COURSE INFORMATION	
Course Code: CE 385	Credit Hour: 3.0
Course Title: Design of Civil Engineering Structures I	Contact Hour: 3.0
PRE-REQUISITE	
EWCE 101 (Analytic Mechanics) , EWCE 211 (Mechanics of Solids)	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SYNOPSIS/ RATIONALE	
It is the design course for reinforced concrete structures, especially designing of various components, such as beam and slab, of a reinforced concrete building. In this course students will learn how to design a reinforced concrete beam and slab due to flexural and shear force. Knowledge gained from this course will be used in later semesters and also in professional life.	
OBJECTIVE	
1. To gain knowledge on the basics of reinforced concrete structure. 2. To become skilled at the design of beam, slab, web reinforcement for beam and bond and anchorage for various members of a building. 3. To become aware of the proper safety and serviceability of reinforced concrete structures.	

COURSE OUTCOMES & GENERIC SKILLS

No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods
CO1	Able to **understand** and **analyze** basic performance of concrete and steel as structural material in reinforced concrete structure.	PO –1	C2, C4	1		1, 3	T, F
CO2	Able to **design** different types of beam, slabs and web reinforcement for beam	PO – 3	C2, C3	1, 3		1, 4,5	T, M, F
CO3	Able to **apply** practical design consideration using different safety and serviceability provisions.	PO – 3	C1, C3	1, 3		4, 7	Asg/ CT, F

**Level of Bloom's Taxonomy:*

C1 – Remember | C2 – Understand | C3- Apply | C4 – Analyze | C5 - Evaluate | C6 - Create

(CP – Complex Problems, CA – Complex Activities, KP – Knowledge Profile, T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Report, F – Final Exam)

COURSE CONTENT

Fundamental behavior of reinforced concrete, introduction to strength design and alternate design methods, flexural design of beams (singly reinforced, doubly reinforced, T-beam) using strength design method, shear, diagonal tension and torsion of beams, bond and anchorage, design of one way slabs, design of two-way edge supported slabs: using strip and

alternate methods.

SKILL MAPPING (CO – PO MAPPING)

No	Course Outcome	PROGRAM OUTCOMES (POs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CO1	Be able to understand and **analyze** basic performance of concrete and steel as structural material in reinforced concrete structure.	3	2										
CO2	Be able to **design** different types of beam, slabs and web reinforcement for beam			3									
CO3	Be able to apply practical design consideration using different safety and serviceability provisions.			2									

(Numerical method used for mapping which indicates 3 as high, 2 as medium and 1 as low level of matching)

JUSTIFICATION FOR CO – PO MAPPING

	Mapping	Corresponding Level of Matching	Justifications
	CO1 – PO1	3	Knowledge of stress and strain will help students to understand the basic performance and mechanism of concrete and steel in reinforced concrete structures.
	CO1 – PO2	2	Student will be able to analyze flexure member under pure bending and performance of concrete can be checked with increase of load.
	CO2 – PO3	3	Using BNBC 2015 and 2020 code provision, student will be able to design building component considering safety and economy.
	CO3 – PO3	2	Students will be able to understand the practical design consideration like serviceability and fire hazard using BNBC provision.

TEACHING AND LEARNING STRATEGY

	Teaching and Learning Activities	Engagement (Hours)
	Face-to-face Learning	
	• Lecture	42
	• Practical/ Tutorial/ Studio	--
	• Student – Centered Learning	--
	Self- Directed Learning	
	• Non-face-to-face learning	9
	• Revision of the previous lecture at home	18
	• Preparation for final examination	46

	Formal Assessment • Continuous Assessment • Final Examination	 2 3
	Total	120
TEACHING METHODOLOGY		
Lecture and Discussion, Problem Based Method		
COURSE SCHEDULE		
		Intended Topics to be Covered	Assessment
Week 1			
	Class 1	Introduction to Concrete, Reinforced Concrete and prestressed concrete, load according to BNBC-2016.	
	Class 2	Introduction to strength design and alternate design methods,	
	Class 3	Safety provision of ACI Code, serviceability.	
Week 2			
	Class 4	Fundamental assumption of RC concrete, Behavior under axial load	CT 1
	Class 5	Design example.	
	Class 6	Materials, properties under compression, shrinkage, temperature, stress strain curve, relaxation etc.	
Week 3			
	Class 7	Flexural analysis and design of beam, bending of homogenous beam	
	Class 8	RC concrete beam behavior.	
	Class 9	Design example.	
Week 4			
	Class 10	Design of tension reinforced rectangular beam, ACI Code Provisions	
	Class 11	Underreinforced, overreinforced beam, minimum reinforcement ratio.	
	Class 12	Design of Singly reinforced beam	
Week 5			
	Class 13	Design example of singly reinforced beam	
	Class 14	Design aid, Practical consideration in the design of beam,	
	Class 15	Rectangular beam with tension and compression.	
Week 6			
	Class 16	Doubly Reinforced beam analysis	
	Class 17	Design example of doubly reinforced beam.	
	Class 18	Design example of doubly reinforced beam.	Mid Term Exam
Week 7			
	Class 19	T-beam analysis	

	Class 20	Effective flange width, strength analysis.	
	Class 21	T-beam design example	
Week 8			
	Class 22	T-beam design example	
	Class 23	Shear and diagonal tension in beams**.** Diagonal tension in homogenous elastic beams	CT 2
	Class 24	Reinforced concrete beam without shear reinforcement	
Week 9			
	Class 25	ACI code provision for shear design	
	Class 26	Design Example.	
	Class 27	Design of web reinforcement.	
Week 10			
	Class 28	Design problems.	
	Class 29	Analysis and design of slab, design of one way slab.	
	Class 30	Temperature shrinkage reinforcement, Design example of one way slab.	
Week 11			
	Class 31	Design example and detailing of one way slab.	
	Class 32	Behavior of two way edge supported slab, column supported slab.	
	Class 33	Design procedure of slab using various methods.	
Week 12			
	Class 34	Introduction to moment coefficient method	
	Class 35	Design example of two way slab using moment coefficient method.	CT 3
	Class 36	Design example of two way slab using moment coefficient method.	
Week 13			
	Class 37	Design example of two way slab using moment coefficient method.	
	Class 38	Design and reinforcement detailing of two way slab.	
	Class 39	Bond and anchorage and Development length, fundamental of flexural bond.	
Week 14			
	Class 40	Bond strength and development length, anchorage requirement for web RCC.	
	Class 41	Bar cut-off and bent point of beams, Bar splices.	
	Class 42	Design example of development length.	

ASSESSMENT STRATEGY

Components	Grading	CO	Bloom's

				Taxonomy
Continuous Assessment (40%)	Class Test/ Assignment (1-3)	20%	CO1, CO4	
	Class Participation	5%	CO2	
	Mid Term	15%	CO2, CO3	
Final Exam		60%	CO1	C1, C2
			CO2	C2
			CO3	C3, C4
			CO4	C2, C3, C4
Total Marks		100%		

(CO = Course Outcome, C = Cognitive Domain, P = Psychomotor Domain, A = Affective Domain)

REFERENCES BOOKS

1. Reinforced Concrete: Mechanics and Design – James Wight and James MacGregor, 6th Ed.
2. Design of Concrete Structures – Nilson (12th Edition).
3. Design of Concrete Structures – Nilson, David & Dolan, 14th Ed.
4. BNBC 1996, 2006, 2015, 2020.

REFERENCE SITE

http://classroom.google.com/...../.....

COURSE INFORMATION	
Course Code: CE 386	Credit Hour: 1.5
Course Title: Civil Engineering Structures Design Sessional	Contact Hour: 3.0

PRE-REQUISITE

EWCE-311 (Structural Analysis and Design I), CE-385 (Design of Civil Engineering Structures I)

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

This is the class room design sessional where students will be guided to design and detail of different components of a low rise masonry structure, slab bridge and balanced cantilever bridge.

OBJECTIVE

1. To apply basic concept of limit state design to determine design load
2. To design the elements of a low rise masonry building.
3. To design the various structural components of a slab bridge and a balanced cantilever bridge as per Bridge Design Specification.

COURSE OUTCOMES & GENERIC SKILLS

No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods
CO1	**Apply** the basic concepts of limit state design	PO – 1	C3	1		1, 3	R, T, Q