# **Department of Civil Engineering**

### M. Tech Geotechnical Engineering Curriculum

### FIRST SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1	CE1011	FOUNDATION ENGINEERING	4-0-0	4
2	CE1012	ADVANCED SOIL MECHANICS	4-0-0	4
3	CE1013	GEOTECHNICAL EARTHQUAKE ENGINEERING	4-0-0	4
4		Elective I	4-0-0	4
5		Elective II	4-0-0	4
6	CE1061	GEOTECHNICAL LAB-I	0-0-4	2
7	CE1062	COMPUTATIONAL LAB	0-0-4	2
		TOTAL		24

## SECOND SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1	CE2011	SOIL DYNAMICS AND MACHINE	4-0-0	4
1		FOUNDATION		
2	CE2012	GROUND IMPROVEMENT	4-0-0	4
3	CE2013	APPLIED NUMERICAL METHODS	4-0-0	4
4		Elective III	4-0-0	4
5		Elective IV	4-0-0	4
6	CE2061	GEOTECHNICAL LAB-II	0-0-4	2
7	CE2062	Seminar - I (Non-Project)	0-0-2	1
8	CE2063	Project-I	0-0-2	1
		TOTAL		24

### THIRD SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1	CE3061	Project-II		11
2	CE3062	Project Seminar - I		2
		TOTAL		13

### FOURTH SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1	CE4061	Project-III		11
2	CE4062	Project Seminar - II & Viva Voce		3
		TOTAL		14

		Department of C	ivil Engine	ering			
Course	Title of the course	Program Core	Total Nu	mber of co	ntact hours		Credit
Code		(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	FOUNDATION	PCR	4	0	0	4	4
1011	ENGINEERING						
	•,						
Pre-requis	sites	Soil Mechanics					
~		CI+EA					
Course	At the end	of the course, the	student wil	l be able to	:		
Outcomes	• CO1: Interp	pret field and labora	tory data an	d prepare so	il investigati	on report.	
	• CO2: Analy	ze bearing capacity	and settlen	nent of found	dations.		
	• CO3: Desig	in shallow and deep	foundation	S.			
	• CO4: Analy	ze and suggest rem	edial measu	res against f	coundation fa	ilures.	
Topics	Soil Exploration	• Exploration Met	hods. Planr	ing the Ex	nloration Pro	oram. Bo	ring and
Covered	Sampling: In Situ	Tests: Standard Pe	netration Te	sts. Field Va	ne & Boreho	le shear te	sts. Rock
covered	Sampling, Core	Recovery, RQD;	Geophysica	1 Exploration	on; Plate Lo	ad Test,	Standard
	Panetration Test.	Preparation of Soil	Report. (8)	)			
	Shallow Founda	tions: Bearing Cap	acity:- Beau	ing capacity	of foundation	on based of	n in-situ
	tests. Bearing cap	bacity for foundation	n on slope, o	lesign of ma	t foundations	s including	floating
	Tait, Effect of Wa	iter Table; Footings	with Eccent ad transfer i	ric or incline	ed Loads, on carrying can	Layered S	0118. (10) load test
	Vertically loade	d piles. Static car	acity. Bear	ing Resista	nce of Piles	on Rock	toau test, t: Uplift
	Resistance; Late	rally Loaded Piles	–Ultimate I	Lateral Resi	stance; Nega	tive Skin	Friction;
	Under Reamed P	iles; Ultimate Capa	city of Pile	Groups in G	Compression	, Pullout &	z Lateral
	Load; Efficiency	Settlements of Pile Groups. (10)					
	Sheet piles: Desi	gn of anchored shee	t piles: Free	Earth Suppo	ort Method, F	fixed Earth	Support
	Coffer Dams: (	18. (0) Tellular cofferdams	- Circular a	and Dianhra	am type M	erite and a	lemerits
	Deign of circular	type cofferdams, p	ractice prob	lems. (6)	gin type, wi		iements,
	Braced Cuts: P	ressure envelope for	or Braced –	Cut design	, Pressure er	velope fo	r cuts in
	layered soil, Des	ign of various com	ponents of	a braced cu	t, Bottom he	ave of cut	in clay,
	Stability of the b	ottom of cut in sand	.(4)				
Text Boo	ks. TEXT BOOKS:						
and/or	1. Design A	ids in Soil Mechan	ics and Four	ndation Eng	ineering S.R.	Kaniraj	
reference	2. Foundati	on Engineering by	V.N.S Murtl	hy	C	5	
material				-			
	REFERENCE H	BOOKS:					
	3. Foundati	on Engineering by	B.M.Das				
	4. Foundati	on Engineering By	J.E. Bowles				
	5. Design o	f Pile Foundation B	y Tomlinsio	on.			

Course Outcome	PO1	PO2	PO3	PO4
CO1	2	3		1
CO2	3	1	2	
CO3	3	2	3	
CO4	2		3	

Mapping of course outcomes with program outcomes

	Department of Civil Engineering							
Course	Title	of the	Program Core	Total Nu	umber of co	ntact hours		Credit
Code	cours	e	(PCR) /	Lecture	Tutorial	Practical	Total	
			Electives	(L)	(T)	(P)	Hours	
			(PEL)					
CE	ADV	ANCED	PCR	4	0	0	4	4
1012	SOIL							
	MEC	HANICS						
Pre-requis	sites		Soil Mechanics					
			CT+EA					
Course		At the end	of the course, the	student wil	ll be able to	:		
Outcomes	6 •	CO1: Analy	yze effective stress f	for different	field condit	ions		
	•	CO2: Calci	alate settlement of set	oils using or	ne dimensio	hal and three	dimension	al
		consolidatio	on theories.	Ũ				
	•	CO3: Calc	ulate seepage thro	ugh soil.				
	•	CO4: Deve	lop stress path diag	rams for dif	ferent load c	onditions.		
Topics	St	resses, Strains	s, and Elastic Defo	rmations of	f Soils			
Covered	St	resses and strai	ins, Idealized stress-	strain respo	onse and yiel	ding, Hooke'	s Law, Pla	ne strain
	an	d axial symme	tric conditions, Ani	sotropic Ela	stic states, s	tress and stra	in states, 7	Fotal and
	Ef	fective stresses	s, Lateral Earth pres	sure at rest,	stresses in so	oil from surfa	ce loads, s	tress and
	sti	ain invariants,	stress paths, practic	cal example.	. (15) f Eine Cueir	and Colla		
		ne-Dimension	calculation of 1	orimary co	nsolidation	settlement	One-Dim	ensional
		onsolidation Th	eory Secondary Co	ompression	settlement (	One-Dimensi	onal Cons	olidation
	La	aboratory Test.	Relationship betwe	en laborator	rv and field	consolidation	n. Typical y	values of
	со	nsolidation set	tlement parameters	and empir	rical relation	ships, Precor	nsolidation	of soils
	us	ing wick Drair	ns, practical exampl	e. (12)		-		
	Т	wo-Dimension	al flow of water th	rough soils				
	T	vo-Dimension	al flow of water thro	ough porous	s media, Flov	vnet sketchin	ig, interpre	tation of
	Fl	ownet, Finite	difference solution	for Two-Di	mensional fl	ow, Flow th	rough Eart	h Dams,
	Sc	oil filtration, pr	actical example. (13	5)				
Text Boo	ks, $\mathbf{T}$	EXT BOOKS			27 T ( ) (	Q 1.11		
and/or		I. BrajaM.	Das, "Advanced Sol		s <sup>m</sup> I ata Mc	Grawhill	T / 1 - NT	D 11 '
reference		2. M. Budh	iu, "Soil Mechanics	and Founda	ations", Wile	ey India Pvt.	Ltd., New	Delhi
material	K	1 DO D	BUUKS:	luodurai "	Electicity o	nd Coomool	nomina Ca	mhridaa
		I. K.U. De Universi	tvis allu A.F.S. St	ervadurar,	Elasticity a	nu Geomeen	lanies, Ca	unonage
		Dross N	ew Vork					
		2 PESot	t "Dringinles of Soi	1 Machania	s" Addison	& Wasley		
Manning of	0011750	2. KT Stor	rearram outcomes		s, Audison	a westey		
Course O	urcome	PO1	PO2	1	PO3	PO/	1	
C01		2			3		1	
$C0^{2}$		3	2		3			
$CO_2$		3	2		3			
C04		3	2		3	1		
		5	2	•	J	1		

		Department of C	ivil Engine	eering			
Course	Title of the course	Program Core	Total Nu	umber of co	ntact hours		Credit
Code		(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	GEOTECHNICAL	PCR	4	0	0	4	4
1013	EARTHQUAKE						
	ENGINEERING						
Pre-requi	sites	Geotechnique					
		CT+EA					
Course	At the end	of the course, the	student wil	l be able to	:		
Outcome	6 • CO1: Deter	mine size of earthq	uake and st	rong ground	d motion para	ameters fr	om a
	recorded se	ismogram or accele	rogram.				
	CO2: Carry	out deterministic s	eismic haza	rd analysis o	onsidering th	ne differer	nt soil
	properties a	nd site conditions.					
	CO3: Princi	ples of Dynamics of	Structures.				
	CO4: Desig	n earthquake resist	ant geotech	nical struct	ures like reta	ining walls	s, slopes
Topics	Introduction to	Geotechnical Ear	thquake E	Ingineering	: Scope and	objective	; ground
Covered	shaking, liquefac	tion, land slide, tsur	nami. (3)		_	-	-
	<ul> <li>Engineering seis Strong ground m Magnitude. Diffe wave magnitude, Magnitude and E</li> <li>Development of Frequency Conte spectra, (6)</li> <li>Dynamic of Strue Newmark's Direct Use of response Without Seepage</li> <li>Soil improveme</li> </ul>	<b>mology:</b> Seismic we notion, effect of levent Magnitude Sc Seismic energy, Sp nergy released. Ear of <b>Spectra</b> : Peal ent and duration, a cetures: SDF and M ct Integration Method e <b>spectra</b> : Building . Examples. (9) ont for remediation	vaves, faults local site c cale: Richt atial Variab thquake mea k Accelera Attenuation DF system. od. Effective g frames, R	, Plate boun ondition on er magnituc ility of Grou asuring instr tion, Peak Relationsh Free and Fo e mass and N etaining wa hazard. (3)	daries, Elasti ground mo le, Moment nd Motion, C uments (7) Velocity, Po ips, Develop rced Vibratic Mass Particip Il and Earth	c Rebound tion. Inter magnitude Correlation eak Disploment of on. Modal A ation Factor en dams	I Theory, asity and s Surface between acement, response Analysis. or. (12) with and
Text Boo	ks. TEXT BOOKS:						
and/or reference material	1. Earthqua 2. EARTH( M.Shrike	ke Engineering . A QUAKE RESISTN ende	nil K. Chop T DESIGN	ra N OF STRI	UCTURES,	Pankaj .	Agarwal,
	<b>REFERENCE E</b> 1. Dynamic	SOOKS: s of Structures . Pro	of. Madhujit	Mukhopad	ya.		

	1 0			
Course Outcome	PO1	PO2	PO3	PO4
CO1	3	2		
CO2	2		3	
CO3	3		1	
CO4	3	2	3	

Mapping of course outcomes with program outcomes

		Department of C	ivil Engine	ering				
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours		Credit	
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total		
		Electives	(L)	(T)	(P)	Hours		
		(PEL)						
CE	SOIL DYNAMICS	PCR	4	0	0	4	4	
2011	AND MACHINE							
	FOUNDATION							
Pre-requis	sites	Geotechnique						
		CT+EA						
Course	At the end	of the course, the	student wil	l be able to	:			
Outcomes	• CO1: Apply	theory of vibration	is to solve d	ynamic soil	problems			
	CO2: Analy	ze and design beha	viour of a m	achine four	dation restir	ng on the s	surface,	
	embedded	foundation and four	ndations on	piles by Soi	as Spring an	d Elastic H	lalf	
	Space.							
	CO3: Analy	ze and design vibra	and design vibration isolation systems					
Topics	Introduction to n	nachine foundation.	chine foundation. (4)					
Covered					C I I I.		<b>C</b> 1	
	General theory:	heory of SDF and MDF system, damping of single and two degree freedom						
	system, transient	response and period	inc response	. (8)				
	Design parameter	ers: Dynamic soil parameters under compression bending vawing etc.					ving etc.	
	Evaluation of ela	stic base theory. (6)	F		r,			
		• • •						
	Block foundation	n: Mode of vibration	on, theoretic	al and reco	mmended m	ethods of	dynamic	
	analysis, design of	of reciprocatng mac	hine founda	tion. (12)				
	Hommon foundat	ion (9)						
	Hammer Toundat	1011 (8)						
	Turbogenerator	foundation: Special consideration in planning and design design data						
	recommended, d	ynamic analysis and	l design. (2)	lion in più	und u	esign, aes	ign autu	
Text Bool	ks, <b>TEXT BOOKS</b> :		0 ( )					
and/or	1. Handboo	ok of Machine Foun	dation . By.:	: C.V. Vaidy	anathan and	P. Sriniva	shalu	
reference	2. Design A	Aids in Soil Mechan	ics and Four	ndation Eng	ineering S.R.	Kaniraj		
material								
	DEFEDENCE	DOOKS.						
	1 Dynamic	DUURD: rs of Structures by N	Aadhuiit M	ukhonadvav				
		is of Structures by h	naanajii wi	uniopauyay				

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Course Ourcome	PO1	PO2	PO3	PO4
CO1	3		2	
CO2		2	3	1
CO3	3		3	

		ivil Engine	ering				
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours		Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	Ground	PCR	4	0	0	4	4
2012	Improvement						
Pre-requis	sites	Soil Mechanics					
		CT+EA					
Course	At the end	of the course, the	student wil	l be able to	:		
Outcomes	• CO1: u	nderstand how to i	mprove the	geotechni	cal propertie	es of soft	soil by
	differer	t techniques.		8	- properties	5 01 5010	som og
	• CO2: jo	lentify ground con	ditions and	suggest me	ethod of im	provemen	t
	• CO3· II	nderstand the princ	riples of so	il reinforce	ment and co	onfinemer	nt in
	enginee	ring constructions		II Telliforee		, in the second s	
	• CO4· P	romote wider use of	techno – ec	onomical co	nstruction te	chniques s	such as
	Reinford	d soil structures. Stone columns.					
Topics	Introduction: F	ormation of soil, ma	jor soil type	e, collapsible	e soil, expans	sive soil, r	eclaimed
Covered	soil, sanitary lar	nd fill, ground imp	rovements;	objective,	potential. (0	)6)	
	General Princi	oal of Compaction:	Mechanics	, field proce	dure, quality	control in	field.
	(06)						
	Ground Impro	vement in Granul	ar Soil: In	place dens	ification by	(i) Vibrof	loatation
	(ii)Compaction	pile (iii) Vibro	Compaction	n Piles (iv	) Dynamic	Compac	tion (v)
	Blasting. (10)						
	Ground Impr	ovement in Cohe	sive Soil:	Preloading	g with and	without	vertical
	Drains Design	of vertical Drains of	nstruction t	isolidation,	Stone Colum	nethous.	n Design
	principles load	carrying canacity	construction	n techniques.	s settlemen	nt of stone	column
	foundation (10	))	onsuuction	n teeninque	s, settlemen	it of stone	column
	Ground Impro	,, vement by Groutin	g and Soil	Reinforcen	nent: Grouti	ng in soil	types of
	grout, desirable	characteristics, grou	ting pressu	re, grouting	methods. S	oil Reinfo	orcement:
	Mechanism, Typ	es of reinforcing ele	ments, reinf	orcement-sc	il interaction	, Reinforc	ement of
	soil beneath the	roads. (08)					
	Drainage & D	ewatering in soils	(04)				
	Liquefaction P	otential and Measur	res to preve	ent liquefact	tion (02)		
Text Boo	ks, <b>TEXT BOOKS</b>	•					
and/or	1. M.P.Mc	sely, "Ground Impro	ovement" C	RC Press, In		· · · · · · · · ·	т.
reference	2. N.N.Sol	n & S.C.Das, "The	ory and Pra	ctice of Fou	ndation Desi	ign", PHI	Learning
material	rvi. Lla New De	., lhi					
	REFERENCE	BOOKS:					
	1. K.B. W	oods, D.S. Berry and	W.H. Goetz	z, "Highwav	Engineering	Handboo	k", 1960.
	2. Winterk	orn& Fang, "Found	lation Engi	neering Ha	nd book", G	algotia P	ublishing
	House.		0	0	, -	<u> </u>	0

Course Ourcome	PO1	PO2	PO3	PO4
CO1	3		1	
CO2	2	3		1
CO3	2		3	
CO4	1		2	3

Mapping of course outcomes with program outcomes

		Department of C	ivil Engine	eering			
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours	-	Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	APPLIED	PCR	4	0	0	4	4
2013	NUMERICAL						
	METHODS						
Pre-requis	sites	Mathematics at U	G levels				
		CT+EA					
Course	At the end	of the course, the	student wil	l be able to	:		
Outcomes	• CO1: As	ssess the error involv	ved in a nun	nerical meth	od		
	• CO2: So	lve problems in eng	ineering and	d science wi	th a required	accuracy	using
	appropri	ate numerical metho	ods				
	• CO3:W1	ite algorithm for the	numerical	methods for	efficient cod	ling of pro	gram
	• CO4:Un	derstand the mathem	natics conce	pts underlyi	ng the nume	rical metho	ods
					e		
Topics	Fundamentals	of numerical m	ethods, E	lements of	matrix alg	ebra, Sol	ution of
Covered	bovered Linear equations and eigenvalue problems: Solution of differenti				differential	l equatior	ns, Error
	analysis and stability of algorithms. (2)					,	
	Nonlinear equations: Newton Raphson method, Muller's method, system of non-					on-linear	
	equations. Roots	of polynomial equa	tions. (6)				
	Linear system	of algebraic equa	tions: Gaus	ss elimination	on method,	LU decon	nposition
	method; matrix	nversion, iterative r	nethods, ill	conditioned	systems. Eig	genvalue p	roblems:
	Jacobi, Given's	and Householder's	methods to	or symmetri	c matrices,	Power and	1 inverse
	Internolation	(0) and annroximatic	n·Newton'	s Laorano	e and Her	mite inte	rnolating
	polynomials, cut	bic splines: least squ	are and min	imax approx	kimations. (6	)	ipolating
	Numerical diffe	erentiation and inte	egration: N	ewton-Cote	s and Gaussi	an type qu	uadrature
	methods. (6)		0				
	Ordinary diffe	rential equations:Ir	nitial value p	problems: sir	ngle step and	multistep	methods,
	stability and the	r convergence. Bou	ndary value	problems:	functional ap	proximati	on, finite
	difference metho	d, finite element me	ethod. (8)	1 C 1	1	1. 11	1 1'
	Partial Differen	tial Equations: Diff	rerence meti	nods for solu	tion of parab	olic and hy	ifformation
	methods for ellir	tic equations Comp	uter oriente	d algorithms	· Numerical s	solution of	different
	problems. (6)	de equations. comp		a argorranns	, i tuineitear s	Solution of	uniterent
Text Boo	ks. TEXT BOOKS	:					
and/or	1. Numerica	al Methods for Scier	ntists and Er	ngineers, R.	W. Hamming	g, Dover	
reference	Publicati	ons; 2 edition			-		
material	2. Numerica	al Methods: Problem	ns and Solut	ions, Mahin	der Kumar Ja	ain (Autho	r),
	S.R.K. Iv	engar (Author), R. I	K. Jain, Nev	v age publisl	ners		
	REFERENCE	BOOKS:		~ 1			
	3. Applied I	Numerical Methods	for Enginee	rs Using Ma	tlab and C, F	Robert J.	
	Schilling	(Author), Sandra L.	Harris, Nel	lson Enginee	ering; Har/Co	lr edition.	
	6			0	<u> </u>		

Course Outcome	PO1	PO2	PO3	PO4
CO1	2	1		2
CO2	2	1	2	2
CO3	2	1	3	2
CO4	2	1		2

Mapping of course outcomes with program outcomes

		Department of C	ivil Engine	eering			
Course	Title of the	Program Core	Total Nu	imber of co	ntact hours		Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	PROBABILITY	PEL	4	0	0	4	4
9040	AND						
	STATISTICS						
Pre-requis	sites	Engineering Ma	thematics				
<b>i</b>		CT+EA					
Course	At the end	of the course the	student wil	l be able to	) <b>.</b>		
Outcomes	$\sim$ CO1: unde	or the course, the	nrohahilit	v and static	tics		
Outcome	• $CO1$ und	retand the rendem	voriables	different d	atributiona	ofrandan	
	• CO2: unde	functions of random	variables,	ioint distri	bution com	of randon	1
	variables,	na actimation than	II vallable,	of hymothe	oution, sam	pillig Inoca of fi	t tooto
			iy, testing				
	• CO3: solve	e different enginee	ring proble	ems applyin	ig the theory	of proba	bility
		CS.	. 1 1. 11.4		1	1.4	.1. :
	• CO4: appl	y the theories of pr	obability a		s to analyse	data white	ch is
Taniaa	Drobobility Av	iomatic definitions	engineering	g structures	and rounda	litional mm	hability
Topics	multiplication r	le total probability	Bayes' Th	eorem and	independence	nuonai pro	$p_{0}$ $(5)$
Covered	Random Varial	ne, total probability	, Dayes II	m variables	nrobability	mass pro	hability
	density and cu	mulative distribution	n functio	ons mather	natical expe	ctation r	noments
	probability and	moment generating	function	Markov ine	quality Cheł	vshev's i	neguality
	problems. (6)				quality, ener	, <u>, , , , , , , , , , , , , , , , , , </u>	
	Special Distril	outions: Discrete	uniform, l	oinomial, g	geometric, n	legative h	oinomial,
	hypergeometric,	Poisson, continuou	s uniform, e	xponential,	gamma, Wei	ibull, beta	, normal,
	lognormal. (8)						
	Function of a ra	andom variable: Di	fferent func	tions of a ra	ndom variab	le . (2)	
	Joint Distribut	ions: Joint, margin	hal and co	nditional di	istributions,	product r	noments,
	(4)	egression, independe	ence of rand	iom variable	s, bivariate r	iormal dis	ribution.
	(4) Sampling Distr	ibutions: The Centr	al I imit The	eorem distri	butions of th	e samnle r	nean and
	the sample varia	nce for a normal por	mulation Ch	i-Square t	and F distrib	utions pro	hlem $(3)$
	Estimation: Ur	biasedness. consis	tency, the	method of	moments a	and the m	ethod of
	maximum likelil	nood estimation. cor	fidence inte	ervals for pa	arameters in c	one sample	and two
	sample problem	s of normal populati	ons, confid	lence interva	als for propor	tions. $(6)$	
	Testing of Hyp	otheses: Null and	alternative	hypotheses	, the critical	and ac	ceptance
	regions, power	of the test, the mo	st powerfu	l test and	Neyman-Pea	arson Fun	damental
	Lemma, tests fo	r one sample and tv	vo sample	problems fo	r normal po	pulations,	tests for
	proportion. (8)						
	Goodness of fit	tests:Chisquare goo	dness of fit	test and its a	applications,	problems.	(2)
Text Bool	ks, TEXT BOOKS		II 1075 D	1 1 1 1	. · -		D1 '
and/or	I. Ang, A.	H. S. and Tang, W.	H. 1975. Pr	obability Co	oncepts in En	gineering	Planning
reference	and Des	Sign: volume 1, Bas		s, whey.	noonto in E-	aincomina	Diannina
material	2. Allg, A.	ign: Volume 2 Desig	11. 1704. Pl	ouauliity Co	w Wilow No.	w Vorlz	r tailing
		BOOKS:	non, misk ål		y, whey, he	W IUIK.	

<ol> <li>Montgomery, D.C. and Runger, G.C. 1998. Applied Statistics and Probability for Engineers, Wiley, New York.</li> </ol>

Course Outcome	PO1	PO2	PO3	PO4
CO1	3			
CO2	3			
CO3			2	
CO4				2

		Dep	artment of C	ivil Engine	ering			
Course	Title	le of the course Program Total Number of contact hours					Credit	
Code			Core	Lecture	Tutorial	Practical	Total	
			(PCR) /	(L)	(T)	(P)	Hours	
			Electives					
			(PEL)					
CE	GEC	DENVIRONMENTAL	PEL	4	0	0	4	4
9041	ENC	NEERING						
Pre-requisites Soil Mechanics, Environmental Engineering						5		
			CT+EA					
Course		At the end of the	e course, the	student wi	ll be able to	):		
Outcome	es	• CO1: Identify co	ntaminant tra	Insport med	hanisms in s	soils		
		• CO2: Design of s	uitable liner f	or landfills.				
		<ul> <li>CO3: Apply sui</li> </ul>	table in-situ	remediatio	n technique	es to deconta	aminate n	olluted
		sites		- cille alatio	n tooninque		anninate p	onatea
Topics		Sources and Site Ch	aracterizatio	<b>n</b> : Scope c	of Geoenviro	onmental En	gineering.	Various
Covered		Sources of Contaminations, Need for contaminated site characterization;					on; and	
		Characterisation methods. (6)						
	Soil properties: Geotechnical properties, Chemical properties. (6)							
		Pollution in Ground	dwater: Intro	oduction, H	lydrodynami	ic dispersior	n of pollu	itants in
		groundwater environm	ent, Solute tra	ansport mod	lelling by the	e finite eleme	ent method	l. (8)
		Advaction Dispersion	oort and Fate	e: Transport	process, M	ass-transfer	process, N	lodeling,
		Remediation Techni	ques: Object	ives of site	remediatic	n various a	porous inc	nassive
		methods, remediation	NAPL sites. F	Emerging Re	emediation 7	Fechnologies	. (6)	passive
		Landfills: Types of	landfills. Si	te Selection	n. Waste C	ontainment	Liners. I	eachate
		collection system, C	over system,	Gas collec	tion system	n. (6)		
Text Bo	oks.	TEXT BOOKS:				~ /		
and/or	,	1. Daniel, D.E.,	"Geotechnica	l practice	for waste d	lisposal", Cl	hapman a	nd Hall,
reference	е	London.		-		-	-	
material	-	2. H.D. Sharma	&K.R.Reddy,	" Geoenv	ironmental	Engineering:	Site rem	ediation,
		waste containr	nent and eme	rging waste	e manageme	nt technolog	ies" John	Wielv&
		Sons, INC.		0 0			,	j
		,						
		<b>REFERENCE BOO</b>	OKS:					
		1. Sincero and S	incero, "Envi	ronmental E	Engineering:	A Design A	pproach",	Prentice
		Hall of India (	P) Ltd. New I	Delhi.				
		2. Kays, W.B., '	'Construction	of Linings	for reservoi	rs, Tanks and	d Pollution	n control
		facilities".						
Mapping of	of cour	se outcomes with progra	am outcomes					

Course Ourcome	PO1	PO2	PO3	PO4
CO1	3		1	
CO2	3	2	3	
CO3	2		3	1

		Department of C	ivil Engine	eering			
Course	Title of the	Program Core	Total Nu	imber of co	ntact hours		Credit
Code	course	(PCR)/	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)	~ /				
СЕ	GROUND	PEL	4	0	0	4	4
9042	WATER		-	Ĵ.	-		
	HYDROLOGY						
Pre-requis	sites	Hydrology & Ir	rigation En	gineering,	Soil Mecha	nics	<u> </u>
<b>^</b>		CT+EA	0	0 0,			
Course	At the end	of the course, the	student wil	l be able to	):		
Outcomes	• CO1. Inter	pret aquifer charac	teristics fo	r availabili	ty of ground	lwater	
	CO2: Estir	nate characteristic	feature of	geo-hydrol	ogy	2 () alor	
	CO3: Estin	nate storage and v	ield and au	ality of gro	und water f	rom the a	auifer
	• CO3: Estin	age and develop g	round wate	or for sustai	nable use	ioni uic a	quiter
CO4. Manage and develop ground water for sustainable use							
Covered	Introduction – Characteristic of Ground water – Distribution of water - ground y				ound wate	r column	
–Permeability - Darcy's Law - Types of aquifers – Hydro-geological Cycle					Vcle – wa	ater level	
fluctuations. (6)							
	Hydraulics of f	ow					
	Storage coeffici	ent - Specific fiel	d - Hetero	geneity and	d Anisotropy	y -Transm	nissivity–
	Governing equa	tions of ground w	ater flow -	Steady sta	ate flow – I	DupuitFor	chheimer
	assumptions – V	elocity potential - F	low nets (6)				
	Estimation of p	arameters					
	Transmissivity a	nd Storavity – Pumj	ping test - U	Insteady stat	te flow - Thie	ess method	1 – Jacob
	method - Image	well theory – Effect	of partial p	enetrations of	of wells - Col	lectors we	ells. (6)
	Ground water of	levelopment	A (*C* * 1	1 D	• • •	o	1 1
	Viald test	ry - Conjunctive use	e - Artificial	f numper (6	ainwater harv	vesting - S	afe yield
	- i leid lest - Ge Water quality	ophysical methods -	- Selection (	or pumps. (o	)		
	Ground water	hemistry - Origin	movement	and quality	v - Water o	uality eta	ndarde _
	Saltwater intrusi	on –Environmental	concern (6)	and quant	y - Water q	durity sta	liuulus
	Groundwater n	nanagement					
	Ground water b	asin management:	concepts of	of coniunct	ion use (4)		
Text Boo	ks. TEXT BOOKS		<u> </u>	5			
and/or	1. Raghunath H.	M., "Ground Water	Hydrology"	, Wiley Eas	tern Ltd., 200	00.	
reference	2. Todd D.K., "(	Ground Water Hydro	ology", John	Wiley and	Sons, 2000.		
material							
	<b>REFERENCE</b>	BOOKS:					
	1. Bawvwr	, Ground Water, Joh	nn Wiley &	Sons			

mapping of course outcomes with program outcomes	Mapp	oing o	of	course	outcomes	with	program	outcomes
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Course Outcome	PO1	PO2	PO3	PO4
CO1	2	3	3	3
CO2	2	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3

		Department of C	Civil Engine	eering			
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours		Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	FINITE	PEL	4	0	0	4	4
9043	ELEMENT						
Pre-requis	sites	Matrix Method	of Analysi	s. Engineer	ring Mechar	nics.	
		CT+EA					
Course	At the end	of the course, the	student wil	l be able to	):		
Outcomes	• CO1: Unde	erstand the concept	of finite ele	ment metho	od for solving	geotechn	ical
	engineering	g problems					
	CO2: Deve	lop algorithms and	write FE coo	le for solvin	g simple desi	gn problei	ms and
	understand	the use of commer	cial package	es for compl	ex problems		
	CO3: Apply	y finite element me	thod for ana	lysing beha	viour of geot	echnical	
	structures.						
Topics	Introduction: H	Basics of FE, discre	etization, no	odes, elemen	its, mesh, st	iffness, de	egrees of
Covered	freedom, eleme	nt stiffness matrix.	, element l	oad vector,	element dis	splacemen	t vector,
	assembly proceed	ure, global stiffness	s matrix gio	bal load vec	tor, global di	splacemer	if vector,
	between linear a	nd quadratic element	f(6)	perces, me	apolation fui	ictions. D	include
		na quadratic cremer	(0)				
	Different form	ulations: Galarkin	e's Residua	al Model,	Virtual Wor	k Model,	Energy
	Principal etc. and	d derivation of shap	e functions i	in light of ab	ove of beam	element.	(6)
	<b>.</b>		4 F	1 2 1	1 . 1	1 6 1	
	function with no	l Rectangular Ele	ment: Form	nulation by	basic metho	d of disp	lacement
	runction with no	dai variables. Exam	pies. (8)				
	Introduction o	f Isoparametric <b>E</b>	lements: P	lane stress	and plane	strain. Co	ncept of
	Integration point	s, Jacobian matrix.	Application	in Geotechr	nical Enginee	ring.Exam	ple. (6)
	3D elements	Formulation as Is	o-narametri	c element	Application	in Geo	technical
	Engineering. Ex	ample. (6)	so-parametri	e cicilient.	Application		teennear
		<b>F</b> (1)					
	Programming or	Simple Element Fo	ormulation (	6)			
Text Boo	ks, <b>TEXT BOOKS</b>	:					
and/or	1 Finite Element	t Analysis (Theory a	and Program	ming). C.S	. Krishnamu	rthy. Tata	McGrew
reference	Hills 2 Einite Element	Mathada Dhanrai	Noir Oxfor	1			
material		menious. Ditailitaj		1 1			
	REFERENCE	BOOKS:					
	1. Problems in S	tructural Analysis b	y Matrix me	ethod. P. Bh	att. Wheelers	8.	

Course Ourcome	PO1	PO2	PO3	PO4
CO1	3			
CO2			3	2
CO3	3		3	

Mapping of course outcomes with program outcomes

		Department of C	ivil Engine	ering				
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours		Credit	
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total		
		Electives	(L)	(T)	(P)	Hours		
		(PEL)						
CE	OFFSHORE	PEL	4	0	0	4	4	
9044	STRUCTURE							
	ENGINEERING							
Pre-requis	sites	Solid Mechanics,	Structural A	Analysis				
		CT+EA						
Course	At the end	of the course, the	student wil	l be able to	:			
Outcomes	G CO1: Identify th	e types of offshore s	tructures, pa	arameters go	overning soli	d-fluid inte	eraction	
	and environment	tal forces acting on o	offshore stru	ctures.				
	CO2: Apply stat	ic methods of analys	sis for stress	es in Offsho	ore structures			
	CO3: Solve for 1	esponse analysis of	offshore str	uctures – sir	igle and mult	ii-degree o	t	
	CO4 Ability to	design offshore plat	ne domain a	inaryses.				
Topics	Loads and struct	ural forms of differe	ent types of o	offshore stru	ictures		(4)	
Covered	Introduction of	SDOF, free and for	ced vibratio	ons; Analysi	is for transie	nt and ste	ady state	
00,000	force; Equivaler	t damping for nonli	near system	is; Dynamic	s of multi d.	o.f. system	ns; Eigen	
	values and vecto	rs; Iterative and tran	sformation 1	methods; Mo	ode superpos	ition. Four	ier series	
	and spectral met	hod for response of	single d.o.f.	systems		(1	0)	
	Vibrations of ba	rs, beams and cones	with referen	nce to soil as	s half space		(4)	
	Behaviour of co	ncrete gravity platfo	rm as a rigid	l body on so	il as a contin	uum	(4)	
	Short and long to	erm statistics of wind	d; Static wir	nd load; Effe	ect of size, sh	ape and fr	equency;	
	Aerodynamic ad	mittance function ar	nd gust facto	or, spectral r	esponse due	to wind fo	r various	
	types of structur	es; Wave loads by N	lorison's equ	uation; Stati	c and dynam	1c analysis	s of fixed	
	Design of offsho	or approximate memory	ous.	d and floatir	(10) na platforms	) Steel con	crete and	
	hybrid platforms	Design criteria. En	vironmental	loading. Wi	ind, wave and	l current lo	ads after	
	installationBeh	aviour under dynam	ic loading.S	tatic and dy	namic analys	is of platf	orms and	
	components.		e	•	(	10)		
Text Boo	ks, <b>TEXT BOOKS</b>	:	. <b>T</b>	T XX/1		.•		
and/or	I. Dynami	cs of Offshore Struc	tures, James	F. Wilson,	Wiley; 2 edi	tion		
reterence	2. Wave F	orces on Offshore St	ructures, Tu	irgut 'Sarp' S	Sarpkaya, Ca	mbridge		
material	Universit	ity Press; I edition						
		BOOKS:	<b>C</b> () =====(					
	3. Hydrody	namics of Offshore	Structures,	S.K. Chakra	idarti, WIT P	ress /		
	Comput	ational Mechanics						
Mapping of	Manning of source outcomes with program outcomes							

Course Outcome	PO1	PO2	PO3	PO4
CO1	2	1		2
CO2	2	1	1	2
CO3	2	1	3	2
CO4	2	1	3	2

Department of Civil Engineering								
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours	-	Credit	
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total		
		Electives	(L)	(T)	(P)	Hours		
		(PEL)						
CE	REMOTE	PEL	4	0	0	4	4	
9045	SENSING AND							
Dro roqui		Nona						
rie-iequi	sites	CT+FA						
Course	At the end of th	ci + LA	ont will bo	abla tar				
Outcome		e course, the stud	ent will be	able to.	nts related w	ith romoto	consing	
Outcomes		ealli about basic iter	ilos, paramet		pis related wi		sensing.	
	• CO2. A	ppry techniques of v	Isual image	Interpretati	on and digita	i image		
		ng.		1	·	. 1		
	• CO3: 0	se GIS and its components for applications in Geo-Environmental						
	engineer	ing.						
Topics	Remote Sensing	g – History, Physica	l basis, Elec	ctromagnetic	c spectrum, S	Spectral re	flectance	
Covered	curves, Spectral	signatures, Resolut	ions, Passiv	e & active r	emote sensir	ig, Remote	e sensing	
	platforms. (10)	~ · · · ·					~	
	Sensors – Differ	ent types, Satellite l	band designa	ations & pri	ncipal applies	ations, FC	C, Aerial	
	Digital image n	rocessing – Pixels $\lambda$	) & DN value	s Divital in	nage formats	Image nr	ocessing	
	functions – Imag	e enhancement. Ima	age transform	mation. Imag	ge classificat	ion & anal	vsis.(10)	
	Geographic Inf	ormation System –	- Introductio	n, GIS com	ponents – ha	rdware, so	ftware &	
	infrastructure, G	IS data types, Data	input & pro	ocessing, Pro	eparation of	thematic n	nap from	
	RS data.(10)		1. 1	• .• • .•	C 11 C C		. 1	
	Integration of RS	5 & GIS techniques	and its appl	ications in th	he fields of G	eo-Enviro	onmental	
T ( D	TEXT DOOLS	_						
I ext Boo	KS, IEAI BOOKS	: a Remote Sensing A	& GIS Oxfo	rd Universit	v Press			
allu/01	1. D. Dhatt	a, Remote Sensing C	¢ 015, 0410		y 11035.			
material	<b>REFERENCE</b> I	BOOKS:						
material	1. T.M. Lil	lesand and R.W. Ki	efer, Remote	e Sensing a	nd Image Inte	erpretation	ı, John	
	Wiley &	Sons.						
	2 CPLO	& A K W Yeung (	oncents &	Techniques	of Geographi	ic Informa	tion	
	Systems.	PHI.	Concepts & rechniques of Geographic Information					

Course Outcome	PO1	PO2	PO3	PO4
CO1	2			
CO2	2	1	3	
CO3		1	3	2

			Department of C	ivil Engine	ering			
Course	Titl	e of the course	Program Core	Total Nu	mber of co	ntact hours		Credit
Code			(PCR) /	Lecture	Tutorial	Practical	Total	
			Electives	(L)	(T)	(P)	Hours	
			(PEL)					
CE	FOF	RENSIC	PEL	4	0	0	4	4
9046	GEC	DTECHNICAL						
	ENG	GINEERING						
Pre-requi	sites		Soil Mechanics					
			CT+EA					
Course		At the end of	of the course, the	student wil	l be able to	:		
Outcome	s	• CO1: Explai	n the need of Fore	nsic Geotecl	hnical invest	tigation.		
		• CO2: Learn	the concept of Bac	k Analysis.				
		• CO3: Outlin	e the Instrumentat	ion, Monito	oring and Ca	se studies in	Forensic	
		Geotechnica	l Investigation.	,	0			
			_					
Topics		Project reconnais	sance and character	rization of th	he distress, i	ncluding doc	cument sea	urch such
Covered		as plans, codes, a	nd other technical s	d other technical specifications followed in the original design. (10)				
		Diagnostic tests -	Analysis of field data – selection of laboratory tests based on actual field					
		parameters to ev	atuate the behaviour of soll/ground. Scope and extent of application of pring techniques in geotechnical and foundation failure investigations					
		Forensic Enginee	ructures expansiv	uctures expansive soils lateral movement other geotechnical and				
		foundation proble	ems groundwater and moisture problems (12)					
		Back analysis: Se	election of theoretical model - methods of analysis, Instrumentation and					
		Monitoring, Deve	elopment of the mos	t probable f	ailure hypot	hesis - cross-	check with	n original
		design.(10)	1	1				U
		Performing relial	bility checks, Leg	al issues ir	nvolving ju	risprudence	system, ir	nsurance,
	:	repairs, reducing	g potential liabil	ity, respon	sibility of	geotechnica	al engine	ers and
		contractors.(10)						
Text Boo	ks,	TEXT BOOKS:						
and/or		1. Robert	t W. Day, "Fore	ensic Geote	echnical ar	nd Foundati	ion Engir	neering"
reference		McGra	aw					
material		Hill.						
		2. Malco	lm D. Bolton, "A	Guide to S	oil Mechar	nics "Univer	sities Pre	SS.
		<b>REFERENCE B</b>	OOKS:					
		1. Saxena,	D.S., "Technical,	"Technical, Ethical, and Legal Issues with Forensic				
		Geotech	nicalEngineering	- A Case H	[istorv". Pro	oceedings 1	3th Asiar	ı
		Regional	Conference on S	Conference on Soil Mechanics and Costochnical Engineering				
		Kollzota	India 11 Das am	; on som mechanics and Geolechnical Engineering,				
		Koikala,	mula, 11 Dec-ell					

Course Outcome	PO1	PO2	PO3	PO4
CO1		1		2
CO2	2	1	2	
CO3		2	3	

Department of Civil Engineering										
Course	Tit	le of the	e	Progra	m Core	Total Nu	umber of co	ntact hours		Credit
Code	co	ırse		(PCR)	/	Lecture	Tutorial	Practical	Total	
				Electiv	ves	(L)	(T)	(P)	Hours	
				(PEL)						
CE	SO	IL		PEL		4	0	0	4	4
9051	ST	RUCTU	RE							
	INTERACTION									
Pre-requis	sites			Soil M	lechanics.	. Engineeri	ng Mechan	ics		
				CT+E	A					
Course		At	t the end	of the co	urse, the	student wi	ll be able to	):		
Outcomes	s	• C(	O1: unde	rstand th	e basis of	soil-struct	ure interact	tion		
	-	• C(	02: unde	rstand va	rious soil	models li	ke beams of	n elastic fou	ndation (	Winkler
		be	am mode	el), infini	te beam.	finite bean	n models.		(	
		• C(	03. apply	v soil-stri	ucture inte	eraction m	odels to dif	ferent type (	of founda	tions
		lik	te pile, sł	neet pile	walls (car	ntilever and	d anchored	sheet nile w	alls).	
		• C(	04: analy	use the fo	undation	of differer	nt civil struc	ctures with a	considerin	g soil-
		str	ucture in	teraction	eraction in static as well as dynamic conditions.					
Topics		Part	I: Intro	duction.	Superstri	ucture-foun	dation inte	eraction. st	atic soil-	structure
Covered		interact	tion. $(4)$	<i>a</i>	Supersui					
Covered		Non-un	iform co	ntact pre	ssure, Inte	eraction pro	oblems of s	shallow four	dation, C	ombined
		footing	, Rigid m	ethod, Fle	exible meth	nod. (6)				
		Variou	is Soil Mo	odels: Bea	ams on ela	stic foundat	tion, Infinite	beam, Finite	beam, Mo	odulus of
		subgrad	le reaction	n and effe	cting para	meters. (10)	)	-	-	
		Sheet p	bile wall,	Cantileve	er and anc	hored sheet	t pile wall,	Fixed earth	support, F	ree earth
		support	t. (4) ndon diffo	rant load	na conditi	one Anoly	aia un dan lat	anal load Di	fforont on	maaabaa
		Mechar	nder diffe	fent load	ltimate lo	ons, Anarys	ions Flastic	continuum	approach	Design
		Analysi	is $(8)$	anuic, O	itillate 10	au, Deffect	ions, Enastic	continuum	approach,	Design,
		Part-II	Ist (e)	tion to Dy	vnamic So	il Structure	interaction.	(2)		
		Estimat	tions of da	amping ra	tio of DSS	SI. (6)				
		Geotecl	hnical cor	nsideration	n of DSSI	(2)				
Text Boo	ks	TEXT	BOOKS	<u>.</u>						
and/or	кз,	1.	Advance	ed GEOTE	ECHNICA	L Engineeri	ing soil-struc	ture Interact	on using C	Computer
reference			and Mate	erial Mod	els by C.S	.Desai, Mus	sharraf Zama	an.	0	1
material		2.	Foundati	ion analys	sis and Des	sign by J.E.	Bowles			
materia		REFEI	RENCE I	BOOKS:						
		1.	Soil-Stru	icture Inte	eraction Nu	umerical Ar	alysis and N	Aodelling by	J. W. Bull	•
	2. Advanced Soil Mechanics B.M. Das, McGraw Hills Publishers.									
Monring - f	200	3.	Dynamic	c Soil-Stru	acture Inte	raction, Joh	n. P. Wolf, I	Prentice Hall	Inc.	
-iviadonny of	cour	se outco	mes with	program	Dee			DO	1	

PO1	PO2	PO3	PO4
3			
3			
	3		
	3		
	PO1 3 3  	PO1     PO2       3        3         3        3	PO1         PO2         PO3           3             3              3             3             3             3

		Department of C	Civil Engineering				
Course	Title of the	Program Core	Total Nu	umber of co	ntact hours		Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	CONSTITUTIVE	PEL	4	0	0	4	4
9052	MODELING IN						
	SOIL DYNAMICS						
Pre-requi	sites	Soil Mechanics	, Engineeri	ng Mechan	ics.		
		CT+EA					
Course	At the end	of the course, the	student wil	l be able to	:		
Outcome	6 • CO1: Unde	erstand theory of p	plasticity a	nd various	yield criteria	a and flow	v rule
	CO2: Apply	y critical state con	cept to cor	nsolidation	and triaxial	soil beha	viour
	CO3: Learn	n the theory of pro	pagation of	f waves thr	ough elastic	medium	
Topics Covered	<ul> <li>CO2: Apply critical state concept to consolidation and triaxial soil behave</li> <li>CO3: Learn the theory of propagation of waves through elastic medium</li> <li>Mechanics of continua (Stress and strain, Concept of strain, Displacement field, Consmall domain, Body undergoing small deformation, Strain tensor, Derivative of a vect in a moving reference, Physical interpretation of strain tensor, Cubical dil Transformation of strains, Equations of compatibility, Stresses, Concept of stress, P stresses and strains, Invariants, Cauchy's stress quadric and Mohr diagram, Oct stresses and strains, Spherical and deviatoric stress components, Constitutive relation Equations of equilibrium (Some useful expressions, Differential equations at (general), Differential equations at a point (in terms of stresses), Differential equatipoint (in terms of displacements), General solution, Two-dimensional cases, Theo elasticity, Principles of superposition, Strain energy, Virtual work. (12)</li> <li>Development of soil dynamics to the present state of art, One-dimensional propaga wave through an elastic medium, Three-dimensional propagation of waves in an elastic medium , Propagation of waves in polar co-ordinates, Reflection/Refraction background on integral transforms and other mathematical theorems, Lamb's solut two-dimensional problem. (16)</li> </ul>						oncept of ctor fixed ilatation, Principal ctahedral ons.(16) a point cions at a orems of gation of n infinite on, Some ution for
Text Boo and/or reference material	ks, <b>TEXT BOOKS:</b> 1. Theory of <b>REFERENCE H</b> 2.Foundation Eng	of Elasticity by Time BOOKS: gineering by J.E. Bo	oshenko and owles. McG	l Gudier. M rew Hills	cGrew Hills		

mapping of course outcomes with program outcomes								
Course Ourcome	PO1	PO2	PO3	PO4				
CO1	2		2					
CO2	3		3					
CO3			2	1				

		Department of C	ivil Engine	eering			
Course	Title of the	Program Core	Total Nu	mber of co	contact hours		Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	ROCK	PEL	4	0	0	4	4
9053	MECHANICS						
Pre-requis	sites	Geotechnique.					
		CT+EA					
Course	At the end	of the course, the	student wil	l be able to	:		
Outcomes	• CO1: Choo	se appropriate met	hods to imp	rove stabilit	y of rock ma	ss	
	CO2: Estim	ate foundation cap	acity of rock	k mass.			
	CO3: Desig	n of tunnel excavat	ion and sup	port system	s.		
Topics Covered	Engineering C classifications, R Rating (RMR), S & modulus and s Stability of Roc Rotational failure Introduction, Es foundations, stre rock, Remedial r Tunnels: Roc interaction, Tu	Rocks: Cla ation (RQD is from clas e strain, Geo indations of ign charts, V slope stabil capacity, S s, Settlemen ns located of l deforma hods, Des	ssification ), Rock Stru sifications, ( engineering <b>on Rocks:</b> I Wedge meth ity and pro Stress distributs in rocks, on edge of jo tion aroun sign of tun	of intact re cture Rating Classification classification Rock slopes, od of analysi tection. Four- bution, Slidin Bearing capa inted slope. ( and tunnels nel lining.	ocks, Rod (RSR), Ro h based on n. (10) Modes of s, Bucklin ndations of g stability acity of pi (22) , Rock	ck mass ock Mass strength f failure, g failure, on Rock: of dam le/pier in support	
Text Boo and/or reference material	ks, <b>TEXT BOOKS</b> 1. Jaeger, Mechani 4th Editi 2. Mogi Ki <b>REFERENCE I</b> 3 Obert and Duy	J.C., Cook, N.G. cs", on, Blackwell Publi yoo, "Experimental <b>300KS:</b> all "Rock Mechanic	W., Zimm shing. Rock Mech	erman, R. anics", Tay	W., "Funda lor & Francis ures" John W	mentals of	of Rock
	5.000rt and Duv			51 01 51 401	105 , John W		

	10			
Course Ourcome	PO1	PO2	PO3	PO4
CO1	3		3	
CO2	2	3		
CO3	3	2	3	

Department of Civil Engineering							
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours		Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	SLOPE	PEL	4	0	0	4	4
9054	STABILITY AND						
	EARTH DAMS						
Pre-requi	sites	Geotechnique					
		CT+EA					
Course	At the end	of the course, the	student wil	l be able to	):		
Outcome	• CO1: App	lication of the prin	ciples and	basic of so	oil and rock	mechanic	es in
	the analysi	s of slope stability	of dams.				
	• CO2: Able	to check the stabi	lity of earth	nen dams, a	nd the safet	v measur	es to
	be underta	then to prevent	the instabi	lity of slo	opes, earthe	en dams	and
	embankme	nts			· · · · · · · · · · · · · · · · · · ·		
Topics	Slope Stability	Analysis: Types o	f Failure: F	ailure surfa	ces - Planar	surfaces,	Circular
Covered	surfaces, Non-ci	rcular surfaces, Lin	nit equilibr	ium methoo	ls, Total stre	ess analysi	is versus
	effective Stress a	nalysis, Use of Bish	op's pore pro	essure paran	neters, Short t	term and L	ong term
	stability in slope	s.(12)			<u>a</u> 1 11	1.0	D' 1 1
	Methods of Slop	be Stability: Taylor	Charts, Effec	t of Tension	Cracks, Ver	tical Cuts.	Bishop's
	Price Analysis	and Morgenstern A	iding Block	ncircular Fa	Solution Surface	s: Morgen ity Stabili	stern and
	slopes. Drainage	measures Soil rei	nforcement	(geosyntheti	ics/soil nailir	ng/micro n	iles etc)
	soil treatment	(cement/lime/therma	al treatmen	(geosynanea), surface	protection	(vegetation	n/erosion
	control mats/sho	tcrete). (16)		,,	1	ν U	
	Earth and Rock	<b>sfill Dams:</b> General	l features, S	election of	site; Merits a	and demer	its of the
	earth and rock	fill dams, Classifie	cation of e	arth dams,	Materials of	f construc	tion and
	requirements, Ca	auses of failure, Sat	fe design cr	iteria. Instru	imentation in	n earth da	ms: Pore
	pressure measur	ements, Settlement	gauges, Inc	clinometers,	Stress meas	surements,	Seismic
	measurements.(1	6)					
Text Boo	ks, <b>TEXT BOOKS</b>						
and/or	1) Christian	n Kutzner, "Earth &	Rock fill da	ams – Princi	ples of desig	n and	
reference	construc	tion",Published					
material	Oxford a	and IBH					
	2) Bharat Singh, "Earth and Rock fill dams"						
	DEEDENCE	DOOVE.					
	1 USIDD	"Design of small d	lame" Oxfor	d and IDU i	Dublishing C	omnany	
	I. USIDK	, Design of small C	ianis Uxiol	u anu idri i	uonsning Co	Jiipaliy	
L							

Mapping of course outcomes v	with program outcomes
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Course Ourcome	PO1	PO2	PO3	PO4
CO1	3		1	
CO2	2	1	3	

Department of Civil Engineering							
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours		Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	REINFORCED	PEL	4	0	0	4	4
9055	CONCRETE						
	SIRUCIURE		_				
Pre-requis	sites	RC and Steel St	ructure De	sign			
		CT+EA					
Course	At the end	of the course, the	student wil	l be able to	):		
Outcomes	• CO1: Lear	n basic concept of	RC design	to solve ge	eotechnical of	engineeri	ng
	problems						
	CO2: Desi	gn shallow and dee	ep foundati	on for stru	ctures		
	CO2: Desi	gn earth and water	retaining s	structures			
Topics	Refreshers cours	e on RC Design-Bea	am, Column	, Slab (8)			
Covered	Design of Mat f	oundation(Flexible	& R1g1d) (1	2)			
	Design of Pile fo	(8)					
	Design of retaini	ng wall $(4)$					
	Design of Brace-	-cut (4)					
	6						
Text Boo	ks. TEXT BOOKS						
and/or	1. Foundati	on design by B.M.	Das				
reference	2. Foundati	ion Engineering by J	J.E.Bowles				
material		0 0 1					
	<b>REFERENCE I</b>	BOOKS:					
	3. Design of	of R.C Structure, Ma	ıllik& Gupta	a			

Course Ourcome	PO1	PO2	PO3	PO4
CO1	3			1
CO2	3	2	3	
CO3	3	2	3	

Department of Civil Engineering								
Course	Title of the		Program Core	Total Nu	imber of co	ntact hours		Credit
Code	co	urse	(PCR) /	Lecture	Tutorial	Practical	Total	
			Electives	(L)	(T)	(P)	Hours	
			(PEL)					
CE	PA	VEMENT	PEL	4	0	0	4	4
9056	AN	NALYSIS AND						
	DE	ESIGN						
Pre-requi	sites		Highway Engine	eering	1	L	L	
•			CT+EA	0				
Course		At the end	of the course the	student wil	l he able to	·		
Outcome	3	CO1: Decid	de factor affecting	selection (	of type of p	avement to	he constr	ucted
Outcome	5	CO1: Deck	if the motorial to	be used for	r novomon		n consu	ucicu
		• $CO2$ . Ident	my the material to	UE USEU IO	vlor flovibl		minid mor	romont
		• CO3: Desig	gn low volume as	well as reg		e pavement.	, rigid pav	vernent
<b>T</b> '		• CO4: Detei	mine the quality of	of the const	ructed flexi	ible as well	as rigid pa	avement
Topics		Characterization	n of Sub-Grade So	ii and Mine	eral Aggreg	ates – Introd	iction, par	ticle size
Covered		classification co	omposition of soil	mass de	termination	of soil cor	n, memor	strength
		determination of	soils strength prop	erties of mir	ieral agoreo	ates (8)	npaction,	suchgui
		Bituminous Mat	terials – Introductio	on. desirable	e properties	of bitumen. t	ests on bit	uminous
		materials, other b	oinders, engineering	properties (	of bituminou	is materials,	mix design	n. (8)
		<b>Design of Ceme</b>	nt Concrete Mixes	s for Paven	<b>nents</b> – Intr	oduction, cer	ment, prop	perties of
		cement, mineral a	aggregates, water, a	dmixtures, p	properties of	fresh concre	te, test on l	hardened
		concrete, design	of cement concrete	mix, factors	considered	for durable co	oncrete, th	e Bureau
		of Indian Standar	ds Method of Ceme	nt Concrete	Mix Design	, Indian Road	d Congress	s Method
		of Cement Conc	rete Mix Design (I	RC: 44-20	08), Dry Le	an Cement C	Concrete (	MORTH
		201), Concrete N	lix Design for Rura	I Roads (IR	C :SP:62-20	(04)(8)	ffeeting	lasian of
		ractors Affectin	ig Pavement Desig	gn – Types	of paveme	nts, factors a	inecting c	lesign of
		Analysis and De	sion of Flevible Pay	vements _ S	tress analysi	is of flexible i	navements	flevible
		pavement design	methods, benefits	of payement	t design bas	sed on M-E	method, te	est roads.
		design methods of	of flexible pavement	ts (4)	it design ou		incuriou, it	.st 10445,
		Structural Evalu	ation of Pavement	s – Purpose	, types, and 1	nethods of st	ructural ev	aluation,
		structural evalua	tion by static load	ing, structu	ral evaluation	on by steady	– state V	/ibratory
		Loading, structur	al evaluation by im	pulse lading	g, Models of	f Falling Wei	ght Deflea	ctometer,
		structural evaluation	tion of flexible pav	ement usin	g FWD, bao	ck calculation	n of Laye	r Moduli
		from FWD Test c	lata, uses of Back-ca	alculated Pa	vement Lay	er Moduli, St	ructural Ev	valuation
		of Rigid Pavemen	nt using FWD. (8)		101	a		
		Structural Eval	uation of Unbound	d Granulai	r and Sub-	Grade Laye	rs using I	Dynamic
		Cone Penetronia	with DCP determine	opinent of L	TP index vo	le Dynamic C	offocting	DCP tost
		results correlation	on of DCP index val	lues with of	her standard	test values	anteching	of DCP
		test data. limitatio	on of DCP. (8)		ier stundulu		PPrication	
Text Boo	ks.	TEXT BOOKS:	(*/					
and/or	,	1. Highwa	y Engineering by I	R. Srinivas	Kumar			
reference		0						
material		<b>REFERENCE E</b>	BOOKS:					

# 2.Principles of Pavement Engineering by Nick Tom

Course Outcome	PO1	PO2	PO3	PO4
CO1	2	3	3	3
CO2	2	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3

Department of Civil Engineering							
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours		Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	REINFORCED	PEL	4	0	0	4	4
9057	EARTH AND						
	GEOTEXTILES						
Pre-requis	sites	Geotechnique					
		CT+EA					
Course	At the end	of the course, the	student wil	l be able to	:		
Outcomes	• CO1: Expla	in the significance o	of Geosynth	etics. Prope	rties of Geote	extiles and	lits
	application		Cessynan				
	• CO2: Desig	on the Reinforced Fa	orth Retainir	ng Walls Rei	inforced Pave	ements ar	hd
	Landfills.			15 <b>W</b> and, rec			iu ii
	<ul> <li>CO3: Apply</li> </ul>	<i>i</i> geocomposite syst	ems to solv	e contempo	rary geotech	nical prob	lems
Topics	Introduction to (	Feosynthetics - Type	es – Geotext	tiles - polym	er type geote	extiles –w	oven and
Covered	non-woven geo	textiles. geogrids.	geo memb	ranes and	geocomposit	es. functi	ons and
Covered	mechanisms in	reinforcement, filt	ration, drain	nage, liquid	barrier, mu	ultiple fur	nctions -
	Materials and ma	anufacturing process	ses - Mecha	nical, endur	ance, hydrau	lic and deg	gradation
	properties - Test	ing and evaluation.	(8)				
	Principles of soil	reinforcement - load	d transfer m	echanism an	d strength de	velopmen	t -Design
	and construction	of geosynthetic rein	forced soil r	etaining stru	ictures – wall	s and slop	es, Codal
	provisions, Soil	Bearing capacity im	provement u	using reinfor	cing element	ts. (14)	
	Geosynthetics in	pavements- Adva	ntages and	disadvantag	es of placin	g geosynt	hetics in
	roads and railwa	sud dase and sud gra	inage and fi	iltering in r	s on son son	s, Geosyn ats railwa	v tracks
	overlay design a	nd constructions tre	nch drains	(8)	bad pavenier	ns, ranwa	y tracks,
	Geosynthetics in	Environmental cor	trol. liners	for ponds a	nd canals, co	overs and l	iners for
	landfills, materia	a aspects and stabili	tv considera	ations, lands	lides - occur	rences and	lmethods
	of mitigation, Er	osion causes, contro	and constr	uction techr	iques. (10)		
					•		
Text Boo	ks, <b>TEXT BOOKS</b>						
and/or	1. Swami	Saran, "Reinforced	d Soil & it'	s Engineeri	ing Applicat	tions"	
reference	2. R. A. Je	wel, "Soil Reinfor	cement wi	th Geotexti	les", Constr	uction In	dustry
material	Researc	h & Information A	Association	(CIRIA) T	homas Telf	ord.	
	<b>REFERENCE</b>	BOOKS:					
	3. Koerner	, R. M, "Designin	g with Geo	synthetics'	, Prentice H	Iall, NJ.	
			-	-	•	-	
Mapping of	course outcomes with	program outcomes					
0 0	DO1	DOO	т			4	

Course Ourcome	PO1	PO2	PO3	PO4
CO1		3		1
CO2	2	2	3	
CO3		2	3	

Department of Civil Engineering							
Course	Title of the	Program Core	Total Nu	umber of co	ntact hours		Credit
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE	MODELLING,	PEL	4	0	0	4	4
9058	SIMULATION &						
	COMPUTER						
D .	APPLICATIONS		· 1		N/ 1 11'		L
Pre-requi	sites	Numerical Tech	inique and	Constitutiv	e Modelling		
		CI+EA					
Course	At the end	of the course, the	student wil	l be able to	):		
Outcomes	CO1: Solve	linear and non-line	ar equation	is using num	erical techni	ques.	
	CO2: Apply	<pre>/ correlation and reg</pre>	gression and	alysis for the	e geotechnica	ıl data	
	CO3: Solve	problem of consoli	dation and	flow throug	h porous me	dia using	
	numerical t	echnique.					
	CO4: apply	y probabilistic app	roach for s	election of	design para	meters a	nd
	compute t	heir impact on risk	assessme	nt			
Topics	Systems and Mo	dels: Fundamentals	of systemic	approach, S	ystem model	ling, Class	sification
Covered	of models, Mode	el structure, Linear,	non-linear,	time-invari	ant, time var	iant mode	ls, State-
	space models, Di	stributed parameter	models, Sys	stem Synthes	sis, Direct and	l Inverse P	roblems,
	Role of optimiza	tion, Role of compu	ters. Examp	les from Civ	il Engineerin	g.Prelimir	ary Data
	Processing; Reg	ression Analysis: L	and	Multiple Re	gression An	alysis, An	alysis of
	Parsimony criter	ion Spatial Distribu	o) ition: Polyn	omial surfa	res Krigging	Soline f	unctions
	Cluster Analysis	Numerical Product	tion of Cont	our Maps T	ime Series A	nalvsis: A	uto-cross
	correlation analy	vsis, Identification	of trend, Sp	bectral analy	sis, Identific	ation of c	lominant
	cycles, Smoothe	ning techniques. F	ilters, Fored	casting Mod	lel Building:	Choice of	of Model
	Structure: A pr	riori considerations	, Selection	based up	on prelimina	ary data	analysis,
	comparing mode	el structures Model	Calibration:	Role of his	torical data.	Direct and	Indirect
	methods of solvi	ng Inverse problem.	(14)	D ·	( D 1 1	.1. 1	• 1
	Validation Sim	ulation: Random	variables:	Basic conce deviation of	epts, Probat	oility den	sity and
	variables and the	vir functions Covari	ance and co	rrelation (8	)	continuou	standom
	Commonly used	theoretical Probabi	lity distribu	tions (unifo	, rm normal l	vinomial ]	Poisson's
	and negative exp	onential), Fitting d	istributions	to raw data	. Kolmogrov	-Smirnov's	s tests of
	the goodness of	fit, central limit th	neorem, var	ious algorit	hms for gene	eration of	Random
	numbers. Queue	ing theory: Element	nts, Determ	inistic quei	ues, Applicat	tions Mon	te Carlo
	simulation: Basic	c concepts, Generati	on of synthe	etic observat	ions. Statistic	cal interpre	etation of
	the output, Evalu	ation of definite int	egrals, Role	in Civil En	gineering, Ex	amples. (1	.0)
Text Boo	s, <b>TEXT BOOKS</b>		T C /	ат · ·			1 · ·
and/or	I. Desai,	C.S. and Christia	an, J.T., `	Numerical	Methods	on Geot	echnical
reterence	Enginee	ering", McGraw H	III, New Yo	ork, N.Y., U	J <b>S</b> A.		
material		$\mathbf{D} \mathbf{W}  $	rical Matt	ada" Oraș	tum Dull:	hara No-	v Vorl-
	2. Hornbe	ck, K.W., Nume	rical Meth	ous, Quar	num Publis	ners, nev	<i>N</i> I OIK,
	N.Y., U	SA.					
	3. Christia	n P. R., George C.	, "Monte C	arlo statisti	cal methods	s" Springe	er, 2004.

Course Ourcome	PO1	PO2	PO3	PO4
CO1	2		3	
CO2	3		3	
CO3		2	3	1
CO4	2		3	

Mapping of course outcomes with program outcomes

	Department of Civil Engineering						
Course	Title of the course	Program Core	Total Nu	mber of co	ntact hours		Credit
Code		(PCR) /	Lecture	Tutorial	Practical	Total	
		Electives	(L)	(T)	(P)	Hours	
		(PEL)					
CE		PCR	0	0	4	4	2
1061	GEOTECHNICAL						
	LAB-I						
Pre-requis	sites	Soil Mechanics					
CT+EA							
Course	Course At the end of the course, the student will be able to:						
Outcomes	• CO1: Deter	mine engineering p	roperties of	different so	oils and unde	rstand the	eir
	behaviour	0 01	•				
	• CO2: Gain	basic knowledge to	wards soil s	pecimen pre	paration and	testing.	
		C				Ū	
Topics	Laboratory test	S:					
Covered	Tri-axial test, Co	nsolidation test, CB	R test, Light	t and heavy	compaction t	est, Swelli	ng index
	and swelling pres	ssure test, Field den	sity test. (40	)			
Text Boo	ks, TEXT BOOKS:						
and/or	1. SP 3	6 (Part I) 1987 Com	pendium of	Indian Stan	dards on soil	Engineeri	ng: Part
reference	I Lat	poratory testing of s	oils for civil	engineering	g purposes.		
material							
	REFERENCE	BOOKS:	111	1			
	2. Depa	artmental geotechnic	cal lab manu	ial			

Course Ourcome	PO1	PO2	PO3	PO4
CO1	3	2		
CO2	2	1	2	

	Department of Civil Engineering							
Course	Title	of the course	Program	Total Nu	umber of co	ntact hours		Credit
Code			Core (PCR) /	Lecture	Tutorial	Practical	Total	
			Electives	(L)	(T)	(P)	Hours	
			(PEL)					
CE1062	COM	PUTATIONAL	PCR	0	0	4	4	2
	LAB							
Pre-requi	sites		Basic Structur	al Analysi	s, Foundati	on Engineer	ing	
_			CT+EA					
Course		At the end o	of the course, the	student w	ill be able t	0:		
Outcomes	s	<ul> <li>CO1: learn f</li> </ul>	inite element soft	ware nack	ages to solve	real life pro	hlems in	
		Geotechnical	Fngineering	thate pack		rearine pro		
		• CO2: Apply ABAOUS Playis3D software tools to solve interdisciplinary					arv	
		problems in	engineering	155D 501		o solve inter	uiscipiine	ti y
Topics		Analysis of frame	2D & 3D: Introdu	uction to A	BAOUS. (3)	)		
Covered	-	inarysis of frame	20 W 30 . milou		5. (5)	/		
covered	S	Static Analysis of	Plane frame: fixe	d base and	on soil base	(Plane stress)	) (6)	
	Frequency analysis of Plane Frame with added mass. (3)							
		Diana frame with Sheer well Interaction under Lateral Land (2)						
	1	Plane frame with Shear wall Interaction under Lateral Load. (3)						
	S	Stress distribution	in Soil under Lin	e Load (3)				
	I	Laterally Loaded	Pile. (3)					
		Seepage Through	Earthen Dam (3)					
	S	Slope Stability (3)	)					
	I	Retaining wall on	soil structure(Pla	ne strain) (4	4)			
	(	Consolidation pro	blem 2D (8)					
	5	Stress –strain anal	ysis in soil subgra	ide under re	epetitive appl	lication of wh	neel load ir	ı flexible
	I	pavement. (2)						
	S	Settlement analysi	is of foundation ir	n overconso	lidated clay.			
	(	Case I: Rigid foun	dation (2)		·			
	(	Case II: Raft foun	dation (2)					
	(	Case III: Pile-Raft	t foundation (2)					
Text Boo	ks, 7	TEXT BOOKS:						
and/or		1. D	ocumentation of	f ABAQU	S			
reference		2. P	laxis tutorial ma	nual				
material								
Mapping of	course	outcomes with pr	rogram outcomes	<u>г</u> .	200			
Course O	Course Ourcome PO1				PO3	PO4	ł	
COI		3	1		2			
CO2		2	1		2	3		

Department of Civil Engineering								
Course	Ti	tle of the course	Program Core	Total Nu	mber of co	ntact hours		Credit
Code			(PCR)/	Lecture	Tutorial	Practical	Total	
			Electives	(L)	(T)	(P)	Hours	
			(PEL)					
СЕ	GI	EOTECHNICAL	PCR	0	0	4	4	2
2061	LA	AB-II						
Pre-requis	sites		Soil Mechanics,	, Environm	ental Engi	neering		
			CT+EA					
Course		At the end of	of the course, the	student wil	l be able to	:		
Outcomes	5	• CO1: Deter	mine geo-environm	iental prope	erties of diff	erent soils ar	nd underst	and
their behaviour								
		• CO2: Gain b	basic knowledge to	wards soil sp	pecimen pre	paration and	l testing.	
			_		-	-	-	
Topics	Laboratory tests:							
Covered		Determination of	porosity of soil, Hy	draulic con	ductivity (ve	ertical and ho	rizontal di	irection),
		Adsorption test 1	n soil (Batch test,	column test	, kinetic rea	action studies	s), pH test	, pHzpc,
		Organic carbon d	etermination of soil	. (40)				
Text Boo	ks,	TEXT BOOKS:	out I) 1097 Common	dium of Ind	ion Standor	la on coil En	-in a a min a c	Dout I
and/or		I. SF 50 (Fa	art I) 1987 Compen		iali Stalluar	IS OILSOIT EIIŞ	gineering.	FaltI
reference		Laborato	[y ] :1 6 ::1 :	·				
material		testing of	solls for civil engli	heering purp	ooses.			
		2. Departme	ental geotecnnical la	ab manual				
		<b>REFERENCE B</b>	OOKS:					
		3. Sharma H	ID and Reddy KR,	"Geoenviro	nmental Eng	gineering: Sit	e Remedia	ation,
		Waste co	nt-					
		ainment.	and Emerging Waste Management Technologies" Wiely, 2004					
			0 0 0			J	,, -	
Manning of course outcomes with program outcomes								

Course Ourcome	PO1	PO2	PO3	PO4
CO1	3	2		
CO2	2	1	2	

		Department of Civil Engineering							
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours		Credit		
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total			
		Electives	(L)	(T)	(P)	Hours			
		(PEL)							
CE2062	Seminar - I (Non-	PCR	0	0	2	2	1		
	Project)								
Pre-requis	sites	None							
		CT+EA							
Course	At the end	d of the course, the	student wil	l be able to	:				
Outcomes	6 • CO1: Imp	rove the communica	ve the communication skills and cultivate lifelong learning.						
	CO2: Bro	aden their knowledge	en their knowledge about Geotechnical Engineering and its significance						
	<ul> <li>CO3: Upc</li> </ul>	ate their knowledge	te their knowledge on the latest developments in geotechincal						
	engineerir	ıg.							
	CO4: Und	erstand the environmental, safety, economical and sustainability aspects							
	of any geo	technical engineerin	echnical engineering structure.						
Topics	Each student h	as to select a topic ar	d collect ab	out 10 pape	rs with at lea	st 5 journa	al papers		
Covered	and prepare a	eport and give a sem	ninar at the o	end the sem	lester.	-			
Text Boo	ks. Peer reviewed.	ournal and conference	ce papers						
and/or	,		I I I						
reference									
material									

Course Outcome	PO1	PO2	PO3	PO4
CO1				3
CO2			2	
CO3			2	
CO4				3

	Department of Civil Engineering								
Course	Ti	tle of the	Program Core	Total Nu	mber of co	ntact hours		Credit	
Code	co	urse	(PCR) /	Lecture	Tutorial	Practical	Total		
			Electives	(L)	(T)	(P)	Hours		
			(PEL)						
CE2063	Pr	oject - I	PCR	0	0	2	2	1	
Pre-requis	sites		None						
CT+EA									
Course		At the end	of the course, the	student wil	l be able to	:			
Outcomes	mes • CO1: Improve the skills of handling real life projects and cultivate lifelong learning.								
	CO2: identify real life projects problems in Geotechnical and Geoenvironmental					ntal			
		engineering		•					
Topics		Project problem	Identification / Lite	rature Revie	ew				
Covered									
Text Bool	ks,	Relevant books a	as per Supervisor di	rection					
and/or		Peer reviewed journal and conference papers							
reference									
material									

Course Outcome	PO1	PO2	PO3	PO4
CO1	1			3
CO2	1	1	2	

	Department of Civil Engineering							
Course	Title of the	Program Core	Total Nu	mber of co	ntact hours		Credit	
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total		
		Electives	(L)	(T)	(P)	Hours		
		(PEL)						
CE3061	Project- II	PCR	0	0	20	20	11	
Pre-requis	sites	None						
		CT+EA						
Course	At the end of the course, the student will be able to:							
• CO1: solve practical problems in the field of Geotechnical and								
	Geoenvir	onmental Engineeri	ng					
		_	-					
Topics	Attempt for sol	ution (Numerical /Ex	perimental)	& Progress				
Covered								
Text Bool	ks, Relevant books	as per Supervisor di	rection					
and/or	Peer reviewed	ournal and conferen	ce papers					
reference								
material								

Course Outcome	PO1	PO2	PO3	PO4
CO1	3	1	2	1

Department of Civil Engineering								
Course	Ti	tle of the	Program Core	Total Nu	mber of co	ntact hours		Credit
Code	co	urse	(PCR) /	Lecture	Tutorial	Practical	Total	
			Electives	(L)	(T)	(P)	Hours	
			(PEL)					
CE4061	Pr	oject- III	PCR	0	0	20	20	11
Pre-requis	sites		None					
CT+EA								
Course At the end of the course, the student wil			l be able to	):				
Outcomes	5	CO1: provide the solution of the problem and recommendations which can be				be used		
		in real life o	r future researches					
Topics		Final reporting 8	Thesis submission					
Covered								
Text Boo	ks,	Relevant books a	as per Supervisor di	rection				
and/or	,	Peer reviewed jo	ournal and conferen	ce papers				
reference								
material								

Course Outcome	PO1	PO2	PO3	PO4
CO1	3	1	2	1

Department of Civil Engineering									
Course	se Title of the		Program Core	Total Number of contact hours				Credit	
Code	Code course		(PCR) /	Lecture	Tutorial	Practical	Total		
			Electives	(L)	(T)	(P)	Hours		
			(PEL)						
CE3062	Pr	oject Seminar- I	PCR	0	0	5	5	2	
Pre-requis	sites		None						
			CT+EA						
Course		At the end	of the course, the	student wil	l be able to	:			
Outcomes	5	CO1: Impro	ove the communication skills and cultivate lifelong learning.						
		CO2: Broad	den their knowledge about real life Geotechnical Engineering problems						
		CO3: Upda	te their knowledge on the latest developments in geotechincal						
engineering									
Topics Each student has to r			to review 20 techn	ical papers	in the area o	of the project	topic witl	h at least	
Covered 10 journal paper		s and prepare a rep	ort and give	e a seminar a	at the end th	e semeste	r.		
Text Bool	ks	Relevant books as per Supervisor direction							
and/or Peer reviewed journal and confere		ce papers							
reference		reel reviewed journal and conference papers							
material									
material									

Course Outcome	PO1	PO2	PO3	PO4
CO1				3
CO2			2	
CO3			2	

Department of Civil Engineering								
Course	Title of the	Program Core	Total Number of contact hours				Credit	
Code	course	(PCR) /	Lecture	Tutorial	Practical	Total		
		Electives	(L)	(T)	(P)	Hours		
		(PEL)						
CE4062	Project Seminar- II	PCR	0	0	5	5	3	
	& Viva Voce							
Pre-requis	sites	None						
		CT+EA						
Course	At the end	of the course, the	student wil	l be able to	:			
Outcomes	• CO1: Impr	ove the communication skills and cultivate lifelong learning.						
	CO2: Broad	den their knowledge	e about real	life Geotech	nnical Engine	ering prob	lems	
	CO3: Upda	ate their knowledge	on the lates	t developm	ents in geote	chincal		
engineering.								
Topics Each student has to review 40 technical papers in the area of the project topic wi				topic witl	n at least			
Covered 30 journal paper		rs and prepare a rep	ort and give	e a seminar a	at the end th	e semeste	r.	
Text Bool	ks, Relevant books	Relevant books as per Supervisor direction						
and/or	and/or Peer reviewed journal and conference							
reference								
material								

Course Outcome	PO1	PO2	PO3	PO4
CO1				3
CO2			2	
CO3			2	