CMR Institute of Technology, Bangalore		
Department(s): Civil Engineering		
Semester: 08	Section(s): A&B	
Advanced Concrete Technology	10CV81	Lectures/week: 04
Course Instructor(s): Karthik N M		
Course duration: 05 Feb., 2018 – 21 May 2018.		

Course Objectives

- Summarize the chemical compositions of cement and its influence on physical and chemical properties.
- Describe the effects of admixtures on fresh and hardened state properties of concrete.
- Design the concrete mix for the specific construction activity.
- Interpret the durability, strength of concrete
- Analyze the characteristic of special concrete.

Prerequisites

- Properties and characteristics of concrete.
- Applications and uses of different concrete types.

LESSON PLAN

Lecture #	Book & Sections	Topics	Portions coverage	
			Teaching Aids	% of Syllabus Covered
1-6	TB1,2: - 1.1, 2.1- 2.5	**UNIT – 1 INTRODUCTION:** 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.	Chalk and Talk	13
Links to some useful online lectures: ➢ https://www.youtube.com/watch?v=uPAE2ZcFdo4				
7-12	TB2,3: 3.1 - 3.2 4.4- 4.5	**UNIT-2 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, GCBS, and their effect on concrete property in fresh state and hardened state.	Chalk and Talk Video Lectures for some topics	12
Links to some useful online lectures: ➢ https://www.slideshare.net/prashanthkumar81/chemical-admixtures-for-concrete				

13-19	RB1/CB1,2	**UNIT 3- 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.	Chalk and Talk	10
Links to some useful online lectures: ➢ https://www.youtube.com/watch?v=lfrzN7OsTzU ➢ https://www.youtube.com/watch?v=I3u6IYWINV0				
20-26	TB2: 6.1 - 6.6	**UNIT 4- 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.	Chalk and Talk Video Lectures for some topics	13
Links to some useful online lectures: ➢ https://www.youtube.com/watch?v=2Q7-o0HZTOE				
27-32	TB3	**UNIT 5- RMC concrete -** manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix Self ompacting concrete concept, materials, tests, properties, Application and Typical mix.	Chalk and Talk Video Lectures for some topics	15
Links to some useful online lectures: ➢ https://www.slideshare.net/onkarkamble94/ppt-on-scc ➢ https://www.slideshare.net/varunkv222/high-volume-fly-ash-concrete				
33-39	TB2,5	**UNIT 6 - 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	Chalk and Talk Video Lectures for some topics	15
Links to some useful online lectures: ➢ https://www.slideshare.net/MiladNourizadeh/linked-in-frc?qid=ccba4d44-6520-4bcb-bc27-6e94d4da4578&v=&b=&from_search=3				
40-44	TB2,5	**UNIT 7 – Lightweight concrete-**materials properties and types. Typical light weight concrete mix High density concrete and high performance concrete-materials, properties and applications, typical mix**.**	Chalk and Talk Video Lectures for some topics	12
Links to some useful online lectures:				

- https://www.slideshare.net/AnilShastry/light-weight-concrete?qid=56a1f491-6adb-4383-a901-8ed1c1eaa2a2&v=&b=&from_search=1

44-48	TB4 RB2	**UNIT – 8 - Test on Hardened concrete**-Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods.	Chalk and Talk Video Lectures for some topics	10

Links to some useful online lectures:

- https://www.slideshare.net/abhiies1/non-destructive-test-on-concrete-ndt?qid=85f4d723-b7d4-4724-99ef-4acf6e732363&v=&b=&from_search=1
- https://www.slideshare.net/AsharGill1/hardened-concrete-testing?qid=15c9bcf4-17b7-45e4-a993-4e163b3a9fde&v=&b=&from_search=8

Text Books	
1.	Properties of Concrete- Neville, A.M. - ELBS Edition, Longman Ltd., London
2.	Concrete Technology- M.S. Shetty
3.	Concrete Technology- A.R. Santhakumar,-Oxford University Press.
4.	Non-Destructive Test and Evaluation of Materials- J.Prasad, C G K Nair,-Mc Graw Hill.
5.	High Performance Concrete- Prof Aitcin P C- E and FN, London.
Reference Books	
1.	Concrete Mix Design- N. Krishna Raju - Sehgal Publishers
2.	Concrete Manual- Gambhir M.L.- Dhanpat Rai & Sons, New Delhi
Code Books	
1.	ACI Code for Mix Design
2.	IS 10262-2004

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01 – 19
IAT-2	Class # 20– 39
IAT-3	Class # 40– 48

* : See calendar of events for the schedules of IATs.

Course Outcomes
By the end of this course, students will be able to
1. Summarize the chemical compositions of cement and its influence on physical and chemical properties.
2. Describe the effects of admixtures on fresh and hardened state properties of concrete.
3. Design the concrete mix for the specific construction activity.
4. Interpret the durability, strength of concrete
5. Analyze the characteristic of special concrete.

COGNITIVE LEVELS	
Cognitive level	**REVISED BLOOMS TAXONOMY KEYWORDS**
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.
L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports

	and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	Apply knowledge and skills to perform diverse tasks of construction industry
PSO2	Analyze, design and develop construction information details of simple structural elements and basic civil engineering systems
PSO3	Support diverse tasks of construction project management as construction engineer
PSO4	Pursue interests in specializations leading to bigger and diverse career opportunities

CORRELATION LEVELS	
0	No Correlation
1	Slight/Low
2	Moderate/ Medium
3	Substantial/ High

Course Outcomes		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	Summarize the chemical compositions of cement and its influence on physical and chemical properties.	2	-	-	-	-	1	1	-	-	1	-	1	2	2	1	1
CO2	Describe the effects of admixtures on fresh and hardened state properties of concrete.	2	-	-	-	-	1	-	-	-	1	-	1	2	-	1	2
CO3	Design the concrete mix for the specific construction activity.	3	1	-	-	-	1	-	2	-	1	-	1	2	2	2	1
CO4	Interpret the durability, strength of concrete	2	-	-	-	-	1	-	2	-	1	-	1	2	-	1	2
CO5	Analyze the characteristic of special concrete.	2	-	-	-	-	1	-	-	-	1	-	1	2	-	1	1

Note : From time to time, assignments will be posted on ERP or from

https://sites.google.com/a/cmrit.ac.in/n-m-karthik/

CMR Institute of Technology, Bangalore		
Department(s): Civil engineering		
Semester: 08	Section(s): A&B	
DESIGN AND DRAWING OF STEEL STRUCTURES	10CV82	Lectures/week: 04
Course Instructor(s): Naresh Dixit P S		
Course duration: 03 Feb., 2018 – 19 May 2018		

Course Objectives

- Learn Bolted connections and Welded connections.
- Design of compression members, built-up columns and columns splices.
- Design of tension members, simple slab base and gusseted base.
- Design of laterally supported and un-supported steel beams.

Prerequisites

- Need to know Rolling of steel elements
- Types of connection and types of steel structure

LESSON PLAN

Lecture #	Book & Sections	Topics	Portions coverage: Teaching Aids	Portions coverage: % of Syllabus Covered
Links to some useful online lectures and courses ➢ http://nptel.ac.in/courses/105106112/ https://www.youtube.com/watch?v=mtRR-5fzKo8 ➢ http://nptel.ac.in/courses/105106112/13 ➢ https://www.youtube.com/watch?v=BcXZvfEA-e4 ➢ https://www.youtube.com/watch?v=9YZ_jE57YQQ		➢ ➢ http://nptel.ac.in/courses/105106112/25 ➢ https://www.youtube.com/watch?v=Nj_HjNRE6-U ➢ http://nptel.ac.in/courses/105106112/20 ➢ http://nptel.ac.in/courses/105106112/36 ➢ https://www.youtube.com/watch?v=pcSvhMpoSDs		
1-8	TB1:- 1.1-1.11, 2.1-2.7	**UNIT - 1** **CONNECTIONS:** Bolted and welded, beam-beam, Beam-column, seated, stiffened and un-stiffened	Chalk and Talk Video Lectures for some topics	15
9-16	TB1 3.1 - 3.5 4.4-	**UNIT - 2** **COLUMNS:** Splices, Column-column of same and different sections. Lacing	Chalk and Talk	15

	4.2 5.1-5.8 10.1-10.3	and battens.	Video Lectures for some topics	
17-21	TB1 6.1-6.2 7.1-7.4	**UNIT - 2** **COLUMNS:** Splices, Column-column of same and different sections. Lacing and battens.	Chalk and Talk	10
22-30	TB2 6.1-6.3 7.1-7.10 TB1 14.1-14.4	**UNIT - 4** **Design and drawing of** i) Bolted and welded plate girder ii) Roof Truss (Forces in the members to be given) iii) Gantry girder	Chalk and Talk Video Lectures for some topics	20

Text Books	
1.	**Design of Steel Structures** - N. Subramanian : Oxford University, Press.
Reference Books	
3.	**Structural Design & Drawing** – N.Krishna Raju, Unversities Press, India. **Design of Steel Structures** - Negi - Tata Mc Graw Hill Publishers **Design of Steel Structures** - Arya and Ajaman- Nem Chand & Bros. Roorkee. **Design of Steel Structures.-** Raghupati IS : 800 – 2007, SP 6 (1) – 1984 or Steel Table.

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01 – 15
IAT-2	Class # 16 - 21
IAT-3	Class # 22 -30

* : See calendar of events for the schedules of IATs.

Course Outcomes
By the end of this course, students will be able to
Design and draw details of different connections such as stiffened and unstiffened connection
Design and draw column bases such as gusseted base and slab base
Design and draw details of trusses
Design and draw details of plate and gantry girder
Design and draw details of different connections such as stiffened and unstiffened connection

Design and draw column bases such as gusseted base and slab base

COGNITIVE LEVELS	
Cognitive level	**REVISED BLOOMS TAXONOMY KEYWORDS**
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.
L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	Apply knowledge and skills to perform diverse tasks of construction industry
PSO2	Analyse, design and develop construction information details of simple structural elements and basic civil engineering systems
PSO3	Support diverse tasks of construction project management as construction engineer
PSO4	Pursue interests in specializations leading to bigger and diverse career opportunities

CORRELATION LEVELS	
0	No Correlation
1	Slight/Low
2	Moderate/ Medium
3	Substantial/ High

Course Outcomes		Modules covered	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	design and draw details of different connections such as stiffened and unstiffened connection		3	2	2	1	0	1	1	0	0	2	0	1	2	3	1	1
CO2	design and draw colum bases such as guzzated base and Slab base		3	2	2	1	0	1	1	0	0	2	0	1	2	3	1	1
CO3	design and draw details of trusses		3	2	2	1	0	1	1	0	0	2	0	1	2	3	1	1
CO4	design and draw details of plate and gantry girder		3	2	2	1	0	1	1	0	0	2	0	1	2	3	1	1

Note : From time to time, assignments will be posted on https://classroom.google.com/u/0/c/MTAzOTM0NDgzMTRa

CMR Institute of Technology, Bangalore		
Department(s): Civil Engineering		
Semester: 08	Section(s): A & B	
Pavement Design	10CV833	Lectures/week: 04
Course Instructor(s): Azhaginiyal A		
Course duration: 05 Feb 2018 – 25 May 2018		

Course Objectives

This course will enable students to

- Gain knowledge about the process of collecting data required for design, factors affecting pavement design, and maintenance of pavement.
- Excel in the path of analysis of stress, strain and deflection in pavement.
- Understand design concepts of flexible pavement by various methods (CBR, IRC 37-2001, Mcleods, Kansas) and also the same of rigid pavement by IRC 38-2002
- Understand the various causes leading to failure of pavement and remedies for the same.
- Develop skills to perform functional and structural evaluation of pavement by suitable methods.

Prerequisites

- Pavement materials and properties
- Basic design procedure of pavements

LESSON PLAN

Lecture #	Book & Sections	Topics	Portions coverage	
			Teaching Aids	% of Syllabus Covered
1-6	TB1: - Chapter 1	**UNIT - 1 INTRODUCTION:** Desirable characteristics of pavement, types and components, Difference between Highway pavement and Air field pavement – Design strategies of variables – Functions of sub-grade, sub base – Base course – surface course – comparison between Rigid and flexible pavement.	Chalk and Talk	15
Links to some useful online lectures: ➢ http://nptel.ac.in/courses/105104098/				
7-12	TB1: - Chapter 2	**UNIT-2 FUNDAMENTALS OF DESIGN OF PAVEMENTS:** Design life – Traffic factors – climatic factors – Road geometry – Subgrade strength and drainage, Stresses and deflections, Boussinesqs theory – principle, Assumptions – Limitations and problems on above - Busmister theory – Two layered analysis – Assumptions – problems on above	Chalk and Talk Video Lectures for some topics	15
Links to some useful online lectures: ➢ http://nptel.ac.in/courses/105104098/				

13-20	TB1:- Chapter 4	**UNIT – 3 DESIGN FACTORS:** Design wheel load – contact pressure – ESWL concept – Determination of ESWL by equivalent deflection criteria – Stress criteria – EWL concept.	Chalk and Talk Video Lectures for some topics	10
Links to some useful online lectures: ➢ http://nptel.ac.in/courses/105104098/				
21-25	TB1:- Chapter 15	**UNIT – 4 FLEXIBLE PAVEMENT DESIGN:** Assumptions – McLeod Method – Kansas method – Tri-axial method - CBR method – IRC Method (old) - CSA Method using IRC 37-2001, problems on above.	Chalk and Talk	20
Links to some useful online lectures: http://nptel.ac.in/courses/105101087/				
26-30	TB1: - Chapter 3	**UNIT – 5 STRESSES IN RIGID PAVEMENT:** Principle – Factors - wheel load and its repetition – properties of sub grade – propertie Pp ps ppppppconcrete. External conditions – joints – Reinforcement – Analysis of stresses – Assumptions – Westergaard's Analysis – Modified Westergaard equations – Critical stresses – Wheel load stresses, Warping stress – Frictional stress – combined stresses (using chart / equations) - problems on above**.**	Chalk and Talk	10
Links to some useful online lectures: ➢ http://nptel.ac.in/courses/105104098/				
31-36	TB1: - Chapter 17	**UNIT – 6 DESIGN OF RIGID PAVEMENT:** Design of C.C. Pavement by IRC: 38 – 2002 for dual and Tendem axle load – Reinforcement in slabs – Requirements of joints – Types of joints – Expansion joint – contraction joint – warping joint – construction joint – longitudinal joint, Design of joints, Design of Dowel bars, Design of Tie bars – problems of the above	Chalk and Talk Video Lectures for some topics	10
Links to some useful online lectures: ➢ http://nptel.ac.in/courses/105104098/				
37-44	TB1:- Chapter 18	**UNIT – 7 FLEXIBLE PAVEMENT FAILURES, MAINTENANCE AND EVALUATION:** Types of failures, causes, remedial/maintenance measures in flexible pavements – Functional Evaluation by visual inspection and unevenness measurement by using different technics - Structural Evaluation by Benkelman Beam Deflection Method, Falling weight deflectometer, GPR Method. Design factors for Runway Pavements - Design methods for Airfield pavements and problems on above.	Chalk and Talk	10

Links to some useful online lectures:

- http://nptel.ac.in/courses/105101087/

45-52	TB1:- Chapter 18	**UNIT – 8 RIGID PAVEMENT FAILURES, MAINTENANCE AND EVALUATION:** Types of failures, causes, remedial/maintenance measures in rigid pavements – Functional Evaluation by visual inspection and unevenness measurements. Design factors for Runway Pavements – Design methods for Airfield pavements.	Chalk and Talk	10

Links to some useful online lectures:

- http://nptel.ac.in/courses/105104098/

Text Books	
1.	**Principles of Pavement Design**- Yoder and Witzack - 2nd edition, John Wileys and Sons
Reference Books	
4.	**Pavement Analysis & Design** - Yang H. Huang- II edition.
5.	**Principles & Practices of Highway Engineering**- L R Kadiyalli & N B. Lal

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01-20
IAT-2	Class # 21-36
IAT-3	Class # 37-52

* : See calendar of events for the schedules of IATs.

Course Outcomes	
By the end of this course, students will be able to	
1.	Outline the desirable characteristics of pavements (flexible, rigid and airfield pavements) and its component layers and select suitable material for pavement construction in lieu with its functions and design strategies
2.	Compare the stresses and strains in different pavement layers using Boussinesq's and Burmister's theory
3.	Explain the different wheel load factors affecting flexible pavement design and compare the different methods of flexible pavement design
4.	Solve for wheel load stresses, frictional stresses and warping stresses in rigid pavements
5.	Examine the standard methods for complete design of flexible pavements, rigid pavements and airfield pavements
6.	Identify different types of failures in flexible and rigid pavements and choose suitable methods for its maintenance and evaluation

COGNITIVE LEVELS	
Cognitive level	**REVISED BLOOMS TAXONOMY KEYWORDS**
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate,

	discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.
L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	Apply knowledge and skills to perform diverse tasks of construction industry
PSO2	Analyse, design and develop construction information details of simple structural elements and basic civil engineering systems
PSO3	Support diverse tasks of construction project management as construction engineer
PSO4	Pursue interests in specializations leading to bigger and diverse career opportunities

CORRELATION LEVELS	
0	No Correlation
1	Slight/Low
2	Moderate/ Medium
3	Substantial/ High

Course Outcomes		**Modules covered**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	Outline the desirable characteristics of pavements (flexible, rigid and airfield pavements) and its component layers and select suitable material for pavement construction in lieu with its functions and design strategies	1,8	2	0	0	0	0	0	2	0	0	0	0	0	0	3	0	2
CO2	Compare the stresses and strains in different pavement layers using Boussinesq's and Burmister's theory	2	3	3	2	0	0	0	0	0	0	0	0	0	0	3	0	3
CO3	Explain the different wheel load factors affecting flexible pavement design and compare the different methods of flexible pavement design	3	3	1	2	0	0	0	0	0	0	0	0	0	0	3	0	2
CO4	Solve for wheel load stresses, frictional stresses and warping stresses in rigid pavements	5	3	2	1	0	0	0	0	0	0	0	0	0	0	3	0	3
CO5	Examine the standard methods for complete design of flexible pavements, rigid pavements and airfield pavements	4,5,6	3	3	2	0	0	0	1	0	0	0	0	0	0	3	0	3
CO6	Identify different types of failures in flexible and rigid pavements and choose suitable methods for its maintenance and evaluation	7	3	1	1	0	0	0	1	0	0	0	0	0	0	3	2	2

Note : From time to time, assignments will be posted on

https://sites.google.com/a/cmrit.ac.in/azhaginiyal-a9780/

CMR Institute of Technology, Bangalore		
Department(s): Civil engineering		
Semester: 08	Section(s): A&B	
Earthquake resistant design of structures	10CV834	Lectures/week: 04
Course Instructor(s): Naresh Dixit P S		
Course duration: 03 Feb., 2018 – 19 May 2018		

Course Objectives

- Define the basics terminologies of earthquake and engineering seismology
- Understand various structural modelling methods
- Apply various dynamic methods to analyse a structure
- Understand and Apply Codal provisions in design and analysis of RC structures
- Understand and Apply Codal provisions in design and analysis of masonry structures

Prerequisites

- Structural dynamics
- Engineering geology
- Geotechnical engineering
- Probability and numerical methods

LESSON PLAN

Lecture #	Book & Sections	Topics	Portions coverage: Teaching Aids	Portions coverage: % of Syllabus Covered
Links to some useful online lectures and courses ➢ http://nptel.ac.in/courses/105108074/ ➢ http://nptel.ac.in/courses/105101134/ ➢ http://nptel.ac.in/courses/105104136/ ➢ http://nptel.ac.in/courses/105101004/				
1-8	TB1: - 1.1-1.11, 2.1-2.7	**UNIT - 1** Earthquake ground Motion, Engineering Seismology, Theory of plate tectonics, seismic waves, Magnitude and intensity of earthquakes, local site effects, seismic zoning map of India.	Chalk and Talk Video Lectures for some topics	15
9-16	TB1 3.1 - 3.5 4.4- 4.2 5.1-5.8 10.1-10.3	**UNIT - 2** Seismic Design Parameters. Types of Earthquakes, earthquake ground motion characteristics, response spectra and design spectrum.	Chalk and Talk Video Lectures for some topics	15
17-21	TB1 6.1-6.2	**UNIT - 3** Structural modelling, Code based seismic design methods. Response control concepts, seismic evaluation	Chalk and Talk	10

	7.1-7.4	and retrofitting methods..		
22-30	TB2 6.1-6.3 7.1-7.10 TB1 14.1-14.4	**UNIT - 4** Effect of Structural Irregularities on seismic performance of RC buildings. Vertical irregularity and plan configuration problems, Seismo resistant building architecture – lateral load resistant systems, building characteristics.	Chalk and Talk Video Lectures for some topics	20
31-36	TB1 12.1-12.8	**UNIT - 5** Seismic design philosophy, Determination of design lateral forces - Equivalent lateral force procedure, dynamic analysis procedure.	Chalk and Talk	10
37-42	TB1 16.1-16.3 18.1-18.3	**UNIT - 6** Step by step procedure for seismic analysis of RC buildings (maximum of 4 storeys, without infills) - Equivalent static lateral force method, response spectrum methods.	Chalk and Talk	10
43-48	TB1 20.1-20.7 21.1-21.6	**UNIT – 7** Earthquake resistant analysis and design of RC buildings – Preliminary data, loading data, load combinations, analysis and design of subframes. (Maximum of 4 storeys, without infills).	Chalk and Talk	10
49-52	TB1 25.1-25.3 27.1-27.10	**UNIT - 8** Earthquake resistant design of masonry buildings - elastic properties of structural masonry, lateral load analysis, Design of two storied masonry buildings	Chalk and Talk	10

Text Books	
1.	Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation. (Listed topics only from Chapters-1 to 12), 5th Edition, Pearson Education ©2013
Reference Books	
6.	Averill M. Law: Simulation Modeling and Analysis , 4th Edition, Tata McGraw-Hill, 2007.ISBN : 9780070667334
7.	Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson Education, 2006.ISBN: 978-0131429178

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01 – 21
IAT-2	Class # 22-42
IAT-3	Class # 43-52

* : See calendar of events for the schedules of IATs.

Course Outcomes
By the end of this course, students will be able to
1. Describe terminologies of engineering seismology
2. model structure using various methods to analyse
8. Analyse the structure using dynamics methods
9. Apply codal design procedures for RC and masonry structures
10. Understand codal provisions for design of RC and Masonry structure
11. Understand concept of site characterization and hazard analysis

COGNITIVE LEVELS

Cognitive level	REVISED BLOOMS TAXONOMY KEYWORDS
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.
L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	Apply knowledge and skills to perform diverse tasks of construction industry
PSO2	Analyse, design and develop construction information details of simple structural elements and basic civil engineering systems
PSO3	Support diverse tasks of construction project management as construction engineer
PSO4	Pursue interests in specializations leading to bigger and diverse career opportunities

CORRELATION LEVELS	
0	No Correlation
1	Slight/Low
2	Moderate/ Medium
3	Substantial/ High

Course Outcomes		**Modules covered**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	Define the basics terminologies of earthquake and engineering seismology	**1**	3	2									-	1	1	-	1	-
CO2	Understand various structural modelling methods	**1,2**	3	3									-	2	1	-	1	-
CO3	Apply various dynamic methods to analyse a structure	**2,3,4**	2	3									-	1	1	-	1	-
CO4	Understand and Apply Codal provisions in design and analysis of RC structures	**5,6**	3	2									-	1	1	-	1	-
CO5	Understand and Apply Codal provisions in design and analysis of masonry structures.	**7**	3	2									-	2	1	-	1	-

Note : From time to time, assignments will be posted on https://classroom.google.com/u/0/c/MTAzOTM0NDgzMTRa

+ CMR Institute of Technology, Bangalore			
Department(s): Civil Engineering			
Semester: 08	Section(s): A&B		
Industrial wastewater treatment		10CV835	Lectures/week: 04
Course Instructor(s): Narendra Kumar Fatehpuriya			
Course duration: 5th Feb. -03rd May,2018		Lectures : 52	

Course Objectives

- .To understands the importance of industrial waste water treatment solutions on various levels.
- Concept of stream sampling, treatment technologies and effluent standards and disposal techniques in details

To be able to understand and design the industrial waste water treatment technologies based on industry types. To understand the industrial waste water treatment technologies, effluent discharge and disposal methods. Stream flow sampling processes. Design and analyze industrial waste water treatment based on the types of industry.

Prerequisites

- Concept of primary secondary and tertiary treatment processes of waste water, water quality analysis
- Sewage disposal and combined discharge techniques. laws and legislations for the industrial discharge.

LESSON PLAN

Lecture #	Book & Sections	Topics	Portions coverage	
			Teaching Aids	% of Syllabus Covered
1-8	TB1: -	**UNIT – 1 INTRODUCTION:** Difference between Domestic and Industrial Wastewater, Effect on Streams and on Municipal Sewage Treatment Plants. Stream Sampling, effluent and stream Standards and Legislation to Control	Chalk and Talk Video Lectures for some topics	15
➢				
9-16	TB1	**UNIT - 2** Stream Quality, Dissolved oxygen Sag Curve in Stream, Streeter– Phelps formulation, Numerical Problems on DO prediction.	Chalk and Talk Video Lectures for some topics	15
Links to some useful online lectures:				
17-21	TB1	**UNIT - 3** **TREATMENT METHODS-I:** Volume Reduction, Strength Reduction,	Chalk and Talk Power	10

		Neutralization, Equalization and Proportioning.	point presentation	
Links to some useful online lectures: ➢				
22-30	TB2	**UNIT - 4** **TREATMENT METHODS-II:** Removal of Inorganic suspended solids, Removal of Organic Solids, Removal of suspended solids and colloids. Treatment and Disposal of Sludge Solids.	Chalk and Talk Video Lectures for some topics	20
Links to some useful online lectures:				
31-36	TB2	**PART - B** **UNIT - 5** **COMBINED TREATMENT:** Feasibility of combined Treatment of Industrial Raw Waste with Domestic Waste, Discharge of Raw, Partially Treated and completely treated Wastes to Streams.	Chalk and Talk &ppt	10
Links to some useful online lectures: ➢				
37-42	TB3	**UNIT - 6** **TREATMENT OF SELECTED INDUSTRIAL WASTE:** Process flow sheet showing origin / sources of waste water, characteristics of waste, alternative treatment methods, disposal, reuse and recovery along with flow sheet. Effect of waste disposal on water bodies **THE INDUSTRIES TO BE COVERED ARE:** 1. Cotton Textile Industry 2. Tanning Industry 3. Cane Sugar Industry & Distillery Industry	Chalk and Talk & ppt	10
Links to some useful online lectures:				
43-48	TB3	**UNIT - 7** **TREATMENT OF SELECTED INDUSTRIAL WASTE-I:** 1. Dairy Industry 2. Canning Industry 3. Steel and Cement Industry	Chalk and Talk	10
Links to some useful online lectures: ➢				

49-52	TB4 and TB5	**UNIT - 8** **TREATMENT OF SELECTED INDUSTRIAL WASTE-II:** 1. Paper and Pulp Industry 2. Pharmaceutical Industry Food Processing Industry	Chalk and Talk	10

Links to some useful online lectures:

-

Text Books	
1.	1. **Industrial Waste Water Treatment**- Nelsol L. Nemerow. 2. **Industrial Waste Water Treatment**.- Rao MN, and Dutta A.K. 3. **Waste water engineering. B .C.Punmia,** Laxmi Publication 2013 4. **Waste Water Treatment, Disposal and Reuse** - Metcalf and Eddy inc - Tata McGraw Hill Publications, 2003. 5. **Industrial Wastewater Treatment** – Patwardhan A.D., PHI Learning Private Ltd., New Delhi, 2009 6. **Pollution Control Processes in industries-** Mahajan S.P. 7. Relevant IS Codes.
Reference Books	
12.	**Industrial Wastewater Treatment** – Patwardhan A.D., PHI Learning Private Ltd., New Delhi, 2009
13.	8. **Pollution Control Processes in industries-** Mahajan S.P.

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01 – 18
IAT-2	Class # 19– 37
IAT-3	Class # 38– 52

*: See calendar of events for the schedules of IATs.

Course Outcomes
By the end of this course, students will be able to
2. Describe the role of important elements of Industrial wastewater treatment and feasible technical solutions for the environment.
2. Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.
14. Interpret the model and apply the results to resolve critical issues in a real world environment.
15. Apply waste water techniques for the industrial own house economical and environment friendly solution.
16. Analyze all the quality testing parameters and compare with the effluent standards
17. Explain the concepts industrial waste water treatment plant, their need and significance for the health and eco friendly environment

COGNITIVE LEVELS	
Cognitive level	**REVISED BLOOMS TAXONOMY KEYWORDS**
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate,

	discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.
L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	Design, implement and maintain business applications in a variety of languages using libraries and frameworks.
PSO2	Develop and simulate wired and wireless network protocols for various network applications using modern tools.
PSO3	Apply the knowledge of software and design of hardware to develop embedded systems for real world applications.
PSO4	Apply knowledge of web programming and design to develop web based applications using database and other technologies

CORRELATION LEVELS	
0	No Correlation
1	Slight/Low
2	Moderate/ Medium
3	Substantial/ High

Course Outcomes		**Modules covered**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	Describe the role of important elements of industrial wastewater treatment	**1**	2	2	1	1	-	1	-	-	-	-	-	1	1	-	1	-
CO2	Importance of industrial waste water treatment with classification	**1,2**	2	3	-	1	-	1	2	1	2	-	-	2	1	-	1	-
CO3	Interpretation of Technical standards, industrial waste quality analysis reports, sampling etc.	**2,3,4**	2	3	2	2	2	2	1	-	1	-	-	1	1	-	1	-
CO4	Apply this knowledge in finding meaningful and technically feasible engineering solutions.	**5,6**	1	2	1	-	2	1	-	-	-	-	-	1	1	-	1	-
CO5	Analyze and finding the suitable treatment for the waste water based on quality analysis	**7**	2	2	-	-	2	-	-	-	-	-	-	2	1	-	1	-
CO6	Explain the waste characteristics and selection of treatment process based on industry types.	**8**	-	-	-	-	1	-	-	- -	-	-	-	-	1		1	

Note: From time to time, assignments will be posted on
https://sites.google.com/a/cmrit.ac.in/narendra-kumar-fatehpuria

CMR Institute of Technology, Bangalore		
Department(s): Civil Engineering		
Semester: 08	Section(s): A & B	
Urban Transport Planning	10CV843	Lectures/week: 04
Course Instructor(s): Azhaginiyal A		
Course duration: 05 Feb 2018 – 25 May 2018		

Course Objectives

This course will enable students to

- Understand and apply basic concepts and methods of urban transportation planning.
- Apprise about the methods of designing, conducting and administering surveys to provide the data required for transportation planning.
- Understand the process of developing an organized mathematical modelling approach to solve select urban transportation planning problem.
- Excel in use of various types of models used for travel forecasting, prediction of future travel patterns.

Prerequisites

- Probability distributions and normal distribution
- Operation research
- Statistical analysis

LESSON PLAN

Lecture #	Book & Sections	Topics	Portions coverage: Teaching Aids	Portions coverage: % of Syllabus Covered
1-6	TB1: - 29.1-29.3	**UNIT - 1 INTRODUCTION:** Scope of Urban transport planning – Inter dependency of land use and traffic – System Approach to urban planning.	Chalk and Talk	15
Links to some useful online lectures: https://www.youtube.com/watch?v=YAEyLOCU-8I&list=PLA5B61833B976038C&index=1 http://nptel.ac.in/courses/105107067/1				
7-12	TB1: - 29.4	**UNIT-2 STAGES IN URBAN TRANSPORT PLANNING:** Trip generation – Trip production - Trip distribution – Modal split – Trip assignment.	Chalk and Talk Video Lectures for some topics	15
Links to some useful online lectures: https://www.youtube.com/watch?v=VP6Q9FZ188c&list=PLA5B61833B976038C&index=5 http://nptel.ac.in/courses/105107067/1				

13-20	TB1:-30.1-30.15	**UNIT – 3 URBAN TRANSPORT SURVEY -** Definition of study area-Zoning-Types of Surveys – Inventory of transportation facilities – Expansion of data from sample.	Chalk and Talk Video Lectures for some topics	10
Links to some useful online lectures: ➢ https://www.youtube.com/watch?v=kjsvNenr0Jg&list=PLA5B61833B976038C&index=8 ➢ https://www.youtube.com/watch?v=qFzbStLr9Bo&list=PLA5B61833B976038C&index=31				
21-25	TB1:-31.1-31.5	**UNIT – 4 TRIP GENERATION:** Trip purpose – Factors governing trip generation and attraction – Category analysis – Problems on above	Chalk and Talk	20
Links to some useful online lectures: ➢ https://www.youtube.com/watch?v=wSp3BPaSMRo&list=PLA5B61833B976038C&index=9				
26-30	TB1: -32.1 -32.10	**UNIT – 5 TRIP DISTRIBUTION:** Methods – Growth factors methods – Synthetic methods – Fractor and Furness method and problems on the above.	Chalk and Talk	10
Links to some useful online lectures: ➢ https://www.youtube.com/watch?v=BkM24PkuawA&list=PLA5B61833B976038C&index=20				
31-36	TB1: -34.1-34.4	**UNIT – 6 MODAL SPLIT:** Factors affecting – characteristics of split – Model split in urban transport planning – problems on above	Chalk and Talk Video Lectures for some topics	10
Links to some useful online lectures: ➢ https://www.youtube.com/watch?v=pLEp7X_EjeE&list=PLA5B61833B976038C&index=13				
37-44	TB1:-33.1-33.7	**UNIT – 7 TRIP ASSIGNMENT:** Assignment Techniques – Traffic fore casting – Land use transport models – Lowry Model – Garin Lowry model – Applications in India – (No problems on the above)	Chalk and Talk	10
Links to some useful online lectures: ➢ https://www.youtube.com/watch?v=mB9wsJf7PsA&index=27&list=PLA5B61833B976038C				
45-52	TB1:-37.1-37.3	**UNIT – 8 URBAN TRANSPORT PLANNING FOR SMALL AND MEDIUM CITIES:** Introduction – Difficulties in transport planning – Recent Case Studies	Chalk and Talk	10
Links to some useful online lectures: ➢ **http://nptel.ac.in/courses/105107067/1**				

Text Books	
1.	Traffic Engineering & Transport Planning – L.R. Kadiyali- Khanna Publishers.
Reference Books	
18.	An introduction to traffic engineering- Jotin Khistey and Kentlal- PHI.
19.	Khisty C.J., 'Transportation Engineering – An Introduction' Prentice Hall.

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01-20
IAT-2	Class # 21-36
IAT-3	Class # 37-52

* : See calendar of events for the schedules of IATs.

Course Outcomes
By the end of this course, students will be able to
7. Design, conduct and administer surveys to provide the data required for transportation planning.
20. Supervise the process of data collection about travel behavior and analyze the data for use in transport planning.
21. Develop and calibrate modal split, trip generation rates for specific types of land use developments.
22. Adopt the steps that are necessary to complete a long-term transportation plan.

COGNITIVE LEVELS	
Cognitive level	**REVISED BLOOMS TAXONOMY KEYWORDS**
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.
L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design

	system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	Apply knowledge and skills to perform diverse tasks of construction industry
PSO2	Analyse, design and develop construction information details of simple structural elements and basic civil engineering systems
PSO3	Support diverse tasks of construction project management as construction engineer
PSO4	Pursue interests in specializations leading to bigger and diverse career opportunities

CORRELATION LEVELS	
0	No Correlation
1	Slight/Low
2	Moderate/ Medium
3	Substantial/ High

Course Outcomes		Modules covered	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	Design, conduct and administer surveys to provide the data required for transportation planning.	**1,2,3**	2	0	0	0	0	0	1	0	0	0	0	0	0	1	1	3
CO2	Supervise the process of data collection about travel behavior and analyze the data for use in transport planning.	**2,3**	3	3	0	0	0	0	0	0	0	0	0	0	0	2	0	3
CO3	Develop and calibrate modal split, trip generation rates for specific types of land use developments.	**4,5,6, 7**	2	2	0	0	0	0	0	0	0	0	0	0	0	2	1	3
CO4	Adopt the steps that are necessary to complete a long-term transportation plan.	**2,8**	2	2	0	0	0	0	0	0	0	0	0	0	0	2	0	3

Note : From time to time, assignments will be posted on

https://sites.google.com/a/cmrit.ac.in/azhaginiyal-a9780/

CMR Institute of Technology, Bangalore		
Department(s): Civil en Engineering		
Semester: 08	Section(s): A&B	
Geographic Information System	10CV844	Lectures/week: 04
Course Instructor(s): Shivika Saxena		
Course duration: 05 Feb 2018 – 21 May 2018		

Course Objectives

- Define the basics of GIS and replicating the practical situations in organizations
- Develop maps using GIS tools
- Generate processed images using different techniques
- GIS, GPS and Remote sensing integration to produce statistical information
- Explain Verification and Validation of image classification results

Prerequisites

- Basics of Remote sensing
- Object Oriented Programming Concepts
- Map basic concepts and Toposheets

LESSON PLAN

Lecture #	Book & Sections	Topics	Portions coverage	
			Teaching Aids	% of Syllabus Covered
1-6	TB1: 1,6,7	**UNIT - 1 Geographic Information system concepts and spatial models.** Introduction, Spatial information, temporal information, conceptual models of spatial information, representation of geographic information. GIS Functionality – Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction**.**	Chalk and Talk Video Lectures and PowerPoint presentation for some topics	15
Links to some useful online lectures: ➢ Introduction to GIS (nptel)				
7-12	TB-1,7	**UNIT - 2 Computer Fundamentals of GIS and Data storage,** Fundamentals of computers vector/raster storage character files and binary files, file organization, linked lists, chains, trees. Coordinate systems and map projection: Rectangular polar and spherical coordinates, types of map projections, choosing a map projection.	Chalk and Talk Video Lectures for some topics	20
Links to some useful online lectures: ➢ Introduction to GIS (nptel) ➢ Map projection and coordinate system				

13-18	TB-8	**UNIT - 3 GIS DATA MODELS AND STRUCTURES –** Cartographic map model, Geo-relation model, vector/raster methods, non-spatial data base structure viz., hierarchal network, relational structures**.**	Chalk and Talk	05
Links to some useful online lectures: ➢ Introduction to GIS (nptel) ➢ Data models				
19-24	TB-10	**UNIT - 4 DIGITIZING EDITING AND STRUCTURING MAP DATA –** Entering the spatial data (digitizing), the non-spatial, associated attributes, linking spatial and non-spatial data, use of digitizers and scanners of different types.	Chalk and Talk Video Lectures for some topics	10
Links to some useful online lectures: ➢ Introduction to GIS (nptel) ➢ Digitising in qGIS				
25-30	TB-7,11,12	**UNIT - 5 DATA QUALITY AND SOURCES OF ERROR –** Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy. Principles of Spatial data access and search, regular and object oriented decomposition, introduction to spatial data analysis, and overlay analysis, raster analysis, network analysis in GIS	Chalk and Talk PowerPoint Presentation	15
Links to some useful online lectures: ➢ Introduction to GIS (nptel)				
31-36	TB-12,13	**UNIT - 6** GIS and remote sensing data integration techniques in spatial decision support system land suitability and multioriteria evaluation, role based systems, network analysis, special interaction modeling, Virtual GIS.	Chalk and Talk	10
Links to some useful online lectures: ➢ Introduction to GIS (nptel) ➢ Virtual GIS				
37-43	TB-9	**UNIT - 7** Data base positioning systems, desirable characteristics of data base management systems, components of a data base management system, understanding the data conceptual modeling	Chalk and Talk Software Interactive session	05
Links to some useful online lectures: ➢ Introduction to GIS (nptel) ➢ DBMS fundamentals				
44-45	RB-1,2,10 TB-6,13.8	UNIT - 8 Global positioning system, hyper spectral remote sensing, DIP techniques, hardware and software requirements for GIS, overview of GIS software.	Chalk and Talk	20

Links to some useful online lectures:

- Introduction to GIS (nptel)
- GPS
- DIP
- QGIS

Text Books	
1.	Textbook of Remote Sensing and Geographical Information Systems: M. Anji Reddy, BS publications, Third edition
Reference Books	
23.	Global Positioning System, Principles and Applications: Sateesh Gopi, McGraw Hill Education
24.	Concepts and Techniques of Geographic Information Systems – C.P.Lo. Albert K.W. Yeung, PHI Learning, New Delhi – 2009 2nd Edition.

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01 – 12
IAT-2	Class # 13– 24
IAT-3	Class # 25– 45

*: See calendar of events for the schedules of IATs.

Course Outcomes
By the end of this course, students will be able to
3. Describe the role of important elements of GIS and data management.
2. Conceptualize real world situations through integration of remote sensing and GIS, for development of decision maps.
25. Analyze various image enhancements and realize their significance in aiding interpretation.
26. Explain the stages in GIS modelling.
27. Analyze output data produced by a model and test validity of the model.
28. Understand the spatial referencing system.

COGNITIVE LEVELS	
Cognitive level	**REVISED BLOOMS TAXONOMY KEYWORDS**
L1	List, define, tell, describe, identify, show, label, collect, examine, tabulate, quote, name, who, when, where, etc.
L2	summarize, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend
L3	Apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover.
L4	Analyze, separate, order, explain, connect, classify, arrange, divide, compare, select, explain, infer.
L5	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarize.

PROGRAM OUTCOMES (PO), PROGRAM SPECIFIC OUTCOMES (PSO)	
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1	Apply knowledge and skills to perform diverse tasks of construction industry.
PSO2	Analyse, design and develop construction information details of simple structural elements and basic civil engineering systems
PSO3	Support diverse tasks of construction project management as construction engineer

PSO4	Pursue interests in specializations leading to bigger and diverse career opportunities

CORRELATION LEVELS	
0	No Correlation
1	Slight/Low
2	Moderate/ Medium
3	Substantial/ High

Course Outcomes		**Modules covered**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	Describe the role of important elements of GIS and data management.	**1,7**	-	-	1	1	1	1	2	-	-	2	3	2	-	-	1	2
CO2	Conceptualize real world situations through integration of remote sensing and GIS, for development of decision maps.	**6,8**	-	3	3	2	1	3	2	1	2	1	1	2	-	-	1	2
CO3	Analyze various image enhancements and realize their significance in aiding interpretation.	**8**	2	3	1	3	2	1	2	-	1	-	-	2	-	-	1	2
CO4	Explain the stages in GIS modelling.	**3,4**	1	2	1	1	3	2	2	-	-	1	-	2	-	-	1	2
CO5	Analyze output data produced by a model and test validity of the model.	**5,6**	2	3	2	2	3	2	2	-	-	1	1	2	-	-	1	2
CO6	Understand the spatial referencing system.	**2**	3	-	1	-	1	3	-	-	-	-	-	3	-	-	1	2

Note: From time to time, assignments will be posted on

Shivika Saxena

+ CMR Institute of Technology, Bangalore		
Department(s): Civil Engineering		
Semester: 08	Section(s): A&B	
Water Resource Engineering	10CV846	Lectures/week: 04
Course Instructor(s): Narendra Kumar		
Course duration: 5th Feb. -03rd May,2018		

Course Objectives

- To understand and acquire a technical knowledge about water resource availability, naturally occurring disaster causes and its key components for the technically feasible engineering solutions.
- To control the flood, storm and other water causing disasters, design an efficient and technically smart structure like spillways, culverts etc.

Prerequisites

- Hydrology , hydraulic concepts, surface runoff and basic fluid mechanics concepts

LESSON PLAN

Lecture #	Book & Sections	Topics	Portions coverage	
			Teaching Aids	% of Syllabus Covered
1-6	TB1: -	**UNIT:1 INTRODUCTION** Introduction, The world's fresh water resources, water use in the world, water management sectors, the water management community, the future of water resources.	Chalk and Talk Video Lectures for some topics	15
➢				
7-13	TB1	**UNIT:2 HYDROLOGIC PROCESS** Introduction to hydrology, hydrologic cycle, atmospheric and ocean circulation. Precipitation: formation and types, rainfall variability, disposal of rainfall on a watershed, design storms.	Chalk and Talk Video Lectures for some topics	15
Links to some useful online lectures:				
14-21	TB1	UNIT:3 SURFACE RUNOFF Drainage basins, hydrologic losses and rainfall excess, rainfall-runoff analysis using unit hydrograph approach, SCS rainfall-runoff relation.	Chalk and Talk Power point presentation	10
Links to some useful online lectures:				
➢				
22-29	TB2	**UNIT:4 WATER WITHDRAWLS AND USES** Water use data: classification of uses, water for energy. Water for agriculture: irrigation trends and needs, irrigation infrastructures,	Chalk and Talk	20

		irrigation system selection and performance, water requirement for irrigation, impacts of irrigation Drought management: options, severity, economic aspects of water storage. Analysis of surface water supply: surface water reservoir systems, storage-firm yield analysis for water supply reservoir simulation	Video Lectures for some topics	
Links to some useful online lectures:				
30-36	TB2	**PART - B** **UNIT:5 FLOOD CONTROL** Introduction, flood plain management, flood plain definition, hydrologic and hydraulic analysis of floods, storm water management.Flood control alternatives: structural and non-structural measures. Flood damage and net benefit estimation: damage relationships, expected damages, risk based analysis. Operation of reservoir systems for flood control.	Chalk and Talk &ppt	10
Links to some useful online lectures: ➢				
37-40	TB3	**UNIT:6 STORM WATER CONTROL:** Storm water management, storm system: information needs and design criteria. Rational method design. Hydraulic analysis of design, storm sewer appurtenances. Storm detention: effects of urbanisation, types of surface detention, subsurface disposal of storm water	Chalk and Talk & ppt	10
Links to some useful online lectures:				
41-46	TB3	**UNIT:7 STORM WATER CONTROL STREET AND HIGHWAY DRAINAGE AND CULVERTS:** Drainage of street and highway pavements: design considerations, flow in gutters, pavement drainage inlets, inlet locations, median, embankment and bridge culvert design. Hydraulic design of culverts: culvert hydraulics, culver design. 08 hrs.	Chalk and Talk	10
47-52		**UNIT:8 DESIGN OF SPILLWAYS FOR FLOOD CONTROL, STORAGE AND CONVEYANCE SYSTEM:** Hydrologic considerations, Dams: types, hazard classification, spillway capacity, criteria, safety of existing dams. Spillways: functions overflow and free overfall spillways, ogee spillways, baffled chute spillways, culvert spillways. Gates and valves: spillway crest gates, gates for outlet works, valves for outlet works.		
Links to some useful online lectures: ➢				

Links to some useful online lectures:

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Text Books	
1.	1. Water resources engineering: Ralph A Wurbs, Wesley P. James, PHI Learning pvt. Ltd. New Delhi (2009 Ed.). 2. water resources engineering: Chin D.A., Prentice Hall (2009 Ed.). wate resources engineering: Larry W. Mays, John Wiley & sons (2005
Reference Books	
29.	1. Water resources engineering : Sathya Narayana Murthy Challa, New Age International Publishers, New Delhi, (2002 Ed.). 2. Water resources engineering, lecture notes, IIT Kharagpur. 3. Elements of water resources engineering, Duggal K.N., Soni J.P., New age international publishers, New Delhi. 4. Water resources engineering, David Chin, Pearson Educaion, NJ, (2006 Ed.).

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01 – 18
IAT-2	Class # 19– 37
IAT-3	Class # 38– 52

* See calendar of events for the schedules of IATs.

Course Outcomes

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

To understand and optimize the water related problems with all the aspects and design a feasible structure to preserve our valuable water resource.

Analyze and correlate the water related disaster causes and remedies with the prevention of these resources and unorganized management.

Create and healthy and environmental friendly sustainable environment for our future And present.

COGNITIVE LEVELS

Cognitive level	REVISED BLOOMS TAXONOMY KEYWORDS
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CO1	Describe the role of important elements of industrial wastewater treatment	**1**	2	2	2	1	-	1	-	-	-	-	-	1	2	-	1	-
CO2	Importance of industrial waste water treatment with classification	**1,2**	2	3	-	1	-	1	3	1	2	-	-	2	1	-	1	-
CO3	Interpretation of Technical standards, industrial waste quality analysis reports, sampling etc.	**2,3,4**	2	3	2	2	2	2	1	-	1	-	-	1	1	-	1	-
CO4	Apply this knowledge in finding meaningful and technically feasible engineering solutions.	**5,6**	1	2	1	-	2	1	-	-	-	-	-	1	1	-	1	-
CO5	Analyze and finding the suitable treatment for the waste water based on quality analysis	**7**	2	2	-	-	2	-	-	-	-	-	-	2	1	-	1	-
CO6	Explain the waste characteristics and selection of treatment process based on industry types.	**8**	3	-	-	2	1	-	-	- -	-	-	-	-	1		1	

Note: From time to time, assignments will be posted on

https://sites.google.com/a/cmrit.ac.in/narendra-kumar-fatehpuria/