# SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

**M.E-Civil Engineering** 

(Structural Engineering)

# **CURRICULUM and SYLLABI**

[For students admitted in 2022-2023]

M.E / M.Tech Regulation 2019

**Approved by BOS and Academic Council meetings** 

### Sona College of Technology, Salem (An Autonomous Institution) Courses of Study for ME I Semester under Regulations 2019 Civil Engineering Branch: Structural Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P19STR101	Finite Element Analysis	3	1	0	4	60
2	P19STR102	Theory of Elasticity and Plasticity	3	1	0	4	60
3	P19STR510	Professional Elective: Advanced Concrete Technology	3	0	0	3	45
4	P19STR525	<b>Professional Elective:</b> Internet of Things of Civil Engineering	3	0	0	3	45
5	P19GE101	Research Methodology and IPR	2	0	0	2	30
6	P19GE701	Audit Course: English for Research Paper Writing	2	0	0	0	30
		Practical					
7	P19STR103	Structural Engineering Laboratory	0	0	4	2	60
		·		То	tal Credits	18	

### Approved by

Chairperson, Civil Engineering BOS Dr.R.Malathy Member Secretary, Academic Council Dr.R.Shivakumar Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

### Copy to:-

HOD/Civil, First Semester ME STR Students and Staff, COE

## Sona College of Technology, Salem (An Autonomous Institution) Courses of Study for ME II Semester under Regulations 2019 Civil Engineering Branch: Structural Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
	1	Theory					
1	P19STR201	Advanced Design of Concrete Structures	3	0	0	3	45
2	P19STR202	Advanced Design of Steel Structures	3	0	0	3	45
3	P19STR505	Professional Elective: Aseismic Design of Structures	3	0	0	3	45
4	P19STR517	Professional Elective: Design of sub structures	3	0	0	3	45
5	P19GE702	Audit Course: Stress Management by Yoga	2	0	0	0	30
		Practical					
6	P19STR203	Structural Software Application Laboratory	1	0	4	3	75
7	P19STR204	Mini Project	0	4	2	60	
		·	•	To	tal Credits	17	

### Approved by

Chairperson, Civil Engineering BOS Dr.R.Malathy Member Secretary, Academic Council Dr.R.Shivakumar Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Civil, Second Semester ME STR Students and Staff, COE

## Sona College of Technology, Salem (An Autonomous Institution) **Courses of Study for ME III Semester under Regulations 2019 Civil Engineering Branch: Structural Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P19STR301 /	Design of Steel Concrete Composite Structures	3	0	0	3	45
2	P19STR516	Professional Elective: Design of Bridges	3	0	0	3	45 /
3	P19ISE601 /	Open Elective: Transport Safety	3	0	0	3	45
	P19MIT602 /	Open Elective: Machine Learning		v	Ŷ		TU /
	Lais - prise is a company	Practical	and a second	<b>ti den a ser a ser a ser a ser a ser a ser</b> a ser a	ali ng manganang mangang manga Sa sa	ينيب العشيط ومصاديها	1
4	P19STR302	Technical Seminar	0	0	2	1	30
5	P19STR303	Practical Training	0	0	4	2	60
6	P19STR304 /	Project Phase – I	0	0	16	8	240
/		Production in the second se In the second	pala internet and an and a second second	То	tal Credits	20 /	465

Approved by

Chairperson, Civil Engineering BOS Dr.R.Malathy

Member Secretary, Academic Council Dr.R.Shivakumar

Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

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Copy to:-

HOD/Civil, Third Semester ME STR Students and Staff, COE

05.07.2023

**Regulations-2019** 

## Sona College of Technology, Salem (An Autonomous Institution) Courses of Study for ME IV Semester under Regulations 2019 **Civil Engineering** Branch: M.E. Structural Engineering

S. No Course Code		Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours	
	•	Practica	Ì	and and a set of the set				
1	P19STR401	Project Phase – II	0	0	28	14	420	
				Te	tal Credits	14		

Approved by

Sol. Chairperson, Civil Engineering BOS Dr.R.Malathy

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Member Secretary, Academic Council Dr.R.Shivakumar 26 74

TAUS Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

Copy to:-HOD/Civil, Fourth Semester ME STR Students and Staff, COE

### Sona College of Technology, Salem (An Autonomous Institution) Courses of Study for ME I Semester under Regulations 2019 Civil Engineering Branch: Structural Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P19STR101	Finite Element Analysis	3	1	0	4	60
2	P19STR102	Theory of Elasticity and Plasticity	3	1	0	4	60
3	P19STR510	Professional Elective: Advanced Concrete Technology	3	0	0	3	45
4	P19STR525	<b>Professional Elective:</b> Internet of Things of Civil Engineering	3	0	0	3	45
5	P19GE101	Research Methodology and IPR	2	0	0	2	30
6	P19GE701	Audit Course: English for Research Paper Writing	2	0	0	0	30
		Practical					
7	P19STR103	Structural Engineering Laboratory	0	0	4	2	60
		·		То	tal Credits	18	

### Approved by

Chairperson, Civil Engineering BOS Dr.R.Malathy Member Secretary, Academic Council Dr.R.Shivakumar Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

### Copy to:-

HOD/Civil, First Semester ME STR Students and Staff, COE

P19STR101         FINTE ELEMENT ANALYSIS         3         1         0         4           Durse Objective (5): The Purpose of learning this course is to:         .	COL	COURSE CODE     COURSE NAME     L     T     P     C												
Durse Objective (3): The Purpose of learning this course is to: <ul></ul>	<b>P</b> 1	19STR10	1		FINIT	E ELEME	ENT ANA	LYSIS		3	1	0	4	
<ul> <li>Understand the concepts of strain displacement relation and numerical techniques.</li> <li>Solve the problems in calculating shape function and formation displacement and stiffness matrix.</li> <li>Evaluate the problems on an iso-parametric element and dynamic Problems using the finite element method.</li> <li>Recognize the concept of FEM applications in engineering problems.</li> <li>Analyse two-dimensional truss and beam elements and to solve problems on rectangular and triangular elements.</li> <li>Durse Outcome (5) (CO3: At the end of this course, the students will be able to:</li> <li>CO2</li> <li>Apply numerical techniques of finite element analysis to solve real time problems. (K3)</li> <li>CO3</li> <li>Manipulate the shape function and interpolation function to study structural behaviour. (K4)</li> <li>CO4</li> <li>Implement linear and quadratic elements in the finite element analysis of various types of structures. (K2)</li> <li>CO5</li> <li>Predict structural behaviour using strain displacement matrix and element stiffness matrix. (K5)</li> <li>nowledge Level: K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:</li> <li>O – PO Mapping</li> <li>CO4</li> <li>D – PO Mapping</li> <li>CO5</li> <li>PO1</li> <li>PO2</li> <li>PO3</li> <li>PO4</li> <li>PO5</li> <li>PO6</li> <li>PO7</li> <li>PO8</li> <li>PO9</li> <li>PO10</li> <li>PO11</li> <li>CO3</li> <li>3</li> <li>3</li> <li>2</li> <li>1</li> <li>1</li> <li>1</li> <li>CO4</li> <li>Substantial</li> <li>INDRODUCTION</li> <li>I 2 Hrs.</li> <li>Infirential equilibrium equations - Strain displacement relation - Linear constitutive relation - Special cost analysis.</li> <li>Substantial</li> <li>UNIT-I</li> <li>INDRODUCTION</li> <li>I 2 Hrs.</li> <li>INDRODUCTION</li> <li>I 2 Hrs.</li> <li>Isplacement models - Convergence requirements - Natur</li></ul>	Course (	Obiective	e (s): The	Purpose	e of lear	ning this	course i	s to:						
<ul> <li>Solve the problems in calculating shape function and formation displacement and stiffness matrix.</li> <li>Evaluate the problems on an iso-parametric element and dynamic Problems using the finite element method.</li> <li>Recognize the concept of FEM applications in engineering problems.</li> <li>Analyse two-dimensional truss and beam elements and to solve problems on rectangular and triangular elements.</li> <li>Analyse two-dimensional truss and beam elements and to solve problems on rectangular and triangular elements.</li> <li>Analyse two-dimensional truss and beam elements and to solve problems on rectangular and triangular elements.</li> <li>Apply numerical techniques of finite element analysis to solve real time problems. (K3)</li> <li>Manipulate the shape function and interpolation function to study structural behaviour. (K4)</li> <li>Manipulate the shape function and interpolation function to study structural behaviour. (K4)</li> <li>Predict structural behaviour using strain displacement matrix and element stiffness matrix. (K5)</li> <li>Predict structural behaviour using strain displacement matrix and element stiffness matrix. (K5)</li> <li>Proto PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 CO1 3 3 3 3 3 2 1 1 - 1 1 1 CO2 3 3 3 3 3 2 1 1 - 1</li></ul>	•	Understa	and the c	concepts	of strain	displace	ement re	lation an	d numer	ical tech	nique	es.		
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<ul> <li>Evaluate the problems on an iso-parametric element and dynamic Problems using the finite element method.</li> <li>Recognize the concept of FEM applications in engineering problems.</li> <li>Analyse two-dimensional truss and beam elements and to solve problems on rectangular and triangular elements.</li> <li>Discuss the displacement models to solve practical problems in Structural engineering. (K3)</li> <li>Discuss the displacement models to solve practical problems in Structural engineering. (K3)</li> <li>Apply numerical techniques of finite element analysis to solve real time problems. (K3)</li> <li>Manipulate the shape function and interpolation function to study structural behaviour. (K4)</li> <li>Implement linear and quadratic elements in the finite element analysis of various types of structures. (K2)</li> <li>Predict structural behaviour using strain displacement matrix and element stiffness matrix. (K5)</li> <li>Prodict structural behaviour using strain displacement matrix and element stiffness matrix. (K5)</li> <li>Prodo PO2 PO3 PO4 PO5 PO5 PO7 PO8 PO9 PO10 PO11 CO1 3 3 3 3 3 2 - 1 1 - 1 1 1 CO2 3 3 3 3 3 2 - 1 1 - 1 1 1 CO2 3 3 3 3 3 2 - 1 1 - 1 1 1 1 CO2 3 3 3 3 3 2 - 1 1 - 1 1 1 1 CO3 3 3 3 3 3 2 - 1 1 - 1 1 1 1 CO3 3 3 3 3 3 2 - 1 1 - 1 1 1 1 CO3 3 3 3 3 3 2 - 1 1 - 1 1 1 1 CO3 3 3 3 3 3 2 - 1 1 - 1 1 1 1 CO3 3 3 3 3 3 2 - 1 1 - 1 1 1 1 1 CO3 3 3 3 3 3 2 - 1 1 - 1 1 1 1 1 CO3 3 3 3 3 3 2 - 1 1 - 1 1 1 1 1 CO3 3 3 3 3 3 2 - 1 1 - 1 1 1 1 1 1 CO3 3 3 3 3 3 2 - 1 1 - 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</li></ul>	ſ	matrix.			-	·								
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CO4         Implement linear and quadratic elements in the finite element analysis of various types of structures. (K2)           CO5         Predict structural behaviour using strain displacement matrix and element stiffness matrix. (K5)           nowledge Level: K1 - Remember:         K2 - Understand:         K3 - Apply:         K4 - Analyze:         K5 - Evaluate:           D - PO Mapping         POs         POs         POs         PO1         PO2         PO3         PO4         PO5         PO6         PO7         PO8         PO9         PO10         PO11           CO2         3         3         3         2         -         1         1         1         1           CO3         3         3         3         2         -         1         1         1           CO4         3         3         3         2         -         1         1         1           CO3         3         3         3         2         -         1         1         1           CO4         3         3         3         2         -         1         1         1           CO5         3         3         3         2         -         1         1         1         1     <	CO3	(K4)												
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IPOI         IPOI <th< th=""><th>COS</th><th>PO1</th><th>PO2</th><th>PO3</th><th>PO/</th><th>PO5</th><th>PO6</th><th>PO7</th><th>POS</th><th>POQ</th><th>PO</th><th>10</th><th>PO11</th></th<>	COS	PO1	PO2	PO3	PO/	PO5	PO6	PO7	POS	POQ	PO	10	PO11	
CO2       3       3       3       3       2       -       -       1       -       1       1       1         CO2       3       3       3       3       2       -       -       1       -       1       1       1       1         CO3       3       3       3       3       2       -       -       1       -       1 <td< td=""><td>CO1</td><td>3</td><td>3</td><td>3</td><td>3</td><td>2</td><td>-</td><td>-</td><td>1</td><td>-</td><td></td><td>10</td><td>1</td></td<>	CO1	3	3	3	3	2	-	-	1	-		10	1	
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umerical techniques in finite element analysis.       12         UNIT-II       DISPLACEMENT MODELS       12         isplacement models - Convergence requirements. Natural coordinate systems - Shape function terpolation function - Linear and quadratic elements - Lagrange and Serendipity elements - Strain splacement matrix - Element stiffness matrix and nodal load vector.       12         UNIT-III       ISOPARAMETRIC ELEMENTS       12         wo dimensional isoparametric elements - Four noded quadrilateral elements - Triangular elements - omputation of stiffness matrix for isoparametric elements - Numerical integration (Gauss uadrature) - Convergence criteria for isoparametric elements.         22       Regulation	ases -	Principle	of sta	tionary r	otentia	l energy	- Annli	cation t	o finite	element	t me	thode	S. Some	
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Isplacement matrix - Element stiffness matrix and nodal load vector.       12         UNIT-III       ISOPARAMETRIC ELEMENTS       12         wo dimensional isoparametric elements - Four noded quadrilateral elements - Triangular elements - omputation of stiffness matrix for isoparametric elements - Numerical integration (Gause uadrature) - Convergence criteria for isoparametric elements.         v22       Regulation	nterpola	ation fur	nction - I	Linear an	d quadr	atic elen	nents - L	.agrange	and Ser	endipity	elem	nents	- Strair	
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22 Regulation	quadrati	ure) - Coi	nvergen	ce criteria	a for iso	parametr	ric eleme	nts.						
22 Regulation														
												Reg	lation	

l	UNIT-IV	APLLICATIONS OF FEM		12						
Assembl	age of elements	- Direct stiffness method - Special character	istics of stiffn	ess matrix -						
Boundar	y condition and	reaction - Gauss elimination and LDLT decompos	sition - Basic s	teps in finite						
element analysis.										
	UNIT-V	ANALYSIS OF STRUCTURES		12						
Analysis	of framed Struct	ures - 2D truss element - 2D beam element. Anal	ysis of plate be	ending: Basic						
theory o	of plate bending	- Displacement functions - plate bending Elemer	nts. Plane stre	ss and plane						
strain an	alysis: Triangular	elements - Rectangular elements.								
			TOT	AL:60 Hours						
REFEREN	ICES:									
1.	Bhavikatti.S.S, "	Finite Element Analysis", New Age International P	ublishers, 201	5.						
2.	Chandrupatla, R	R.T. and Belegundu, A.D., "Introduction to Finite El	lements in Engi	ineering",						
3.	Rao.S.S, "Finite	Element Method in Engineering", Butterworth – H	Heinmann, UK,	2008.						
4.	Logan D. L., A Fi	ogan D. L., A First Course in the Finite Element Method, Cengage Learning, 2015.								
5.	R.D.Cook, Conce	D.Cook, Concepts and Applications of Finite Element Analysis, John Wiley & Sons, 2011.								

COURS	E CODE				COURS	E NAME			L	T	Ρ	С
P19ST	R102		-	THEORY O	F ELASTIC	ITY AND F	PLASTICIT	Y	3	1	0	4
<b>Course Objective</b>	(s): The P	ourpose o	flearning	this cours	se is to:							
<ul> <li>Understar</li> <li>plasticity</li> <li>Expose st</li> </ul>	nd the co udents to	ncepts of two-dim	stresses, ensional p	strains and	d stress-st n Cartesia	rain relati n coordina	onships, b ates	basic theor	y of elast	icity an	d	
Understar	nd the pro	oblem for	mulations	s and solut	tion techn	iques						
Familiariz	e student	s with the	e principle	e of torsio	n of prism	atic bars o	of non-circ	ular sectio	ons.			
<ul> <li>Expose th</li> </ul>	e student	ts to elast	oplastic p	roblems in	nvolving p	lastic defo	rmation o	of beams a	nd bars.			
Course Outcome	Course Outcome (s) (COs): At the end of this course, the students will be able to:											
CO1 Explain the concept of stress and strain and their relationships (k2)												
CO2	Analyze	the two-	dimensior	nal probler	ns in Carte	esian and	polar cool	rdinates (k	(4)			
CO3	Apply th	e concep	t of torsio	on to Prism	natic bars (	of differer	nt sections	; (k3)				
CO4	Solve sir	nple prot	olems of e	lasticity ar	nd plastici <sup>.</sup>	ty underst	anding th	e basic co	ncepts. (k	(4)		
CO5	Apply nu	umerical r	methods t	o solve co	ntinuum p	oroblems.	(k5)					
Knowledge Level:	: K1 – Ren	nember:	K2 – Und	derstand:	КЗ – Арр	ly: K4 –	Analyze:	K5 – Eval	uate:			
CO – PO Mapping	5											
COs	<b>DO1</b>	<b>DO</b> 2	<b>DO</b> 2	<b>DO</b> 4	DOF	POs	007	DOG	DOD	0010		044
	PO1	PO2	PO3	PO4	PO5	P06	P07	P08	PO9	PO10	P(	011
<u> </u>	3	3	2	2	2	1	-	2	2	1		1
<u> </u>	3	3	2	2	2	1	-	2	2	1	-	1
CO3	3	3	3	3	2	1	-	2	3	2		1
C04	3	3	3	3	2	1	-	2	3	2		1
<u> </u>	3	3	3	3	2	1	-	2	3	3	-	<u> </u>
	3	3	2.6	2.6	2	1		2	2.6	1.8		1
<b>Correlation Level</b>	: 1:5	Slight (Lov	w)	2:Moder	ate (Medi	um)	3:Subst	antial (Hig	h)	,		
UN	IT-I		ANALYS	IS OF STRE	ESS AND S	TRAIN IN	CARTESIA	N COORD	INATES		1	2
Displacement, An	alysis of	stress (tv	wo and th	nree dime	nsions)- B	ody force	, surface	force - U	niform st	ate of	stre	ss –
Principal stresses	- stress t	ransform	ation laws	s - Differer	ntial equa	tions of eq	quilibrium	. Analysis	of strain	(two ar	d th	iree
dimensions) Straii	n displace	ement rela	ations - Co	ompatibili	ty equatio	ns - state	of strain a	at a point -	– strain ti	ransform	nati	on -
principal strain -	principle	e of supe	rposition.	Stress-st	rain relat	ions - gei	neralized	Hooke's I	aw - Lar	ne's co	nsta	nts,
Boundary value p	roblems								CI A NI			•
UNI	Diama atm	منبع بمراجع				EIVIS OF E			SIAN		1	<u>Z</u>
Plane stress and	function	ain probi	ems - Air	y s stress	TUNCTION ·	· Polynom	ilais – Dir	ect metho	a of det	erminin	gΑ	iry's
		- 30101101							s		1	2
General equation	s in nolar	coordina	tos - Stro	ss distribu	tion symm	notrical at		vis - Duro h	o opnding (		d ha	<u>r</u>
Strain component	s in polar	coordina	toc Dice	Jacomont	for symm		rocc dictril	hution D	otating D		u be adin	ns-
Strain component	s in polar	coordina	ites - Disp	nacements	s for symm	ietrical sti	less distri		Diating D	isc - Bei	ium	g oi
a curved bar by fo	rce at the	e end	TODGLO			DC .						2
UNI Conorol colutions	I-IV	oblom bi		N OF PRIS		KS	notion)	d force /r	م الدام مرمد	troce f.	1	
General solutions	or the pr		i uispiacei	ment (St. )	venant's V	varping tu	netion) ar	iu iorce (F	rianuti S S	stress fl	JUCT	1011)
approaches - Me	mbrane a	analogy-T	orsion of	shafts of	circular a	ind nonci	rcular (ell	iptic, triar	ngular, ar	nd recta	angu	llar)
cross-sectional sh	cross-sectional shapes. Torsion of hollow thin-walled single and multicelled sections.											

U	NIT-V	PLASTIC DEFORMATION	12
Introductio	on to stress-strai	in curve - Ideal plastic body - Criterion of yielding - Rankine's theo	ry - St.Venant's theory -
Tresca's cr	iterion – Beltram	ni's theory - Von-mises criterion - Mohr's theory of yielding - yield su	ırface – Plastic potential,
Isotropic H	lardening-Flow r	rule (plastic stress-strain relation) Prandtl Reuss equations - Plastic	work - Plastic potential
Nadai's sar	nd heap analogy.		
			TOTAL: 60 Hours
REFERENC	ES:		
1.	Sadhu Singh, T	heory of Plasticity, Khanna Publishers, N.Delhi, 2008.	
2.	S. Timoshenko	and J. N. Goodier, Theory of Elasticity, Mc Graw Hill Book Co., 2010.	
3.	RagabA.R., Bay	oumi S.E., Engineering Solid Mechanics, CRC Press, 1999	
4.	Computational	Elasticity, AmeenM, Narosa, 2005.	
5.	Advanced Mec	hanics of Solids, Srinath L.S, Tata McGraw Hill, 2009.	

COURS	E CODE			COL	JRSE NA	ME			L	Т	Ρ	C
P1951	FR103	S-	TRUCTU	RAL ENG	GINEERI	NG LAB	ORATOR	RΥ	0	0	4	2
Course Object	ive (s): The Pur	pose of	learning	this co	urse is to	0:						-
Praction	ce the design of	high str	ength co	oncrete								
<ul> <li>Gain tl</li> </ul>	he knowledge to	o condu	ct variou	us Non-c	lestructi	ve tests						
Praction	ce various engin	eering p	rinciple	s to und	erstand	the beh	avior of	structu	res			
Course Outcor	me (s) (COs): At	the end	of this	course,	the stuc	lents wi	II be ab	le to:	-			
C01	Design high st	rength c	oncrete	and stu	dy the p	aramet	ers affeo	ting its	perform	ance	k4)	
CO2 Conduct Non-Destructive tests on existing concrete structures (k5)												
CO3 Apply Engineering principles to understand behaviour of structural elements (k5)												
<b>Knowledge Level:</b> K1 – Remember: K2 – Understand: K3 – Apply: K4 – Analyze: K5 – Evaluate:												
CO – PO Manning												
					P	Os						
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8									PO1	) F	<b>'</b> 011
CO1	3	2	1	3	3	2	1	2	2	3		1
CO2	3	2	1	3	3	2	1	3	3	3		1
CO3	3	3	1	3	3	2	1	1	1	3		1
СО	3.0	2.3	1.0	3.0	3.0	2.0	1.0	2.0	2.0	3.0		1.0
Correlation Le	vel: 1:Slig	ht (Low)		2:Mc	oderate	(Mediur	n)	3:Su	Ibstantia	al (Hig	h)	
	0		•				,			· 、 0	,	
CONTENTS:-											e	50
Study of stress	s-strain curve of	high str	ength co	oncrete								
Correlation be	tween cube stre	ength, cy	/lindrica	l strengt	th, split	tensile s	trength	and mo	dulus of	ruptu	re	
Effect of cyclic	loading on stee			0	<i>·</i> ·		U			·		
					_							
Non-Destructiv	ve testing of exis	sting coi	ncrete n	nembers	5							
Behaviour of b	eams under flex	kure, she	ear and	torsion								
Model study on continuous beam with influence line coefficients												
											Tota	al: <b>60</b>
<b>REFERENCES:</b>												
1.	Properties	of Conci	rete, Ne	ville A.N	1, 5 <sup>th</sup> Edi	ition, Pr	entice H	all, 2013	3.			
2.	Concrete T	echnolo	gy, Shet	ty M.S.,	S.Chanc	and Co	., 2008.	,				

COURSE CODE     COURSE NAME     L     T     P     C									C			
P19ST	R510		ADV	ANCED C	ONCRETE	TECHNOL	.OGY		3	0	0	3
Course Ob	jective (s):	The Purp	ose of lea	arning this	s course is	s to:			<u> </u>	1 1		
• An	alyse the c	haracteri	sation of o	concrete r	natrix wit	h influenc	ing factor	s like strer	ngth and k	pehavio	ur	
• Sig	gnify the va	rious met	hod of m	ix proport	ions							
• Ev	aluate and	study of t	he factor	s to affect	ing the du	urability o	f concrete	9				
• Ap	ply the spe	ecial conci	rete with	specified	quality an	d study th	ne limitatio	ons				
● Ev	aluate the	Concrete	propertie	s based o	n Non des	tructive n	nethods					
Course Ou	tcome (s)	(COs): At t	the end o	f this cou	rse, the st	udents w	ill be able	to:				
CO1	Discuss n	nicrostruc	ture conc	rete and o	dimension	al stability	y (K4)					
CO2	Prepare a	a mix desi	gn for the	various c	oncrete g	rades (K3)	)					
CO3	Enumera	te the pro	perties of	f ingredieı	nts consid	ered for d	lurability o	of concret	es (K4)			
CO4	Explain tl	he differe	nt types o	of special c	oncrete a	nd their a	pplicatior	ns in const	ruction (K	(3)		
CO5	Explain d	ifferent ty	pes of no	n-destruc	tive testir	ng methoo	ds (K4)					
Knowledge	e Level: K1	– Remerr	ber: K2	– Underst	tand: K3	– Apply:	K4 – Ana	alyze: K5	– Evaluat	:e:		
CO – PO M	lapping											
COs						POs	-	-		-		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	)	PO11
CO1	1	2	1	3	1	1		1	3	2		2
CO2	1	2	1	3	1	1		1	3	2		2
CO3	1	2	1	3	1	1		1	3	2		2
CO4	1	2	1	3	1	1		1	3	2		2
CO5	1	2	1	3	1	1		1	3	2		2
СО	1	2	1	3	1	1		1	3	2		2
Correlation	n Level:	1:Slight (I	_ow)	2:Modera	ate (Mediu	um)	3:Subs	tantial (Hi	igh)	<u>I</u>		
								•	0 /			
UNI	T-I	CONCRE	TE CHAR	ACTERISA	TION						9 Ho	ours
Microstruc	cture of co	ncrete: Ag	gregate p	hase, hyc	rated cen	nent paste	e, interfac	ial transiti	ion zone.	Strengt	h: str	ength-
porosity re	elationship	, failure m	nodes in c	concrete, f	factors aff	fecting co	mpressive	e strength,	behavior	of con	crete	under
various str	ress states	. Dimensi	ional stab	oility: Elas	tic behav	ior, dryin	g shrinkag	ge and cr	eep, ther	mal shr	inkag	ge and
thermal pr	operties of	f concrete										
UNI	T-II	PROPOR	RTIONING	CONCRET		RES					9⊦	lours
Significanc	e and obj	ectives, g	eneral co	nsideratio	ons, proce	edures, M	ethods of	f concrete	mix des	ign, des	sign o	of high
strength a	nd high pe	rformance	e concrete	e using rel	levant coo	les. Testir	ng and cor	ntrol of co	ncrete qu	ality: N	letho	ds and
significanc	e, accelera	ted stren	gth testing	g, core tes	sts and qu	ality conti	rol charts.					-
UNI	<b>[-   </b>	DURABI	LITY OF C	ONCRETE	. <u>.</u>	1		<u> </u>			91	lours
Water as a	an agent o	deterioi	ration: str	ucture of	water, p	ermeabilit	ty, causes	of deteri	oration o	t concr	ete: s	surface
wear, crys	stallization	of salts	in pores,	frost act	ion, effec	ct of fire,	sulfate a	attack, alk	ali aggre	gate re	actio	n, and
corrosion	of embed	dded stee	el in con	crete: M	lechanism	-control,	developr	nent of l	holistic n	nodel d	of co	oncrete
deteriorati	ion, concre	ete in the	marine	environm	ent. Metł	nods of p	roviding o	durable co	oncrete, s	short-te	rm te	ests to
assess long	g-term beh	aviour.										
UNI	Γ-IV	SPECIAL	TYPES OF		TE						9⊦	lours
Roller com	pacted co	ncrete-se	lf compac	ted concr	ete-shrink	kage com	pensation	concrete,	pervious	concre	te-co	ncrete
containing	polymers	-heavv w	, veight co	ncrete fo	r radiatio	n shieldi	ng-high r	performan	ce concr	ete, hi	gh st	rength
concrete	shotcrete	, fibre reint	forced co	ncrete- ba	acterial co	ncrete-M	ass concr	ete – theii	r material	s. mix r	orono	ortions
properties	applicatio	ons and lin	nitations							,r	- 1- 0	
	,											

UNI	Г-V	NON-DESTRUCTIVE METHODS		9 Hours						
Surface ha	rdness m	nethods, Penetration resistance techniques, pull out tests, maturity met	thod, s	stress wave						
propagatio	n method	ls, electrical methods, electrochemical methods, electromagnetic method	s, Ton	nography of						
reinforced concrete.										
			ΤΟΤΑ	L: 45Hrs.						
REFERENC	ES:-									
1.	Kumar N	1ehta, Paulo J.M Monteiro., Concrete Microstructure, properties and Mate	erials, I	McGraw Hill						
	Education	n(India) Pvt Ltd, New Delhi,2014								
2.	Job Thor	nas, "Concrete Technology", Cengage Learning India, 2015								
3.	Gambhir.	.M.L., Concrete Technology, McGraw Hill Education, 2011								
4.	Gupta.B.	L, Amit Gupta, "Concrete Technology, Jain Book Agency, 2010								
5.	Neville, A	A.M., Properties of Concrete, Prentice Hall, 2013, London								
6.	Shetty M	.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2008								
7.	IS 10262:	2019, Concrete Mix Proportioning – Guidelines (Second Revision), Bureau of I	ndian	Standars,						
	New Dell	ni.2019								

COURSE	CODE			CO	URSE NAI	ME			L	Т	P C
P19ST	R525		Inter	net of Th	ings of Civ	vil Enginee	ering		3	0	0 3
Course Ob	jective (s)	: The Pur	pose of le	arning thi	s course i	s to:					
1. Ur	nderstand	the basic	compone	nts in the	architectu	ire of IoT.					
2. Er	able to kn	ow the ba	sic conce	pt of WoT	•						
3. Ur	nderstand	the worki	ng princip	le of the S	sensors us	sed in lol.					
4. AC	quire the	knowledg	e in Appli	cation of I	ol in Sma	rt Cities.					
5. Ur	iderstand	the role of		nvironme		oring.					
Course Ou	Trunksin t	(COS): At			rse, the st	ludents w					
C01	Explain ti	ne basic c	oncept an	d pillars o	T 101 (K1)		£ +  + : / 14	2)			
CO2	Demonst	rate the p	illars and	the archit	ecture of	the webo	t things (K	<b>2)</b>	(1/2)		
03	Apply the	e suitabili	ty of lol s	ensors to	r various a	ipplication	ns in Civil	Engineerii	ng <b>(K3)</b>		
C04	Understa	ind the lo	tools for	smart cit	y applicat	ions(K4)					
CO5	Monitor	the enviro	onment us	sing lol ar	chitecture	e and relat	ted conce	pts <b>(K5)</b>			
Knowledg	e Level: K	L – Remer	nber: K2	– Unders	tand: K3	s – Apply:	K4 – An	alyze: K	5 – Evalua	te:	
CO – PO N	lapping										
COs						POs					
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3		2	3	2	2	1	2	2	3
CO2	2	2	1	2	3	2	2	2	2	2	3
CO3	1	2	1	2	3	2	2	2	2	2	3
CO4	1	1	1	2	3	2	2	2	2	2	3
CO5	1	1	1	2	3	2	2	2	2	2	3
CO	1	2	1	2	3	2	2	2	2	2	3
Correlatio	n Level:	1:Slight (	Low)	2:Mod	erate (Me	dium)		3:Substai	ntial (High	)	+
					· · · · ·				· · ·	-	
UNIT-I		INTROD	UCTION								10 Hours
Definition	and funct	ional Regu	uirements	-Motivati	on-Archite	ecture-We	eb3.0 Viev	v of IoT-U	biquitous	IoTapplic	tions-Four
pillars of I		ionai neqi		nroach f	or End-us	er particio	nation in t	he Intern	et of Thir	ngs .Midd	eware for
	oT-DNA o	f loT-The	Toolkit ap	ргоасн н						•	
loT: Overv	oT-DNA o <sup>.</sup> iew-Comn	f IoT-The nunicatior	Toolkit ap 1 middlew	are for lo	F-loT Infoi	rmation Se	ecurity			0	
loT: Overv	oT-DNA o iew-Comn	f IoT-The	Toolkit ap middlew WEB OF	are for lo	T-loT Infoi	rmation Se	ecurity				10 Hours
IoT: Overv UNIT-II Web of t	oT-DNA o iew-Comn hings vers	f IoT-The nunication	Toolkit ap middlew WEB OF et of thi	are for lo THINGS ngs-Two	pillars of	the web	ecurity -Architect	ure Stand	dardizatio	n for Wo	<b>10 Hours</b> TUnified
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IoT: Overv UNIT-II Web of t Multitier V things. UNIT-III Introduction Selection	oT-DNA o iew-Comm hings vers WoTArchit	table pho	Toolkit ap middlew WEB OF et of thi bud of Th enomena-	are for lo THINGS ngs-Two ings:Grid/ IOT SEN conversio	r-loT Infor pillars of SOA and SORS n method	the web- cloud con	Architect	ure Stand Mobile C sured qua	dardizatio loud com intiuties-F	n for Wo puting-Th Physiocal	10 Hours TUnified e cloud of 9 Hours Principles- tages and
IoT: Overv UNIT-II Web of t Multitier V things. UNIT-III Introduction Selection of application	oT-DNA or iew-Comm hings vers WoTArchit on –Detector of sensor-I n-Pressure	table pho	Toolkit ap middlew WEB OF eet of thi bud of Th enomena- sensor –ro	are for lo THINGS ngs-Two ings:Grid/ IOT SEN: conversionale of sense ure sensor	F-IoT Infor pillars of SOA and SORS n methoo sor. Types	the web- cloud con ds-commo of sensor	-Architect nputing – only meas r: Require	ure Stand Mobile C sured qua ments, Ad	dardizatio loud com intiuties-F dvantages	n for Wo puting-Th Physiocal , disadvar	10 Hours TUnified e cloud of 9 Hours Principles- itages and oscope
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IoT: Overv UNIT-II Web of t Multitier V things. UNIT-III Introduction Selection of application UNIT-IV	oT-DNA o iew-Comm hings vers NoTArchit on –Detec of sensor-I n-Pressure	table pho Need for s	Toolkit ap middlew WEB OF et of thi bud of Th enomena- sensor –ro Femperation	ings-Two ings-Two ings:Grid/ iOT SEN: conversio ole of sens ure senso CITY APPL	F-IoT Infor pillars of SOA and SORS n method sor. Types r-Humidity	the web- cloud con ds-commo of sensor y sensor-c	-Architect nputing – only meas r: Require hemical s	ure Stand Mobile C sured qua ments, Ad ensor-Acc	dardizatio loud com intiuties-F dvantages seleromet	n for Wo puting-Th Physiocal , disadvar er and gyr	10 Hours TUnified e cloud of 9 Hours Principles- itages and oscope 8 Hours
IoT: Overv UNIT-II Web of t Multitier V things. UNIT-III Introduction Selection of application UNIT-IV Smart tra	oT-DNA or iew-Comm hings vers WoTArchit on –Detec of sensor-I n-Pressure nsportatio	table pho Need for s	Toolkit ap middlew WEB OF et of thi bud of Th enomena- sensor –ro Gemperate SMART ( igent par	are for lo THINGS ngs-Two ings:Grid/ IOT SEN conversional ole of sensure sensor CITY APPL king-Auto	F-loT Infor pillars of SOA and SORS n method sor. Types r-Humidity ICATION nomous	the web- cloud con ds-commo of sensor y sensor-co Vehicle r	Architect -Architect nputing – only meas r: Require themical s	ure Stand Mobile C sured qua ments, Ad ensor-Acc Smart bu	dardizatio loud com intiuties-F dvantages seleromete ildings –	n for Wc puting-Th Physiocal , disadvar er and gyr Energy a	10 Hours TUnified e cloud of 9 Hours Principles- itages and oscope 8 Hours ware-inter
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IoT: Overv UNIT-II Web of t Multitier V things. UNIT-III Introduction Selection of application UNIT-IV Smart tra building N studies	oT-DNA or iew-Comm hings vers WoTArchit on –Detector of sensor-I n-Pressure Insportation	table pho Need for s s sensor-	Toolkit ap middlew WEB OF eet of thi bud of Th enomena- sensor –ro Gemperato SMART of igent par mental se	are for lo THINGS ngs-Two ings:Grid/ IOT SEN: conversio ble of sens ure sensor CITY APPL king-Auto nsing-Sus	F-IoT Infor pillars of SOA and SORS n method sor. Types r-Humidity ICATION nomous tainable of	the web- cloud con ds-commo of sensor y sensor-co Vehicle r cities-City	Architect -Architect nputing – only meas r: Require chemical s network. insights.	ure Stand Mobile C sured qua ments, Ad ensor-Acc Smart bu Health m	dardizatio loud com intiuties-F dvantages seleromete ildings – nonitoring	n for Wc puting-Th Physiocal , disadvar er and gyr Energy a for struc	10 Hours TUnified e cloud of 9 Hours Principles- itages and oscope 8 Hours ware-inter cures-Case
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IoT: Overv UNIT-II Web of t Multitier V things. UNIT-III Introduction Selection of application UNIT-IV Smart tra building N studies UNIT Water standards	oT-DNA or iew-Comm hings vers NoTArchit on –Detector of sensor-I n-Pressure nsportation Javigation. T-V managem	table pho secture.Clo ctable pho Need for s s sensor- n –Intell Environr ENVIRO ent –F	Toolkit ap middlew WEB OF et of this bud of Th enomena- sensor –ro femperation SMART of igent par mental se NMENTAL Process	ings-Two ings-Two ings:Grid/ IOT SEN: conversional of sensure sensor CITY APPL king-Auto nsing-Sus MONITC –applica	F-IoT Infor pillars of SOA and SORS n method sor. Types r-Humidity ICATION nomous tainable of RING tion.Airpo	the web- cloud con ds-commo of sensor y sensor-co Vehicle r cities-City	ecurity -Architect nputing – only meas r: Require hemical s network. insights. ethods-ac	ure Stand Mobile C sured qua ments, Ad ensor-Acc Smart bu Health m	dardizatio loud com antiuties-F dvantages celeromete nildings – nonitoring	n for Wo puting-Th Physiocal , disadvar er and gyr Energy a of struc 8 monitor mate mor	10 Hours TUnified e cloud of 9 Hours Principles- itages and oscope 8 Hours ware-inter cures-Case Hours ng-quality
IoT: Overv UNIT-II Web of t Multitier V things. UNIT-III Introduction Selection of application UNIT-IV Smart tra building N studies UNIT Water standards.	oT-DNA or iew-Comm hings vers WoTArchit on –Detec of sensor-I n-Pressure nsportatio Iavigation. <b>T-V</b> managem Indication	table pho sus Intern ecture.Clo table pho Need for s s sensor- on –Intell Environr Environr ent –F of calami	Toolkit ap middlew WEB OF eet of thi bud of Th enomena- sensor –ro Temperatu SMART of igent par mental se NMENTAL Process ties-alert	ings-Two ings-Two ings:Grid/ ings	F-IoT Infor pillars of SOA and SORS In method Sor. Types F-Humidity ICATION nomous tainable of PRING tion.Airpo	the web- cloud con ds-commo of sensor y sensor-co Vehicle r cities-City Illution-M ns.Smart in	ecurity -Architect nputing – only meas r: Require chemical s network. insights. ethods-ac rrigation-c	ure Stand Mobile C Sured qua ments, Ad ensor-Acc Smart bu Health m dvantages case study	dardizatio loud com intiuties-F dvantages releromete ildings – nonitoring .Water v.Micro cli	n for Wc puting-Th Physiocal , disadvar er and gyr Energy a of struc 8 monitor mate mor	10 Hours TUnified e cloud of 9 Hours Principles- itages and oscope 8 Hours ware-inter cures-Case Hours ng-quality nitoring.

RE	FERENCES:
1.	The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press – 2012
2.	Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011
3.	The Internet of Things: Applications to the Smart Grid and Building Automation by - Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012
4.	Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012

#### **CIVIL ENGINEERING**

#### M. E. / STRUCTURAL ENGINEERING

SEMESTER – I	NUMERICAL METHODS FOR STRUCTURAL	L	Т	Р	С
P19STR506	ENGINEERING	2	1	0	3

#### **COURSE OUTCOMES**

At the end of the course student should be able to,

- 1 find the numerical solution of algebraic and transcendental equations.
- 2. solve the linear system of equations by direct and indirect methods.
- 3. find the interpolation and polynomial approximation for the given data.
- 4. find the numerical solution of ordinary differential equations.
- 5. find the numerical solution of partial differential equations by finite difference method.

		(3/2/1	indicates	strength o	CO / PO of correlat	Mapping ion) 3-St	rong, 2-Me	edium, 1-V	Veak		
		Pr	ogramme	Outcome	s (POs) at	nd Progra	mme Spec	ific Outco	me (PSC	s)	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11
CO1	3	3	3	3	3		2		1	1	
CO2	3	3	3	3	3		2				
CO3	3	3	3	3	3		2				
CO4	3	3	3	3	3		2				
CO5	3	3	3	3	3		2		1		

#### UNIT – I ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Bisection method - Regula-Falsi method - Fixed point iteration method - Newton Raphson method.

### UNIT – II LINEAR SYSTEM OF EQUATIONS AND EIGEN VALUE PROBLEMS

Gauss elimination method – Gauss-Jordan method – Gauss-Jacobi method – Gauss-Seidel method – Eigen values of a matrix by Power method.

#### UNIT – III INTERPOLATION AND APPROXIMATION

Newton's forward and backward difference formulae – Newton's divided difference interpolation – Lagrange's interpolation – inverse Lagrange's interpolation.

10.05.2019

M.E / M.Tech Regulations 2019

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#### Sona College of Technology

## ORDINARY DIFFERENTIAL EQUATIONS

UNIT - IV Solution of first and second order ordinary differential equations - Taylor series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method.

#### PARTIAL DIFFERENTIAL EQUATIONS UNIT - V

Classification of linear second order partial differential equations - Solution of parabolic partial differential equations by Bender - Schmidt explicit and Crank-Nicolson implicit methods - Solution of hyperbolic partial differential equations by explicit method - Solution of two dimensional Laplace's and Poisson's partial differential equations on rectangular domain.

Theory: 30 Hours

Tutorial: 15 Hours

Total: 45 Hours

#### TEXT BOOK:

S. S. Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall India Publishers, 5th 1 Edition, 2012.

#### **REFERENCE BOOKS:**

- K. E. Atkinson, "An Introduction to Numerical Analysis", Wiley Publishers, 2<sup>nd</sup> Edition, 1989. 1.
- F. Scheid, "Theory and Problems of Numerical Analysis", Mc Graw Hill Publishers, 2<sup>nd</sup> Edition, 2 1988.
- S. R. K. Iyengar, R. K. Jain and M. K. Jain, "Numerical Methods for Scientific and Engineering 3. Computation", New Age International Publishers, 6th Edition, 2012.
- R. L. Burden and J. D. Faires, "Numerical Analysis", Cengage Publishers, 9th Edition, 2012. 4.

Non

**Prof. S. JAYABHARATHI** Head / Department of Mathematics Sona College of Technology Salem - 636 005

Dr. M. RENUGA BoS - Chairperson Science and Humanities Sona College of Technology Salem - 636 005

10.05.2019

M.E / M.Tech Regulations 2019

Department of Mathematics

16.09.2022

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### P19GE101

#### **RESEARCH METHODOLOGY AND IPR**

#### **COURSE OUTCOMES**

At the end of the course, the student will be able to

- 1. Review the literature of the research problem
- 2. Choose appropriate data collection and sampling method according to the research problem.
- 3. Interpret the results of research and communicate effectively with their peers
- 4. Explain the Importance of intellectual property rights
- 5. Evaluate trade mark, develop and register patents

		(3)	/2/1 ind	licates s	( strength	CO/PO	, PSO I relation	Mappin a) 3-Str	ng ong, 2-	Medium	, 1-Weal	¢	
~	Section of		Program	mme O	utcome	s (POs	) and P	rogram	me Spe	ecific Ou	itcome (I	PSOs)	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO12	PSO1	PSO2
CO1	3	3	3	3	2						3	3	3
CO2	3	3	3	3	2	Constant of the					3	3	3
CO3	3	3	3	3	2	1000	C. Start				3	3	3
CO4	3	3	3	3	2						3	3	3
CO5	3	3	3	3	2		and the second	3		19	3	3	3

#### UNIT I INTRODUCTION TO RESEARCH METHODS

Definition and Objective of Research, Various steps in Scientific Research, Types of Research, Criteria for Good Research, Defining Research Problem, Research Design, Case Study Collection of Primary and Secondary Data, Collection Methods: Observation, Interview, Questionnaires, Schedules,

#### UNIT II SAMPLING DESIGN AND HYPOTHESIS TESTING

steps in Sampling Design, Types of Sample Designs, Measurements and Scaling Techniques -Testing of hypotheses concerning means (one mean and difference between two means one tailed and two tailed tests), concerning variance – one tailed Chi-square test.

#### UNIT III INTERPRETATION AND REPORT WRITING

Techniques of Interpretation, Precaution in Interpretation, Layout of Research Report, Types of Reports, Oral Presentation, Mechanics of Writing Research Report

#### UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights, Innovations and Inventions trade related intellectual property rights.

16-09-2022 J. AKILANDESWARI

PROFESSOR & HEAD Department of Information Technology SONA COLLEGE OF TECHNOLOGY RALEM-636 005 M Tech Regulations 2019

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#### UNIT V TRADE MARKS, COPY RIGHTS AND PATENTS

Purpose and function of trade marks, acquisition of trade mark rights, trade mark registration processes, trademark claims –trademark Litigations- International trademark law

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

THEORY: 30 Hours TUTORIAL: - PRACTICAL: - TOTAL: 30 Hours

#### **TEXT BOOKS**

- 1. C.R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques ,4<sup>th</sup> Edition, New Age International Publishers, 2019.
- 2. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets", Delmar Cengage Learning, 4<sup>th</sup> Edition, 2012.
- Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", Tata Mc Graw Hill Education, 1<sup>st</sup> Edition, 2008.

#### **REFERENCE BOOKS**

- 1. Panneerselvam, R., Research Methodology, Second Edition, Prentice-Hall of India, New Delhi, 2013.
- Ranjith Kumar, Research Methodology A step by step Guide for Begineers, 4<sup>th</sup> edition, Sage publisher, 2014.
- D Llewelyn & T Aplin W Cornish, "Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights", Sweet and Maxwell, 1<sup>st</sup> Edition, 2016.
- Ananth Padmanabhan, "Intellectual Property Rights-Infringement and Remedies", Lexis Nexis, 1<sup>st</sup> Edition, 2012.
- Ramakrishna B and Anil Kumar H.S, "Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers", Notion Press, 1<sup>st</sup> Edition, 2017.
- 6. M.Ashok Kumar and Mohd.Iqbal Ali :"Intellectual Property Rights" Serials Pub

-09-2022 **Ur. J. AKILANDESWARI** M Tech Regulations 2019 PROFESSOR & HEAD Department of Information Technology SONA COLLEGE OF TECHNOLOGY SALEM-636 005

### **English for Research Paper Writing**

#### **Course Outcomes:**

At the end of the course, the students will be able to

- Demonstrate research writing skills both for research articles and thesis
- Frame suitable title and captions as sub-headings for articles and thesis
- · Write each section in a research paper and thesis coherently
- Use language appropriately and proficiently for effective written communication
- · Exhibit professional proof-reading skills to make the writing error free

#### Unit - I

Planning and preparation, word order, breaking up long sentences, organising ideas into paragraphs and sentences, being concise and avoiding redundancy, ambiguity and vagueness

	6
anding and avoiding plagiarism, para	aphrasing sections
	6
bstract, to give an introduction	
	6
terature, methods, results, discussion	and conclusions
	6
	anding and avoiding plagiarism, para bstract, to give an introduction erature, methods, results, discussion

Usage of appropriate phrases and key terms to make the writing effective - proof-reading to ensure error-free writing.

#### **Text Books:**

- 1. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
- Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book, 1998.

3. Day R, How to Write and Publish a Scientific Paper, Cambridge University Press, 2006.

4. Goldbort R, Writing for Science, Yale University Press, 2006. (available on Google Books)

#### REFERENCES

Martin Cutts, Oxford Guide to Plain English, Oxford University Press, Second Edition, 2006

Dr. M. Renuga BoS – Chairperson, Science & Humanities HOD / H&L Total: 30 hours

## Sona College of Technology, Salem (An Autonomous Institution) Courses of Study for ME II Semester under Regulations 2019 Civil Engineering Branch: Structural Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
	1	Theory					
1	P19STR201	Advanced Design of Concrete Structures	3	0	0	3	45
2	P19STR202	Advanced Design of Steel Structures	3	0	0	3	45
3	P19STR505	Professional Elective: Aseismic Design of Structures	3	0	0	3	45
4	P19STR517	Professional Elective: Design of sub structures	3	0	0	3	45
5	P19GE702	Audit Course: Stress Management by Yoga	2	0	0	0	30
		Practical					
6	P19STR203	Structural Software Application Laboratory	1	0	4	3	75
7	P19STR204	Mini Project	0	0	4	2	60
		·	•	To	tal Credits	17	

### Approved by

Chairperson, Civil Engineering BOS Dr.R.Malathy Member Secretary, Academic Council Dr.R.Shivakumar Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Civil, Second Semester ME STR Students and Staff, COE

# 9 Hrs. Calculation of deflection and crack width according to IS Code. Construction of Interaction curve for compression member with axial force and bending - Design of slender column. Behaviour of beams for flexure, shear and **UNIT -II: DESIGN OF SPECIAL REINFORCED CONCRETE ELEMENTS** 9 Hrs. Design of Reinforced Concrete walls, Design of shear wall, - Strut and tie method of analysis for corbels and deep beams, Design of corbels, deep beams and grid floors. UNIT -III: FLAT SLABS AND YIELD LINE APPROACH 9 Hrs.

**Advanced Design of Concrete Structures** 

Design of flat slabs according to IS method - Design of spandrel beams - Yield line analysis and design of square, rectangular, triangular and circular slabs with various boundary conditions. Hillerborg's strip method.

#### UNIT -IV: INELASTIC BEHAVIOUR OF CONCRETE BEAMS AND COLUMNS 9 Hrs.

Inelastic behaviour of concrete beams by Baker's method, moment - rotation - curvature characteristics. Limit analysis - Conditions for moment redistribution - Stress-Strain behaviour of confined and unconfined columns.

## **UNIT -V: DUCTILE DETAILING**

Concept of Ductility – Design and detailing of beams, columns for ductility - Design of cast-in-situ joints in frames – Determination of ductility factor for singly and doubly reinforced beams.

## **REFERENCE BOOKS:**

- 1. Gambhir.M. L., "Design of Reinforced Concrete Structures", Prentice Hall of India, 2012.
- 2. Purushothaman, P, "Reinforced Concrete Structural Elements: Behaviour Analysis and Design", Tata McGraw Hill, 1984
- 3. Unnikrishna Pillai and Devdas Menon "Reinforced Concrete Design', Third Edition, Tata McGraw Hill Publishers Company Ltd., New Delhi, 2009.
- 4. Varghese, P.C, "Advanced Reinforced Concrete Design", Prentice Hall of India, 2005.
- 5. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, 2007.

At the end of the course, the student will be able to:

- CO1. Describe the design philosophy of Concrete Structures
- CO2. Design the columns, walls, corbels, deep beams and grid floors
- CO3. Design the flat slabs by yield line approach
- CO4. Discuss the inelastic behaviour of concrete beams and columns
- CO5. Deliberate the detailing for ductility of beams, columns and frames

## **UNIT-I: INTRODUCTION**

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Total: 45 hrs.

9 Hrs.

P19STR202

**COURSE OUTCOMES** 

#### At the end of the course, the student will be able to: CO1. Explain and design the different types of steel connections CO2. Analysis and design various components of industrial structures. CO3. Design the steel members subjected to combined forces. CO4. Design steel chimney subjected to wind loads. CO5. Evaluate the behaviour and design of light gauge elements. **UNIT-I: DESIGN OF CONNECTIONS** 9 Hrs. Introduction- Classification of connections. Bolted and Welded connections: Basic concepts- Beam-to-Beam connections. Beam-Column connection: Unstiffened and Stiffened seated Connections-Moment Resistant Connections. UNIT -II: ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS 9 Hrs. Industrial building-Planning-Structural framing-Elements of industrial building- Analysis and design of trusses-Design of Purlins, Gable column and Gable wind girder-Introduction to pre-engineered building. Design and detailing for earthquake and wind loads. Design consideration for durability. **UNIT -III: DESIGN OF COMBAINED FORCES** 9 Hrs. Design of members subjected to combined forces: Beam-Column-Crane Gantry Girders –Design of simple bases, Gusseted bases and Moment Resisting Base Plates **UNIT -IV: DESIGN OF STEEL CHIMNEY** 9 Hrs. Introduction to chimneys -Types-Dimensions of steel stacks-Components: Lining- Breech openings and access ladder-Loading and load combinations-Design considerations-Design of self supporting and guyed steel chimney. **UNIT -V: DESIGN OF LIGHT GAUGE STEEL STRUCTURES** 9 Hrs. Light gauge steel section: Introduction-Applications-Advantages-Behaviour-Forms-Edge and Intermediate stiffener-Stiffened, unstiffened and multiple stiffened element-Flat-width ratio-Effective width for load and deflection determination-Analysis and design of compression and flexural members. Total: 45 hrs. **REFERENCE BOOKS:** 1. Subramanian N, "Design of Steel Structures", Oxford University Press, New Delhi 2011. Duggal S.K, "Design of Steel Structures", Tata McGraw-Hill Education, 2009. 2. Shivekar M.R, "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, 2017. 3. 4. Punmia B.C., Comprehensive Design of Steel Structures, Lakshmi Publications, New Delhi, 2000. Teaching Resource on Structural steel Design, INSDAG, Ministry of Steel Publishing, 2000. 5. Bhavikatti.S.S, "Deign of Steel structures", I.K. International publishing house, New Delhi, 2009. 6.

**Advanced Design of Steel Structures** 

P199	STR203	Structural Software Application Laboratory	1	0	4	3
COURS	E OUTCOM	ES				
At the en	nd of the cou	rse, the student will be able to:				
CO1	. Analysis ar	nd design of steel roof trusses by softwares				
CO2	. Analysis ar	nd design of Reinforced Concrete frames by softwares				
CO3	. Analysis of	various members by Finite Element Analysis softwares				
Content	ts				45	Hrs.
1.	Analysis and	design of 2D and 3D Steel roof trusses for static, wind and seismic forces.				
2.	Analysis and	design of 2D and 3D Reinforced Concrete rigid frames for static, wind and	l seismi	ic	for	ces.
3.	Finite Eleme	nt modeling, analysis and design of Reinforced Concrete and Steel Element	ts.			
			To	ta	l: 7	5 hrs.
Referen	ces:-					
1.	Laboratory m	nanuals prepared by Civil Engineering Department, Sona College of Techno	ology, S	al	em.	•

- 2. Unnikrishna Pillai and Devdas Menon "Reinforced Concrete Design", Third Edition, Tata McGraw Hill Publishers Company Ltd., New Delhi, 2009.
- Subramanian N, "Design of Steel Structures", Oxford University Press, New Delhi 2011
   Prof. S.K. Bhattacharyya and Dr. D. Maity "Finite Element Analysis" NPTEL Web course, IIT Kharagpur.

#### P19STR204 **COURSE OUTCOMES**

At the end of the course, the student will be able to:

CO1. Identify structural engineering problems reviewing available literature.

CO2. Study different techniques used to analyze complex structural systems.

CO3. Work on the solutions given and present solution by using his/her technique applying engineering principles.

## **Syllabus Contents:**

30 Hrs. Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid Semester and End Semester will be monitored by the departmental committee.

Total: 60 hrs.

#### **Mini Project**

P19STR505	Aseismic Design of Structures	3 0	0	3
COURSE OUTCO	DMES			
Upon completion of	of this course, the student will be able to			
CO1 Identify	the causes and effects of earthquake and describe the terr	ns relat	ed to	)
earthqu	ake.	_		
CO2 Define	the basic concepts of elements of vibration and behavior of	of struct	ures	under
cyclic l	oading.			
CO3 Practice	e the codal provisions for design and detailing of earthqual res.	ce resis	tant	
CO4 Formul	ate the design principles for Non-engineered buildings and	1 desig	n pre	ovisions
for brid	lges and dams.		- <b>F</b>	
CO5 Categor	rize the new concepts on different types of base isolation t	echniq	ies.	
UNIT- I: ELEM	IENTS OF SEISMOLOGY			9
Elements of Er	gineering Seismology, Characteristics of Earthquakes,	Histo	ry, S	Seismic
Susceptibility of	Indian Subcontinent, Performance of structures during	past e	arth	quakes,
Lessons learnt fr	om past earthquakes.	1		1 /
UNIT – II: THI	EORY OF VIBRATIONS			9
Theory of vibra	tions ,Building Systems , Rigid Frames, Braced Fran	nes, S	hear	Walls,
Behavior of R	C, Steel and Prestressed concrete elements under cy	clic lo	adin	g ,Soil
liquefaction and	prevention methods			
UNIT – III: CO	DAL PROVISIONS FOR DESIGN & DETAILING			9
Concept of Earth	hquake Resistant Design, Response Spectrum ,Design SI	bectrum	n Pro	ovisions
of Seismic Code	IS 1893 (Part I) – 2002 ,Structural Configuration , 3 D co	mputer	: ana	lysis of
building (Theor	y) ,Design and Detailing of Frames, Shear Walls a	nd Fra	med	Walls
,Provisions of IS	-13920.			
UNIT – IV: NO	N ENGINEERED BUILDINGS			9
Design of Non E	ngineered construction, strengthening of buildings, Desig	n Provi	sion	s for
Bridges and Dan	18.			
UNIT – V: BAS	E ISOLATION TECHNIQUES			9
Modern Concepts	B – Base Isolation, Adoptive systems and Case studies.			
		T	otal:	45 hrs.
REFERENCE BO	DOKS:	1.1.1.1		
1. Shashikant K	Duggal, Earthquake resistant design of structures, Oxford	1 highe	r	
2 Pankai Agan	val & Manish Shrikhanda "Earthquake Resistant Design	of Strue	oturo	s''
2. Talikaj Agar PHI Learning	val & Manish Shirkhande, Earthquake Kesistant Design	JI Suu	luic	з,
3 Damodarasat	my S.R. "Basics of Structural Dynamics and Aseismic De	sign"	PHI	
J. Damodardsan	t I td. New Delhi 2009	51 <u>5</u> 11 ,	1 1 1 1	
4 Anil K Chop	ra "Dynamics of structures – Theory and applications to			
Earthquake F	Engineering". Prentice Hall Inc., 2001.			
5. Clough R.W.	and Penzien J., 'Dynamics of Structures', McGraw-Hill, 2	2nd edi	ion.	1993.
6. IS 1896:2016	5 Criteria for Earthquake Resistant Design of Structures. F	IS. Ne	wDe	lhi.
7. IS 13920:201	6 Ductile Design and Detailing of Reinforced Concrete S	tructure	es es	
Subjected to	Seismic Forces – Code of Practice, BIS, NewDelhi.			

**COURSE OUTCOMES** 

P19STR517

At the end of the course, the student will be able to

CO1. Describe the basic requirements of foundations and design the shallow foundations

CO2. Design of pile foundations

CO3. Design of well foundations

CO4. Design of machine foundations

CO5. Design of foundations on expansive soil

#### **UNIT-I: SHALLOW FOUNDATIONS**

Soil investigation - Basic requirements of foundation - Types and selection of foundations. Bearing capacity of soil - plate load test – Design of reinforced concrete isolated, strip, combined and strap footings – mat foundation.

#### **UNIT -II: PILE FOUNDATIONS**

Introduction - Types of pile foundations - load carrying capacity - pile load test - structural design of straight piles –configuration of piles- different shapes of piles cap – structural design of pile cap.

#### **UNIT -III: WELL FOUNDATIONS**

Types of well foundation – Grip length – load carrying capacity – construction of wells – Failures and Remedies – Design of well foundation – Lateral stability.

#### **UNIT -IV: MACHINE FOUNDATIONS**

Introduction - Types of machine foundation - Basic principles of design of machine foundation - Dynamic properties of soil – vibration analysis of machine foundation – Design of foundation for Reciprocating machines and Impact machines - Reinforcement and construction details - vibration isolation.

#### **UNIT -V: SPECIAL FOUNDATIONS**

Foundation on expansive soils - choice of foundation - under-reamed pile foundation. Foundation for concrete Towers, chimneys – Design of anchors- Reinforced earth retailing walls.

Total: 45 hrs.

#### **REFERENCE BOOKS:**

- 1. Bowles .J.E., "Foundation Analysis and Design", McGraw Hill Publishing co., New York, 1997.
- 2. Swamy Saran, Analysis and Design of substructures, Oxford and IBH Publishing Co. Pvt. Ltd., 2006.
- Tomlinson.M.J, "Foundation Design and Construction", Longman, Sixth Edition, New Delhi, 1995. 3.
- Varghese.P.C, "Design of Reinforced Concrete Foundations" PHI learning private limited, New Delhi -4. 2009.

**Design of Substructures** 

3003

9 Hrs.

9 Hrs.

9 Hrs.

9 Hrs.

9 Hrs.

#### 22.02.2023

#### P19GE702

#### Stress Management by Yoga

#### **Course Outcomes:**

At the end of completion of this course, students will be able to

- 1. Develop physical and mental health thus improving social health
- 2. Increase immunity power of the body and prevent diseases
- 3. Accelerate memory power
- 4. Achieve the set goal with confidence and determination

5. Improve stability of mind, pleasing personality and work with awakened wisdom UNIT-I

Yoga-Introduction - Astanga Yoga- 8 parts-Yam and Niyam etc.- Do's and Don'ts in life-Benefits of Yoga and Asana- Yoga Exercise- and benefits- Pranayam Yoga- Nadi suthi, Practice and Spinal Sclearance Practice- Regularization of breathing techniques and its effects-Practice and kapalapathy practice.

#### UNIT - II

Neuromuscular breathing exercise and Practice- Magarasa Yoga, 14 points Acupressure techniques and practice- Body relaxation practice and its benefits- Raja Yoga- 1.Agna explanation and practice- Activation of Pituitary- Raja Yoga- 2. Santhi Yoga-Practice-Balancing of physical and mental power.

#### UNIT - III

6

Raja Yoga- 3. Sagasrathara yoga -practice- Activation of dormant brain cells-Kayakalpatheory- Kayakalpa -practice-Yogic exercise to improve physical and mental health and practice-Asanas -explanation-Practice-benefits

#### **UNIT-IV**

12 poses-explanation and practice-Yoga Sun namaskar--Asana-Padmasana, vajrasana, chakrasana, viruchasana etc-Stress management with Yoga-Role of women and Yoga

Equality, nonviolence, Humanity, Self- control- Food and yoga Aware of self-destructive habits

Avoid fault thinking (thought analysis-Practice)-Yoga Free from ANGER (Neutralization of anger)& practice

#### UNIT-V

Moralisation of Desire & practice- Punctuality-Love-Kindness-Compassion Eradication of worries-Practice -Personality development, positive thinking-Good characters to lead a moral life

How to clear the polluted mind- Benefits of blessing- Five- fold culture -explanation- Karma Yoga Practice In Geetha- Sense of duty-Devotion, self- reliance, confidence, concentration, truthfulness, cleanliness.

#### **Reference Books**

0 Dr. M. Renuga

d

1. 'Yogic Asanas for Group Tarining-Part-I" Janardan Swami Yogabhyasi Mandal, Nagpur 2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama

(Publication Department), Kolkata

**Total: 30 hours** 

BoS - Chairperson. Science & Humanities HOD/H&L

2000

## Sona College of Technology, Salem (An Autonomous Institution) **Courses of Study for ME III Semester under Regulations 2019 Civil Engineering Branch: Structural Engineering**

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P19STR301 /	Design of Steel Concrete Composite Structures	3	0	0	3	45
2	P19STR516	Professional Elective: Design of Bridges	3	0	0	3	45 /
3	P19ISE601 /	Open Elective: Transport Safety	3	0	0	3	45
	P19MIT602 /	Open Elective: Machine Learning		v	Ŷ		TU /
	Lais - prise is a company	Practical	and a second	<b>ti den a ser a ser a ser a ser a ser a ser</b> a ser a	ali ng mangalan ng mangalan sa	ينيب العشيط ومصاديها	1
4	P19STR302	Technical Seminar	0	0	2	1	30
5	P19STR303	Practical Training	0	0	4	2	60
6	P19STR304 /	Project Phase – I	0	0	16	8	240
/		Production in the contract of the design of the second second second second second second second second second In the second	pala internet and an and a second second	То	tal Credits	20 /	465

Approved by

Chairperson, Civil Engineering BOS Dr.R.Malathy

Member Secretary, Academic Council Dr.R.Shivakumar

Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

ME-CIVI

Copy to:-

HOD/Civil, Third Semester ME STR Students and Staff, COE

05.07.2023

**Regulations-2019** 

## SONA COLLEGE OF TECHNOLOGY, SALEM – 636 005. DEPARTMENT OF CIVIL ENGINEERING M.E STRUCTURAL ENGINEERING (Full Time) CURRICULUM for REGULATION R2019

		SEMESTER – III				an an an Annaigh an a
S.No.	Course Code	Name of the Course	L	T	P	C
1	P19STR301	Design of Steel Concrete Composite Structures	3	0	0	3
2	P19STR516	Professional Elective: Design of Bridges	3	0	0	3
3		Open Elective:	3	0	0	3
4	P19STR302	Technical Seminar	0	0	2	1
5	P19STR303	Practical Training	0	0	4	2
6	P19STR304	Project Phase - I	0	0	16	8
			Tota	al Cre	edits	20



COURSE CO	DDE		C	DURSE	NAM	E			L	T	P	С
P19STR3	01 De	sign of S	teel-Co	oncrete	Com	posite	Struct	ures	3	0	0	3
Course Object	ive (s): The	Purpose o	f learni	ng this	course	e is to:						
<ul> <li>Unders</li> </ul>	tand the stee	el - concret	e comp	osite co	nstruct	ion and	Const	uction	issues i	n desig	n.	
<ul> <li>Design</li> </ul>	of various co	mposite n	nember									
<ul> <li>Design</li> </ul>	of various co	nnectors			E L							
Unders	tand the des	ign concep	viour of	steel	oncret	ox gira	er oria	ges	through	h case	etud	100
Course Outcou	ne (c) (COc)	· At the en	nd of th	is cour	se the	studen	te will	he able	to	,11 case	Stud	103
CO1	Understan	d the steel	-concret	te com	osite a	ctions (	K1)	ov abre				
CO2	Design of	composite	membe	ers (K3)	obite u	otions (						
CO3	Design of	connection	ns in con	mposite	structu	ires (K3	3)					
CO4	Behaviou	of box gi	der brid	lges (K	4)							
CO5	Seismic be	ehaviour o	f compo	site str	uctures	(K5)						
Knowledge Le	vel: Kl – Re	member:	K2-L	Indersta	and: ]	K3 – Aj	pply:	K4 – A	nalyze	K5	-Ev	aluate:
CO - PO Map	ping											
-						POs		and and the se		er opprovide se		
COs	PO1	PO2	PO3	PO4	<b>PO5</b>	PO6	PO7	PO8	PO9	PO1	)	PO11
COl	3	3	3	3	3	2	1	2	2	2		2
CO2	3	3	3	3	3	2	1	2	2	2		2
CO3	3	3	3	3	3	2	1	2	2	2		2
CO4	3	3	3	3	3	2	1	2	2	2		2
C05	3	3	3	3	3	2	1	2	2	2	-	2
CO (Avg)	3	3	3	3	3	2	1	2	2	2		2
<b>Correlation Le</b>	<b>vel</b> : 1	Slight (Lo	ow)	2:	Modera	ate (Me	dium)		3:Sub	stantial	(Hi	gh)
UNIT-I	INT	RODUC	ΓΙΟΝ	A Contract		delle sere	and the set			Contraction of		9 Hrs.
ntroduction to	steel - cond	crete comp	osite co	onstruct	ion –	Codes	- Com	posite	action -	- Serv	iceal	oility a
Construction is:	sues in desig	n.				11 12 12 12 12 12 12 12 12 12 12 12 12 1	-	the state of the s	And a state of the second	-	-Description	
UNIT-II	DES DES	SIGN OF	COMP	OSITE	MEM	BERS	C	•				9 Hrs.
Jesign of comp	DESILE DEALIS,	SIADS, CON	CONNI		NC	s - Desi	gn of c	omposi	te truss	es.		A LIma
Shear connecto	rs – Types –	Design of	f conne	ctions	in com	nosite s	structur	es - D	esion o	f shear	con	7 mis.
Partial shear int	eraction.	Dengir v	i conne	wiono ,	in vom	poone o	, a cour	<b>4</b> 5 D	0.1511 0.	I SHOUL	001	1001015
UNIT-IV	CO	MPOSIT	E BOX	GIRDI	CR BR	IDGES					ill species manage	9 Hrs.
ntroduction - b	ehaviour of l	oox girder	bridges	- design	1 conce	pts						
UNIT-V	CA	SE STUD	IES									9 Hrs.
Case studies o tructures.	n steel - co	ncrete cor	nposite	constru	uction	in buil	dings -	seismi	c beha	viour 4	of c	omposi
	•									TOT	AL:	45 Hou
KERERENCE.	S:	C	04		C4 1	10			71.1. 7	1.1		1 F
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TOL	a second s	d Dradfor	dMA	"Con	posite	Steel a	and Co	ncrete	Structu	ral Me	mbe	rs.
2. Oel Fur	idamental be	haviour",	Pergam	on press	s, Oxfo	rd, 199	5.					,
2. Oel Fur 3. Ow Bla	ens.G.W an ckwell Scien	haviour", d Knowles ttific Publi	Pergamo s.P, "Sto cations.	on press cel Des 1992.	s, Oxfo	rd, 199 Manua	5. I", Ste	el Con	crete In	stitute	UK	), Oxfo

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COIII	DSE COD	T			COUL	SE NAI	ME			L'	ГРС
P198	STR516				Design	of Brid	ges			3	0 0 3
Course O	biective (s	s): The P	urpose of	f learning	this cours	e is to:	8				
• K	nowing th	e loadin	e standar	ds of vari	ous types (	of bridge	-S				
• P	ractice wi	th desig	n principle	es of long	span RC B	ridges	-				
• F	amiliarize	the Pre-	stressed	concrete	bridge desi	igns					
• 1	Inderstand	the dv	namic effe	ects of ste	el bridges	0					
• R	ecognize	the desir	n concer	t of bear	ings and fo	undation	n of bridge	S			
COURSE	OUTCO	MES	Zir conech								
At the en	d of the co	ourse, the	e student v	will be ab	le to						
CO1. CO2. CO3. CO4.	Discuss al Design of Design of Design of	bout typ long sp Pre-stre steel br	es, loadin an RC bri ssed conc idges s and four	g conditio dges prete bridg	on of bridge ges	es. Analy	vsis and de	sign of sl	hort span F	C bridge	S
Knowled	pe Level: k	(1 – Ren	nember:	K2 - 1	Inderstand	<b>!</b> •	K3 – Apply	: К4	- Analyze:	K5 - F	valuate:
CO-PO	Mannino	·			onderotant	and a state of the second	no rippiy		/ undity 201		
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COs	POI	PO2	PO3	PO4	PO5	POG	PO7	POS	PO9	PO10	PO11
COL	3	1	2	2	2	1	2	1	1	2	2
602	2	2	3	2	2	1	1	1	2	1	1
CO3	2	2	3	2	2	2	2	1	2	1	
CO4	2	2	2	2	2	1	1	1	2	2	1
COS	2	7	2	2	2	1	2	1	2	1	1
<u> </u>	22	18	24	2	2	12	16	1	12	16	12
(Avg)		1.0		-	-	1.2	1.0		1.2	1.0	1.4
	ŀ. "I	Correlat	ion Level:	1: Slight	(Low) 2:M	oderate (	(Medium)	3:Substa	ntial (High)		
		5.6 P. 14									
UNIT-I:	GENERA	L INTI	RODUCT	TION AN	D SHORT	SPAN	RC BRID	GES		9 Hrs.	
Types of	bridges an	nd loadin	ng standai	ds - Choi	ice of type	- I.R.C.	specificati	ons for r	oad bridge	es – Desig	n of RCC
solid slab	bridges -	analysis	and desig	gn of slab	culverts, T	ee beam	and slab b	oridges.			
UNIT-I	I: LONG	SPAN I	RC BRID	GES						9 Hrs.	
Design pi	rinciples o	f contin	uous girde	er bridges	, box girde	r bridges	s, and bala	nced can	tilever brid	iges – Ar	ch bridges
- Box cul	IVERTS - SE	FDESSI	Druges.		DIDCES					A 11	
Flexural	and torsio	nal nara	meters -	Courbon	's theory -	Distrib	ution co-e	fficient b	v exact at	9 HIS.	Design of
girder sec	tion – ma	ximum a	and minin	num prest	ressing for	ces – Ec	centricity	- Live lo	ad and dea	ad load sh	ear forces
- Cable Z	Zone in gi	rder – cl	neck for s	tresses at	various se	ctions -	check for	diagonal	tension -	Diaphrag	ms – End
block - sl	hort term a	and long	term defl	ections.				0		1 6	
UNIT-I	V: STEEI	BRID	GES							9 Hrs.	
General -	- Railway	loading	s – dynai	nic effect	t – Railwa	y culver	t with stee	l beams	- Plate gi	rder bridg	ges – Box
girder bri	dges – Tri	uss brid	ges – Ver	tical and I	Horizontal	stiffener	s.				
UNIT -V	: BEARI	NGS AN	ND SUBS	TRUCT	URES			tan da est		9]	Hrs.
Different	types of l	Dearings	- Design	of beari	ngs – Desi	gn of pi	ers and ab	utments	of differen	nt types -	Types of
orluge 101	unuations	- Desigi	i or tound	ations.	· · · ·					Tat	al. 45 has
REFED	NCE BO	OK8.								100	11. 4J IIIS.
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- 1. Jagadeesh.T.R. and Jayaram.M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd. 2017.
- Johnson Victor, D. "Essentials of Bridge Engineering", Oxford and IBH Publishing Co. New Delhi, 2017. 2.

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Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, 2008.
 Raina V.K." Concrete Bridge Practice" Tata McGraw Hill Publishing Company, New Delhi, 1991.



CO	URSE CO	DE			COURS	E NAME			L T P C					
P	19STR30	2			Technica	l Semina	r	0 0 2						
Course C	bjective (	s): The Pu	irpose of	learning t	his course	e is to:					l Sala			
• 1	nprove the	presentat	ion skill a	nd answer	the questi	ons in a bi	rief manne	r within th	e stipulate	ed time				
Course C	outcome (s	) (COs): /	At the end	l of this co	ourse, the	students	will be ab	le to:						
Knowled	ge Level:   Manning	K1 – Rem	ember: 1	K2 – Unde	rstand:	K3 – Appl	y: K4-	Analyze:	K5 – Ev	aluate:				
<u> </u>	I F B					POs								
COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	<b>PO10</b>	P	011		
со	3	3	3	3	3	3	1	2	2	3		2		
Correlati	on Level:	1: S	light (Lov	v)	2:Modera	ate (Mediu	im)	3:Subst	antial (Hig	gh)				
			F		The same state of the state					TOTAL	30 H	lours		
The stude	ents will v	vork for t	wo hours	per week	c guided b	ov a grou	n of staff	members	They w	ill be ask	ed to	give		

a presentation on any topic of their choice related to Structural Engineering and to engage in discussion with the audience. A brief copy of their presentation also should be submitted. Similarly, the students will have to present a seminar of not less than fifteen minutes and not more than thirty minutes on the technical topic. They will defend their presentation. Evaluation will be based on the technical presentation and the report and also on the interaction shown during the seminar.



. CO	URSE CO	DE			COURS	E NAME			L	Т	P	C
P	19STR30	3			Practical	Trainin	g		0	0	4	2
Course (	)bjective (s	): The Pu	rpose of	learning	this course	e is to:		and the second second				
• 1	rained in t	ackling a	practical	field/ind	lustry-ori	entated p	roblem re	lated to S	tructural	Enginee	ring.	
Course (	Jutcome (s)	) (COs): A	At the end	of this c	ourse, the	students	will be ab	le to:		<b>2</b>		
• 1	Develop sk	ills in fac	ing and s	olving th	e field pro	oblems (k	(5)					
Knowled	ge I evel• k	1 _ Rem	ember I	() Und	rotond: 1	V2 Anni	V. VA	Analuma	<b>V5</b> E	Inches	n an si	
Kilowica	ge Level. I			<u> </u>		K3 – Appi	ly: K4-	Analyze:	KJ - EV	aluate:		
CO - PO	Mapping						and the state					
COs						POs						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO8 PO9 PO10			PO11
СО	3	3	3	3	3	3	1	2	2	3		2
Correlati	on Level:	1: \$	light (Low	<i>i</i> )	2:Modera	ate (Mediu	im)	3:Subst	antial (Hig	gh)		
										TOTAL	: 60	Hours
	anen en											
The stud period of ten days examinat	ents indivi four week from the ion by a te	dually un cs. At the comment c	ndertake end of the ncement ternal state	training ne trainin of the s ff.	in reputed g, a detai emester.	Industrie led report The stud	es during t on the w lents will	the sum ork done be eval	ner vacat should b uated thr	ion for e submi rough a	a spe ted v viva	cified within -voce

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P19ST Course Objec • Expre	TR304 tive (s): The F	urpose of	learning	Project his course	Phase – I	[		0	0 1	6	
Course Objec • Expre	tive (s): The P	urpose of	learning	this course	a is to.	AND CONTRACTOR		0 0 16			
• Expre	a his/har fin			and the second se							
and the second second second second	55 III5/IICI IIII	lings in th	e project	in sequen	iced man	ner and de	efend thei	ir ideas			
<b>Course Outco</b>	me (s) (COs):	At the end	l of this c	ourse, the	students	will be ab	le to:				
phase 1 Knowledge La	II work in a sy evel: K1 – Rer	stematic wa	ay. K2 – Und	erstand:	K3 – Appl	ly: K4-	Analyze:	K5 – Ev	aluate:		
CO – PO Map	ping										
COs P	01 PO2	PO3	PO4	PO5	POs PO6	PO7	PO8	PO9	PO10	PO	
со	3 3	3	3	3	3	1	2	2	3	2	
Correlation L	evel: 1:	Slight (Lov	v)	2:Modera	ate (Mediu	ım)	3:Subst	stantial (High)			

interest. The student can select any topic which is relevant to his/her specialization of the programme. The topic may be experimental or analytical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.



# Regulation 2019

## Course Code : P19ISE601 Course Name : TRANSPORT SAFETY

Lecture	-	3 Hrs/Week	Internal Marks	50
Tutorial	-	0 Hrs/Week	External Marks	50
Practical	- 01		Credits	3

Pre-requisites subject: Nil

Course

Outcomes

#### Upon completion of this course the students will be able to

**C01** explain the dangers of transporting hazardous goods and the safe procedures to be followed during transit.

**CO2** Determine the main factors contribute to the safety in road transport and implement appropriate measures to prevent accidents.

**CO3** know the methods of selecting and training drivers and teach them the safe procedures to be followed.

**CO4** Analyze the construction features of road and rails which contribute the accidents and design appropriate traffic management.

**C05** implement the methods of keeping repair shop and off road vehicle safe and the wafer ways of servicing the vehicles.

					CO	/ PO,	PSO	Маррі	ng					
OTES	(3/2/1	L indic	ates s	streng	th of	correl	ation)	3-Str	ong,	2-Medi	um, 1-\	Neak	THALL	
etea-anotmodo	Prog	ramm	ne Out	come	s (POs	s) and	Prog	ramm	e Spe	cific Ou	utcome	(PSOs)	Trans	
COs, POs	P01	PO2	PO3	<b>PO4</b>	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2
PSOs Mapping	eise	her	p-Q-1ih	nan i	soline	-9-9ni	diarg	ttery	id-noi	operar mant	ah naca jupa b	ew noi schotor	operat road n	
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CO - 2	3	2	2	1	3	3	3	3	2	2	r= bno	2	2	3
CO - 3	2	3	2	3	3	3	3	3	3	3	3	2.	2	3
CO - 4	2	1	3	3	3	3	2	3	1	2	SALS Y	2	3	3
CO - 5	1	3	3	3	-	3	-	3	3	3	2	3	2	2

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## UNIT I TRANSPORTATION OF HAZARDOUS GOODS

Transport emergency card (TREM) - driver training-parking of tankers on the highways-speed of the vehicle - warning symbols - design of the tanker lorries -static electricity-responsibilities of driver - inspection and maintenance of vehicles-check list- loading and decanting procedures - communication.

## UNIT II ROAD TRANSPORT

#### L9TO

L9TO

Introduction - factors for improving safety on roads - causes of accidents due to drivers and pedestrians-design, selection, operation and maintenance of motor trucks-preventive maintenance check lists-motor vehicles act - motor vehicle insurance and surveys - modern sensor devices.

## UNIT III DRIVER AND SAFETY

Driver safety programme - selection of drivers - driver training-tacho-graph-driving test-driver's responsibility-accident reporting and investigation procedures-fleet accident frequency-safe driving incentives-slogans in driver cabin-motor vehicle transport workers act- driver relaxation and rest pauses - speed and fuel conservation - emergency planning and Haz mat codes

### **UNIT IV ROAD SAFETY**

Road alignment and gradient-reconnaissance-ruling gradient-maximum rise per k.m.- factors influencing alignment like tractive resistance, tractive force, direct alignment, vertical curvesbreaking characteristics of vehicle-skidding-restriction of speeds-significance of speeds-Pavement conditions - Sight distance - Safety at intersections - Traffic control lines and guide posts-guard rails and barriers - street lighting and illumination overloading-concentration of driver. Plant railway: Clearance-track-warning methods-loading and unloading-moving carssafety practices.

## UNIT V SHOP FLOOR AND REPAIR SHOP SAFETY

Transport precautions-safety on manual, mechanical handling equipment operations-safe driving movement of cranes-conveyors etc., servicing and maintenance equipment-grease rack operation wash rack operation-battery charging-gasoline handling-other safe practices-off the road motorized equipment.

TOTAL NUMBER OF PERIODS= 45

#### **Content beyond syllabus**

- Aviation safety
- Maritime safety
- Railway safety .
- Traffic management
- Safety management systems

#### L9TO

# L9TO

L9TO

#### **Learning Resources**

#### **TEXT BOOKS:**

1. Popkes, C.A. "Traffic Control and Road Accident Prevention" Chapman and Hall Limited, 1986.

2. Babkov, V.F., "Road Conditions and Traffic Safety" MIR Publications, Moscow, 1986.

#### REFERENCES

1. Kadiyali, "Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 1983.

2. Motor Vehicles Act, 1988, Government of India.

3. "Accident Prevention Manual for Industrial Operations", NSC, Chicago, 1982.

4. Pasricha, "Road Safety guide for drivers of heavy vehicle" Nasha Publications, Mumbai, 1999.

5. K.W.Ogden, "Safer Roads - A guide to Road Safety Engineering"

Dr.D. SENTHIL KUMAR, M.E., Ph.D PROFESSOR & HEAD DEPT. OF MECHANICAL ENGG. SONA COLLEGE OF TECHNOLOGY JUNCTION MAIN ROAD, SALEM-5.

#### **MACHINE LEARNING**

#### P19MIT602

#### PREAMBLE

Machine learning is a rapidly evolving field of study that focuses on developing algorithms and models capable of learning from data and making predictions or decisions without being explicitly programmed. The power of machine learning lies in its ability to uncover patterns, relationships, and insights from large and complex datasets. By analyzing and extracting valuable information from data, machine learning algorithms can make predictions, classify data, detect anomalies, recommend actions, and automate decision-making processes.

Machine learning is an exciting and rapidly expanding field that leverages the power of data and algorithms to make predictions and automate decision-making. Python's versatility and rich ecosystem of libraries make it an ideal language for developing and deploying machine learning models. By mastering machine learning techniques, you can unlock the potential of data and contribute to advancements in various industries.

#### **COURSE OUTCOMES**

At the end of the course, the student will be able to

- 1. Explain the concepts of different types of learning and apply linear regression
- 2. Summarize the concepts of logistic regression and implement the same with python
- 3. Explain and apply the concepts of Neural networks and support vector machines
- 4. Evaluate the hypothesis based on factors like bias and variance
- 5. Explain the concepts of clustering, dimensionality reduction and anomaly detection.

			(3/2/1	indica	tes stre	CO ength of	/ PO, I f correl	PSO M ation)	appin 3-Stro	g ng, 2-M	edium,	1-Weak		
COs			Prog	gramm	e Outc	omes (	POs) a	nd Pro	gramn	ne Speci	fic Outc	ome (PS	SOs)	
cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	1				1	1		1	2	2
CO2	3	3	3	3	3				1	1		1	2	2
CO3	3	3	3	3	3				1	1		1	$\frac{1}{2}$	2
CO4	3	3	3	1	1				1	1		1	2	2
CO5	3	3	1	1	1				1	1		1	2	2

#### UNIT I INTRODUCTION AND LINEAR REGRESSION

9

Introduction to Artificial Intelligence - What is machine learning? – Supervised Learning – unsupervised learning – Linear Regression – cost function – gradient descent algorithm – normal equation - Gradient descent for multiple variables – feature scaling – learning rate – polynomial regression – normal equation

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#### UNIT II LOGISTIC REGRESSION

Hypothesis representation – decision boundary – nonlinear decision boundaries – cost function – gradient descent – advanced optimizations – multi class classification problems – **Regularization -** Problem of overfitting – cost function optimization for regularization – regularized linear regression – regularization with normal equation - regularized logistic regression

#### UNIT III NEURAL NETWORKS AND SUPPORT VECTOR MACHINES

Overview and summary – neurons and brain – model representation – artificial neural networks representation – example – multiclass classification – cost function – back propagation algorithm – gradient checking – random initialization – Support vector machines – optimization objective – cost function – large margin intuition – decision boundary – kernels – adapting to nonlinear classifiers - implementation

### UNIT IV ADVICE FOR APPLYING MACHINE LEARNING

Debugging a learning algorithm – evaluating a hypothesis – model selection and training, validation test sets – bias Vs variance – regularization and bias/variance – learning curves machine learning system design

#### UNIT V OTHER TOPICS

Unsupervised learning – k-means algorithm – optimization objective – choosing number of clusters - Dimensionality reduction – principle component analysis - Anomaly detection – algorithm – developing and evaluating the algorithm – anomaly detection Vs supervised algorithm -Case study – recommender system – collaborative filtering - Large scale machine learning – online learning – map reduce and parallelism.

Total: 45 hours

#### REFERENCES

- Stanford's machine learning course presented by Professor Andrew Ng online resource - http://www.holehouse.org/mlclass/
- 2. James, G., Witten, D., Hastie, T., Tibshirani, R, "An Introduction to Statistical Learning with Applications in R", Springer, 2013.
- 3. Tom M. Mitchell, "Machine Learning", 1st edition, McGraw Hill Education, 2017.
- 4. Ethem Alpaydın, "Introduction to Machine Learning", The MIT Press, 2nd edition, 2013.
- 5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
- 6. Sebastianraschka, "Python Machine Learning", Packt Publishing Ltd., 2017.

J. allant

Dr. J. AKILANDESWAR) PROFESSOR & HEAD Department of Information Technology SONA COLLEGE OF TECHNOLOGY SALEM-636 005

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## Sona College of Technology, Salem (An Autonomous Institution) Courses of Study for ME IV Semester under Regulations 2019 **Civil Engineering** Branch: M.E. Structural Engineering

Practical	Contact Hours	Credit	Practical	Tutorial	Lecture	Course Title	•	Course Code	S. No
					and an and the second	Practical		• • • • • • • • • • • • • • • • • • •	na star star (1)
1 P19STR401 Project Phase - II 0 0 28 14	420	14	28	0	0		Project Phase - II	P19STR401	1

Approved by

Sol. Chairperson, Civil Engineering BOS Dr.R.Malathy

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Member Secretary, Academic Council Dr.R.Shivakumar 26 74

TAUS Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

Copy to:-HOD/Civil, Fourth Semester ME STR Students and Staff, COE