Analyzing (K4), Manipulation (S2)
CO3	detailing the various steel structures	Analyzing (K4), Manipulation (S2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3		3		1	1			2	3	3
CO2	3	3	2	3		3		1	1			2	3	3
CO3	3	3	2	3		3		1	1			2	3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisites	Engineering Drawing	4	PC	0	0	2	1
Preamble	This course imparts knowledge about the preparation of plan, section & elevation of different types of buildings as per specification						

1.	Building Planning - NBC provisions & Bye-laws -Terminologies, Orientation, Ventilation & Lighting
2.	Introduction to Building Elements-Foundations, Super structure, Roof, Staircase, Doors and Windows
3.	Introduction to AutoCAD and basic drafting tools /commands
4.	Drawing the Plan, Elevation & Section of a residential Building with Load Bearing Wall
5.	Drawing the Plan, Elevation & Section of an Industrial Building
6.	Drawing the Plan, Elevation & Section of a Residential Building with Framed structure
7.	Drawing the Plan, Elevation & Section of a School Building with Framed structure
8.	Drawing the Plan, Elevation & Section of a Residential Building with Pitched Roof
9.	Preparation of approval plan for a Residential Building
10.	Preparation of approval plan for a Commercial Building

REFERENCES/MANUAL/SOFTWARE:

1.	Reference manual for AutoCAD
2.	Sikka V.B., "A course in Civil Engineering drawing", 4 th Edition, S.K.Kataria and Sons,2015.
3.	S.S Bhavikatti & M.V. Chitawadagi., "Building Planning and Drawing", I.K. International Publishing House Pvt. Ltd. New Delhi, 2019

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	plan buildings based on NBC specifications and building bye-laws	Applying (K3), Manipulation (S2)
CO2	prepare plan, section & elevation for different types of buildings	Applying (K3), Manipulation (S2)
CO3	prepare approval plan for buildings	Applying (K3), Manipulation (S2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	3	3								3	3
CO2	3	2	2	3	3								3	3
CO3	3	3	3	3	3								3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

20CEC41 GEOTECHNICAL ENGINEERING II

(IS6403-1981 code is permitted)

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	GEOTECHNICAL ENGINEERING I	4	PC	2	0	2	3

Preamble	This course facilitates the students to understand the behaviour of foundations for engineering structures and to gain knowledge of the design methods that can be applied to practical problems	
Unit - I	Soil Exploration and Foundation Systems:	6
Soil exploration – planning – test pits – boring – sampling – standard penetration test – static and dynamic cone penetration tests – geophysical methods (seismic, electrical resistivity) – preparation of soil investigation report-Types of foundation – Choice of foundations based on soil profile.		
Unit - II	Bearing Capacity:	6
Terms and definitions – Types of bearing capacity failure – Terzaghi's method - IS code method – Teng's method - Factors affecting bearing capacity - Methods of improving bearing capacity		
Unit - III	Settlement Analysis and Design of Shallow Foundation:	6
Causes of settlement – Elastic settlement– primary settlement– differential settlement – estimation of settlement from SPT – codal provisions – methods of minimizing settlement – Plate load test for bearing capacity -Design principles of isolated and spread footing – combined rectangular and trapezoidal footing		
Unit - IV	Deep Foundation:	6
Classifications – construction of piles - load carrying capacity – static and dynamic analysis – Pile load tests – negative skin friction - Group action of piles – load carrying capacity of pile groups– Settlement of pile groups		
Unit - V	Earth Pressure Analysis:	6
Introduction- Plastic equilibrium in soils – active and passive earth pressure – Rankine's theory – Coulomb's wedge theory - Graphical method (Rebhann and Culmann).		

List of Exercises / Experiments:

1.	Determination of Specific Gravity
2.	Determination of Grain size distribution-sieve analysis
3.	Determination of Atterberg limits
4.	Determination of differential free swell index of cohesive soil
5.	Determination of field density by a. sand replacement method b. core cutter method
6.	Determination of moisture – density relationship using Standard Proctor Method
7.	Determination of relative density of cohesionless soil
8.	Determination of coefficient of permeability by constant head and falling head method
9.	Determination of shear parameters by direct shear test in cohesionless soil
10.	Determination of shear parameters by unconfined compression test in cohesive soil

Lecture: 30, Practical: 30, Total: 60**TEXT BOOK:**

1.	Arora K.R., "Soil Mechanics and Foundation Engineering", 7 th Edition, Standard Publishers and Distributors, New Delhi, 2019
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REFERENCES:

1.	Varghese P.C., "Foundation Engineering", 2nd Edition, PHI Learning, New Delhi. 2011.
2.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	summarize soil exploration techniques and foundation systems	K2 (Understanding)
CO2	determine bearing capacity and settlement of shallow foundations	K3 (Applying)
CO3	design shallow foundations	K3 (Applying)
CO4	calculate the load carrying capacity and settlement of pile foundation	K3 (Applying)
CO5	analyse the earth retaining structures	K4 (Analyzing)
CO6	characterize the given soil based on the index properties	Analyzing (K4), Manipulation (S2)
CO7	determine the drainage characteristics and rate of consolidation	Applying (K3), Manipulation (S2)
CO8	evaluate the shear strength parameters of cohesive and cohesionless soil	Analyzing (K4), Manipulation (S2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2				1		1	3	2
CO2	3	2	1			3						1	3	3
CO3	3	2	1			3						1	3	3
CO4	3	2	1			3						1	3	3
CO5	3	3	2			3						1	3	3
CO6	3	3	2	2		3			1			2	3	3
CO7	3	2	1	2		3			1			2	3	3
CO8	3	2	1	2		3			1			2	3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	10	20	70				100
CAT2	10	30	60				100
CAT3	10	20	40	30			100
ESE	10	20	50	20			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

20CEC51 ENVIRONMENTAL ENGINEERING

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	Nil	4	PC	2	0	2	3

Preamble	The course aims to impart knowledge on water and sewage occurrence, distribution, treatment and disposal techniques.	
Unit - I	Water Supply, Source and Conveyance:	6
Objectives and Factors influencing Public Water Supply systems – Sources of water – Population Forecasts – Water quality parameters and standards – Intake Structures – Laying, Jointing and Testing of pipelines – Pipe Appurtenances.		
Unit - II	Principles of Treatment:	6
Basic principles of water treatment – Unit processes and operations – Screens –Grit chamber – Design of sedimentation tanks – Principles of Flocculators – Design of Filters – Disinfection methods – Water Softening Methods.		
Unit - III	Collection and Conveyance of Sewage:	6
Sources and characteristics of wastewater – Quantity – Storm runoff estimation – Minimum and Maximum velocity – Laying, jointing and testing of sewers – Layout of Sewage treatment plant – Sewer appurtenances.		
Unit - IV	Principles of Sewage Treatment:	6
Basic principles of biological treatment – Principles and operation of Trickling filter– Activated sludge process and its Modifications – Aeration process and types – Oxidation Ditch – Waste stabilization ponds – Principles and Design of Septic tanks.		
Unit - V	Sewage Disposal and Rural Sanitation:	6
Objectives of sludge treatment – Properties of sludge –Sludge Digestion – Oxygen sag curve – Eutrophication – Sanitary fixtures – One pipe and Two pipes systems – Rural sanitation system – Environmental Protection Acts.		

List of Exercises / Experiments:

1.	Sampling and preservation methods of water and wastewater
2.	Determination of i) pH and turbidity ii) Hardness
3.	Determination of Acidity & Alkalinity
4.	Determination of Chlorides
5.	Determination of Sulphates
6.	Determination of Optimum Coagulant Dosage
7.	Determination of dissolved oxygen
8.	Determination of Total Dissolved Solids and Suspended Solids
9.	Determination of B.O.D
10.	Determination of C.O.D

Lecture: 30, Practical: 30, Total: 60

TEXT BOOK:

1.	Garg S.K., "Environmental Engineering- Vol. I& II", 33rd & 39th Edition, Khanna Publishers, New Delhi, 2010 & 2019.
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REFERENCES:

1.	Metcalf and Eddy, " Waste Water Engineering: Treatment and Reuse", 4th Edition, McGraw-Hill, New Delhi, 2017.
2.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	estimate the population and analyze the water demand	Applying (K3)
CO2	classify the water purification methods	Applying (K3)
CO3	calculate the quantity of waste water generated from various sources	Applying (K3)
CO4	design the principal components of sewage treatment plant	Applying (K3)
CO5	suggest appropriate sludge treatment methods and sanitary fixtures	Applying (K3)
CO6	analyze the physical and chemical parameters present in the water	Analyzing (K4) Manipulation (S2)
CO7	determine the amount of oxygen required for self-purification of a stream	Applying (K3) Manipulation (S2)
CO8	recommend the type of coagulants required for potable supplies	Understanding (K2) Manipulation (S2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2									2	2
CO2	3	3	3	3									3	3
CO3	3	3	3	2									3	3
CO4	3	3	3	3									3	3
CO5	3	3	2	2									3	3
CO6	3	2	2	3		3	2						3	3
CO7	3	2	2	3		2	3						2	2
CO8	3	2	2	3		2	2						3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	25	45				100
CAT2	20	40	40				100
CAT3	25	35	40				100
ESE	20	40	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

20CEEC61 TRANSPORTATION ENGINEERING

(IRC : 37-2012 & IRC : 58-2002 permitted)

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL	6	PC	2	0	2	3

Preamble	To impart knowledge about the history of highway development, planning, design, construction and maintenance of pavement & Traffic characteristics and controls.	
Unit - I	Transportation Infrastructure:	6
Highway development in India - Classification of roads - Road patterns, Highway alignment and engineering surveys; Highway materials - Soil, Aggregates & Bitumen - Desirable properties and control quality tests.		
Unit - II	Geometric Design:	6
Cross-sectional elements – Camber - Sight distances, Design of horizontal alignment - Horizontal curves, Super elevation, Widening of curves, Transition curves, Set-back distance - Design of vertical alignment - Gradients, grade compensation, vertical curves		
Unit - III	Highway Pavements:	6
Design factors for flexible and rigid pavements - Design of flexible pavement using IRC: 37-2012 - Stresses, Design of joints, dowel bar, tie bar - Design of rigid pavements using IRC: 58-2002 - Construction Procedure and Distresses in flexible and rigid pavements - Drainage and Pavement Maintenance		
Unit - IV	Traffic Characteristics:	6
Microscopic and macroscopic parameters of traffic flow, Fundamental relationships; Traffic studies on flow, speed, travel time, delay and O-D study, PCU, peak hour factor, parking study, accident study and analysis		
Unit - V	Traffic Control:	6
Conflicts at intersection, Types of intersections - At-grade intersection, Grade separated intersections and channelization, Rotary intersection; Traffic signs - Road markings - Traffic control aids - Street furniture, Control devices, Signal design by Webster's method. Signal coordination; Highway capacity and level of service		

List of Exercises / Experiments:

1.	Water absorption and Specific gravity test on aggregates and Bitumen
2.	Gradation of coarse aggregates
3.	Aggregate Impact value test and crushing value test
4.	Attrition and Abrasion test on aggregates
5.	Flakiness and Elongation test on aggregates
6.	Penetration and Specific Gravity test on Bitumen
7.	Viscosity on bitumen and Stripping test on bituminous mixes
8.	Softening point test on bitumen
9.	Ductility test on bitumen
10.	Marshall stability of bituminous mixes
11.	Skid resistance test
12.	CBR test on sub-grade soil

Lecture: 30, Practical: 30, Total: 60**TEXT BOOK:**

1.	Khanna S.K. and Justo C.E.G., Highway Engineering, 10th Revised Edition, Nemchand & Bros, 2015.
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REFERENCES:

1.	Kadiyali L.R., Traffic Engineering and Transport Planning, 7th Edition, Khanna Publications, 2013.
2.	Laboratory Manual

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Infer the knowledge of highway planning and testing of materials	Understanding(K2)
CO2	analyze the geometric design elements of highway	Applying (K3)
CO3	apply the design procedure of flexible and rigid pavement	Applying (K3)
CO4	analyze the characteristics of traffic and accident data	Applying (K3)
CO5	design traffic signals and elaborate intersections with traffic control	Applying (K3)
CO6	determine physical properties of aggregates and bitumen	Applying (K3) Manipulation (S2)
CO7	design a mix ratio for required grade of bitumen	Applying (K3) Manipulation (S2)
CO8	determine the sub grade strength of the soil and to assess the surface condition of the pavement	Applying (K3) Manipulation (S2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											3	2
CO2	3	3	2										3	3
CO3	3	2	1										3	3
CO4	3	3	2										3	3
CO5	3	2	1										3	3
CO6	3	2	1	3									3	3
CO7	3	2	1	3									3	3
CO8	3	2	1	3									3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	30	50				100
CAT2	10	30	60				100
CAT3	10	30	60				100
ESE	10	30	60				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

Annexure - III

Syllabi of the courses to be studied for BE/BTech (Civil Engineering Branch) with Honours in Construction Technology under R2020

If a candidate earns 18 to 20 credits additionally in any particular specialization during the programme, such candidate can be awarded with Honours degree in that specialization as per the guidelines of AICTE upon getting the approval from Anna University, Chennai. A candidate shall have not less than 8.0 CGPA and no history of arrears to opt for the honours degree and has to maintain the same during the entire programme.

BE Degree in Civil Engineering with Honours in Construction Technology

S. No	Course name	Hours/Week			Credit
01	Construction Project Planning Systems	3	1	0	4
02	Construction Cost Analysis	3	1	0	4
03	Sustainable Construction Methods	3	1	0	4
04	Project Formulation and Appraisal	3	0	0	3
05	Advanced Concrete Technology	3	0	0	3
	Total Credits				18

CONSTRUCTION PROJECT PLANNING SYSTEMS

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL			3	1	0	4

Preamble	To enhance the knowledge among management tools and techniques for planning, scheduling, organizing, controlling and monitoring of construction projects.	
UNIT – I	Introduction to Project:	9+3
Concept of a Project – Characteristic features – Project Life cycle – Phases – Project Management – Tools and techniques for project management – Role of project managers - Organization and project team – Communication in project management.		
Unit - II	Construction Planning:	9+3
Introduction to Construction Projects - Project Categories - Project Participants - Project Life Cycle – Planning – Role of Planning Department in Construction- objectives – principles - stages of planning –Defining work task and precedence relationships among activities- Estimating durations and resources requirements- Coding system		
Unit - III	Project Scheduling:	9+3
Construction scheduling - Work Breakdown Structure - Project Cost and Time Estimation - Bar Chart - Milestone Chart - CPM - PERT - RPM - LOB - Software's in construction scheduling - Primavera - MSP.		
Unit - IV	Cost Control:	9+3
Monitoring and control of construction projects – quality control- importance-objectives – methods - cost control – objectives – control systems – direct and indirect cost control – project budgetary control – Project risk analysis and mitigation.		
Unit - V	Organizing and Use of Project Information:	9+3
Types of project information- accuracy – use of information – computerized information – uses – database – database models- relational model- centralized model- applications.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Dr. Seetharaman S., "Construction Engineering and Management", 2nd Edition, Umesh Publications, 2000.

REFERENCES:

1. Chitkara K.K., "Construction Project Management Planning Scheduling and Controlling", 18th Reprint, Tata McGraw Hill, 2009.
2. Sengupta and Guha, "Construction Management and Planning", 1st Edition, Tata McGraw Hill Publication, 2015.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	identify the owners view on a project in consideration with entire life cycle of project.	Understanding (K2)
CO2	summarize the importance of planning	Understanding (K2)
CO3	determine the project time and cost	Applying (K3)
CO4	recognize the need of project control	Understanding (K2)
CO5	classify the database models and its applications in construction projects	Understanding (K2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											3	3
CO2	2	1											3	2
CO3	3	2	1										3	2
CO4	2	1											3	2
CO5	2	1											3	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	50	50					100
CAT2	40	40	20				100
CAT3	50	50					100
ESE	20	60	20				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

CONSTRUCTION PROJECT PLANNING SYSTEMS

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL			3	1	0	4

Preamble	To improve the installation and estimate procedure of various construction method and maintenance with effective cost analysis methods.		
UNIT – I	Cost Implications:		9+3
Cost implications to different forms of construction and maintenance - Calculation of construction cost - Cost estimating - Investment Criteria - Discounting Criteria - Accounting -Concepts.			
Unit - II	Cost Installation:		9+3
Installation and running - cost of service - capital investment in project- Labour cost for construction - Cost for general conditions and requirements - Calculation of project cost -Miscellaneous cost in project.			
Unit - III	Cost Analysis:		9+3
Cost analysis by traders and functional element - Cost control during design and construction - Cost analysis methods - Break Even Analysis - Cash flow analysis - Risk analysis - Capitalized cost analysis - Benefit cost analysis			
Unit - IV	Cost and Finance:		9+3
Financing of projects-means of finance - Financial institutions - Direct and Indirect cost- Project Crashing - Budgetary control - Need, Objectives -Essentials of Budgeting - Different types of budgets.			
Unit - V	Cost Estimates:		9+3
Contracts - bonds - Insurance -cost estimates -Types of estimates - Life cycle cost - Strategic planning and cost programming -cost planning - cost curves.			

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1.	Kumar Neeraj Jha, "Construction Project Management", 2 nd Edition, Pearson India Education Services, New Delhi, 2018.
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REFERENCES:

1.	Prasanna Chandra, "Projects - Planning Analysis Selection Implementation & Review", 4th Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi.2005.
2.	Joy P.K. "Total Project Management - The Indian Context", New Delhi, Macmillan India Ltd., 2002.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	infer the cost implications made to forms of construction	Understanding (K2)
CO2	calculate the serviceability cost of construction	Applying (K3)
CO3	analyse the different methods of cost during design and construction	Analysing (K4)
CO4	interpret the types of costs and budgets incurred for a construction project	Understanding (K2)
CO5	implement strategic planning for cost estimates and programming	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											3	3
CO2	3	2	1										3	2
CO3	3	2	2										3	2
CO4	2	1											3	2
CO5	3	2	1										3	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	40	30				100
CAT2	20	30	30	20			100
CAT3	10	70	20				100
ESE	20	60	10	10			100

* $\pm 3\%$ may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

SUSTAINABLE CONSTRUCTION METHODS

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL			3	1	0	4

Preamble	To impart the knowledge on benefits of sustainable construction and methods to Preserve and protect the natural resources that surround the construction site.	
UNIT – I	Introduction:	9+3
Definitions of Sustainability - Various types of sustainability - Pillars of Sustainability - Circle of Sustainability - Need for Sustainability - systems and their sustainability - sustainability in the built environment context - Green Buildings -Difference between Green and Sustainability - Climate Change, Global warming - National and International policies and Regulations on sustainability		
Unit - II	Technology and its effects on the Environment :	9+3
Global Warming, climate change loss of biodiversity - Technological advancements and their effects on the environment - Advancement in building and construction technologies such as steel and concrete technologies, Development of framed structures, multistoried buildings, large span structures, invention of plastics - Effects on the environment - Generation of waste, use of high manufacturing energy, peak oil, depletion of fossil and natural resources.		
Unit - III	Green Building Technologies:	9+3
Introduction- Necessity - Concept of Green building. Principles of green building – Selection of site and Orientation of the building – usage of low energy materials – effective cooling and heating systems – effective electrical systems – effective water conservation systems - Certification systems- Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED), case studies		
Unit - IV	Sustainable Construction Techniques:	9+3
Alternative construction techniques such as SMB, CSEB, and steam cured blocks, composite beam and panel, funicular shells, filler slabs, reinforced concrete masonry, vaulted roofs, ferro-cement walls etc., - Case studies		
Unit - V	Waste As A Resource:	9+3
Recycling industrial, agricultural and municipal waste - Recycling waste as alternative material for buildings, landscape and other products - Study of innovative practices for use of recycled material, specifications and construction methods for using recycled waste - Demonstrative architecture and landscape using waste, vermi composting, biological and thermal energy options - Energy from sanitary landfills, refuse derived fuel and other options.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

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|----|---|
| 1. | R. L. Rag, "Introduction to Sustainable Engineering", 1 st Edition, PHI Learning Pvt. Ltd, New Delhi, 2015 |
|----|---|

REFERENCES:

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| 1. | Bill Reed, "The Integrative Design Guide to Green Building: Redefining the Practice of Sustainability", 1st Edition, Wiley India Private Ltd, New Delhi, 2009 |
| 2. | Rogers Peter P, "An Introduction to Sustainable Development", 1st Edition, Glen Educational Foundation Inc, USA, 2012. |

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	assimilate the concept of sustainability for future	Understanding (K2)
CO2	examine the environmental impact	Applying (K3)
CO3	use of green building technologies	Applying (K3)
CO4	implement sustainable construction techniques	Applying (K3)
CO5	carry out waste as a resource	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											2	2
CO2	3	2	1										2	2
CO3	3	2	1										2	2
CO4	3	2	1										2	2
CO5	3	2	1										2	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	13	70	17				100
CAT2	10	30	60				100
CAT3	10	30	60				100
ESE	10	30	60				100

* $\pm 3\%$ may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

PROJECT FORMULATION AND APPRAISAL

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL			3	0	0	3

Preamble	To assimilate the elements involved in costing and financial aspects of projects	
UNIT – I	Project Formulation:	9
Generation and Screening of Project Ideas -Project identification –Preliminary Analysis, Market, Technical, Financial, Economic and Ecological -Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report –Different Project Clearances required.		
Unit - II	Project Costing:	9
Project Cash Flows –Time Value of Money – Time lines and Notations -Cost of Capital - Present and future value of single amount - Simple Interest - Compound Interest- Project cash Flows - Principles of cash flow estimation.		
Unit - III	Project Appraisal:	9
NPV–BCR –IRR –ARR –Urgency –Pay Back Period –Assessment of Various Methods –Indian Practice of Investment Appraisal –International Practice of Appraisal –Analysis of Risk –Different Methods –Selection of a Project and Risk Analysis in Practice.		
Unit - IV	Project Financing:	9
Project Financing –Means of Finance –Financial Institutions –Special Schemes –Key Financial Indicators - Distinction between Management Accounting and Financial Accounting.		
Unit - V	Private Sector Participation:	9
Private sector participation in Infrastructure Development Projects -BOT, BOLT, BOOT -Technology Transfer and Foreign Collaboration -Scope of Technology Transfer.		

Lecture:45, Total:45

TEXT BOOK:

1.	Prasanna Chandra, "Projects -Planning Analysis Selection Implementation and Review", 21st Edition, Tata McGraw Hill, New Delhi, 2014.
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REFERENCES:

1.	Shishir Dutta, "Project Management: Concepts and Guidance", 1st Edition, Excel India Publishers, New Delhi, 2019.
2.	Joy P.K, "Total Project Management -The Indian Context", 2nd Edition, Macmillan India Ltd, New Delhi, 2002.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	plan for clearances required for a project	Applying (K3)
CO2	calculate the capital in-flow for a project	Understanding (K2)
CO3	infer the appraisal methods and risk analysis for a project	Applying (K3)
CO4	assimilate the funding patterns of financial Institutions for construction projects and the risks involved in it	Understanding (K2)
CO5	interpret the need for technology transfer	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1										2	2
CO2	2	1											2	2
CO3	3	2	1										2	2
CO4	2	1											2	2
CO5	3	2	1										2	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	40	30				100
CAT2	30	40	30				100
CAT3	30	40	30				100
ESE	30	40	30				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

ADVANCED CONCRETE TECHNOLOGY

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL			3	0	0	3

Preamble	This course imparts knowledge on the microstructure of concrete, advances in concrete technology and non-destructive testing techniques for concrete	
UNIT – I	Microstructure and Properties of Hardened Concrete:	9
Microstructure of aggregate phase – Microstructure of hydrated cement paste – Interfacial transition zone in concrete. Strength – porosity relationship – Failure modes in concrete – Compressive strength and factors affecting the compressive strength- Behavior of concrete under various stress states. Dimensional stability – Elastic behavior – Drying shrinkage & creep – Thermal shrinkage – Thermal properties of concrete.		
Unit - II	Concrete at Early Age:	9
Workability -Slump loss – Segregation and bleeding – Early volume changes – Setting time – Temperature of concrete – Testing and control of concrete quality – Early age cracking in concrete.		
Unit - III	Durability of Concrete:	9
Water as an agent of deterioration – Permeability – Classification of the causes of concrete deterioration – Surface wear – Crystallization of salts on the pores – Frost action – Effect of fire – Deterioration of concrete by chemical reactions – Sulfate attack – Alkali-aggregate reaction – Hydration of crystalline MgO and CaO – Corrosion of embedded steel in concrete - Concrete in the marine environment.		
Unit - IV	Advances in Concrete Technology:	9
Structural light weight concrete – High-Strength concrete – Self-consolidating concrete – High performance concrete – Shrinkage compensating concrete – Fiber-reinforced concrete – Concrete containing polymers – Shotcrete – Heavyweight concrete for radiation shielding – Pervious concrete – Mass Concrete – Roller-compacted concrete.		
Unit - V	Non-Destructive Testing Methods:	9
Surface hardness methods - Penetration resistance techniques - Pullout tests - Maturity methods - Concrete quality from absorption & permeability tests - Stress wave propagation methods - Electrical methods - Electrochemical methods - Electromagnetic methods - Topography of reinforced concrete.		

Lecture:45, Total:45

TEXT BOOK:

1.	Mehta P. K., and Monteiro P. J. M., "Concrete: Microstructure, Properties, and Materials", 4th Edition, McGraw Hill Education, New Delhi, 2017.
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REFERENCES:

1.	Neville A. M. & Brooks, J.J., "Concrete Technology" Pearson Education Limited, 2 nd Edition, Pearson Education Limited, Chennai, 2019.
2.	Shetty M.S., "Concrete Technology Theory and Practice", 8 th Edition, S.Chand & Company Ltd., New Delhi, 2018.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	explain the microstructure and hardened properties of concrete	Understanding (K2)
CO2	outline the factors influencing the concrete at early age	Understanding (K2)
CO3	identify the factors affecting the durability of concrete	Applying (K3)
CO4	compare and contrast the various types of special concrete	Understanding (K2)
CO5	explain the various non-destructive testing techniques in concrete	Understanding (K2)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				3							3	2
CO2	2	1				3							3	2
CO3	3	2	1			3							3	2
CO4	2	1				3							3	2
CO5	2	1				3							3	2
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	80					100
CAT2	20	60	20				100
CAT3	20	80					100
ESE	20	70	10				100

* $\pm 3\%$ may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

**Syllabi of the courses to be studied for BE/BTech (Civil Engineering Branch) with Honours in
Smart Cities under R2020**

Course Code	Course Title	Hours / Week			Credit	Maximum Marks			Category
		L	T	P		CA	ESE	Total	
Theory/Theory with Practical									
	Fundamentals of Smart Cities	3	1	0	4	50	50	100	PC
	Strategic Planning for Infrastructure Sectors	3	1	0	4	50	50	100	PC
	Urban Planning and Design	3	1	0	4	50	50	100	PC
	Infrastructure Finance	3	0	0	3	50	50	100	PC
	Urban Environmental Management	3	0	0	3	50	50	100	PC
Total Credits					18				

FUNDAMENTALS OF SMART CITIES

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL	6	PC	3	1	0	4

Preamble	This course imparts knowledge on national smart city mission of India, components, policies, challenges and future of smart city in India.	
UNIT – I	Smart city planning and development	9+3
Definitions – Evolution – Features and strategies – Challenges – India 100 smart cities policy and mission, smart city planning and development, Dimension of smart cities, global standards and performance benchmarks, practice codes, smart city planning and development, financing smart cities development. Governance of smart cities – case studies in India.		
Unit - II	Smart Urban Mobility and Smart Energy:	9+3
Need for urban mobility – multiple perspectives – objectives – components – emerging concepts and strategies – ICT supported smart mobility systems – policy priorities. Introduction to smart energy – urban density and energy use – objectives – elements of smart energy management system – strategies – smart grid – challenges.		
Unit - III	Water and Waste Management:	9+3
Smart water management – definitions – water resource and cycle – functions and objectives – steps in implementation – benefits – policy challenges. Smart waste management – approaches and implementation – existing systems – strategies – challenges and policies.		
Unit - IV	Smart Environment and Smart Buildings:	9+3
Global background of environmental concerns – concept of environmental resources - basic environmental challenges – smart environment – stakeholders – ICT framework for environmental management. Intelligent buildings – objectives – components – systems of smart building – benefits, challenges.		
Unit - V	E- Governance and ICT:	9+3
Governance challenges in new era – history of smart governance – functions and objectives – ICT in governance – system infrastructure – benefits, challenges and future vision. Taxonomy of layers of ICT architecture – major technology areas – components – emerging technologies in ICT – challenges and concerns in ICT		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Anilkumar P.P, "Introduction to Smart Cities", 1st Edition, Pearson India Education Service Pvt Ltd, Noida,Uttar Pradesh, India, 2019.

REFERENCES:

1. Germaine R. Halegoua, "Smart Cities", 1st Edition, The MIT Press Essential Knowledge Series, London, England, 2020.
2. Andy Pike, Andres Rodriguez-Pose & John Tomaney, "Handbook of Local and Regional Development", 3rd Edition, Taylor & Francis, United Kingdom, 2010.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	explain the concepts of smart city development and design	Understanding (K2)
CO2	describe mobility and energy in smart city	Understanding (K2)
CO3	explain water and waste management techniques in smart city	Understanding (K2)
CO4	model smart environment and smart buildings	Applying (K3)
CO5	plan e-governance and ICT in smart city	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											3	3
CO2	2	1											3	3
CO3	2	1											3	3
CO4	3	2	1										3	3
CO5	3	2	1										3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	70					100
CAT2	30	70					100
CAT3	10	30	60				100
ESE	20	50	30				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

STRATEGIC PLANNING FOR INFRASTRUCTURE SECTORS

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL			3	1	0	4

Preamble	This course imparts knowledge on the concepts and principles of planning and management applied to infrastructure industry	
UNIT – I	An overview of basic concepts related to infrastructure:	9+3
Introduction to infrastructure - An overview of the power sector- water supply and sanitation sector, road, rail, air and port transportation sectors- telecommunications sector- urban infrastructure- rural infrastructure in India - special economic zones.		
Unit - II	Infrastructure project finance:	9+3
Overview of infrastructure project finance – procurement process, concession- design and award, financial risk analysis, management and mitigation. Credit rating of infrastructure projects, credit allocation framework for infrastructure projects		
Unit - III	Private involvement in infrastructure:	9+3
Infrastructure privatization- benefits of infrastructure privatization- problems with infrastructure privatization- challenges in privatization of water supply- challenges in privatization of power privatization of infrastructure in India- Privatization of road transportation infrastructure in India		
Unit - IV	Challenges to successful infrastructure planning and implementation:	9+3
Mapping and facing the landscape of risks in infrastructure projects- economic and demand risks political risks- socio- environmental risks- cultural risks in international infrastructure projects- legal and contractual issues in infrastructure- challenges in construction and maintenance of infrastructure - risk management framework for infrastructure projects- shaping the planning phase of infrastructure projects to mitigate risks		
Unit - V	Strategies for infrastructure project implementation:	9+3
Innovative design and maintenance of infrastructure facilities- infrastructure modelling and life cycle analysis techniques Capacity building and improving the Governments role in infrastructure implementation. An integrated framework for successful infrastructure planning and management.		

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

- David I. Cleland and Roland Gareis, "Global Project Management Handbook: Planning, Organization and Controlling International Projects", 2nd edition, McGraw Hill Series, 2006

REFERENCES:

- Jeffrey L. Beard, Edward C. Wundran, Michael C. Loulakis, "Design, Build: Planning through development", McGraw Hill Series, 2001
- Richard Lambeck, John Eschemuller, "Urban Construction Project Management", McGraw Hill Series, 2009

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	explain the basic concepts related to infrastructure	Understanding (K2)
CO2	discuss infrastructure project finance	Understanding (K2)
CO3	describe the benefits and problems with infrastructure privatization	Understanding (K2)
CO4	identify the challenges for successful planning and implementation of infrastructure	Applying (K3)
CO5	Apply different strategies for successful planning and implementation of infrastructure	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2									3		3	3
CO2	2	2		2							3		3	3
CO3	2	2									3		3	3
CO4	3	3	3	3							3		3	3
CO5	3	3	3	3							3		3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	80					100
CAT2	20	80					100
CAT3	20	50	30				100
ESE	20	60	20				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

URBAN PLANNING AND DESIGN

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL			3	1	0	4

Preamble	This course imparts knowledge on Urban planning and design to improve the quality of the life of people living in complex urban conditions.
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UNIT – I	Introduction to Urban settlements	9+3
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Settlements - rural and urban settlements – their characteristics ; basic components, factors influencing urban settlements and their interrelationships; anatomy & classification of human settlements based on configuration of shape, function, location, resource, population & occupational structure; structure and form of human settlements – linear, non-linear and circular –combinations; reasons for development – major growth factors – advantages and disadvantages – case studies – factors influencing development / decay

Unit - II	Urban Planning	9+3
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Planning process and monitoring; Planning machinery in India – levels of planning – town and country planning act; types of development plans - regional plan, master plan, structure plan, zonal development plan – their scope and content; urban development programmes like JNNURM, TNUDP, IDSMT etc; Regulations and legislation in India; Indicators of development and quality of life; role of infra structure in urban development

Unit - III	Infrastructure planning for urban development:	9+3
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Urban development strategies and initiatives in India; smart city – smart grid; National and International guidelines; planning norms and standards for zoning and sub division, physical (transport, water supply, drainage, solid waste management, power etc), social (educational, health, recreational, cultural etc) infrastructure, residential and commercial infrastructure

Unit - IV	Sustainable urban development:	9+3
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Ecological, environmental and social impact of urbanization and development; Policies and urban design guidelines for new developments; Environmental Impact assessment – need, process and issues; social and environmental cost benefit; Indicators of ecological analysis;

Unit - V	Case Studies	9+3
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Best practices in urban planning and design – inter-national and national case studies; Case studies of Planning of large scale residential, commercial, physical and social Infrastructure at urban level.

Lecture:45, Tutorial:15, Total:60

TEXT BOOK:

1. Jayashri Ray Chaudhuri, “An Introduction to Development & Regional Planning” Orient Longman Ltd, 2001

REFERENCES:

1. Rangwala, "Town Planning" 18th edition, Charotar Publishing House, 2003.
2. Mercedes Gonzalez de la Rocha “Fundamentals of Town Planning”, Black well publishers, 2001

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	explain the characteristics and types of urban settlements	Understanding (K2)
CO2	identify the role of urban planning in development	Understanding (K2)
CO3	discuss the theories and models of urban planning	Understanding (K2)
CO4	apply sustainable practices in urban development and planning	Applying (K3)
CO5	design infrastructure with an understanding of the urban context and development	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2			2						2		3	3
CO2	2	2			2						2		3	3
CO3	2	2			2						2		3	3
CO4	3	3	2								3		3	3
CO5	3	3	3	2							3		3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	80					100
CAT2	20	80					100
CAT3	20	50	30				100
ESE	20	60	20				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

INFRASTRUCTURE FINANCE

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL			3	0	0	3

Preamble	This course imparts knowledge on financing technique that is widely used to finance infrastructure projects.	
UNIT – I	Introduction to Financial Management	9
Scope & Functions of Finance, Goals of Financial Management - Organization of the Finance Function. Accounting Principles - Preparation of journal, ledger, trial balance, Double Entry system, preparation of final account		
Unit - II	Statement of Changes in Financial Position	9
Preparation of Fund- Flow Statement, Preparation of Cash- Flow Statement, Analysis of Financial Statement– Profitability Turnover Ratios, Liquidity Ratios, Leverage Ratios, and Financial Ratios, Sensitivity Analysis		
Unit - III	Capital Budgeting	9
Concept and importance, factors influencing working capital requirements, Time Value of Money- Future value of a single cash flow, Annuity, Present value of a single cash flow, Annuity, Present value of an Uneven Cash Flow, Multi - Period Compounding. Capital Budgeting Decision.		
Unit - IV	Capital Structure	9
Capital structure, Relevance of Capital Structure, Theories of Capital Structure- Factors Influencing - EBIT Approach, EBT Approach, EBIT – EPS Analysis, Nature of Risk, Financial Leverage, Operating Leverage, Combined Leverage.		
Unit - V	Working Capital Management	9
Working capital – Components of working capital - Factors Influencing Working Capital Requirements - Operating Cycle and Cash Cycle - Determinants of Working Capital		

Lecture:45, Total:45

TEXT BOOK:

1. Khan M.Y., Jain P.K, "Financial Management", Tata Mcgraw Hill Publication, 2012
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REFERENCES:

1. Narayanaswamy, "Financial Accounting – A Managerial Perspective", PHI, 2011
2. Michael Jones, "Accounting for Non-Specialists", Person Education, 2012

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	explain the various factors involved in financial management	Understanding (K2)
CO2	Apply statement of changes in financial accounting	Applying (K3)
CO3	Solve problems related to capital budgeting	Applying (K3)
CO4	Explain factors influencing capital structure	Understanding (K2)
CO5	Solve problems related to working capital management	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											3	3
CO2	3	2	1										3	3
CO3	3	2	1										3	3
CO4	2	1											3	3
CO5	3	2	1										3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	20	60	20				100
CAT2	20	50	30				100
CAT3	20	60	20				100
ESE	20	50	30				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

URBAN ENVIRONMENTAL MANAGEMENT

Programme & Branch	B.E. & CIVIL ENGINEERING	Sem.	Category	L	T	P	Credit
Prerequisite	NIL			3	0	0	3

Preamble	This course imparts knowledge on various environmental issues in an urban scenario. It provides exposure to the urban water resources and its management.	
UNIT – I	Urban Environmental issues	9
Urbanization- Population growth scenario – migration – Pollution of surface water resources – rivers, tanks, channels – ground water exploitation – wastewater – characteristics – pollution problems – Solid waste – air pollution – CPCB norms		
Unit - II	Urban waste resources management	9
–Water in urban ecosystem – urban water resources planning and organization aspects – storm water management practices – types of storage – magnitude of storage – storage capacity of urban components – percolation ponds – temple tanks – rainwater harvesting		
Unit - III	Urban wastewater management	9
Sewage generation – storm drainage estimation – industry contribution – wastewater collection system – separate and combined system – hydraulic design of sewer and storm drain – wastewater treatment – disposal methods – concept of decentralization – 3R concepts		
Unit - IV	Municipal solid waste management	9
Sources of solid waste – characteristics – rate of generation – segregation at source – collection of solid waste – methods of collection – route analysis – transfer and transfer stations – processing and disposal of solid waste.		
Unit - V	Case Studies	9
Environmental economics- Social and Physiological aspects of pollution- Successful Urban Management – models- Urban Management-Case studies from Developed Nations – Softwares		

Lecture:45, Total:45

TEXT BOOK:

1.	Josef Leitmann, "Sustaining Cities - Environmental Planning and Management in Urban Design", McGraw-Hill, 1999
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REFERENCES:

1.	Gert de Roo, "Urban Environmental Planning", Taylor & Francis, 2017.
2.	Adrian Atkinson, Julio D. Dávila, Michael Mattingly, "The Challenge of Environmental Management in Urban Areas", Taylor & Francis, 2019.

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	explain various environmental related issues	Understanding (K2)
CO2	infer the importance of urban water resources management	Understanding (K2)
CO3	apply urban waste water management concepts	Applying (K3)
CO4	explain the methods of municipal solid waste management	Understanding (K2)
CO5	summarize the case studies related to urban waste management	Applying (K3)

Mapping of COs with POs and PSOs														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1											3	3
CO2	2	1											3	3
CO3	3	2	1										3	3
CO4	2	1											3	3
CO5	3	2	1										3	3
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy														

ASSESSMENT PATTERN - THEORY							
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	30	70					100
CAT2	30	50	20				100
CAT3	30	50	20				100
ESE	30	50	20				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

Annexure – IV

List of One / Two credit courses, on-line courses and syllabi, Transfer of credits from UGC and AICTE approved institutions and Credit transfer from foreign universities under R2018 & R2020 (from the year 2021-22 onwards)

One credit/Two credit courses:

1. Fundamentals of MATLAB for Civil Engineers
2. Advanced MATLAB for Civil Engineers

Online courses:

1. noc22-ge03- Entrepreneurship Essentials (12 Weeks)

Course Layout:

Week 1:	Introduction Dhirubhai Ambani & Sofia Myths & Realities about entrepreneurship entrepreneurial qualities Why start-ups fail?
Week 2:	Mission, vision, entrepreneurial qualities – I Mission, vision, entrepreneurial qualities – II Value proposition Business Model canvas Business model generation
Week 3:	Competitive advantage Lean start-up – 1 Lean start-up – 2 Team and early recruit Legal forms of business
Week 4:	Marketing management 1 Marketing management 2 Market research –I Market research –II Market research –Example
Week 5:	Introduction to financial statements Profit & Loss statement Balance sheet Cash flow Example – 1 Example – 2 Cost-volume-profit & Bread-Even analysis Capital budgeting
Week 6:	Business plan-I Business plan-II Pitching Go-to-market strategies Does & Don'ts
Week 7:	How to innovate Design Thinking Design-Driven Innovation, Systems thinking Open innovation, TRIZ How to start a start-up?
Week 8:	Government incentives for entrepreneurship (1 lecture) Incubation, acceleration Funding new ventures – bootstrapping, crowd sourcing, angel investors, VCs, debt financing (3), due diligence Legal aspects of business (IPR, GST, Labour law)
Week 9:	Cost, volume, profit and break-even analysis Margin of safety and degree of operating leverage Capital budgeting for comparing projects or opportunities Product costing Product pricing

- Week 10: Funding new ventures – bootstrapping, crowd sourcing,
Angel investors, VCs, debt financing (3), and due diligence
Incubation and acceleration
Government incentives for entrepreneurship
Project cost and Financial Closure
- Week 11: Dos & Dents in entrepreneurship
Growth Hacking
Growth Strategy
Legal aspects of business (IPR, GST, Labor law)
Negotiation skill
- Week 12: Human Resource management in startups
Pivoting
Entrepreneurial cases
Risk assessment and analysis
Strategy management for entrepreneurial ventures
Factors driving success and failure of ventures
Concluding remarks

2. noc22-ce13 Modern Construction Materials (12 Weeks)

Course layout

- Week 1: Prologue – Intro. to the course, Science, Engineering and Technology of Materials-1&2, Atomic Bonding-1
- Week 2 : Atomic Bonding-2, Structure of Solids-1, Structure of Solids-2&3
- Week 3 : Movement of Atoms, Development of Microstructure-1, Development of Microstructure-2
- Week 4 : Surface Properties, Response to Stress-1, Response to Stress-2&3
- Week 5 : Failure Theories, Fracture Mechanics-1, Fracture Mechanics-2
- Week 6 : Rheology & Thermal properties, Review of Const. Materials & Criteria for Selection, Wood and Wood Products-1
- Week 7 : Wood and Wood Products-2, Wood and Wood Products-3, Polymers
- Week 8 : Fibre Reinforced Polymers-1&2, Metals-1, Metals-2
- Week 9 : Metals-3, Bituminous Materials-1, Bituminous Materials-2
- Week 10: Concrete-1, Concrete-2, Concrete-3
- Week 11: Concrete-4, Concrete-5, Glass - Guest Lecture, Glass - Guest Lecture
- Week 12: Waterproofing Materials, Polymer Floor Finishes, Anchors

3. noc22-ce05 Digital Land Surveying And Mapping (DLS&M) (8 Weeks)

Course layout

- Week 1: Fundamentals of Land Surveying & GPS
- Week 2: Global Positioning System (GPS)
- Week 3: Global Positioning System (GPS)
- Week 4: TOTAL STATION(TS)
- Week 5: TS & DIGITAL LAND SURVEYING (DLS)
- Week 6: DLS& DIGITAL MAPPING (DM)
- Week 7: DM & DIGITAL DATA MANIPULATION (DDM)
- Week 8: DIGITAL LAND SURVEYING AND MAPPING (DLS&M)

4. noc22_hs05 Effective writing (4 Weeks)

Course layout

Topics :

- Introduction to Effective Writing
- Effective Writing as an Art
- Principles of Effective Writing
- Types and Stages of Effective Writing
- Notions of Correctness and Appropriateness, Part I
- Notions of Correctness and Appropriateness, Part II
- Essay Writing
- Types of Essays
- Essentials of Academic Writing, Part I
- Essentials of Academic Writing, Part II
- Business Writing and its Functions
- Mechanics of Business Writing
- Business Letters and Memos
- Format of Business Letters and Memos
- Types of Business Letter
- Sales, Complaint and Adjustment Letters

Report Writing
Strategies and Structure of Reports
Style of Report Writing
Creative Writing

Annexure-V

REPORTING ITEM

Online/ conventional method of examination system being followed for the November / December 2021 (both regular and arrear exams) End Semester / Trimester Examinations to be held in February 2022.

- a) As per the directions issued by Anna University and guidelines issued by Higher Education Department, Government of Tamilnadu, BE / BTech, BSc and MSc (Integrated) End Semester Examinations will be conducted through online mode, with students taking up the examinations from their places of stay. Examinations will be proctored by using appropriate software and also be monitored by faculty invigilators.
- b) MBA, MCA, ME / MTech and PhD coursework End Semester / Trimester Examinations will be conducted through conventional method (paper and pen) in campus.
- c) The above examination procedure shall also be followed for the maximum period exhausted students