

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
DEPARTMENT OF CIVIL ENGINEERING, INSTITUTE OF TECHNOLOGY


MINUTES OF MEETING


Meeting of Board of Studies, (Notified vide letter No 135/BOS/Meeting/Civil Engg./2017, BSP, dtd. 30.05.2017) of the Department of Civil Engg, IT, GGV has been held today on 6th June 2017, at 11.00 AM in the office chamber of the HOD, Civil Engg. Following members were present in the meeting.

1. Dr. Shailendra Kumar Professor & Head, CED, ITGGV Chairman, BOS
2. Dr. U.K. Dewangan Professor & Head, CED, NIT, Raipur, External Subject
Expert-Member
3. Shri R.V. Anand Project Director, IRCON International Ltd., Bilaspur (C.G),
Industry Expert - Member
4. Dr. M. Chakradhara Rao Asso. Professor, CED,IT, GGV - Member
5. Mr. N.K. Verma Asst. Professor, CED,IT, GGV - Member

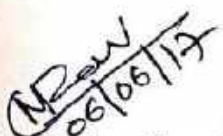
In the meeting, the course scheme and syllabi as per CBCS B. Tech. ordinance (effective from session 2015&16) was discussed. The members discussed the scheme and detailed syllabi, proposed for the B. Tech. 3rd and 4th year Civil Engg.(V to VIII Semesters), as per choice based credit system(CBCS).

As such, after discussion and deliberation, members recommended and approved the Course scheme and syllabi as attached herewith for B. Tech. 3rd and 4th year Civil Engg.(V to VIII Semesters) to be effective from session 2017-18 and onwards.


Prof. Shailendra Kumar


Prof. U. K. Dewangan


Shri R.V. Anand


Dr. M. Chakradhara Rao


Mr. N. K. Verma



गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)

(केन्द्रीय विश्वविद्यालय अधिनियम 2009, क्रमांक 25 के अन्तर्गत स्थापित केन्द्रीय विश्वविद्यालय)

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

(A Central University established by the Central Universities Act, 2009 No 25 of 2009)

Web Site - www.ggu.ac.in, Ph. No. 07752-260342, fax No. 07752-260148,154

क्रमांक 275 / अका. / 2018

बिलासपुर, दिनांक 16-08-2018

प्रति,

समस्त विभागाध्यक्ष/समस्त अधिष्ठातागण,
गुरु घासीदास विश्वविद्यालय,
बिलासपुर (छ.ग.)

विषय:- विभिन्न अध्ययन मण्डलों, शोध समितियों, विद्यापीठ मण्डलों के कार्यवृत्त की मूल प्रति जमा करने बाबत।

महोदय/महोदया,

उपरोक्त विषयान्तर्गत अवगत कराना है कि वर्तमान में कई विभागों के द्वारा विभाग में हुए बैठकों के कार्यवृत्त एवं संलग्नकों की छायाप्रति अकादमिक शाखा को प्रेषित की जा रही है। अकादमिक शाखा विभागों से प्राप्त कार्यवृत्त को, सुसंगत दस्तावेजों को कोई अन्य संबंधित विभागों/अनुभागों को प्रेषित करता है। ऐसी स्थिति में छायाप्रति की छायाप्रति कराना दुष्कर हो जाता है। अतः आपसे अनुरोध है कि आपके विभाग में आयोजित होने वाले विभागीय शोध समिति, अध्ययन मण्डल एवं विद्यापीठ मण्डल आदि की बैठकों के कार्यवृत्त की मूल प्रति ही अकादमी शाखा को प्रेषित करने का कष्ट करें। उक्त मूल प्रति में संबंधित विभाग के अध्यक्ष एवं समिति के सदस्यों के नाम का उल्लेख होना चाहिए। यदि विभाग को यह आवश्यकता महसूस होता है कि संबंधित कार्यवृत्त एवं दस्तावेजों का संधारण विभाग के कार्यालय में भी होनी चाहिए तो ऐसी स्थिति में अनुरोध है कि कार्यवृत्त एवं सुसंगत दस्तावेज दो प्रतियों में तैयार कराना चाहें, जिससे एक प्रति विभाग में संधारित हो सके एवं द्वितीय प्रति को अकादमी शाखा में जमा कराया जा सके। कृपया उपरोक्तानुसार कार्यवाही सूचनार्थ प्रेषित।

सहायक कुलसचिव (अका0)

BOS File
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CBCS SCHEME

For

B.TECH. DEGREE PROGRAMME

In

Civil Engineering

(V, VI, VII & VIII Semesters, Effective from 2017-18 onwards)

INSTITUTE OF TECHNOLOGY



GURU GHASIDAS VISHWAVIDYALAYA,

(A CENTRAL UNIVERSITY)

BILASPUR (C.G.) - 495009

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V SEMESTER B.TECH. (CIVIL ENGG.)

SI No	Subject Code	Subjects Theory	Periods /Week			Evaluation Scheme						Grand Total	Credits
						Internal Assessment					E.S.E		
			L ¹	T ²	P ³	C.T. ⁵	M.S.E ⁴	T.A. ⁶	LA ⁷	Total			
1	CE5TPC07	Design of Concrete Structures	3	1	0	10	20	10	-	40	60	100	4
2	CE5TPC08	Structural Analysis - II	3	1	0	10	20	10	-	40	60	100	4
3	CE5TPC09	Highway Engineering	3	0	0	10	20	10	-	40	60	100	3
4	CE5TPC10	Estimation and Costing	3	0	0	10	20	10	-	40	60	100	3
5	CE5TPC11	Geotechnical Engineering - I	3	0	0	10	20	10	-	40	60	100	3
6	CE5TPC12	Environmental Engineering - I	3	0	0	10	20	10	-	40	60	100	3
Practical													
1	CE5LPC04	Highway Engineering Lab	-	-	3	-	-	-	30	30	20	50	2
2	CE5LPC05	Environmental Engineering Lab	-	-	3	-	-	-	30	30	20	50	2
Total Credits												24	

VI SEMESTER B.TECH. (CIVIL ENGG.)

SI No	Subject Code	Subjects Theory	Periods /Week			Evaluation Scheme						Grand Total	Credits
						Internal Assessment					E.S.E		
			L ¹	T ²	P ³	C.T. ⁵	M.S.E ⁴	T.A. ⁶	LA ⁷	Total			
1	CE6TPC13	Water Resources Engineering - I	3	0	0	10	20	10	-	40	60	100	3
2	CE6TPC14	Environmental Engineering - II	3	0	0	10	20	10	-	40	60	100	3
3	CE6TPC15	Design of Steel Structures	3	1	0	10	20	10	-	40	60	100	4
4	CE6TPC16	Geotechnical Engineering - II	3	0	0	10	20	10	-	40	60	100	3
5	CE6TPE1X	Professional Elective -1X	3	1	0	10	20	10	-	40	60	100	4
6	CE6TOE1X	Open Elective -1X	3	0	0	10	20	10	-	40	60	100	3
Practical													
1	CE6LPC05	Geotechnical Engineering - Lab	0	0	3	-	-	-	30	30	20	50	2
2	CE6LPC06	Computer Applications in Civil Engg. Lab	0	0	3	-	-	-	30	30	20	50	2
Total Credits												24	
Note: Industrial Training for one month is mandatory after end semester examination													

X_ indicates the serial alphabet of a subject in the subject group

¹-Lecture Hours, ²-Tutorial Hours, ³-Practical Hours, ⁴-Mid Sem. Exam, ⁵-Class Tests/Assignments, ⁶-Lab Work Assessment

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(Dr. J.K. Dewangan)
NIT Raipur.

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VII SEMESTER B.TECH. (CIVIL ENGG.)

Sl No	Subject Code	Subjects	Periods /Week		Evaluation Scheme					Grand Total	Credits	
					Internal Assessment				E.S.E			
					L ¹	T ¹	P ¹	CT ¹				M.S.E ¹
		Theory										
1	CE7TPC17	Water Resources Engineering-II	3	0	0	10	20	10	-	60	100	3
2	CE7TPE2X	Professional Elective -2X	3	1	0	10	20	10	-	60	100	4
3	CE7TPE3X	Professional Elective -3X	3	0	0	10	20	10	-	60	100	3
4	CE7TPE4X	Professional Elective -4X	3	0	0	10	20	10	-	60	100	3
5	CE7TPESX	Professional Elective -5X	3	0	0	10	20	10	-	60	100	3
6	CE7TOE2X	Open Elective -2X	3	0	0	10	20	10	-	60	100	3
		Practical										
1	CE7LPS01	Seminar	0	0	3	50		50	-	50		2
2	CE7LPS02	Minor project	0	0	8	60		60	40	100		4
Total Credits											25	

X_ indicates the serial alphabet of a subject in the subject group

VIII SEMESTER B.TECH.(CIVIL ENGG.)

Sl No	Subject Code	Subjects	Periods /Week			Evaluation Scheme					Grand Total	Credits	
						Internal Assessment				E.S.E			
						L ¹	T ¹	P ¹	CT ¹				M.S.E ¹
		Theory											
1	CE8TPC18	Earthquake Resistant Design of structure	3	1	0	10	20	10	-	40	60	100	4
2	CE8TPE6X	Professional Elective -6X	3	0	0	10	20	10	-	40	60	100	3
3	CE8TPE7X	Professional Elective -7X	3	1	0	10	20	10	-	40	60	100	4
4	CE8TOE3X	Open Elective -3X	3	0	0	10	20	10	-	40	60	100	3
		Practical											
1	CE8LPS03	Major Project	0	0	15		120			120	80	200	8
2	CE8LPC07	Structural Detailing Lab	0	0	3	-	-	-	30	30	20	50	2
Total Credits											24		

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¹-Lecture Hours, ²-Tutorial Hours, ³- Practical Hours, ⁴- Mid Sem. Exam, ⁵-Class Tests/Assignments, ⁶-Lab Work Assessment

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List of Professional (Core) Electives

Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE6TPE1X	Professional Elective-1 (PE Group-1)	4	VI
A	CE6TPE1A	Advanced Concrete Technology		
B	CE6TPE1B	Advanced Surveying		
C	CE6TPE1C	Advanced Concrete Design		
D	CE6TPE1D	Highway Safety		
E	CE6TPE1E	Advanced Fluid Mechanics		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TPE2X	Professional Elective-2 (PE Group-2)	4	VII
A	CE7TPE2A	Design of Prestressed Concrete		
B	CE7TPE2B	Structural Dynamics		
C	CE7TPE2C	Theory of Elasticity & Plasticity		
D	CE7TPE2D	Fracture of Concrete Structures		
E	CE7TPE2E	Advance Structural Analysis		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TPE3X	Professional Elective-3 (PE Group-3)	3	VII
A	CE7TPE3A	Environmental Geotechnical Engineering		
B	CE7TPE3B	Air Pollution Control Engineering		
C	CE7TPE3C	Industrial Waste Water Management		
D	CE7TPE3D	Water Resources Planning & Management		
E	CE7TPE3E	Environmental Impact Assessment		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TPE4X	Professional Elective-4 (PE Group-4)	3	VII
A	CE7TPE4A	Ground Water Hydrology		
B	CE7TPE4B	Ground Improvement Techniques		
C	CE7TPE4C	Geo-Informatics & GIS Applications		
D	CE7TPE4D	Rock Mechanics		
E	CE7TPE4E	Design of Hydraulic Structures		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TPE5X	Professional Elective-5 (PE Group-5)	3	VII
A	CE7TPE5A	Industrial Structures		
B	CE7TPE5B	Systems Analysis in Civil Engineering		
C	CE7TPE5C	Railway Engineering		
D	CE7TPE5D	Pavement Construction and Maintenance		
E	CE7TPE5E	Planning & Design of Building Services		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE8TPE6X	Professional Elective-6 (PE Group-6)	4	VIII
A	CE8TPE6A	Machine Foundation		
B	CE8TPE6B	Earthquake Geotechnical Engineering		
C	CE8TPE6C	Bridge Engineering		
D	CE8TPE6D	Solid and Hazardous Waste Management		
E	CE8TPE6E	Construction Equipment & Techniques		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE8TPE7X	Professional Elective-7 (PE Group-7)	3	VIII
A	CE8TPE7A	Air and Water Transportation		
B	CE8TPE7B	Theory of Plates & Shells		
C	CE8TPE7C	Repair and Rehabilitation of Structures		
D	CE8TPE7D	Finite Element Analysis		
E	CE8TPE7E	Hydropower Engineering		

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List of Open Electives

Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE6TOE1X	Open Elective-1 (OE Group-1)	3	VI
A	CE6TOE1A	Construction Planning and Management		
B	CE6TOE1B	Rural Technology and Community Development		
C	CE6TOE1C	Engineering System Design Optimization		
D	CE6TOE1D	Engineering System Modelling and Simulation		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TOE2X	Open Elective-2 (OE Group-2)	3	VII
A	CE7TOE2A	Value Engineering		
B	CE7TOE2B	Supply Chain Management-Planning		
C	CE7TOE2C	Travel Demand Analysis		
D	CE7TOE2D	Quality Control Assurance and Safety in Construction		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE8TOE3X	Open Elective-3 (OE Group-3)	3	VIII
A	CE8TOE3A	Management Information System		
B	CE8TOE3B	Enterprise Resource Planning		
C	CE8TOE3C	Engineering Risk-Benefit Analysis		
D	CE8TOE3D	Fluid Dynamics		

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VII SEMESTER B.TECH. (CIVIL ENGG.)

Sl No	Subject Code	Subjects Theory	Periods /Week			Evaluation Scheme					Grand Total	Credits	
						Internal Assessment				E.S.E			
			L ¹	T ²	P ³	C.T ⁴	M.S.E ⁵	T.A ⁶	L.A ⁷				
1	CE7TPC17	Water Resources Engineering-II	3	0	0	10	20	10	-	60	100	3	
2	CE7TPE2X	Professional Elective -2X	3	1	0	10	20	10	-	60	100	4	
3	CE7TPE3X	Professional Elective -3X	3	0	0	10	20	10	-	60	100	3	
4	CE7TPE4X	Professional Elective -4X	3	0	0	10	20	10	-	60	100	3	
5	CE7TPE5X	Professional Elective -5X	3	0	0	10	20	10	-	60	100	3	
6	CE7TOE2X	Open Elective -2X	3	0	0	10	20	10	-	60	100	3	
Practical													
1	CE7LPS01	Seminar	0	0	3	50			50	-	50		2
2	CE7LPS02	Minor project	0	0	8	60			60	40	100		4
Total Credits												25	

X_ indicates the serial alphabet of a subject in the subject group

VIII SEMESTER B.TECH.(CIVIL ENGG.)

Sl No	Subject Code	Subjects Theory	Periods /Week			Evaluation Scheme					Grand Total	Credits	
						Internal Assessment				E.S.E			
			L ¹	T ²	P ³	C.T ⁴	M.S.E ⁵	T.A ⁶	L.A ⁷				Total
1	CE8TPC18	Earthquake Resistant Design of structure	3	1	0	10	20	10	-	40	60	100	4
2	CE8TPE6X	Professional Elective -6X	3	0	0	10	20	10	-	40	60	100	3
3	CE8TPE7X	Professional Elective -7X	3	1	0	10	20	10	-	40	60	100	4
4	CE8TOE3X	Open Elective -3X	3	0	0	10	20	10	-	40	60	100	3
Practical													
1	CE8LPS03	Major Project	0	0	15	120			120	80	200		8
2	CE8LPC07	Structural Detailing Lab	0	0	3	-	-	-	30	30	20	50	2
Total Credits												24	

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List of Professional (Core) Electives

Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE6TPE1X	Professional Elective-1 (PE Group-1)	4	VI
A	CE6TPE1A	Advanced Concrete Technology		
B	CE6TPE1B	Advanced Surveying		
C	CE6TPE1C	Advanced Concrete Design		
D	CE6TPE1D	Highway Safety		
E	CE6TPE1E	Advanced Fluid Mechanics		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TPE2X	Professional Elective-2 (PE Group-2)	4	VII
A	CE7TPE2A	Design of Prestressed Concrete		
B	CE7TPE2B	Structural Dynamics		
C	CE7TPE2C	Theory of Elasticity & Plasticity		
D	CE7TPE2D	Fracture of Concrete Structures		
E	CE7TPE2E	Advance Structural Analysis		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TPE3X	Professional Elective-3 (PE Group-3)	3	VII
A	CE7TPE3A	Environmental Geotechnical Engineering		
B	CE7TPE3B	Air Pollution Control Engineering		
C	CE7TPE3C	Industrial Waste Water Management		
D	CE7TPE3D	Water Resources Planning & Management		
E	CE7TPE3E	Environmental Impact Assessment		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TPE4X	Professional Elective-4 (PE Group-4)	3	VII
A	CE7TPE4A	Ground Water Hydrology		
B	CE7TPE4B	Ground Improvement Techniques		
C	CE7TPE4C	Geo-Informatics & GIS Applications		
D	CE7TPE4D	Rock Mechanics		
E	CE7TPE4E	Design of Hydraulic Structures		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TPE5X	Professional Elective-5 (PE Group-5)	3	VII
A	CE7TPE5A	Industrial Structures		
B	CE7TPE5B	Systems Analysis in Civil Engineering		
C	CE7TPE5C	Railway Engineering		
D	CE7TPE5D	Pavement Construction and Maintenance		
E	CE7TPE5E	Planning & Design of Building Services		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE8TPE6X	Professional Elective-6 (PE Group-6)	4	VIII
A	CE8TPE6A	Machine Foundation		
B	CE8TPE6B	Earthquake Geotechnical Engineering		
C	CE8TPE6C	Bridge Engineering		
D	CE8TPE6D	Solid and Hazardous Waste Management		
E	CE8TPE6E	Construction Equipment & Techniques		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE8TPE7X	Professional Elective-7 (PE Group-7)	3	VIII
A	CE8TPE7A	Air and Water Transportation		
B	CE8TPE7B	Theory of Plates & Shells		
C	CE8TPE7C	Repair and Rehabilitation of Structures		
D	CE8TPE7D	Finite Element Analysis		
E	CE8TPE7E	Hydropower Engineering		

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List of Open Electives

Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE6TOE1X	Open Elective-1 (OE Group-1)	3	VI
A	CE6TOE1A	Construction Planning and Management		
B	CE6TOE1B	Rural Technology and Community Development		
C	CE6TOE1C	Engineering System Design Optimization		
D	CE6TOE1D	Engineering System Modelling and Simulation		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE7TOE2X	Open Elective-2 (OE Group-2)	3	VII
A	CE7TOE2A	Value Engineering		
B	CE7TOE2B	Supply Chain Management-Planning		
C	CE7TOE2C	Travel Demand Analysis		
D	CE7TOE2D	Quality Control Assurance and Safety in Construction		
Sl. No.	Subject Code	Name of Subject	Credits	SEMESTER
x	CE8TOE3X	Open Elective-3 (OE Group-3)	3	VIII
A	CE8TOE3A	Management Information System		
B	CE8TOE3B	Enterprise Resource Planning		
C	CE8TOE3C	Engineering Risk-Benefit Analysis		
D	CE8TOE3D	Fluid Dynamics		

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CBCS SCHEME

For

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V SEMESTER B.TECH. (CIVIL ENGG.)

SI No	Subject Code	Subjects Theory	Periods /Week			Evaluation Scheme					Grand Total	Credits	
			L ¹	T ²	P ³	Internal Assessment				E.S.E			
						C.T. ⁵	M.S.E. ⁴	T.A. ⁶	L.A. ⁷				Total
1	CESTPC07	Design of Concrete Structures	3	1	0	10	20	10	-	40	60	100	4
2	CESTPC08	Structural Analysis - II	3	1	0	10	20	10	-	40	60	100	4
3	CESTPC09	Highway Engineering	3	0	0	10	20	10	-	40	60	100	3
4	CESTPC10	Estimation and Costing	3	0	0	10	20	10	-	40	60	100	3
5	CESTPC11	Geotechnical Engineering - I	3	0	0	10	20	10	-	40	60	100	3
6	CESTPC12	Environmental Engineering - I	3	0	0	10	20	10	-	40	60	100	3
Practical													
1	CESLPC04	Highway Engineering Lab	-	-	3	-	-	-	30	30	20	50	2
2	CESLPC05	Environmental Engineering Lab	-	-	3	-	-	-	30	30	20	50	2
												Total Credits	24

VI SEMESTER B.TECH. (CIVIL ENGG.)

SI No	Subject Code	Subjects Theory	Periods /Week			Evaluation Scheme					Grand Total	Credits	
			L ¹	T ²	P ³	Internal Assessment				E.S.E			
						C.T. ⁵	M.S.E. ⁴	T.A. ⁶	L.A. ⁷				Total
1	CE6TPC13	Water Resources Engineering - I	3	0	0	10	20	10	-	40	60	100	3
2	CE6TPC14	Environmental Engineering - II	3	0	0	10	20	10	-	40	60	100	3
3	CE6TPC15	Design of Steel Structures	3	1	0	10	20	10	-	40	60	100	4
4	CE6TPC16	Geotechnical Engineering - II	3	0	0	10	20	10	-	40	60	100	3
5	CE6TPE1X	Professional Elective -1X	3	1	0	10	20	10	-	40	60	100	4
6	CE6TOE1X	Open Elective -1X	3	0	0	10	20	10	-	40	60	100	3
Practical													
1	CE6LPC05	Geotechnical Engineering - Lab	0	0	3	-	-	-	30	30	20	50	2
2	CE6LPC06	Computer + Applications in Civil Engg. Lab	0	0	3	-	-	-	30	30	20	50	2
												Total Credits	24

Note: Industrial Training for one month is mandatory after end semester examination

X_ indicates the serial alphabet of a subject in the subject group

¹-Lecture Hours, ²- Tutorial Hours, ³- Practical Hours, ⁴- Mid Sem. Exam, ⁵-Class Tests/Assignments, ⁶-Lab Work Assessment

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SYLLABUS	(SEMESTER-V)								
Subject Code:	CE5TPC07	CREDITS: 4			SESSIONAL - TA				ESE
Subject:	Design of Concrete Structures	L	T	P	CT	MSE	TA	TOTAL	
		3	1	-	10	20	10	40	60
<p>UNIT – 1: Introduction to design of concrete structures-limit state analysis and design of beams flexure, bond</p> <p>UNIT- 2: Shear and torsion</p> <p>UNIT-3: One way slabs, stair cases, Two-way slabs</p> <p>UNIT- 4: Axially and eccentrically loaded columns. (uniaxial only)</p> <p>UNIT-5: Footings – different types of isolated footings, synthesis of limit state and working St methods.</p> <p>REFERENCE BOOK: Reinforced Concrete Design by Pillai & Menon Limit State Design of Reinforced Concrete by P.C. Verghese</p>									

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SYLLABUS	(SEMESTER-V)							
Subject Code:	CESTPC08	CREDITS: 4			SESSIONAL - TA			ESE
Subject:	Structural Analysis - II	L	T	P	CT	MSE	TA	TOTAL
		3	1	-	10	20	10	40
<p>UNIT-1: Analysis of indeterminate beams by Consistent Deformation methods, Analysis of indeterminate rigid plane frames and truss using energy method.</p> <p>UNIT-2: Slop Deflection Method: Continuous beams and portals by moment distribution due to load and yielding of supports.</p> <p>UNIT-3: Moment-distribution method. Continuous beams and portals by moment distribution due to load and yielding of supports.</p> <p>UNIT-4: Introduction to Flexibility matrix and Stiffness Matrix methods: Applications of the methods to simple indeterminate beams.</p> <p>UNIT-5: Analysis of symmetrical two hinge arches (parabolic and circular). Influence lines for propped cantilevers, continuous beams using Muller-Breslau's principle.</p> <p>REFERENCE BOOK: Indeterminate Structural Analysis by C. K. Wang Fundamental of Structural Analysis by Leet.</p>								

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SYLLABUS	(SEMESTER-V)							
Subject Code:	CESTPC09	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Highway Engineering	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT 1: Introduction: Importance of highway transportation, Modes of transportation, characteristics of highway transport. Historical development & planning: Historical development of roads, Road development and planning in India, Necessity of planning, Roads classification, patterns, Planning surveys. Highway alignment and surveys: Engineering Surveys for highway location Maps and Drawing. Highway drainage: Importance, Surface and subsurface drainage.

UNIT 2: Geometric Design: Cross Section elements, Sight Distance, Design of horizontal and vertical Alignment.

UNIT 3: Traffic Engineering: Traffic characteristics, studies such as volume, density, Speed, 'O' and 'D' and their uses, Traffic control devices and road accidents.

UNIT 4: Highway Materials: Behaviour of highway materials, properties of Subgrade materials and pavement component materials. Tests on subgrade soil, aggregate and bitumen.

UNIT 5: Pavement Design: Types of pavements, Factors affecting design of flexible and rigid pavements, Design of flexible pavements: Group index, I.R.C. recommended method, California highway department method, U. S. Corp method
Design of Rigid pavement: Westergard's stress analysis of wheel loads for design of pavement, effect of temperature and warping stress in design

TEXT BOOK:
Principle and Practices of Highway Engineering – Kadiyali & Lab (Khanna Publishers, Delhi)
Highway Engineering – S. K. Khanna & C.E.G. Justo (Khanna Publishers, Delhi)
Highway Engineering – Rangawala S.C. (Charotar Publishers)
A textbook of Transportation Engineering – S.P. Chandola (S. Chand)
Transportation Engineering – A.K. Upadhyay (S.K. Kataria & Sons)

REFERENCE BOOK:
Specifications for Road and Bridge Works – MOST (IRC Publishers) Manual for Survey, Investigation and Preparation of Road Projects – IRC Publication 2001.

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SYLLABUS	(SEMESTER-V)							
Subject Code:	CE5TPC10	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Estimation and Costing	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT-1: Method of estimating, measurements, taking out quantities.

UNIT-2: Typical estimates for buildings and Civil Engineering Works, Specifications for all types building items.

UNIT-3: Analysis of rates, data for various building items.

UNIT-4: Earthwork calculations.

UNIT-5: Introduction to Departmental procedures, tender, contracts, arbitrations, valuation of buildings.

REFERENCE BOOKS:

B.N Dutta, Estimating and Costing in Civil Engineering Theory and Practice

M. Chakraborti, Estimating, Costing and Specifications in Civil Engineering.

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SYLLABUS	(SEMESTER-V)								
Subject Code:	CESTPC11	CREDITS : 3			SESSIONAL - TA			ESE	
Subject:	Geotechnical Engineering - I	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

Unit 1: Introduction, Basic Definitions and Relationships, Determination of Index Properties, Classification of Soils.

Unit 2: Soil Water: Types of soil water, Capillarity in soils, Permeability of soils, Darcy's law, Determination of permeability of soils, Permeability of stratified soils, Seepage velocity, Absolute coefficient of permeability, Factors affecting permeability- Effective stress principle- Effective stress under different field conditions- Seepage pressure-Quick sand condition.

Unit 3: Stress distribution in Soils: Importance of estimation of stresses in soils – Boussinesq's and Westergaard's theories for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal planes – Newmark's influence chart.

Unit 4: Compaction of Soils: Definition and importance of compaction – Standard Proctor compaction test, Modified compaction test- Factors affecting compaction- Influence of compaction on soil properties – Field compaction and its control.

Consolidation: Types of compressibility – Immediate settlement – Primary consolidation and secondary consolidation – Stress history of clay, normally consolidated soil, over consolidated soil and under consolidated soil- pre consolidation pressure and its determination- Estimation of settlements - Terzaghi's 1-D consolidation theory – Coefficient of consolidation and its determination.

Unit 5: Shear Strength: Definition and use of shear strength - Source of shear strength- Normal and Shear stresses on a plane – Mohr's stress circle- Mohr-Coulomb failure theory- Measurement of shear strength, Drainage conditions -Direct shear test, Triaxial shear test, Unconfined compression test and Vane shear test – Factors affecting shear strength of granular soils and cohesive soils.

Stability of Soil Slopes: Types of slopes – Types of slope failures – Slip circle method, Determination of centre of most critical slip circle – Taylor's stability charts and their use. Stabilisation of soil slopes.

REFERENCE BOOKS:

1. "Basic and Applied Soil Mechanics" by Gopal Ranjan and A.S.R. Rao, Wiley Eastern Ltd., New Delhi, 2009.
2. "Soil Mechanics and Foundation Engg" by V.N.S. Murthy, CBS Pub. New Delhi. 2007.
3. Geotechnical Engineering by B. M. Das, Bharat Singh, Samsher Alam
4. Geotechnical Engineering by S. K. Gulathi & Dutta
5. Soil Mechanics by Lambe & Whitman
6. Soil Mechanics by B.C.Punamia,

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SYLLABUS	(SEMESTER-V)								
Subject Code:	CESTPC12	CREDITS: 3			SESSIONAL - TA			ESE	
Subject:	Environmental Engineering - I	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: Introduction: Necessity and importance of water supply schemes. Water demand: Classification of water demands, Estimation of quantity of water required by a town, per capita demand, factors affecting per capita demand, design period and population forecasting, variation in water demand. Sources of water supply. Surface sources and underground sources, Intake works, site selection, type of intake works.

UNIT 2: Quality of water: Common impurities, physical, chemical and biological characteristics of water, water quality standards for municipal and domestic supplies. Water Processing: Object of water processing, flow diagrams of typical ground water system and surface water systems. Sedimentation Theory of sedimentation, sedimentation tanks and its types, design parameters related with sedimentation tanks, sedimentation with coagulations, coagulants and coagulant aids, Jar test for determining coagulant dosage.

UNIT 3: Filtration; Theory of filtration, slow sand and rapid sand filters, Construction and operation. Disinfection, Methods of disinfection, Chlorination, Types of chlorination, Break Point chlorination.

UNIT 4: Softening: Methods of Softening, Iron Removal, Fluoridisation. Distribution System: Methods of distribution, layout of distribution system, methods of analysis, pressure in the distribution system, distribution reservoirs, functions and its types, storage capacity of distribution reservoir.

UNIT 5: Air Pollution: Introduction, causes, sources, characteristics, effects of air pollution on plants, humans, animals and materials and atmosphere, air pollution control methods and equipment. Noise Pollution: Definition, sources, effects of noise pollution on humans, animals and non-living things, methods of noise control.

TEXT BOOKS:
 Water Supply Engineering – S.K. Garg (Khanna Publication).
 Water Supply Engineering – B.C. Punmia (Laxmi Publication, New Delhi)

REFERENCE BOOKS:
 Environmental Engineering – Peavy & Rowe (Tata McGraw Hill, New Delhi).
 Water Supply and Sanitary Engineering – G.S. Birdi (Dhanpat Rai Publications).
 Introduction to Environmental Science – Y. Anjaneyulu (B.S. Publications)
 Environmental Science and Engineering – Henry and Heinke (Pearson Education)

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SYLLABUS	(SEMESTER-V)							
Subject Code:	CE5LPC04	CREDITS: 2			SESSIONAL - TA			ESE
Subject:	Highway Engineering Lab	L	T	P	CT	MSE	TA	TOTAL
		-	-	3	-	-	30	30
								20

Minimum 10 experiments to be performed

1. To determine the crushing value of the given aggregate sample.
2. To determine 10% finer value of the given aggregate sample.
3. To determine the abrasion value of the given aggregate sample by los angeles apparatus.
4. To determine the impact value of the given aggregate sample.
5. To determine the elongation Index of the given aggregate sample.
6. To determine the flakiness index of the given aggregate sample.
7. To determine the water absorption of the given coarse aggregate.
8. To determine the specific gravity of the given coarse aggregate.
9. To determine the penetration value of the given bitumen material.
10. To determine the softening point of the given bitumen material.
11. To determine the ductility of the given bitumen material.
12. To determine the viscosity of the given bitumen material.

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SYLLABUS		(SEMESTER-VI)							
Subject Code:	CE6TPC13	CREDITS: 3			SESSIONAL - TA			ESE	
Subject:	Water Resources Engineering -I	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: Introduction: Need for Irrigation, advantages and disadvantages of irrigation, types of irrigation systems – Flow Irrigation, Lift Irrigation. Methods of Irrigation: Introduction, requirement of irrigation methods, surface and sub-surface Irrigation. Water Requirement of crops: Introduction, water requirement of crop, crop season and crops of India, crop period and base period, delta, duty of water, relationship between delta, duty and base period, factors affecting duty.

UNIT 2: Canal Irrigation: Classification of canal, parts of canal irrigation system, canal alignment, typical canal cross section, command areas, losses in irrigation systems. Design of stable channels in alluvium. Introduction, Kennedy's silt theory, Lacey's Theory, Lacey's regime equations, Lacey's shock theory, Design of channels by Kennedy's and Lacey's theories, maintenance of irrigation channels.

UNIT 3: Water Logging and its Control. Causes and ill effects of water logging, prevention and control, reclamation of water logged lands, surface drainage. Design of Lined Channels. Introduction, benefits of lining, types of lining, economics of lining, procedure and design of lined canals.

UNIT 4: River behaviour, control and training. Objects, river characteristics, classification of river training works, methods of river training embankments, bank protection, cut-offs, meandering causes and parameters. Flood Control; Introduction, channel improvement, flood ways evacuation and flood plain zoning. National Policy of floods.

UNIT 5: Reservoir Planning: Introduction, type of reservoirs, storage zones of a reservoir, mass curve and demand curve, determination of reservoir capacity, safe field. Hydrograph, unit hydrograph, Flood Routing: flood Routing principle, inflow storage discharge method, reservoir losses, reservoir, sedimentation, life of reservoir.

TEXT BOOKS:

Irrigation Engineering and Hydraulic Structures – S.K. Garg (Khanna Publications)
Irrigation Engineering – B.C. Punmia (Laxmi Publications)

REFERENCE BOOKS:

Irrigation, Water Resources and Water Power Engineering – Dr. P.N. Modi (Standard Book House)
Theory and Design of Irrigation Structures (Volume – I & II) – Varshney (Nem Chand & Bros.)
Irrigation and Water resources Engineering – Asawa G.L. (New Age International Publications)
Fundamentals of Irrigation Engineering – Bharat Singh (Nem Chand & Bros)
Water Resources Engineering Larry -W. Mays (Wiley, John & Sons)

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SYLLABUS		(SEMESTER-VI)							
Subject Code:	CE6TPC14	CREDITS: 3			SESSIONAL - TA				ESE
Subject:	Environmental Engineering - II	L	T	P	CT	MSE	TA	TOTAL	
		3	-	-	10	20	10	40	60

UNIT - 1: Objective, design period, Physical, Chemical and Biological characteristics. Waste water sampling, self-purification of natural streams, effluents Standards, Oxygen Sag Curve, sources of sewage. Design of sanitary sewers, minimum size of sewer, velocities in sewers and gradient of sewers. Sewer appurtenances viz. manholes, street inlets, flushing devices, Vent pipes etc.

UNIT - 2: Waste Water primary Treatment: characteristics of wastewater. Effluent discharge standards, Primary, secondary and tertiary treatment of wastewater. Types of screens, design of screen chamber, sources of grit, design of grit chamber, disposal of grit, oil and grease removing skimming tanks, design of PST with Inlet and outlet details, primary sludge and its disposal

UNIT - 3: Aerobic Treatment UNITS: Biological principle of ASP, SVI, sludge bulking and control; biological principle of Trickling filter, re-circulation, operational troubles; Rotating biological contactor. Low cost treatment methods: Principle of Oxidation pond, symbiosis, principle of Aerated Lagoons, aeration method, Principle of Oxidation Ditches, sewage farming, ground water recharge.

UNIT- 4: Anaerobic Treatment UNITS: Septic tanks, biological Principle, method of treatment and disposal of tank effluent. Anaerobic digester, principle of anaerobic digestion, Stages of digestion, bio-gas production. Sludge disposal methods, advantages and disadvantages

UNIT - 5: Municipal Solid Wastes: Characteristics, generation, collection & transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment & disposal), environmental & health implications, disposal of solid waste by land filling, composting and incineration methods. Hazardous waste management, environmental and health implications due to Exposure, incineration, landfill disposal, site remediation, disposal of refuse by Composting.

TEXT BOOKS:

Environmental Engineering – Peavy & Rowe (Tata McGraw Hill, New Delhi).

Waste Water Engineering – S.K. Garg (Khanna Publication).

Manual on sewerage & sewage Treatment published by Ministry of Urban Dev. GOI, Ministry of Urban development

REFERENCE BOOKS:

Waste Water Engineering – Metcalf Eddy (Tata McGraw Hill, New Delhi).

Hazardous Waste management: M.D. LaGrega, P.L. Buckingham, J.C.Evans

Manual on Municipal Solid Waste Management: CPHEEO (Ministry of Urban Dev.)

Environmental Engineering-II.P.Venugopala Rao Tata McGraw Hill Water and Wastewater Technology ,Hammer (PHI)

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SYLLABUS		(SEMESTER-VI)						
Subject Code:	CE6TPC15	CREDITS:			SESSIONAL - TA			ESE
Subject:	Design of steel Structures	L	T	P	CT	MSE	TA	
		4						
		3	1	-	10	20	10	40
								60

UNIT 1: Introduction: General, types of Steel, mechanical behaviour of steel, measures of Yielding, measures of Ductility, types of Structures, Structural Steel Sections.
Methods of Structural design: Introduction- Design Philosophies-Working Stress method-Ultimate Strength method-Load and Resistant factor- Limit State Method-Partial safety factor-Load-Load combinations-Classification of Cross sections- General aspects in the design.

UNIT 2: Design of Steel fasteners: Types of fasteners – Riveted connections- Bolted connections- Assumptions- Failure of bolted joints – Strength of bolted joints – Design examples – Design of Welded connections – Butt weld- fillet weld – Design examples.

UNIT 3: Design of Tension Members: General – Modes of Failure of Tension member- Analysis of Tension members- Example - Design steps – Design examples – Lug angles – Design.
Design of Compression Members: General – Strength of Compression members- Design Compressive strength- Example on analysis of Compression members – Design of Angle struts – Design Examples- Built up Columns- Design of Lacing – Design of Battens- Design Examples- Design of Roof members.

UNIT 4: Design of Beams: General- Lateral Stability of Beams- Bending Strength of Beams – Plastic Section Modulus - Design Examples.
Design of Beam Columns: Behaviour of members under combined loading – Modes of Failures – Design Examples.
Design of Column Splices and Column Base: Design of Column Splice-Design Examples- Design of Column Base- Slab Base- Gusseted Base- Design Examples.

UNIT 5: Design of Eccentric Connections: Design of Brackets- Type-1 and Type 2 – Moment Resistant connections - Design Examples.
Design of Plate Girder: General- Components of Plate Girder- Optimum depth – Bending Strength – Shear Strength – Shear Buckling- Simple Post critical method- Tension Field method- Stiffeners- Bearing- Transverse stiffeners - Design Examples.

Reading:

1. Limit state Design of Steel Structures – Duggal.
2. Limit state Design of Steel structures – Bhavikatti S S.
3. IS-800-2007.
4. Limit state Design of Steel Structures - Arya & Azmani.

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SYLLABUS		(SEMESTER-VI)							
Subject Code:	CE6TPC16	CREDITS:			SESSIONAL - TA			ESE	
Subject:	Geotechnical Engineering- II	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: Lateral Earth Pressures: Lateral earth pressure theory, different types of earth pressures, Rankine's active and passive earth pressures, pressure distribution diagram for lateral earth pressures against retaining walls for different conditions in cohesion less and cohesive soils, Coulomb's active and passive earth pressure theory, Culmann's graphical construction, Problems.

UNIT 2: Bearing capacity of foundation: Bearing capacity – Basic Definitions, Factors affecting bearing capacity, estimation of Bearing capacity by different methods. Analytical measures – Terzaghi's and Meyerhof methods and calculations. Field measures – SPT, CPT and Plate load tests. Settlement of foundation: Settlement analysis – Types of foundation settlement, Components of settlements - their estimation, allowable settlement values, effects, causes and remedial measures of total and differential settlements

UNIT 3: Shallow foundations: Types of shallow foundations and choice, basic requirements, significance of these foundations
Pile foundations: Classification and uses, load carrying capacity calculations by different methods – static methods, dynamic methods, in-situ penetration tests, piles load test; Negative skin friction; under reamed pile foundations; Pile groups – Necessity, Efficiency, Group capacity and settlements.

UNIT 4: Well foundations; Types of caissons and their construction; Different shapes of wells, component parts and forces; Estimation of bearing capacity, sinking of wells and remedial measures for tilts and shifts.

UNIT 5: Soil Exploration: Introduction and different methods – Direct methods, Semi-direct and Indirect methods; Sampling in soils and rocks; Subsurface exploration program - Preparation of bore logs and preparation of exploration report

Reading:

1. Murthy V.N.S (2007): Soil Mechanics and Foundation Engineering – CBS publications, Delhi.
2. Das, BM (2009): Geotechnical engineering – Cengage learning, New Delhi.
3. Gopal Ranjan, Rao ASR (2000): Basic and applied soil mechanics – New age publication, Delhi.
4. Iqbal H Khan (2007): Geotechnical Engineering – Prentice Hall, Delhi.
5. Basic & Applied Soil Mechanics. by- Gopal Ranjan & A. S. R. Rao
6. Foundation Analysis & Design by - J. E. Bowles

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SYLLABUS		(SEMESTER-VI)							
Subject Code:	CE6TPE1X	CREDITS: 4			SESSIONAL - TA			ESE	
Subject:	Professional Elective - 1X	L	T	P	CT	MSE	TA		TOTAL
		3	1	-	10	20	10	40	60
Professional Elective-1A or Professional Elective-1B or Professional Elective-1C or Professional Elective-1D or Professional Elective-1E		Any one subject to be Selected from the Professional Electives (Group-1 i.e. CE6TPE1A or CE6TPE1B or CE6TPE1C or CE6TPE1D or CE6TPE1E)							
Professional Electives Group -1									
CE6TPE1A		Advanced Concrete Technology							
CE6TPE1B		Advanced Surveying							
CE6TPE1C		Advanced Concrete Design							
CE6TPE1D		Highway Safety							
CE6TPE1E		Advanced Fluid Mechanics							

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SYLLABUS		(SEMESTER-VI)							
Subject Code:	CE6TPE1A	CREDITS: 4			SESSIONAL - TA			ESE	
Subject:	Advanced Concrete Technology	L	T	P	CT	MSE	TA		TOTAL
		3	1	-	10	20	10	40	60

UNIT – 1: Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter. CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation super-plasticiser.

MINERAL ADMIXTURE-Fly ash, Silica fume, GGBS, and their effect on concrete property in fresh state and hardened state.

UNIT – 2: MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS10262-2004.

UNIT – 3: DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability.

UNIT – 4: RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix, Self compacting concrete concept, materials, tests, properties, application and typical mix.

UNIT – 5: Fiber reinforced concrete - Fibers types and properties, Behaviour of FRC in compression, tension including pre-cracking stage and post-cracking stages, behaviour in flexure and shear, Ferro cement - materials, techniques of manufacture, properties and application. Light weight concrete-materials properties and types. Typical light weight concrete mix high density concrete and high performance concrete-materials, properties and applications, typical mix.

REFERENCES:

Neville, A.M. and Brooks, J.J., " CONCRETE TECHNOLOGY", ELBS .1990.
 Neville, A.M., "PROPERTIES OF CONCRETE", PITMAN. 1983.
 Brandt, A.M., "CEMENT BASED COMPOSITES: Materials, Mechanical Properties and Performance", E & FN Spon. 1995.
 Newman, K., "CONCRETE SYSTEMS in COMPOSITE MATERIALS". EDT BY L.Holliday. Elsevier Publishing Company. 1966.

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SYLLABUS	(SEMESTER-VI)							
Subject Code:	CE6TPE1B	CREDITS: 4			SESSIONAL - TA			ESE
Subject:	Advanced Surveying	L	T	P	CT	MSE	TA	TOTAL
		3	1	-	10	20	10	40
								60
<p>UNIT 1: Astronomical Surveying: Astronomical coordinate systems, astronomical triangle, determination of azimuth.</p> <p>UNIT 2: Construction and Boundary Surveys: Equipment for construction surveys, Setting out pipe line, setting out buildings and structures, setting out a highway.</p> <p>UNIT 3: Theory of Errors: Types and sources of errors, theory of least squares, method of weights, method of correlates, angle and station adjustment, figure adjustment. Land Surveys: Layouts, measurements.</p> <p>UNIT 4: Triangulation and Baseline Measurements: Triangulation figures or systems, station marks, signals, towers, baseline measurement by rigid bars, flexible apparatus, problems, satellite station and reduction to centre.</p> <p>UNIT 5: Total Station and GPS: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.</p> <p>Reading:</p> <ol style="list-style-type: none"> 1. Borden D. Dent, Jeffrey Troguson, Thomas W. Hodler, Cartography: Thematic Map Design, McGraw-Hill Higher Education, 2008. 2. Gopi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India, 2007. 3. Hoffman.B, H.Lichtenegga and J.Collins, Global Positioning System - Theory and Practice, Springer-Verlag Publishers, 2001. 4. Punmia B. C, Ashok K. Jain, Arun K. Jain, Higher Surveying, Laxmi Publications, 2005. 								

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SYLLABUS	(SEMESTER-VI)							
Subject Code:	CE6TPE1C	CREDITS: 4			SESSIONAL - TA			ESE
Subject:	Advanced Concrete Design	L	T	P	CT	MSE	TA	TOTAL
		3	1	-	10	20	10	40
								60

UNIT 1: Combined Footings: Simple Rectangular, trapezoidal footings (with and without central beam); Strap footing; raft foundation.

UNIT 2: Types of retaining walls; Cantilever Retaining wall design; Counterfort retaining wall (demonstration only)

UNIT -3: Water tanks resting on ground; Intze type water tank design

UNIT-4: Large span concrete roofs, Introduction- classification- behaviour of flat slabs - direct design and equivalent frame method- codal provisions - waffle slabs.

UNIT-5: Chimneys, analysis of stresses in concrete chimneys- uncracked and cracked sections- codal provisions- design of chimney.

TEXT BOOKS & REFERENCES:

Purushothaman, P., Reinforced Concrete Structural Elements-, Tata McGraw Hill, 1986

Ashok K Jain, Reinforced Concrete -Nem Chand Bros. Roorkee , 1998

Jain and Jaikrishna, Plain and Reinforced Concrete -Vol I and II, NemChand Bros., Roorkee, 2000.

Taylor C Pere, Reinforced Concrete Chimneys, Concrete publications, 1960

Design of deep girders, Concrete Association of India, 1960

Mallick and Gupta, Reinforced Concrete, - Oxford and IBH, 1982

BIS codes (IS 456 , IS 2210, IS 4998, IS 3370, SP 16, SP 24, SP 34).

IRC Codes (IRC 5, IRC 6, IRC 21)

Menon and Pillai, Reinforced Concrete Design

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SYLLABUS		(SEMESTER-VI)							ESE
Subject Code:	CEGTPE1D	CREDITS: 4			SESSIONAL - TA				
Subject:	Highway Safety	L	T	P	CT	MSE	TA	TOTAL	
		3	1	-	10	20	10	40	60

UNIT 1: Introduction to safety - Accident characteristics and factors: road – driver – vehicle-environment.

UNIT 2: Statistical Interpretation and Analysis of Crash Data - Accident recording and analysis.

UNIT 3: Advanced statistical methods, Crash Reconstruction - Driver behaviour and crash "causality", crash reporting and collision diagrams, basics of crash statistics, before-after methods in crash analysis.

UNIT 4: Road Safety Audits - Safety Programs, safety education, Traffic Law Enforcement. Elements of highway safety management systems, Safety countermeasures.

UNIT 5: Safety management process, Mitigation Measures - Crash Facts, Exclusive pedestrian signal phasing, Roadway lighting, pedestrian refuge islands and curb extension. Road Safety Management System.

Reading:

1. Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
2. Lynn B. Fricke, Traffic Accident Reconstruction, Northwestern University Center for Public Safety, 1990.
3. Ogden, K.W. Safer Roads: A Guide to Road Safety Engineering. Avebury Technical, 1996.
4. Rune Elvik and Truls Vaa, The Handbook of Road Safety Measures, Elsevier, 2004.
5. Leonard Evans, Traffic Safety, Science Serving Society, 2004.
6. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted 2002).
7. Simon Washington, Matthew Karlaftis, and Fred Mannering, Statistical and Econometric Methods for Transportation Data Analysis, Chapman & Hall/CRC Press, 2003.
8. J. Stannard Baker, Traffic Collision Investigation, Northwestern University Center for Public Safety, 2002.
9. Lynn B. Fricke, Traffic Accident Reconstruction, Northwestern University Center for Public Safety, 1990.

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SYLLABUS		(SEMESTER-VI)						
Subject Code:	CE6TPE1E	CREDITS: 4			SESSIONAL - TA			ESE
Subject:	Advanced Fluid Mechanics	L	T	P	CT	MSE	TA	TOTAL
		3	1	-	10	20	10	40
								60

UNIT 1: Dynamic of Fluid Flow, One-Dimensional method, The Navier Stokes Equation, Limiting Case, Applications. Boundary Layer Theory for low and high Viscosity, Boundary Layer thickness, Prandtl's Equation, Momentum Integral Equation, Pressure Distribution in boundary layer.

UNIT2: Dimension analysis and similarities, Buckingham theorem, types of similarities, forces influencing hydraulic phenomenon, significance of dimensionless numbers, distorted model, and model proto type similarity law; Laminar and Turbulent

UNIT 3: Flow in Pipes, Reynolds experiment, mechanism of turbulent flow, Prandtl's mixing length theory, Karman similarity hypothesis, Universal velocity distribution near solid boundary, Hydro dynamically smooth and rough pipes. Power law for velocity distribution, Nikuradse experiment, Ageing of Pipes; Compressible Fluid Flow, Equation of motion, continuity equation and energy equation. Stagnation point and its properties, flow through ducts of varying areas, flow through convergent and divergent nozzles, effects of compressibility, shock waves, supersonic expansion and contraction; Ideal Fluid Flow, Circulation and Vorticity, Source and sink, combining flow field by super position, combined flow field for Engineering importance. Doublet in rectilinear flow and Doublet with Circulation.

UNIT 4: Flow past a cylinder curved flow and with circulation and their different combinations; Unsteady flow in bounded systems, Quasi-steady flow, unsteady flow in pipes and open channel flow.

UNIT 5: Finite difference representation of depth dependent-discharge, Simulation of unsteady flow in pipes, channels and ducts. Development of St. Venant equation of continuity and motion Non uniform flow in open channel flow, equation of gradually varied flow. Classification of water surface profiles, location of hydraulic jump.

ESSENTIAL READING:

J. F. Douglas, J. M. Gaslorek, J. A. Swaffield, Fluid Mechanics, Pearson Education. R. J. Garde, A. G. Mirajgaoker, Engineering Fluid Mechanics, SciTech Publication, Chennai.

SUPPLEMENTARY READING:

V. L. Streeter, Fluid Mechanics, McGraw-Hill Book, New York, 1971.

J. A. Liggett and D. A. Caughey, Fluid Mechanics: An Interactive text, ASCE press.

A. K. Jain, Fluid Mechanics, Khanna Publishers, Delhi.

K. C. Patra, Engineering Fluid Mechanics and Hydraulic Machines, Narosa publishing house, New Delhi.

Fluid Mechanics and Application with CD roams, CENGEL, Prentice Hall, New Delhi.

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SYLLABUS	(SEMESTER-VI)								
Subject Code:	CE6TOE1X	CREDITS:3			SESSIONAL - TA			ESE	
Subject:	Open Elective -1X	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60
Open Elective-1A or Open Elective-1B or Open Elective-1C or Open Elective-1D		Any one subject to be Selected from the Open Electives Group (i.e. CE6TOE1A or CE6TOE1B or CE6TOE1C or CE6TOE1D)							
Open Electives Group 1									
CE6TOE1A		Construction Planning and Management							
CE6TOE1B		Rural Technology and Community Development							
CE6TOE1C		Engineering System Design Optimization							
CE6TOE1D		Engineering System Modelling and Simulation							

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SYLLABUS		(SEMESTER-VI)						
Subject Code:	CE6TOE1A	CREDITS: 3			SESSIONAL – TA			ESE
Subject:	Construction Planning and Management	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT 1: Introduction: Objectives and functions of project management, project feasibility reports, Planning for construction projects: Steps, factors, advantages and disadvantages for different stake holder.
Scheduling: Scheduling Job layout and Line of balance, project management through networking, Bar Chart, Linked bar chart, Work-break down structures, Activity-on-arrow diagrams.

UNIT 2: PERT: Network analysis, critical path, probability of project.

UNIT3: CPM: Network analysis, Critical Path, Difference between CPM and PERT.

UNIT 4: Safety: Importance, causes of Accidents safety measures, responsibility for safety, safety benefits to various parties.
Quality control in construction: Importance, Elements of quality, Characteristics, factors affecting, specification , inspection, quality control circle.

UNIT 5: Time and motion studies, Standard and special equipment, factors affecting selection of construction equipment, cost of owning and operating the construction Equipment,
Excavatory equipment: Mass haul diagram, terms related with excavatory equipment, types, factors for selection, factors affecting output.

TEXT BOOKS:
Construction Engineering and Management – S. Seetharaman (Umesh Publications, New delhi, 1997)
PERT & CPM – Punmia, B.C. and Khandelwal, K.K. (Laxmi Publications, New Delhi 1997)
Construction Management and Planning – Sen Gupta & Guha (Tata McGraw Hill)
Construction planning and management by U K Srivastava

REFERENCE BOOKS:
Construction Planning Equipment and Methods – Peurify/ Schexnayder, 6th Edition (Tata McGraw Hill)
PERT & CPM – Sreenath, I.S. (East West Press, New Delhi, 1975)
Construction Management and Accounts – Vazirani, V.N. & Chandola, S.P. (Khanna Publishers, New Delhi, 2002)
Construction Planning and Management – Gahlot & Dhir (New Age Publishers)

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SYLLABUS		(SEMESTER-VI)						
Subject Code:	CE6TOE1B	CREDITS : 3			SESSIONAL - TA			ESE
Subject:	Rural Technology and Community Development	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT 1: Data Analysis and Measures of Central Tendency- Meaning, nature, scope and limitations of statistics, collection of statistical data, classification, tabulation and diagrammatic representation of data, Measures of central tendency: Statistical averages Mean, Median, Mode.

UNIT 2: Data, Information and Knowledge; concept of Information, need of information (professional, educational, research), qualities of information, value of information, difference between data and information, properties of the needed information. Information and Management; planning, organizing, co-ordinating and controlling.

UNIT 3: Concepts of marketing; difference between marketing selling and retailing; marketing mix, market-segmentation, marketing planning, strategy and approaches; modern concept of marketing.

UNIT 4: Community development; concept, definition, meaning, need, history, principles, objectives and scope. Community Building: Coming of Age, regenerating community, community model.

UNIT 5: Consensus Organizing Model, What's Behind Building Healthy Communities? , Participatory Democracy, The Role of various NGOs in Community Development. The Role of Business and Government in Community Development Initiatives. How to Form a Non-profit Corporation Fund Raising and Grant Writing.

TEXT/REFERENCE BOOKS:

1. Biddle, William Wishart. 1968. Encouraging Community Development: A Training Guide for Local Workers. New York: Holt, Rinehart and Winston.,
2. Clark, Kenneth B. and Jeannette Hopkins, eds. 1969. A Relevant War Against Poverty: A Study of Community Action Programs and Observable Social Change. New York: Harper and Row.
3. Clinard, Marshall Barron. 1970. Slums and Community Development: Experiments in Self-Help. New York: Free Press.,
4. Creevey, Lucy E., ed. 1986. Women Farmers in Africa: Rural Development in Mali and the Sahel. Syracuse, NY: Syracuse University Press.,
5. Dobyns, Henry F., Paul L. Doughty, and Harold D. Lasswell, eds. 1971. Peasants, Power, and Applied Social Change: Vicos as a Model. Beverly Hills, CA: Sage,
6. Edwards, Allen David and Dorothy G. Jones. 1976. Community and Community Development. The Hague, Netherlands: Mouton.,
7. Green, Tova and Peter Woodrow. 1994. Insight and Action: How to Discover and Support a Life of Integrity and Commitment to Change. Philadelphia, PA: New Society Publishers,
8. Heskin, Allen David. 1991. The Struggle for Community. Boulder, CO: West view Press.,
9. Kramer, Ralph M. and Harry Specht. 1975. Readings in Community Organization Practice. 2d ed. Englewood Cliffs, NJ: Prentice-Hall.,
10. Lean, Mary. 1995. Bread, Bricks, and Belief: Communities In Charge of Their Future. West Hartford, CT: Kumarian Press.,
11. Sustainable Rural Technology, by M.S. Viridi, Daya Publishing House, ISBN: 8170355656,
12. Rural Technology. (Paperback, English), by Punia Rd Roy, Publisher: Satya Prakashan (2009),
13. Rural Education And Technology, by S B Verma S K Jiloka , Publisher: Deep & Deep pvt. ltd (2006)

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SYLLABUS		(SEMESTER-VI)						
Subject Code:	CE6TOE1C	CREDITS:3			SESSIONAL - TA			ESE
Subject:	Engineering System Design Optimization	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
<p>UNIT 1: Introduction- Optimization problem formulation, optimization algorithms, applications and examples, different optimization methods available.</p> <p>UNIT 2: Single Variable optimization-Optimization criteria, bracketing methods – Exhaustive search method, Bound phase method; Region Elimination methods – Fibonacci search method, Golden search method; Gradient based methods – Newton Raphson method, Bisection method; Root finding using optimization technique.</p> <p>UNIT 3: Multi objective optimization- Optimization criteria, Different search methods, Unidirectional search, Direct search method – Evolutionary optimization method, Powell’s conjugate direction method; Gradient based methods – Newton’s method and Variable metric method.</p> <p>UNIT 4: Specialized Methods- Integer programming, Geometric programming, simulated annealing, Global optimization using - steep descent method, simulated annealing.</p> <p>UNIT 5: Genetic algorithms and evolutionary approaches-Differences and similarities between genetic algorithms and traditional techniques, operators of GA’s, Computer program for simulated annealing, Newton-Raphson method, Evolutionary optimization method.</p> <p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Kalyanmoy Deb, “Optimization for Engineering design”, Prentice Hall, India, 2005. 2. Kalyanmoy Deb, “Multi objective optimization using Evolutionary algorithms”, John Wiley, 2001. <p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Taha, Operations Research, TMH 2010 								

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SYLLABUS		(SEMESTER-VI)						
Subject Code:	CE6TOE1D	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Engineering System Modelling and Simulation	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT 1: Introduction-Systems, System types, System Modelling, Types of system modelling, Classification and comparison of simulation models, attributes of modelling, Comparison of physical and computer experiments, Application areas and Examples

UNIT 2: Mathematical and Statistical Models- Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers.

UNIT 3: Language-System modelling, programming languages, comparison of languages, Identifying and selection of programming language, feasibility study of programming language for the given application.

UNIT 4: Experiments-Simulation of different systems, Analysis, validation and verification of input and output simulated data, study of alternate techniques.

UNIT 5: Case study-Developing simulation model for information centres, inventory systems and analysis of maintenance systems.

TEXT BOOKS:

1. Geoffrey Gordon, "System Simulation", Second edition, Prentice Hall, India, 2002.
2. Jerry Banks and John S. Carson, Barry L. Nelson, David M. Nicol, "Discrete Event System Simulation", Third edition, Prentice Hall, India, 2002.

REFERENCE BOOKS:

1. Robert E. Shannon, "System Simulation The art and science", , Prentice Hall, New Jersey, 1995.
2. D.S. Hira, "System Simulation", S.Chand and company Ltd, New Delhi, 2001.

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SYLLABUS		(SEMESTER-VI)							
Subject Code:	CE6LPC05	CREDITS: 2			SESSIONAL - TA			ESE	
Subject:	Geotechnical Engineering - Lab	L	T	P	CT	MSE	TA		TOTAL
		-	-	3	-	-	30	30	20

Minimum 10 experiments to be performed

1. Specific Gravity of soil particles.
2. Sieve Analysis.
3. Liquid Limit, Plastic Limit & Shrinkage Limit.
4. Proctor's Standard Compaction Test.
5. Determination of Field Density.
6. Constant Head Permeability Test.
7. Variable Head Permeability Test.
8. Unconfined Compression Test.
9. Triaxial Compression Test (U.U Test).
10. Consolidation Test.

Reading:
Soil Mechanics Laboratory Manual.

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SYLLABUS		(SEMESTER-VI)							
Subject Code:	CE6LPC06	CREDITS:			SESSIONAL - TA			ESE	
Subject:	Computer Application in Civil Engg. Lab	L	T	P	CT	MSE	TA		TOTAL
		-	-	3	-	-	30	30	20

Minimum 10 problems to be solved either by using STAAD Pro/Excel Programming

USING MS EXCEL Programs

1. Analysis of simple beams
2. Design of simply supported RCC beams
3. Design of columns
4. Design of isolated footing (Flat, stepped and sloped)
5. Design of combined footings
6. Design of cantilever retaining walls
7. Design of slabs (one way and Two way)

USING STAAD Pro

8. Analysis of simple beams and Frames (2-D)
9. Analysis of multi storey frames for DL and LL
10. Analysis of multi storey frames for DL, LL, WL/EQL
11. Design of structural elements
12. Analysis and design of combined footing
13. Analysis and design of roof truss
14. Analysis of simple beams for rolling loads

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SYLLABUS		(SEMESTER-VI)						
Subject Code:	CE6LPC06	CREDITS:			SESSIONAL - TA			ESE
Subject:	Environmental Engineering Lab	L	T	P	CT	MSE	TA	
		-	-	3	-	-	30	30
								20

Determination of the following Parameters in the given Water Sample:

1. Turbidity by Nephelometer.
2. TDS and fixed solids by Gravimetric method.
3. pH using pH-meter.
4. Carbonate, Bi-Carbonate & Hydroxide Alkalinity.
5. Dissolved Oxygen [DO] using DO meter.
6. Concentration of Chlorides.
7. Optimum coagulant dose for coagulation by Jar test apparatus.
8. Chlorine Demand of Water.
9. Total Hardness and Calcium Hardness.
10. Study of Weather Monitoring Station.
11. Study of Sound Level Meter.

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SYLLABUS (SEMESTER-VII)									
Subject Code:	CE7TPC17	CREDITS: 3			SESSIONAL - TA			ESE	
Subject:	Water Resources Engg.-II	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: Dams: Types of Dams, Forces, failure of dams and criteria for structural stability, principle and shear stress, stability analysis, Elementary profile of a gravity dam, Profile from practical considerations, Openings in dams.

UNIT 2: Spillways and Energy Dissipaters: Introduction, essential requirements of a spillway, spillway capacity, components, Types of spillways, Ogee Spillway, Energy Dissipation below spillways, Types of Energy dissipater, USBR stilling basins

UNIT 3: Diversion Head-works: Introduction, Types of diversion works, location and components, Weir and Barrage, Effect of construction of weir on the river regime, Bligh's creep theory, Theory of seepage flow, Khosla's theory, Vertical drop Weir.

UNIT 4: Regulation Works: Introduction, Definition of falls, necessity and location of falls, comparative study of the main types of falls. Hydraulic Gates: Spillway gates, types, tainter gates, Roller gates.

UNIT 5: Cross Drainage Works: Introduction, suitability, various types of C-D Works, Design principles of C-D Works

NAME OF TEXT BOOKS:
Irrigation Engineering and Hydraulic Structures – S.K. Garg (Khanna Publications)
Irrigation Engineering – B.C. Punmia (Laxmi Publications)

Name of Reference Books:
Irrigation, Water Resources and Water Power Engineering – Dr. P.N. Modi (Standard Book House)
Theory and Design of Irrigation Structures (Volume – I & II) – Varshney (Nem Chand Bros.)
Irrigation Engineering – Asawa G.L. (New Age International Publications)
Fundamentals of Irrigation Engineering – Bharat Singh (Nem Chand & Bros.)
Dams and weirs- William G Bligh, Kessinger Publishing

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SYLLABUS									
Subject Code:	CE7TPE2X	CREDITS: 4			SESSIONAL - TA				ESE
Subject:	Professional Elective -2X	L	T	P	CT	MSE	TA	TOTAL	
		3	1	-	10	20	10	40	60
Professional Elective-2A or Professional Elective-2B or Professional Elective-2C or Professional Elective-2D or Professional Elective-2E		Any one subject to be Selected from the Professional Electives Group-2 (i.e. CE7TPE2A or CE7TPE2B or CE7TPE2C or CE7TPE2D or CE7TPE2E)							
Professional Electives Group -2									
CE7TPE2A		Design of Prestressed Concrete							
CE7TPE2B		Structural Dynamics							
CE7TPE2C		Theory of Elasticity & Plasticity							
CE7TPE2D		Fracture of Concrete Structures							
CE7TPE2E		Advance Structural Analysis							

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SYLLABUS								
Subject Code:	CE7TPE2A	CREDITS : 4			SESSIONAL - TA			ESE
Subject:	Design of Prestressed Concrete	L	T	P	CT	MSE	TA	TOTAL
		3	1	-	10	20	10	40
								50

UNIT 1: Introduction: Fundamentals of prestressing - Classification and types of prestressing- Concrete Strength and strain characteristics - Steel mechanical properties - Auxiliary Materials like duct formers.

UNIT 2: Prestressing Systems: Principles of pretensioning and post tensioning - study of common systems of prestressing for wires strands and bars. Losses of Prestress: Losses of prestress in pre tensioned and post tensioned members - I.S. code provisions.

UNIT 3: Analysis of Sections: In flexure, simple sections in flexure, kern distance - cable profile - limiting zones - composite sections cracking moment of rectangular sections.

UNIT 4: Design of Simply Supported Beams: Allowable stress as per I.S. 1343 - elastic design of rectangular and I-sections.

UNIT 5: Shear and Bond: Shear and bond in prestressed concrete beams - conventional design of shear reinforcement - Ultimate shear strength of a section - Prestress transfer in pretensioned beams-Principles of end block design.

Reading:

1. Krishna Raju. N "Prestressed Concrete", Tata Mc Graw Hill.
2. Lin.T.Y, "Prestressed concrete", Mc Graw Hill Pub. Co.
3. Rajagopalan, "Prestressed concrete", Narosa Publishing House.

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Subject Code:		SYLLABUS						
CE7TPE2B		CREDITS:			SESSIONAL - TA			ESE
Subject:		L	T	P	CT	MSE	TA	TOTAL
Structural Dynamics		3	1	-	10	20	10	40
								60

UNIT- 1: INTRODUCTION: Comparison between static and dynamic analysis; Degrees of freedom; Undamped system; Newton's law of motion; 'D' Alembert's principle; Solution of the differential equation of motion.

UNIT-2: FREE VIBRATION OF SINGLE DEGREE - OF - FREEDOM SYSTEM: Equation of motion for single degree - of - freedom system; Free un damped vibration of the SDOF system; Damped single degree - of - freedom system -Viscous damping, Equation of motion, Critically damped system, Over damped system. Under damped system and Logarithmic decrement.

UNIT-3: RESPONSE OF SDOF SYSTEM TO HARMONIC LOADING: Undamped harmonic excitation; Damped harmonic excitation; Evaluation of damping at resonance; Response to support motion; Force transmitted to the foundation. Response of SDOF system to general dynamic loading; Impulsive loading and Duhamel's integral; Numerical evaluation of Duhamel's integral — Undamped system; Numerical evaluation of Duhamel's integral -Damped system.

UNIT-4: GENERALIZED COORDINATES AND RAYLEIGH'S METHOD: Principle of virtual work; Generalized SDOF system - Rigid body; Generalized SDOF system - Distributed elasticity; Rayleigh's method; Improved Rayleigh's method.

UNIT-5: STRUCTURES MODELED AS SHEAR BUILDINGS: Stiffness equations for the shear building; Flexibility equations for the shear building; Free vibration of a shear building (Single bay two Storeyed) - Natural frequencies and normal modes. FORCED MOTION OF SHEAR BUILDINGS (Two Storeyed): Modal superposition method; Response of a shear building to base motion; Harmonic forced excitation.

REFERENCES:

Earthquake Resistant Design of Structures by Pankaj Agarwal, Manish Shrikhande , First edition(2006), Prentice Hall of India Private Ltd., New Delhi . (for Chapters 1,2,4 and 5)
Dynamics of Structures by A.K.Chopra, Second edition (2001), Prentice Hall India Private Ltd

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SYLLABUS								
Subject Code:	CE7TPE2C	CREDITS:			SESSIONAL - TA			ESE
Subject:	Theory of Elasticity & Plasticity	L	T	P	CT	MSE	TA	TOTAL
		3	1	-	10	20	10	40
<p>UNIT-1: Basic concepts of deformation of deformable bodies- Notations of stress and strain in a 3D field Transformations of stresses and strains in Cartesian and polar co-ordinates- Equilibrium equations in two and three dimensions in Cartesian co-ordinates.</p> <p>UNIT-2: Plane stress and plane strain problems - Two dimensional problems in Cartesian co-ordinates as applied in beam bending, using Airy's stress function - Polar co-ordinates. Equations of equilibrium and compatibility-Two dimensional problems in polar co-ordinates-Stress concentration in holes.</p> <p>UNIT-3: Energy principle -theorem of minimum potential energy and complementary potential energy-</p> <p>UNIT-4: Torsion of various shaped bars- Prandtl's membrane analogy- energy method Torsion of rolled Profiles- Stress concentration at re-entrant corners.</p> <p>UNIT-5: Introduction, yield criteria for metals, graphical representation of yield criteria, Flow laws of plastic mass, Plastic strain relations-Application to thick cylinders - Hollow spheres -Torsion.</p> <p>REFERENCES: Timoshenko and Goodier, Theory of Elasticity, McGraw-Hill, 2006. Wang, Applied Elasticity, Dover Publications Inc. Newyork.1985. W.F. Chen and D.J. Pan., Plasticity for Structural Engineers, Springer Verlag 1998</p>								

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SYLLABUS									
Subject Code:	CE7TPE2D	CREDITS:			SESSIONAL - TA			ESE	
Subject:	Fracture of Concrete Structures	L	T	P	CT	MSE	TA		TOTAL
		3	1	-	10	20	10		40

UNIT 1: Concepts of linear elastic fracture mechanics,
 UNIT-2: Principles of Nonlinear fracture mechanics and energy balance approach
 UNIT-3: Behaviour of materials like concrete under fracture load and fracture process of concrete
 UNIT-4: Nonlinear fracture properties of concrete using different models, Modelling and applications of nonlinear fracture models, R-curve behaviour of concrete,
 UNIT-5: Test methods for determining fracture parameters of concrete, Fracture mechanics applications to concrete structures.

REFERENCES:

Anderson TL (2005) Fracture Mechanics Fundamentals and Applications. CRC Press, Taylor & Francis Group, Boca Ranton.
 Bažant ZP, Planas J (1998) Fracture and size effect in concrete and other quasibrittle materials, Florida: CRC Press.
 Karihaloo BL (1995) Fracture mechanics and structural concrete, Concrete Design and Construction Series, Longman Scientific & Technical, Harlow, Essex, England.
 Kumar S. and Barai S.V. (2011). Concrete Fracture Models and Applications. Springer.

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Subject Code:	CE7TPE2E	SYLLABUS							ESE
		CREDITS: 4			SESSIONAL - TA				
Subject:	Advanced Structural Analysis	L	T	P	CT	MSE	TA	TOTAL	
		3	1	-	10	20	10	40	60

UNIT-1: Direct stiffness method Introduction - element stiffness matrix - rotation transformation matrix - transformation of displacement and load vectors and stiffness matrix - equivalent nodal forces and load vectors - assembly of stiffness matrix and load vector - determination of nodal displacements and element forces - analysis of plane truss - plane frame (with numerical examples) - analysis of grid - space-truss and space-frame (without numerical examples) - computer implementation - introduction to analysis packages (A project on development of an analysis program using above method is envisaged at this stage)

UNIT-2: Beams on elastic foundation: general theory - infinite beam subjected to concentrated load - boundary conditions - infinite beam subjected to a distributed load segment - semi-infinite beam subjected to loads at its end - semi-infinite beam with concentrated load near its end - short beams.

UNIT-3: Beams curved in plan: Analysis of cantilever beam curved in plan - analysis of circular beams over simple supports

UNIT-4: Non-symmetrical bending of straight beams: Shear centre - a review, symmetrical and non-symmetrical bending - bending stresses in beams subjected to non-symmetrical bending - deflections of straight beams subjected to unsymmetrical bending - fully plastic load for unsymmetrical bending.

UNIT-5: Introduction to Structural Dynamics
Single degree of freedom - un-damped and damped vibration-free vibration - forced vibration, introduction to multi degree of freedom systems.

REFERENCES

Wang, C. K., Matrix Methods of Structural Analysis, International Textbook Company, 1970.
 Przemieniecki, J. S., Theory of Matrix Structural Analysis, McGraw Hill, New York, 1985.
 Weaver, W., and Gere, J. M., Matrix Analysis of Framed Structures, CBS Publishers, 2004.
 Rajasekaran, S., and Sankara subramanian, G., Computational Structural Mechanics, PHI
 Boresi, A. P. and Sidebottom, O. M., Advanced Mechanics of Materials, John Wiley and Sons, 2003.
 Srinath, L. S., Advanced Mechanics of Solids, Tata McGraw Hill, 2009.
 Timoshenko, S., Strength of Materials, Part II, CBS Publishers, 2002.
 Reddy, C. S., Basic Structural Analysis, Tata McGraw Hill, New Delhi, 2007.
 Paz M., Structural Dynamics, CBS Publishers, 2007.
 Meirovich, L., Elements of Vibration Analysis, McGraw Hill, 2007.

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SYLLABUS (SEMESTER-VII)									
Subject Code:	CE7TPE3X	CREDITS:3			SESSIONAL - TA				ESE
Subject:	Professional Elective -3X	L	T	P	IA	MSE	TA	TOTAL	
		3	-	-	10	20	10	40	60
Professional Elective-3A or Professional Elective-3B or Professional Elective-3C or Professional Elective-3D or Professional Elective-3E	Any one subject to be Selected from the Professional Electives Group-3 (i.e. CE7TPE3A or CE7TPE3B or CE7TPE3C or CE7TPE3D or CE7TPE3E)								
Professional Electives Group -3									
CE7TPE3A	ENVIRONMENTAL GEOTECHNICAL ENGINEERING								
CE7TPE3B	AIR POLLUTION CONTROL ENGINEERING								
CE7TPE3C	INDUSTRIAL WASTEWATER MANAGEMENT								
CE7TPE3D	WATER RESOURCES PLANING & MANAGEMENT								
CE7TPE3E	ENVIRONMENTAL IMPACT ASSESSMENT								

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SYLLABUS								
Subject Code:	CE7TPE3A	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Environmental Geotechnical Engineering	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT-1: Soil- Pollutant Interaction: Introduction to geo environmental engineering – environmental cycle – sources, production and classification of waste – causes of soil pollution – factors governing soil-pollutant interaction- Physio-chemical behaviour and modelling -failures of foundations due to pollutants

UNIT-2: Characterization, Stabilization and Disposal: Safe disposal of waste – site selection for landfills – characterization of land fill sites – waste characterization –stability of landfills – current practice of waste disposal- passive contaminant system - Hazardous waste control and storage system – mechanism of stabilization - solidification of wastes – micro and macro encapsulation – absorption, adsorption, precipitation- detoxification — organic and inorganic stabilization

UNIT-3: Transport of Contaminants: Contaminant transport in sub surface – advection – diffusion – dispersion – governing equations– contaminant transformation – sorption – biodegradation – ion exchange – precipitation – hydrological consideration in land fill design – ground water pollution – bearing capacity of compacted fills – pollution of aquifers by mixing of liquid waste – protecting aquifers.

UNIT-4: Detection and Testing Methods: Methodology- review of current soil testing concepts – Proposed approach for characterization and identification of contaminated ground soil for engineering purposes

UNIT-5: Remediation of Contaminated Soils: Rational approach to evaluate and remediate contaminated sites – monitored natural attenuation – ex-situ and in-situ remediation – solidification, bio – remediation, incineration, soil washing, electro kinetics, soil heating, verification, bio venting – Ground water remediation – pump and treat, air sparging, reactive well- application of geo synthetics in solid waste management – rigid or flexible liners.

REFERENCES:

Wentz, C.A., Hazardous Waste Management, McGraw Hill, Singapore, 1989.

Daniel, B.E., Geotechnical practice for waste disposal, Chapman and Hall, London, 1993.

Fang, H.Y. Introduction to environmental Geotechnolgy, CRC press New York, 1997.

Lagrega, M.d., Bukingham, P.L., and Evans, J.C., Hazardous Waste Management, McGraw Hill, Inc. Singapore, 1994.

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Subject Code: CE7TPE3B		SYLLABUS					
		CREDITS: 3			SESSIONAL - TA		
Subject: Air Pollution Control Engineering	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10
							60

UNIT-1: INTRODUCTION: Sources and classification of Air pollutants: Natural contaminants, Aerosols, Gases & Vapours; Primary & Secondary Air pollutants; Stationary & Mobile Sources. Meteorology and Air pollution: Factors influencing Air pollution; Atmospheric stability & temperature inversions; Mixing height; Plume behaviour; Wind rose; Stack effluent dispersion theories; Stack height.

UNIT-2: SAMPLING PROCEDURES: Sampling Methods, Difficulties in sampling, Stages & considerations of air sampling, Instruments for sampling waste gases & atmosphere, sampling period & methods, High volume sampler, Stack sampling techniques, selection of sampling location, procedure for collection & sampling of particulate matter, Gaseous sampling, recent trends in sampling of stack effluents.

UNIT-3: Control of Particulates / aerosols: Objectives & types of Collection equipment; Principle, application, working, advantages & disadvantages of: i) Settling chambers, ii) Inertial separators, iii) Cyclones, iv) Filters, v) Electrostatic Precipitators & vi) Scrubbers; Choice of equipment.

UNIT-4: Control of Smoke -Gaseous Contaminants & Odour: Smoke: Sources, measurement by Ringelmaan chart, miniature chart & other method; Prevention & control of smoke. Control of exhaust emissions. Gaseous Contaminants: Methods of control viz. combustion, absorption, adsorption, closed collection & masking. Odour Control.

UNIT-5: Control measures for Industrial Applications: Introduction to control of air pollution by process changes. Control measures for industries such as Cement Industry, Concrete batching plant, Asphaltic concrete plant, Glass manufacture, Asbestos processing, Thermal Power plant and Coal tar industry.

REFERENCES:

- Richard W. Boubel et al "Fundamentals of Air pollution", Academic Press, New York, 1994.
- Noel de Nevers, Air Pollution control Engineering, McGraw Hill, New York, 1995.
- M.N. Rao et al, "Air Pollution" Tata McGraw Hill, 1989.

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Subject Code:		SYLLABUS							ESE
CE7TPE3C		CREDITS: 3			SESSIONAL - TA			60	
Subject:	Industrial Wastewater Management	L	T	P	CT	MSE	TA		TOTAL
				3	-	-	10	20	10

UNIT-1: Introduction: Industrial scenario in India- Industrial activity and Environment - Uses of Water by industry – Sources and types of Industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater monitoring and sampling -generation rates, characterization and variables –Toxicity of Industrial effluents and Bioassay tests – Major issues on water quality management

UNIT-2: Industrial Pollution Prevention: Prevention and Control of Industrial Pollution – Benefits and Barriers – Waste management Hierarchy - Source reduction techniques – Pollution Prevention of Assessment - Material balance - Evaluation of Pollution prevention options –Cost benefit analysis – payback period - Waste minimization Circles

UNIT-3: Industrial Wastewater Treatment: Equalisation - Neutralisation – Oil separation – Flotation – Precipitation – Heavy metal Removal- Aerobic and anaerobic biological treatment – Sequencing batch reactors –High Rate reactors - Chemical oxidation – Ozonation – carbon adsorption -Photo catalysis – Wet Air Oxidation – Evaporation – Ion Exchange – Membrane Technologies – Nutrient removal.- Treatability studies.

UNIT-4: Wastewater Reuse And Residual Management: Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.

UNIT-5: Case Studies: Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries.

REFERENCES:

Eckenfelder, W.W., 'Industrial Water Pollution Control', Mc-Graw Hill, 2000.
 Nelson Leonard Nemerow, "Industrial waste treatment – contemporary practice and vision for the future", Elsevier, Singapore, 2007
 Frank Woodard, 'Industrial waste treatment Handbook', Butterworth Heinemann, New Delhi, 2001.
 World Bank Group, 'Pollution Prevention and Abatement Handbook – Towards Cleaner Production', World Bank and UNEP, Washington D.C., 1998
 Paul L. Bishop, 'Pollution Prevention: - Fundamentals and Practice', Mc-Graw Hill International, Boston, 2000.

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SYLLABUS									
Subject Code:	CE7TPE3D	CREDITS: 3			SESSIONAL - TA				ESE
Subject:	Water Resources Planning & Management	L	T	P	CT	MSE	TA	TOTAL	60
		3	-	-	10	20	10	40	

UNIT 1: Introduction: Role of water in national development, assessment of water resources of country, scope of water resources development vis-a-vis environment, Irrigation development in India, utilisation of Irrigation potential.

UNIT 2: Planning: Water resources planning process; planning for single purpose and multipurpose projects, estimation of different water needs and project formulations, comparison of alternatives, cost-benefit analysis.

UNIT 3: Water Resources Systems: Definition, types of system, optimization techniques, system approach, system analysis, linear programming, and formulation of a linear programming problem, formulation with different types of constraints, graphical analysis, graphical solution, simplex method, optimization techniques and systems approach.

UNIT 4: Management: Evaluation and monitoring of water quantity and quality, managing water distribution networks for irrigation, flood control and power generation, inter-basin transfer of water, conjunctive use of surface and ground water.

UNIT 5: Modelling: Water quantity and quality modelling, evaluation of impacts of water resources projects on river regimes and environment, reservoir sedimentation and watershed management.

NAME OF TEXT BOOKS:
 Principles of Water Resources Planning – Good Man, A.S., (Prentice Hall, Inc., Englewood Cliffs, N.J. 1984.)
 Water Resources Engineering – Linsley, R.K. and Franzini, J.B., (3rd Edition) (McGraw Hill, New York, 1979)

Name of Reference Books:
 Water Resources System, Planning and Management – M.C. Chaturvedy (Tata McGraw Hill)
 System Approach to Water Management – Biswas A.K. (Tata McGraw Hill)
 Water Resources System, Planning and Management – Helweg O.J. (John and Wiley & Sons)

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SYLLABUS								
Subject Code:	CE7TPE3E	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Environmental Impact Assessment	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT-1: Introduction: Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA – Cross sectoral issues and terms of reference in EIA – Public Participation in EIA. EIA process- screening – scoping - setting – analysis – mitigation

UNIT-2: Components And Methods For EIA: Matrices – Networks – Checklists – Connections and combinations of processes – Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modelling for impact prediction – Assessment of impacts – air – water – soil – noise – biological – Cumulative Impact Assessment – Documentation of EIA findings – planning – organization of information and visual display materials – Report preparation. EIA methods in other countries.

UNIT-3: Socio-Economic Impact Assessment: Definition of social impact assessment. Social impact assessment model and the planning process. Rationale and measurement for SIA variables. Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition - neighbourhood and community impacts. Selecting, testing and understanding significant social impacts. Mitigation and enhancement in social assessment. Environmental costing of projects.

UNIT-4: Environmental Management Plan: Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment.

UNIT-5: Sectoral EIA: EIA related to the following sectors - Infrastructure –construction and housing Mining – Industrial - Thermal Power - River valley and Hydroelectric – coastal projects-Nuclear Power. EIA for coastal projects.

REFERENCES:
 Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Inter science, New Jersey, 2003.
 World Bank –Source book on EIA
 Petts, J., Handbook of Environmental Impact Assessment, Vol., I and II, Blackwell Science, London, 1999.
 Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York.

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SYLLABUS									
Subject Code:	CE7TPE4X		CREDITS: 3			SESSIONAL - TA			
Subject:	Professional Elective -4X		L	T	P	CT	MSE	TA	TOTAL
			3	-	-	10	20	10	40
Professional Elective-4A or Professional Elective-4B or Professional Elective-4C or Professional Elective-4D or Professional Elective-4E			Any one subject to be Selected from the Professional Electives Group-4 (i.e. CE7TPE4A or CE7TPE4B or CE7TPE4C or CE7TPE4D or CE7TPE4E)						
Professional Electives Group -4									
CE7TPE4A			Ground Water Hydrology						
CE7TPE4B			Ground Improvement Techniques						
CE7TPE4C			Geo-Informatics & GIS Applications						
CE7TPE4D			Rock Mechanics						
CE7TPE4E			Design of Hydraulic Structures						

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Subject Code:	CE7TPE4A	SYLLABUS						ESE
		CREDITS: 3			SESSIONAL - TA			
Subject:	Ground Water Hydrology	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT 1: Hydrologic cycle, Water balance, Occurrence of ground water: Origin, geological formations as aquifers, type of aquifers, groundwater basins, springs. Darcy's Law, validity of Darcy's Law permeability,

UNIT 2: Laboratory and field measurement of permeability, groundwater Flow lines. Steady flow to a well, steady radial flow to a well in confined aquifer and unconfined aquifer, Unsteady radial flow into a confined aquifer, Non equilibrium Theis equation, Theis method of solution, multiple well system; Methods of constructions of deep and shallow wells: The percussion (or cable tool) method of drilling. Direct circulation hydraulic rotary method, Down the hole hammer method, well logs-receptivity logging, testing of wells for yield, Effect of irrigation, stream flow, rainfall on groundwater fluctuations, seasonal and secular variations, fluctuation due to miscellaneous causes;

UNIT 3: Surface and Subsurface investigations of groundwater: Geophysical exploration, Electrical resistivity method, aerial photo interpretation, remote sensing applications to ground water exploration, test drilling, Artificial recharge by water spreading, through pits and shaft, recharge through other methods;

UNIT 4: Ground water pollution: Municipal sources, liquid wastes from domestic uses, solid wastes, Industrial sources, tank and pipeline leakage, Mining activity, agricultural sources, septic tank and cesspools, saline water intrusion in coastal aquifers, methods to control saline water intrusion ;

UNIT 5: Groundwater management: Concepts of Basin management, Equation of hydrologic equilibrium, groundwater basin investigations, conjunctive use of surface and groundwater.

TEXT BOOK:

K. C. Patra, Hydrology and Water Resources Engg., Narosa Publishing house, New Delhi.
D. K. Todd, Groundwater Hydrology, John Wiley and Sons.

REFERENCES:

H. M. Raghunath, Ground Water.
S. P. Garg, Groundwater and Tube Wells, Oxford and IBH Publishing Co., New Delhi.
V. T. Chow, Hand book of Applied Hydrology, McGraw-Hill Publishing Company, New York.

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Subject Code:	CE7TPE4B	SYLLABUS							ESE
		CREDITS:			SESSIONAL - TA				
Subject:	Ground Improvement Techniques	L	T	P	CT	MSE	TA	TOTAL	60
				3	-	-	10	20	

UNIT 1: Introduction: Engineering properties of soft, weak and compressible deposits, Natural on land, off-shore and Man-made deposits.

UNIT 2: Role of ground improvement in foundation engineering, methods of ground improvement, Selection of suitable ground improvement techniques

UNIT 3: In-situ methods: In-situ densification soils, Dynamic compaction and consolidation, Vibroflotation, Sand pile compaction, Preloading with sand drains and fabric drains, Granular columns, Micro piles, Soil nailing, Ground Anchors, Lime piles, Injections, Thermal, Electrical and Chemical methods, Electro osmosis, Soil freezing ;

UNIT 4: Reinforced Soil: The Mechanism, Reinforcement materials, Reinforcement - Soil Interactions, Geosynthetics, Principles, Analysis and Design of Reinforced Retaining Structures, Embankments and Slopes, soil nailing.

UNIT 5: Worldwide Case studies of various methods of ground improvement techniques applied for ground improvement.

ESSENTIAL READING:

R. M. Korner, Design with Geosynthetics, Prentice Hall, New Jersey, 3rd Edn. 2002.
 P. P. Raj, Ground Improvement Techniques, Tata McGraw Hill, New Delhi, 1995.

SUPPLEMENTARY READING:

B. M. Das, Principles of Foundation Engineering Thomson, Indian Edition, 2003.
 G. V. Rao & G. V. S. Rao, Text Book on Engineering with Geotextiles, Tata McGraw Hill
 T. S. Ingold & K. S. Miller, Geotextile Hand Book, Thomas Telford, London.
 N. V. Nayak, Foundation Design Manual, Dhanpat Rai and Sons, Delhi.

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SYLLABUS									
Subject Code:	CE7TPE4C		CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Geo-Informatics & GIS Applications		L	T	P	CT	MSE	TA	TOTAL
	3	-	-	10	20	10	40	60	

UNIT-1: Data base system levels of abstraction in DBMS principles of data base. Model of real world. Data organization, information management system preliminary study of INGRES, ORACLE, RDBMS and DBASE. GIS: maps and spatial information. Computer assisted mapping and map analysis, Components. Future directions and trends in GIS.

UNIT-2: Data structures for Thematic maps & GIS. Points, lines and areas. Map Geographic data. File and data processing, data base structures, perceived structures and computer representation and geographical data. Raster data structure, Vector data structures for geographical entities. Data structures for thematic maps - The choice between raster and vector. DEMs: The need of DEMs, methods of representing DEMs. Image methods, data sources and sampling methods for DEMs. Products from a DEM. Automated landform delineation from DEMs. Map projections in GIS

UNIT-3: Data input, data verification, correction and storage data output; data user interfaces. Methods of Data Analysis and Spatial Modelling: Introduction, definition of the database. Simple data retrieval. A general approach to map overlay, Cartographic modelling using natural language commands. Linking command sequences into cartographic models, advantages and disadvantages of cartographic modelling in land evaluation and planning.

UNIT-4: Data Quality, Errors and Natural Variation: Sources, Errors resulting from natural variation of from original measurements. Errors arising through processing, problem; and errors arising from overlay and boundary intersections. Errors resulting from rasterizing a vector map. Errors associated with overlaying two or more polygon networks. The nature of boundaries. The statistical nature of boundaries. Combining attributes from overlaid maps. Classification methods: Classification, Multivariate analysis and classification, allocating individuals to existing classes. Expert systems for GIS. Classification methods in GISs.

UNIT-5: Methods of Spatial interpolation, Global methods, location interpolators, optimal interpolation. Extensions of kriging to large areas. Comparing kriging with other interpolation techniques. Choosing a GIS. Designing the needs for GIS. The procedure for GIS Setup. Tools for Map analysis: Single maps, Map reclassification, operations and attribute tables, spatial topological and geometric modelling and operations on spatial Neighbourhood. Tools for map Analysis: Map pairs, map overlay and map modelling correlation between two maps. Tools for map analysis: Multiple maps, types of models, Boolean logic models, Index overlay models, Fuzzy logic methods.

LIST OF TEXT BOOKS

Principles of Geographical Information System for Land Resource Assessment, P.A. Burrough, Clarendon Press, Oxford, 1986.

Geographic Information Systems, T.R. Smith & Piquet, London Press, 1985.

Principles of data base systems, J.D. Ullman, Computer Science Press.

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Subject Code:	CE7TPE4D	SYLLABUS						ESE
		CREDITS: 3			SESSIONAL - TA			
Subject:	Rock Mechanics	L	T	P	CT	MSE	TA	TOTAL
				3	-	-	10	20
								60

UNIT - 1: INTRODUCTION TO ROCK MECHANICS: Definition, Scope and importance, development, application in mining, Discontinuities; Description of discontinuities, Introduction to mapping and hemispherical projection of discontinuities, Barton's shear strength of joints. **ANALYSIS OF STRESS:** Introduction, Definition and basic concepts, stress in a plane, (two dimensional stresses), Mohr's Circle of stress, Secondary principal stress, equations of equilibrium, plane stress equations.

UNIT - 2: ANALYSIS OF STRAIN: Introduction, Definition and basic concepts, strain in a plane, (two dimensional stress), Mohr's Circle of strain, equations of compatibility, stress-strain relationship, basic equations in elastic theory, plain strain equations, elasto plastic behaviour of rocks. Stress - strain curves of various rocks. **PHYSICAL PROPERTIES:** Definition and determination of Density, hardness, porosity, permeability, moisture content, degree of saturation. Electrical and thermal properties of rocks.

UNIT - 3: MECHANICAL PROPERTIES: Definition and determination of Compressive Strength, tensile strength, shear strength, triaxial testing. Time dependent properties. Scaling of laboratory data to in-situ values. Rock Indices: protodyakanov strength index, point load strength index, RQD. In-situ strength properties of rocks, Necessity and requirement, methods of in-situ stress measurements. Plate load test, cable jack test, bore hole test, dilatometer test, flat jack test, hydraulic fracture and velocity propagation.

UNIT - 4: RHEOLOGICAL MODELS: Relationship and rate of change of stress-strain for idealizing materials - Models representing elastic, plastic, viscous, elasto plastic, non-elastic and brittle rock properties.

UNIT - 5: STATIC AND DYNAMIC ELASTIC CONSTANTS OF ROCKS: Static: Introduction, definition, instrument, measurement of deformation: mechanical, optical, electrical gauges, LVDT, calculation of elastic constants of rocks. Dynamic: Introduction, elastic wave, calculation of modulus of elasticity.

TEXT BOOKS:

Strata Mechanics in Coal Mining - Jeremic, K. L. Jeremic, Rotterdam, Balkema, 1985.

Fundamentals of Rock Mechanics - Jager & Cook, Methuen andco. London, 1969.

REFERENCE BOOKS:

Hand Book on Mechanical Properties of rocks - R.D. Lama, V. S. Vutukuri, Vol. I to IV, Transtech Publications, 1978.

Mechanics and Engineering - Charles Jaeger, Cambridge University Press, 1979.

Rock Mechanics for Underground Mining - 2nd edition, Brady and Brown, Kluwer Academic Publishers, 1993.

Ground Mechanics in Hard rock Mining - M. L. Jeremic, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

Rock Mechanics and Design of Structures in Rock - L. Obert & W.I. Duvall, John wiley and Sons, 1966.

Rock Mechanics for Engineers - B. P. Verma, 2nd edition, Khanna Publishers, 1989.

Introduction to Rock Mechanics - R. E. Goodman, 2nd edition, John wiley and Sons, 1989.

The elements of Mechanics of Mining Ground - B. S. Verma Vol. I. Julin & Co. Lucknow 1981.

Engineering Rock Mechanics, An Introduction to the Principles - John A. Hudson and John. P. Harrison Pergamon Press 1997.

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Subject Code:	CE7TPE4E	SYLLABUS						ESE
		CREDITS:			SESSIONAL - TA			
Subject:	Design of Hydraulic Structures	L	T	P	CT	MSE	TA	TOTAL
				3	-	-	10	20
								60

UNIT 1: Introduction - Classification of dams, Gravity dams, Earth dams, Arch dam, Buttress dam, Steel dams, Timber dams, selection of site for dam, selection of type of dam, Investigations of dam sites, Engineering surveys, Geological investigations, Types of hydropower plants, site selection for power plant, General arrangement of a hydropower project.

UNIT 2: Principles of Design of Hydraulic Structures - Hydraulic structures on permeable foundations, Theories of subsurface flow, Khosla's method of independent variables, Exit gradient, Location of Hydraulic jump, water surface profiles, scour due to subsurface flow, Design Principles, Energy dissipation principles.

UNIT 3: Gravity Dams - Types of storage head works, Forces acting on gravity dams, Analysis of gravity dams, Profile of a gravity dam, Finite Element Method, Design of gravity dam, joints in gravity dam, Galleries in gravity dam, Adits and shafts, Construction of gravity dam, Foundation Grouting, Instrumentation of gravity dams.

UNIT 4: Earth dams - Types of earth dams, Causes of failure of earth dams, Seepage analysis, phreatic line, flow net construction, criteria for safe design of gravity dams, typical cross sections of earth dams, Stability analysis, Seepage control, and design of filters.

UNIT 5: Spillways and energy dissipation systems - Essential requirements of spillways, Required spillway capacity, component parts of spillway, Types of spillways, Design of Ogee spillway, Design of shaft spillway, Design of siphon spillway, Design of stilling basins. Hydropower structures - Storage power plant, Runoff River plant, Pumped storage plant, Water conveyance systems, Tunnels and Penstocks, Gates, Surge tanks, Power house layout.

Reading:

1. Golze, A. R., Handbook of Dam Engineering, Von Rostrand Reinhold Co., 1977
2. Sharma, H.D., Concrete Dams, CBIP Publication, 1998.
3. Siddiqui, I H, Dams and Reservoirs: Planning, Engineering, Oxford University Press, USA, 2009.
4. Novak, P., Moffat, A. I. B., Nalluri, C and Narayan, R., Hydraulic Structures, Taylor & Francis, 2006.
5. Modi P.M., Irrigation Water Resources and Hydropower Engineering, Standard Publishing Company, New Delhi, 2000.
6. Arora K.L. Irrigation Water Resources Engineering, Standard Book Publishing Co., Delhi, 1996.

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SYLLABUS							
Subject Code:	CE7TPE5X			CREDITS: 3		SESSIONAL - TA	
Subject: Professional Elective -5X	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10
Professional Elective-5A or Professional Elective-5B or Professional Elective-5C or Professional Elective-5D or Professional Elective-5E				Any one subject to be Selected from the Professional Electives Group-5 (i.e. CE7TPE5A or CE7TPE5B or CE7TPE5C or CE7TPE5D or CE7TPE5E)			
Professional Electives Group -5							
CE7TPE5A	Industrial Structures						
CE7TPE5B	Systems Analysis in Civil Engineering						
CE7TPE5C	Railway Engineering						
CE7TPE5D	Pavement Construction and Maintenance						
CE7TPE5E	Planning & Design of Building Services						

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Subject Code:		SYLLABUS						
CE7TPE5A		CREDITS:			SESSIONAL - TA			ESE
Subject:		L	T	P	CT	MSE	TA	
Industrial Structures		3	-	-	10	20	10	40
								60

UNIT 1:
Detailed Design of Steel Gantry Girders.
Detailed Design of Portal Frames-Single bay two storeys.

UNIT 2:
Detailed Design of Gable Structures.
Detailed Design of Knee Brace.

UNIT 3:
Detailed Design of Light weight metal structures.
Design of connections-Shear and Flexure Design.

UNIT 4:
Detailed Design of Steel Bunkers.
Detailed Design of Silos.

UNIT 5:
Detailed Design of Self Supported Chimneys.

Reading:

1. Design of Steel Structures, Arya and Azmani, Nem Chand Brothers, Roorkee, 2004
2. Punmia B.C, Ashok Kr. Jain, Arun Kr. Jain, RCC Designs (Reinforced Concrete Design), 10th Edition, Lakshmi Publishers, 2006.
3. Ramachandra, Design of Steel Structures, 12th Edition, Standard Publishers, 2009.

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Subject Code:		SYLLABUS							
CE7TPE5B		CREDITS:			SESSIONAL - TA			ESE	
Subject: Systems Analysis in Civil Engineering		L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: Concept of systems approach: system, boundaries of system, goals and objectives, optimality, mathematical models, objective function and constraints, problem solving mechanism, types of problems, modelling / problem formulation, sub-optimization, solution techniques, sensitivity analysis. Basic concepts of probability and probability distributions, regression and curve fitting.

UNIT 2: Decision theory: classification of decision situations, decision tables and decision tree, criteria for decision making under certain, uncertain and risk conditions. Index numbers: basic requirements of index numbers, constructing index numbers: using relatives, using aggregates.

UNIT 3: Linear programming: general nature of problem, graphical method of solution, simplex method, dual, sensitivity analysis.

UNIT 4: Distribution models: transportation and assignment problems and their solutions. Queuing models: various situations, queue discipline and customer behaviour, single server model.

UNIT 5: Simulation: general approach, Monte Carlo simulation, simple problems using hand calculations.

Text/Reference Books:

1. Benjamin J R & Cornell C A, "Probability, Statistics and Decisions for Civil Engineers", McGraw Hill
2. Jewell T K, " A Systems Approach to Civil Engineering Planning and Design", Harper & Row
3. Ossenbruggen P J, "Systems Analysis for Civil Engineers".
4. Shrivastava, Shenoy and Sharma, "Quantitative Techniques for Managerial Decisions", Wiley Eastern.

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Subject Code:	CE7TPE5C	SYLLABUS						ESE
		CREDITS:			SESSIONAL - TA			
Subject:	Railway Engineering	L	T	P	CT	MSE	TA	TOTAL
				3	-	-	10	20
								60

UNIT 1: Introduction to Railways in India: Role of Indian Railways in National Development – Railways for Urban Transportation
 Alignment of Railway Lines: Engineering Surveys for Track Alignment. –LRT & MRTS.
 Permanent Way: Components and their Functions

UNIT 2: Rails - Types of Rails, Length of rail, Weight of Rail, Rail Joints, Creep of rail, Buckling of rail, Kinks of Rail Fastenings, Coning of Wheels & tilting of rails.
 Sleepers –Types, Functions, sleeper density
 Ballasts- Types, function, advantage & disadvantage of each type.

UNIT 3: Geometric Design of Railway Tracks: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal Curves.

UNIT 4: Points and Crossings, Turnouts: Working Principles, Cross overs.

UNIT 5: Signalling: Types and their function.
 Station and Yards: Types, Requirements, factors for site selection.

Reading:

1. Chandra S. and M.M. Agarwal, Railway Engineering, Oxford University Press, New Delhi, India, 2007.
2. Saxena, S.C. and S.P. Arora, Railway Engineering, Dhanpat Rai and Sons, New Delhi, India, 1997.
3. Agarwal, M.M., Indian Railway Track, Prabha and Co., New Delhi, India, 1988.
4. Rangwala, S.C., Principles of Railway Engineering, Charotar Publishing House, Anand, India, 1988.
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Subject Code:	CE7TPE5D	SYLLABUS						ESE
		CREDITS:			SESSIONAL - TA			
Subject:	Pavement Construction and Maintenance	L	T	P	CT	MSE	TA	TOTAL
				3	-	-	10	20
								60

UNIT 1: Pavement Inventories And Evaluation - Factors affecting Pavement Deterioration, Functional Condition Evaluation Techniques: Roughness Measurements, serviceability concepts: Visual & Ride Deflection, Measurement and Analysis, structural Condition Evaluation Techniques: NDT Procedures, Rebound Factors, Overlay Design methods, IRC, Overlay Design methods, Remaining Life Concept, AI's Equivalency Pavement Safety: Skid Resistance, Factors, evaluation, Hydroplaning Reduction with Porous Overlays & Popcorn Friction overlay,

UNIT 2: Deterioration Modelling Concepts: Factors Influencing Structural & Functional Condition Deterioration, Examples of Initiation and Progressing Deterioration Models, Use of Deterioration Models by HDM Software.

UNIT 3: Pavement Construction - Construction of Subgrade layers, Sub-base and Base Courses, Bituminous Surface Courses, Cement Concrete Surface Courses, MORTH specifications, Quality control.

UNIT 4: Pavement Maintenance & Quality Control - Routine, Periodic Maintenance, Special Repairs, Responsive Maintenance Programmes, Rehabilitation and Reconstruction, Components of Pavement Maintenance Management System (PMMS), Stages in Implementing PMMS.

UNIT 5: Total Quality Management (TQM): Quality Assurance/Quality Control Concepts, Sampling, Tolerances and Controls Related to Profile & Compaction, Role of ISO 9000 in TQM.

Reading:

1. RCC Haas, W. Ronald Hudson, et al, Modern Pavement Management, Krieger Publishing Company.
2. ISTE Summer School Report on PMSS by Bangalore University. ISTE, New Delhi.
3. Mohammed Y. Shahin, Pavement Management for Airports, Roads & Parking Lots, Chapman & Hall Publishers.
4. Instructor's Guide-Asphalt Institute, Asphalt Technology and Construction Practices, Educational series.
5. A.F. Stocks, Concrete Pavements, Elsevier Applied Science Publishers, New York.
6. Harold N. Atkins, Highway Materials, Soils & Concrete 3rd Edition, Prentice Hall.
7. MORTH, Govt. of India, Specifications for Roads & Bridge Works, New Delhi.
8. Peurifoy, R.L., and Clifford, JS "Construction Planning Equipment and Method"- McGraw Hill Book Co. Inc.
9. Sharma S.C., "Construction Equipment and its Management"- Khanna Publishers.
10. Freddy L Roberts, Prithvi S Kandhal et al, "Hot Mix Asphalt Materials, mixture design and construction"- (2nd Edition), NAPAR and Education Foundation, Maryland, USA.

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Subject Code: CE7TPE5E		SYLLABUS						
Subject: Planning & Design of Building Services	CREDITS: 3			SESSIONAL - TA				ESE
	L	T	P	CT	MSE	TA	TOTAL	
	3	-	-	10	20	10	40	60

UNIT 1: Integrated design: factors affecting selection of services/systems. Provision of space in the building to accommodate building services. Structural integrity of building services equipment.

UNIT 2: Sound and vibration attenuation features. Provisions for safe operation and maintenance. Building services engineering system for intelligent buildings: introduction to information transmission systems, communication and protection system, call systems, public address system and Building automation/management systems.

UNIT 3: The concepts and importance of energy conservation and energy efficiency for environmental protection, environmental protection and maintenance of building services systems, selection of environmentally friendly products and materials used in building services systems.

UNIT 4: Co-ordination and management of design and installation of various building services systems during the design and construction stages in particular the builder's works. Computer-aided design and installations of building services. Testing and commissioning of building services systems: fire safety systems, vertical transportation equipment ventilation systems, etc. Sick building syndrome.

UNIT 5: The impacts of life-cycle-cost on planning and implementation. An appreciation of capital and operating costs. Implication of low cost inefficient equipment, poor installation, inadequate access for maintenance.

TEXT BOOKS
 Stein B. Reynolds J.S. & McGuinness W.J. (1986) Mechanical and Electrical Equipment for Buildings, 7th Edition, Volume 1 & 2, John Wiley & Sons Chadderton D.V. (1991) Building Services Engineering, E. & F.N. Spon Hassan G. (1996) Building Services, Macmillan Greeno R. (1996) Building Services and Design, Longman

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(SEMESTER-VII)							
CE7TOE2X	CREDITS: 3			SESSIONAL - TA			
Open Elective -2X	L	T	P	CT	MSE	TA	TOTAL
	3	-	-	10	20	10	40
Open Elective-2A or Open Elective-2B or Open Elective-2C or Open Elective-2D	Any one subject to be Selected from the Open Electives Group 2 (i.e. CE6TOE2A or CE6TOE2B or CE6TOE2C or CE6TOE2D)						
Open Electives Group 2							
CE7TOE2A	Value Engineering						
CE7TOE2B	Supply Chain Management-Planning						
CE7TOE2C	Travel Demand Analysis						
CE7TOE2D	Quality Control Assurance and Safety in Construction						

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		SYLLABUS							
Subject Code:	CE7TOE2A	CREDITS:			SESSIONAL - TA				
Subject:	Value Engineering	L	T	P	CT	MSE	TA	TOTAL	ESE
		3	-	-	10	20	10	40	

UNIT-1: Basic Concepts: Meaning of the term value, basic kind, reasons for poor value, value addition, origin and history. Benefits, relevance in Indian scenario.

UNIT-2: Techniques: Different techniques, organizing value engineering study, value engineering and quality.

UNIT-3: Job Plan: Different phases, General phase, Information phase, Functional Phase, Creation Phase, Evaluation Phase, Investigation Phase, Implementation Phase, Audit.

UNIT-4: Selection of evaluation of VE Projects: Project selection, method selection, value standard, application of methodology.

UNIT-5: Value Engineering Program: VE operations in maintenance and repair activities, VE Cost, life cycle, cost model, training for VE, general value engineering, case studies.

TEXT BOOKS
 Value Engineering – S.S. Iyer – New Age International Publishers, New Delhi
 Industrial Engineering & Management – O.P. Khanna – Dhanpat Rai & Sons

REFERENCES
 Techniques of Value Analysis and Engineering – L.D. Miles – McGraw Hill, New York
 Value Engineering, A Systematic Approach – A.E. Mudge – McGraw Hill, New York
 Compendium on Value Engineering – H.G. Tufty – Indo American Society

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Subject Code:	CE7TOE2B	SYLLABUS						
		CREDITS:			SESSIONAL - TA			
Subject:	Supply Chain Management-Planning	L	T	P	CT	MSE	TA	TOTAL
				3	-	-	10	20
								60

UNIT 1: Introduction to Supply Chain- Supply chain systems, stages and decision phases and Process view of supply chain; supply chain flows; examples of supply chains; competitive supply chain strategies; drivers for supply chain performance.

UNIT 2: Designing the Supply Chain Network- Distribution Networking – role, design; Supply Chain Network – SCN- Role, factors; framework for design decisions.

UNIT 3: Facility Location and Network Design- Models for facility location and capacity location; Impact of uncertainty on SCN – discounted cash flow analysis; evaluating network design decisions using decision trees; analytical problems.

UNIT 4: Planning and Managing Inventories in a Supply Chain- Inventory concepts, trade promotions; managing multi-echelon cycle inventory, safety inventory determination; impact of supply uncertainty aggregation and replenishment.

UNIT 5: Sourcing, Transportation and Pricing Products-Role of sourcing, supplier- scoring and assessment, selection and contracts, design collaboration; role of transportation, models of transportation and designing transportation network; revenue management.

Text Books:

1. Sunil Chopra and Peter M, Supply Chain Management, Pearson publishing, 2001
2. Blanchard D., Supply chain management: Best practices. New Jersey: John Wiley & Sons. 2007

Reference Books:

1. Hugos, M., Essentials of supply chain management. (2nd ed.). New Jersey: John Wiley & Sons, 2006
2. Kim, B., Supply chain management in the mastering business in As

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		SYLLABUS							
Subject Code:	CE7TOE2C	CREDITS:			SESSIONAL - TA			ESE	
Subject:	Travel Demand Analysis	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: Transportation Issues - Population, Urbanization and Migration, Findings of Commission on Urbanization Introduction to Urban Transportation Urban Issues, Travel Characteristics, Concept of Region, Issues Related to Regional Transportation Planning, Methods of Delineation Regions.

UNIT 2: Travel Demand - Trends, Overall Planning process, Long term Vs. Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques. Data Collection And Inventories - Collection of data - Organisation of surveys and Analysis, Study Area, Zoning, Screen Lines, Types and Sources of Data - Road Side Interviews - Home Interview Surveys - Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors - Accuracy Checks, Use of Secondary Sources, Economic data - Income - Population - Employment - Vehicle Owner Ship. Four Stage Demand Forecasting - UTPS Approach.

UNIT 3: Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates. Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT 4: Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Models and Probabilistic Approaches. Traffic Assignment: Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment, Diversion Curves.

UNIT 5: Regional Travel Demand Estimation - Factors Affecting Goods and Passenger Flows, Use of Mathematical Models to Estimate Freight and Passenger Demand, Abstract Mode Models, Mode Specific Models, Direct Demand Models, IVF Models, IO Model.

Reading:

1. Jotin Khisty C, Transportation Engineering - An Introduction, Prentice Hall, Englewood Cliffs, New Jersey, 2004.
2. Kadiyali L.R., Traffic Engineering and Transportation Planning, Khanna Publication, N.D, 2011.
3. Papakostas. C.S., Fundamentals of Transportation Engineering, PHI Pvt. Ltd., New Delhi, 2003.
4. Subhash C. Saxena, A Course in Traffic Planning and Design, Dhanpat Rai and Sons, New Delhi, 1989.

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SYLLABUS									
Subject Code:	CE7TOE2D	CREDITS:			SESSIONAL - TA			ESE	
Subject:	Quality Control Assurance and Safety in Construction	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: Construction Projects: Agencies involved in Construction Projects, mutual relationship, quality control at site; and whose job is it.

UNIT 2: ISO / IS Requirements: IS 9000 (Parts 1 to 4) (Pt 1; 1994, Pt 2; 1993, Pt 3; 1991, Pt 4; 1993) for Total Quality Management. ISO 14000 – 1988 for environment – Impact of large construction projects.

UNIT 3: Quality Control on Construction Projects: Inspection of reinforced concrete, masonry and steel works, testing techniques and quality at reports.

UNIT 4: Statistical Analysis: Sampling frequencies, statistical and reliability analysis, optimum sample size.

UNIT5: Quality Assurance: Quality Assurance in construction.

Name of Text Books:
 ISO 9000 in Construction – Nee, Paul A. (Wiley Inter science Publication, 1994)
 IS: 14000, – Quality System – Guidelines for Selection and Use of Standards on Quality System 1988.

NAME OF REFERENCE BOOKS:
 ISO 9000 in Construction – Wah, L.S., Min., L.C. & Ann, T.W. (McGraw Hill Book Company, 199
 Construction Engineering and Management – S. Seetaraman (Umesh Publication)

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SYLLABUS	(SEMESTER-VII)					
Subject Code:	CE7LPS01	CREDITS: 2			SESSIONAL - TA	ESE
Subject:	Seminar	L	T	P	IA	
		-	-	3	50	-

SYLLABUS	(SEMESTER-VII)					
Subject Code:	CE7LPS02	CREDITS: 4			SESSIONAL - TA	ESE
Subject:	Minor project	L	T	P	IA	
		-	-	8	60	40

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SYLLABUS		(SEMESTER-VIII)							
Subject Code:	CE8TPC18	CREDITS: 4			SESSIONAL - TA				ESE
Subject:	Earthquake Resistant Design of Structures	L	T	P	CT	MSE	TA	TOTAL	ESE
		3	1	-	10	20	10	40	60

UNIT-I: Elements of structural dynamics, Sources of vibrations; Types of vibrations; Degrees of freedom; Spring action and damping; Free vibration of undamped system having single degree of freedom; Free vibration of viscous damped system having single degree of freedom; Forced vibration of a viscous damped single degree freedom system subjected to harmonic excitation;

UNIT-II: Elements of Earth Quake Ground motion, Earthquake size- Intensity and magnitude; Seismic Zoning-Introduction; Analysis of single storey and single bay RCC Plane Frame (Columns vertical): (As per IS:1893(part-I)). Calculation of lateral force due to earthquake using equivalent static method; Analysis for different load combinations.

UNIT III: Design forces and moments in beam and columns (As per IS:456 and IS13920). Design of column; Design of beam.

UNIT-IV: Ductility factor, Ductility of singly reinforced rectangular beam, Detailing of beam, column, beam-column junction as per relevant IS codes (IS13920). Introduction and basic principle of design of shear wall.

UNIT-V: Masonry Structures :House types and damages, cause and location of damage, Making houses earthquake resistant, Earthquake resistant features, summary of earthquake resistant features, improving housing designs.

TEXT BOOKS:

Elements of Earthquake Engineering by Jai Krishna, A.R.Chandrasekaran and Brijesh Chandra, Second Edition(1994), South Asian Publishers, New Delhi.
 Geotechnical Engineering - S.K.Gulati & Manoj Datta, Tata McGraw-Hill Publishing Company Ltd.
 Earthquake Resistant Design of Structures by Pankaj Agarwal, Manish Shrikhande , First edition(2006), Prentice Hall of India Private Ltd., New Delhi .
 Earthquakes and Buildings - A.S.Arya, A.Revi, Pawan Jain
 CODES: IS:1893(part-I), IS13920, IS:456-2000, SP34

REFERENCE BOOK

Dynamics of Structures by A.K.Chopra, Second edition (2001), Prentice Hall India Private Ltd

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SYLLABUS		(SEMESTER-VIII)							
Subject Code:	CE8TPE6X	CREDITS: 3			SESSIONAL - TA				ESE
Subject:	Professional Elective - 6X	L	T	P	CT	MSE	TA	TOTAL	ESE
		3	-	-	10	20	10	40	60
Professional Elective-6A or Professional Elective-6B or Professional Elective-6C or Professional Elective-6D or Professional Elective-6E		Any one subject to be Selected from the Professional Electives Group-6 (i.e. CE8TPE6A or CE8TPE6B or CE8TPE6C or CE8TPE6D or CE8TPE6E)							
Professional Electives Group -6									
CE8TPE6A		Machine Foundation							
CE8TPE6B		Earthquake Geotechnical Engineering							
CE8TPE6C		Bridge Engineering							
CE8TPE6D		Solid and Hazardous Waste Management							
CE8TPE6E		Construction Equipment & Techniques							

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SYLLABUS		(SEMESTER-VIII)						ESE	
Subject Code:	CE8TPE6A	CREDITS: 3			SESSIONAL - TA				
Subject:	Machine Foundation	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: General Principles of Machine Foundation Design: Introduction, Types of Machines and Foundations, General requirements, Permissible Amplitude, Allowable soil pressure, Permissible stress of concrete and steel, Permissible stresses of Timber.

UNIT 2: Foundations of Reciprocating Machines: Modes of vibration of a rigid foundation block, methods of analysis, linear elastic weightless spring methods, elastic half space method, effect of footing shape on vibratory response, dynamic response of embedded block foundations, soil mass participating in vibrations, design procedure for a block foundation.

UNIT 3: Foundations of impact machines: Introduction, Dynamic analysis; single degree freedom system, Multi degree freedom system, determination of initial velocity of hammer, stress in the pad, stresses in the soil, Design procedure for a hammer foundation.

UNIT 4: Foundations of Rotary Machines: Introduction, special considerations, design criteria, loads on a turbo generator foundation, methods of analysis and design, resonance method, amplitude method, combined method, three dimensional analysis.

UNIT 5: Vibration isolation and screening: Introduction, force isolation, motion isolation, screening of vibrations by use of open trenches, passive screening by use of pile barriers, problems.

Reading:

1. "Handbook of Machine Foundations" Srinivasulu, P. And Vaidyanathan, C. V., Tata McGraw-Hill, New Delhi, 2001
2. "Foundations for Machines, Analysis and Design" Prakash Shamsher and Puri Vijay K, John Wiley and Sons, USA, 1988.

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SYLLABUS		(SEMESTER-VIII)						
Subject Code:	CE8TPE6B	CREDITS: 3			SESSIONAL - TA			ESE
Subject:	Earthquake Geotechnical Engineering	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT 1: Seismology and earthquakes: Basic earthquake principles: Introduction – Internal structure of earth – Plate tectonics faults – seismic waves – Seismograph – Classification of earthquakes – Magnitude and intensity of earthquakes – Seismic zones in India. Common Earthquake effects: Surface rupture – Regional subsidence – liquefaction – slope movement – Tsunami and seiche. Earthquake structural Damage: Earthquake induced settlement – Resonance of structures.

UNIT 2: Soil dynamics: Dynamics of discrete system – Soil structure interaction – Vibratory system – free and forced vibration without and with damping – Base shaking – Dynamic soil properties – Geotechnical earthquake engineering analysis: Site investigation: Scope of investigation – quantitative evaluation – subsurface investigation – laboratory testing – peak ground acceleration – report preparation – problems.

UNIT 3: Liquefaction: Introduction – mechanism – laboratory liquefaction studies – factors that govern Liquefaction in the field – Liquefaction analysis – cyclic stress ratio from the SPT, DCPT and shear wave velocity- FS against liquefaction – Anti Liquefaction measures – problems. Earth quake induced settlement: Introduction – settlement VS factor of safety against Liquefaction induced ground damage – volumetric compression – settlement due to dynamic loads caused by rocking – problems.

UNIT 4: Bearing capacity analysis for earthquakes: Introduction – one third increases in bearing capacity pressure for seismic condition – Bearing capacity analysis for liquefied soil – granular soil with earthquake induced pore water – Bearing capacity analysis for cohesive soil weakened by the earthquake – problems.

Slope stability analysis for earthquake: Introduction – inertia slope stability: pseudo static method, new mark method – weakening slope stability: flow slides, liquefaction induced lateral spreading, strain softening soil – restrained retaining walls and temporary retaining walls – problems.

UNIT 5: Other geotechnical earthquake engineering analysis: Introduction – pavement design – pipe line design – problems.

Site improvement methods to mitigate earthquake effects: Soil improvement Methods: Introduction – Grading, soil replacement, water removal, site strengthening, grouting, thermal, and ground water control methods.

Foundation analysis: Introduction – shallow and deep foundations.

Reading:

1. Kramer, S. L. (2003): "Geotechnical Earthquake Engineering", Pearson Education.
2. Day, R. W. (2003): "Geotechnical Earthquake Engineering handbook", McGraw Hill.
3. Kamalesh Kumar, (2008): "Basic Geotechnical Earthquake Engineering", New Age.
4. IS-1893(part-1) 2002, "Criteria for Earthquake resistant design of structures" part 1- general provision of buildings.

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SYLLABUS		(SEMESTER-VIII)						
Subject Code:	CEBTPEGC	CREDITS:			SESSIONAL - TA			ESE
Subject:	Bridge Engineering	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
								60

UNIT-I: Brief historical review, Different types of Bridges and span range, Bridge codes, Importance of hydrologic factors in bridge design, Hydraulic geometry, linear water ways, economic span, afflux and scour.

UNIT-II: Design of Reinforced concrete deck slab bridges.

UNIT-III: Design of Reinforced Concrete Tee beam bridges.

UNIT-IV: Design of Box culverts.

UNIT-V: Design of Piers and Abutments.

Text Books:

- 1) Xanthakos, P. P. (1993) Reinforced Concrete Bridges, in Theory and Design of Bridges, John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/9780470172889.ch3
- 2) Design of Bridge Structures by M A Jayaram, Prentice-Hall Of India Pvt. Limited, 01-Aug-2004 - Bridges - 292 pages
- 3) Design of Bridges by N. Krishna raju , Oxford and IBH Publishing, ISBN 8120417410, 9788120417410
- 4) Essentials Of Bridge Engineering, G/E, Viktor , Oxford and IBH Publishing, 2007, ISBN 8120417178, 9788120417175

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SYLLABUS		(SEMESTER-VIII)							
Subject Code:	CE8TPE6D	CREDITS:			SESSIONAL - TA			ESE	
Subject:	Solid and Hazardous Waste Management	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT-1: Municipal Solid Waste Management: Legal and Organizational foundation: Definition of solid waste – waste generation technological society – major legislation, monitoring responsibilities, sources and types of solid waste – sampling and characterization – Determination of composition of MSW – storage and handling of solid waste – Future changes in waste composition.

UNIT-2: Collection and Transport of Solid Waste: Collection of Solid Waste: Type of waste collection systems, analysis of collection system –alternative techniques for collection system. Separation and Processing and Transformation of Solid Waste: UNIT operations user for separation and processing, Materials Recovery facilities, Waste transformation through combustion and aerobic composting, anaerobic methods for materials recovery and treatment – Energy recovery – Incinerators Transfer and Transport: Need fir transfer operation, transport means and methods, transfer station types and design requirements. Landfills: Site selection, design and operation, drainage and leachate collection systems – requirements and technical solution, designated waste landfill remediation – Integrated waste management facilities.

UNIT-3: Hazardous Waste Management: Definition and identification of hazardous wastes-sources and characteristics – hazardous wastes in Municipal Waste – Hazardous wastes regulations – minimization of Hazardous Waste-compatibility, handling and storage of hazardous waste-collection and transport, e-waste sources, collection, treatment and reuse management.

UNIT-4: Hazardous waste treatment and Design: Hazardous waste treatment technologies - Design and operation of facilities for physical, chemical and thermal treatment of hazardous waste – Solidification, chemical fixation and encapsulation, incineration. Hazardous waste landfills: Site selection, design and operation – remediation of hazardous waste disposal sites.

UNIT-5: Laboratory Practice: Sampling and characterization of Solid Wastes; TCLP tests and leachate studies.

REFERENCES:

George Tchobanoglous et al, "Integrated Solid Waste Management", McGraw-Hill Publication, 1993.
 Charles A. Wentz; ""Hazardous Waste Management", McGraw Hill Publication, 1995.

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SYLLABUS		(SEMESTER-VIII)							
Subject Code:	CEBTPE6E	CREDITS:			SESSIONAL - TA			ESE	
Subject:	Construction Equipment and Techniques	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: Large and heavy engineering projects- characteristics and complexities, methods statement for major activities like excavation, concreting, steel fabrication and erection for projects like earthen dams, hydropower projects, nuclear power plant, refineries and other industrial projects,

Excavation for heavy engineering projects- Excavation in various types of soils, selection of equipment, safety measures in excavation, drainage in excavation.

UNIT 2: Concrete construction for heavy engineering projects-Selection of equipment for batching, mixing, transporting, placing and compacting for various types of jobs, safety measures during concreting, Special concretes and mortars-preplaced aggregate concrete, roller compacted concrete, Prefabricated construction- Planning for pre-casting, selection of equipment for fabrication, grouting transport and erection, quality measures, safety measures during erection.

UNIT 3: Steel construction-Planning for field operations, selection of equipment and erection tools, tools and methods of welding, tools and methods of cutting and joining, bridge erection, quality measures, safety measures during fabrication and erection.

UNIT 4: Specific issues related to planning, site layouts, equipment selection and pre-project activities for large size construction projects like earthen dams, concrete dams, thermal power stations, nuclear power stations, light houses, airports and ports, bridges. Information related to special equipments and their applications to off-shore construction, underground utility construction.

UNIT 5: New materials and equipment for construction; Case studies of heavy construction projects.

Text/Reference Books:

1. Thomas baron, Erection of steel structures
2. Stubbs, handbook of heavy construction
3. Journals of Civil Engineering and Construction Engineering

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SYLLABUS	(SEMESTER-VIII)							
Subject Code:	CE8TPE7X	CREDITS:4			SESSIONAL - TA			ESE
Subject:	Professional Elective - 7X	L	T	P	CT	MSE	TA	TOTAL
		3	1	-	10	20	10	40
	Professional Elective-7A or Professional Elective-7B or Professional Elective-7C or Professional Elective-7D or Professional Elective-7E	Any one subject to be Selected from the Professional Electives Group-7 (i.e. CE8TPE7A or CE8TPE7B or CE8TPE7C or CE8TPE7D or CE8TPE7E)						
Professional Electives Group -7								
	CE8TPE7A	Air and Water Transportation						
	CE8TPE7B	Theory of Plates & Shells						
	CE8TPE7C	Repair and Rehabilitation of Structures						
	CE8TPE7D	Finite Element Analysis						
	CE8TPE7E	Hydropower Engineering						

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SYLLABUS		(SEMESTER-VIII)						
Subject Code:	CE8TP07A	CREDITS: 4			SESSIONAL - TA			ESE
Subject:	Air and water transportation	L	T	P	CT	MSE	TA	
		3	1	-	10	20	10	TOTAL
								40
								60

UNIT 1: Air Transportation: Aircraft Characteristics - Landing gear configurations, aircraft weight, engine types, Aircraft performance characteristics: speed, payload and range, runway performance, declared distances, wingtip vortices.

UNIT 2: Geometric Design of the Airfield - Airport classification, Runways, wind rose, estimating runway length, sight distance and longitudinal profile, transverse gradient, Taxiways and taxi lanes: design of taxiway curves and intersections, end-around taxiways, Aprons: holding aprons, terminal aprons and ramps, surface gradients, Control tower visibility requirements.

UNIT 3: Structural Design of Airport Pavements - Soil investigation and evaluation, FAA pavement design methods. Airport Lighting, Marking, and Signage. Terminal Area - Passenger terminal system and its components, Apron gate system: number of gates, gate size, aircraft parking type, apron layout, apron circulation, passenger conveyance to aircraft.

UNIT 4: Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification, ship characteristics, Harbour works: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals.

UNIT 5: Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lock gates: materials, size, Dredging: classification, dredgers, uses of dredged materials, Coastal erosion and protection: seal wall, revetment, and bulkhead.

Reading:

1. Ashford, N. J., Mumayiz, S. A., and Wright, P. H. Airport Engineering: Planning, Design and Development of 21st Century Airports, Fourth Edition, John Wiley & Sons, New Jersey, USA, 2011.
2. Horonjeff, R., McKelvey, F. X., Sproule, W. J., and Young, S. B. Planning and Design of Airports, Fifth Edition, McGraw-Hill, New York, USA, 2010.
3. Kazda, A., and Caves, R. E. Airport Design and Operation, Second Edition, Elsevier, Oxford, U.K., 2007. ,
4. Khanna, S. K., Arora, M. G., and Jain, S. S. Airport planning and Design, Sixth Edition, Nem Chand and Bros, Roorkee, India, 2012. ,
5. Kumar, V., and Chandra, S. Air Transportation Planning and Design, Galgotia Publications Pvt. Ltd., New Delhi, India, 1999. ,
6. Neufville, R. D., and Odoni, A. Airport Systems: Planning, Design, and Management, McGraw-Hill, New York, USA, 2003. ,
7. Young, S. B., and Wells, A. T. Airport Planning and Management, Sixth Edition, McGraw-Hill, New York, USA, 2011. ,
8. Bindra, S.P. A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, India, 1992. ,
9. Seetharaman, S. Dock and Harbour Engineering, Umesh Publications, New Delhi, India, 1999. ,
10. Srinivasan, R. Harbour, Dock and Tunnel Engineering, Charotar Publishing House, Anand, India, 1987.

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SYLLABUS		(SEMESTER-VIII)						
Subject Code:	CE8TPE7B	CREDITS: 4			SESSIONAL - TA			ESE
Subject:	Theory of Plates & Shells	L	T	P	CT	MSE	TA	TOTAL
		3	1	-	10	20	10	40
								60

UNIT-1: Simple bending of Plates-Assumptions in thin plate theory-Different relationships- Different, Boundary Conditions for plates- Plates subjected to lateral loads - Navier's method for simply supported plates - Levy's method for general plates - Example problems with different types of loading.

UNIT-2: Circular plates subjected to Axi-symmetrical loads-concentrated load, uniformly distributed load and varying load - Annular circular plate with end moments.

UNIT-3: Rayleigh-Ritz method - Application to different problems - Finite difference method - Finite element methodology for plates-Orthotropic Plates

UNIT-4: Bending of anisotropic plates with emphasis on orthotropic plates - Material Orthotropy - Structural Orthotropy - Plates on elastic foundation.

UNIT-5: Shells- Classification of shells - Membrane and bending theory for singly curved and doubly curved shells - Various approximations - Analysis of folded plates

REFERENCES:

Rudolph Szilard, Theory and Analysis of Plates, Prentice Hall, New Jercey 1986.

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SYLLABUS		(SEMESTER-VIII)							
Subject Code:	CE8TPE7C	CREDITS:			SESSIONAL - TA			ESE	
Subject:	Repair and Rehabilitation of Structures	L	T	P	CT	MSE	TA		TOTAL
		3	1	-	10	20	10	40	
									60

UNIT 1: Aging of structures - performance of structures - need for rehabilitation. Distress in concrete / steel structures - damage - source - cause - effects - case studies.

UNIT 2: Damage assessment and Evaluation models - Damage testing methods - NDT - Core samples.

UNIT 3: Rehabilitation methods - grouting - detailing - imbalance of structural stability - case studies.

UNIT 4: Methods of repairs - shotcreting - guniting - epoxy - cement mortar injection - crack ceiling.

UNIT 5: Repair and maintenance of buildings - IS standards - Bridge repairs - Seismic strengthening.

Reading:

1. Diagnosis and treatment of Structures in Distress - R N Raikar.
2. Bridge Rehabilitation - V K Raina.
3. Building Failures - Diagnosis and Avoidance - W H Ranson.
4. Forensic Engineering - Kenneth and Carper.

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SYLLABUS		(SEMESTER-VIII)							ESE
Subject Code:	CE8TPE7D	CREDITS:			SESSIONAL - TA				
Subject:	Finite Element Analysis	L	T	P	CT	MSE	TA	TOTAL	
		3	1	-	10	20	10	40	60

UNIT 1: Matrix Methods of Structural Analysis – Review of concepts – Actions and displacements – compatibility – indeterminacy – Member and joint loads – Flexibility Matrix formulation - Stiffness Matrix formulation.

UNIT 2: Introduction to Finite Element Method – Background and general description of the method of the analysis procedure.

UNIT 3: Theory of Finite element method – Concept of element – various elements shapes – displacement models – shape functions – isoparametric elements – formulation of element stiffness and loads – condensation of internal degrees of freedom.

UNIT 4: Overall problem – Assemblage of elements construction of stiffness matrix and loads – boundary conditions and solution of overall problem – Application to continuous beam – spring assemblage – stability of columns – curved beams and vibration problems - torsions of shafts.

UNIT 5: Generalization of FEM – Six step finite element procedures in general terms – application to structural engineering problems – analysis of plates, shells and frames.

Reading:

1. Finite element analysis, theory and Programming by CS Krishna Murthy.
2. Introduction to Finite element Method by Tirupathi chandra Patla and Belugundu.
3. Textbook of Finite Element Analysis, 1st Edition, PHI, 2009.

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SYLLABUS		(SEMESTER-VIII)							
Subject Code:	CE8TPE7E	CREDITS:				SESSIONAL - TA			ESE
Subject:	Hydropower Engineering	L	T	P	CT	MSE	TA	TOTAL	
		3	1	-	10	20	10	40	60

UNIT 1: Stream flow analysis, Hydrograph, Mass curve, Runoff estimation methods, estimation of hydropower potential, flow duration curves, power duration curves, pondage and storage. Electrical load on hydro turbines, load curves, load duration curves, Performance factors.

UNIT 2: Types of hydropower plants, Storage power plant, Runoff River plant, Pumped storage plant, two unit and three unit arrangements, Reversible pump turbines, types of turbines, hydraulics of turbines, cavitation in turbine, efficiency of pumped storage plants.

UNIT 3: Intakes, losses in intakes, air entrainment at intake, inlet aeration, Water conveyance systems, fore bay, canals,

UNIT 4: Tunnels and Penstocks, classification of penstocks, design criteria of penstock, economical diameter of penstock, Anchor blocks, Conduit valves, types of valves, bends and manifolds.

UNIT 5 : Water hammer, resonance in penstocks, channel surges, Gates, Surge tanks, Power house layout, lighting and ventilation, variations in design of power house, underground power house, structural design of power house.

Reading:

1. Arora, K.R., Irrigation Water Power and Water Resources Engineering, Standard Book Company, Delhi, 2002
2. Dandekar, M.M., and Sharma, K.N., Water Power Engineering, Vikas Publishing Company, New Delhi, 2003
3. Garg, S.K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 2009
4. Jog, M.G., Hydroelectric and Pumped Storage Plants, Wiley Eastern Ltd., New York, 1989.

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SYLLABUS		(SEMESTER-VIII)						
Subject Code:	CE8TOE3X	CREDITS: 3			SESSIONAL - TA			
Subject:	Open Elective -3X	L	T	P	CT	MSE	TA	TOTAL
		3	-	-	10	20	10	40
Open Elective-3A or Open Elective-3B or Open Elective-3C or Open Elective-3D		Any one subject to be Selected from the Open Electives Group 3 (i.e. CE8TOE3A or CE8TOE3B or CE8TOE3C or CE8TOE3D)						
Open Electives Group 3								
CE8TOE3A		Management Information System						
CE8TOE3B		Enterprise Resource Planning						
CE8TOE3C		Engineering Risk-Benefit Analysis						
CE8TOE3D		Fluid Dynamics						

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SYLLABUS									
Subject Code:	CE8TOE3A		(SEMESTER-VIII)						
Subject:	Management Information System		CREDITS: 3			SESSIONAL - TA			ESE
	L	T	P	CT	MSE	TA	TOTAL		
	3	-	-	10	20	10	40		60

UNIT 1: Management and System- Advance in management, the process of MIS development, MIAS organization, Information dynamics.

UNIT 2: Planning, Design and implementation of MIS, Strategic planning, MIS design- Group design concepts, Acquiring information system.

UNIT 3: System life cycle-Information flow, Entity relationship modelling, data modelling, detailed process analysis, data flow diagrams.

UNIT 4: Decision making system with MIS, System concepts for MIS.

UNIT 5: Data information and communication, problem solving and decision making, security, control and failure, Future trends in MIS.

TEXT BOOKS:

Management Information Systems, by S. Sadagopan, PHI Learning Pvt. Ltd

Management Information Systems By . Chatterjee, PHI Learning Pvt. Ltd

Management Information Systems (11th Edition), by Ken Laudon and Jane Laudon

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SYLLABUS									
Subject Code:	CE8TOE3B	(SEMESTER-VIII)							
Subject:	Enterprise Resource Planning	CREDITS:			SESSIONAL - TA				ESE
		L	T	P	CT	MSE	TA	TOTAL	
		3	-	-	10	20	10	40	
								60	

UNIT-1: Conceptual foundation of Business Process reengineering; Role of Information Technology and BPR; Process improvement and Process redesign, Process identification and mapping; Role/Activity diagrams, Process Visioning, and benchmarking.

UNIT -2: Enterprise Resource Planning: Evolution of ERP- MRP and MRP II, structure of ERP- two tier architecture, three tier architecture, Electronic data processing, management information system, Executive information system, ERP as an integrator of information needs at various Levels.

UNIT -3: Typical Business Processes: Core processes, Product control, Sales order processing, Purchases, Administrative processes, Human resource, Finance support processes, Marketing, Strategic planning, Research and development, Problems in traditional view.

UNIT -4: ERP models/functionality: Sales order processing, Production scheduling, forecasting, distribution, finance, features of each of the models, description of data flow across each module, overview of supporting databases & packages.

UNIT -5: ERP implementation issues: Opportunities and problems in ERP selection, and implementation; ERP implementation: identifying ERP benefits, team formation, Consultant intervention, Selection of ERP, Process of ERP.

BOOKS:

V.K. GARG & N .K. VENKATKRISHNAN:, ERP, Concepts and Practices, PM
 Rahul V. Altekar, Enterprise wide Resource Planning-theory and practice, PHI

REFERENCES:

ALEXIS LEON: Enterprise Resource Planning, TMH S. SADAGOPAN: MIS,
 PMV. RAJARAMAN: Analysis and Design of Information Systems, PHIMONK' & BRADY: Concepts in ERP, Vikas pub, Thomson

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SYLLABUS		(SEMESTER-VIII)							
Subject Code:	CE8TOE3C	CREDITS:			SESSIONAL - TA			USE	
Subject:	Engineering Risk-Benefit Analysis	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT 1: Introduction- Knowledge and Ignorance, Information Uncertainty in Engineering Systems, Introduction and overview of class; definition of Engineering risk; overview of Engineering risk analysis. Risk Methods: Risk Terminology, Risk Assessment, Risk Management and Control, Risk Acceptance, Risk Communication, Identifying and structuring the Engineering risk problem; developing a deterministic or parametric model

UNIT 2: System Definition and Structure: System Definition Models, Hierarchical definitions of Systems, System Complexity. Reliability Assessment: Analytical Reliability Assessment, Empirical Reliability Analysis Using Life Data, Reliability Analysis of Systems

UNIT 3: Consequence Assessment-Types, Cause-Consequence Diagrams, Microeconomic Modelling, Value of Human Life, Flood Damages, and Consequence Propagation. Engineering Economics: Time Value of Money, Interest Models, Equivalence

UNIT 4: Decision Analysis: Risk Aversion, Risk Homeostasis, Influence Diagrams and Decision Trees, Discounting Procedures, Decision Criteria, Tradeoff Analysis, Repair and Maintenance Issues, Maintainability Analysis, Repair Analysis, Warranty Analysis, Insurance Models

UNIT 5: Data Needs for Risk Studies: Elicitation Methods of Expert Opinions, Guidance

Text Books:

1. Risk Analysis in Engineering and Economics, B. M. Ayyub, Chapman-Hall/CRC Press, 2003.

Reference Books:

1. Probability, Statistics, and Reliability for Engineers and Scientists, Ayyub & McCuen, 2003.

2. Probabilistic Risk Assessment and Management for Engineers and Scientists, by H. Kumamoto and E. J. Henley, Second Edition, IEEE Press, NY, 1996.

3. Bedford, T. and Cooke, R. Probabilistic Risk Analysis: Foundations and Methods. New York: Cambridge University Press, 2001.

4. Normal Accidents, Living with High-Risk Technologies, C. Perrow, Princeton University Press, 1999.

5. Accident Precursor Analysis and Management - Reducing Technological Risk Through Diligence, National Academy of Engineering, the National Academies Press, Washington, DC, 2004.

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SYLLABUS		(SEMESTER-VIII)							
Subject Code:	CE8TOE3D	CREDITS:			SESSIONAL - TA			ESE	
Subject:	Fluid Dynamics	L	T	P	CT	MSE	TA		TOTAL
		3	-	-	10	20	10	40	60

UNIT I: Introduction & overview of Fluid Dynamics, units and basic flow concepts. Continuum, velocity fields, viscosity, classifications of fluids. Fluid statics, hydrostatic forces on surfaces, rigid body motion, Pressure measurements.

UNIT II: Incompressible potential flow, Bernoulli's equation, Flow metering. Introduction to differential approach to flow analysis, Stream functions, Material Derivative, Reynolds Transport Theorem

UNIT III: Integral approach to flow analysis, control volume concepts, Conservation of mass, momentum and energy, applications. Differential approach to flow analysis, continuity, momentum and energy equations.

UNIT IV: Overview of dimensional analysis, basic equations in non-dimensional form. Introduction to viscous flow in conduits, Moody diagrams, Minor losses, analysis of piping networks, flow metering.

UNIT V: External incompressible viscous flow, boundary layers, Lift and drag forces. Introduction to compressible flow, speed of sound, isentropic stagnation properties, isentropic flows, normal shock waves,

Text Books:

Fundamental of Fluid Mechanics" by Munson, Young and Okiishi, 5th edition.

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SYLLABUS		(SEMESTER-VIII)					
Subject Code:	CE8LPS03	CREDITS: 8			SESSIONAL - TA		ESE
Subject:	Major Project	L	T	P	IA	TOTAL	
		-	-	15	120	120	80

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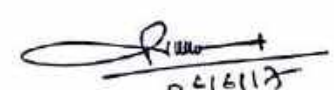

SYLLABUS	(SEMESTER-VIII)							
Subject Code:	CE8LPC07	CREDITS: 2			SESSIONAL - TA			ESE
Subject:	Structural Detailing Lab	L	T	P	CT	MSE	TA	TOTAL
		-	-	3	-	-	30	30

Part A: (Steel Structures)

1. Detailing of Tension Members.
2. Detailing of Built up Compression Members.
3. Detailing of Column Bases.
4. Detailing of connections.
5. Detailing of an Industrial shed.
6. Detailing of a Plate girder/Gantry girder.

Part B: (Reinforced Concrete Structures)

1. Details of reinforcement in RCC Continuous Beams.
2. Details of reinforcement for RCC column with isolated footings.
3. Details of reinforcement in a one way/two way slabs.
4. Details of reinforcement in stair cases.
5. Detailing of Combined footings.
6. Detailing of Retaining walls/Water Tanks.

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