

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Diploma Engineering				Branch	Civil Engineering			
Semester	VI				Version	1.0.0.0			
Effective from Academic Year	2020-21				Effective for the batch Admitted in	July 2018			
Subject code	1CI2601		Subject Name		DESIGN OF R.C.C. STRUCTURE				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	2	0	5	Theory	40	60	100
Hours	3	0	4	0	7	Practical	60	40	100

Pre-requisites:
The students have to know about Basics of Applied Mechanics, Structural Mechanics I & II, Concrete technology.

Course Learning Outcomes:
The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:
CO1. Application of different specification of IS -456-2016 For design and ability to understand the design Philosophy.
CO2. Ability to analyze the design of RC Beams and slab based on guidelines given in IS 456 2016.
CO 3. Analysis and design of slab and staircase for Different Support Condition.
CO 4. To Understand design flexure member for different Support Condition & Analyze and design RC Columns and footing.

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1 INTRODUCTION TO IS 456-2016	1.1 Reinforced Cement concrete, necessity of steel in concrete, normal location of Tension steel in beams, slabs & in footing. 1.2 Limit State, Limit State of Collapse, Flexure, Shear, Compression, Torsion, Limit State of, Serviceability, Deflection, Cracking. 1.3 Characteristic Strength of Concrete and Steel, Partial Safety Factor for Concrete and Steel. 1.4 Characteristic or Working Load, Partial Safety Factor for Load, Limit State or Factored Load.	1a Explain Limit State Method and its types. 1b Explain concrete and steel for its Design compressive and tensile strength and Limit State Load. 1c Apply Deflection clauses of IS 456- 2016 to Slab & Beam. 1d Apply Cracking clauses of IS 456- 2016 to Slab & Beam Apply Development Length clauses of IS 456- 2016.	05	04
UNIT – 2 SINGLY RC BEAM	2.1 Assumptions for Limit State of Collapse due to Flexure. 2.2 Stress and Strain Diagram of SRRS. Equation related to maximum depth of N.A- Xumax,	2a Analyse & Design of Singly Reinforced Rectangular Section (SRRS) under Flexure. 2b Analyse SRRS for flexure using SP-16.	10	06

	<p>Actual Depth of N.A- X_u , Limiting Moment of Resistance- M_{ulim} , Actual Moment of Resistance- M_u , maximum % limiting steel – P_{tlim} as per IS 456-2016 & Design Aid SP 16.</p> <p>2.3 Balance Section, Under Reinforced Section, Over Reinforced Section</p> <p>2.4 Minimum and Maximum steel in beam and in slab and clear cover as per IS 456-2016 (Clause 26.4, 26.5, Table 16).</p> <p>2.5 Design problem to find size of SRRS Beam and steel area for limit state Bending Moment.</p> <p>2.6 Related Numerical.</p>			
UNIT – 3 DOUBLY RC-BEAM	<p>3.1 Stress and Strain Diagram of DRS and Condition for Doubly Reinforced Section.</p> <p>3.2 Equation stated in SP-16 for D.R.S.</p> <p>3.3 Related Numerical.</p>	3a Analyse & Design Doubly Reinforced Rectangular Section.	05	05
UNIT – 4 DEVELOPMENT LENGTH & SHEAR REINFORCEMENT	<p>4.1 Diagonal Tension Crack in Beam due to Shear.</p> <p>4.2 Equation related to Limit State of Collapse due to Shear as per IS 456-2016.</p> <p>4.3 IS 456-2016 clauses (26.5.1.5 & 1.6) related to Minimum and Maximum Spacing of Stirrups, minimum shear reinforcement. Anchoring reinforcing bars in Tension and in Compression (Clause 26.2.2) Clauses related to Lap Length of Is 456-2016.</p> <p>4.4 Numerical to check the slab for shear.</p>	<p>4a. Design Stirrups for R.C . Rectangular Beam.</p> <p>4b. Apply shear requirements of IS 456-2016 to Designed Slab.</p> <p>4c. Apply Development Length clauses of Is 456-2016.</p>	10	09
UNIT – 5 AXIALLY LOADED COLUMN	<p>5.1 Column, slenderness Limit for Short & Long Column, Minimum Eccentricity in column, condition for axially loaded column, equation for axially loaded short column of IS 456-2016 (Clause 25 & 39.3).</p> <p>5.2 Clauses (26.5.3.1, 26.5.3.2(C, 1-2)) of IS 456-2016 related to % compression steel, numbers of compression bars and its spacing, lateral ties – diameter and pitch.</p>	5a. Analyse and Design axially Loaded Short Column.	10	05

<p style="text-align: center;">UNIT – 6 ISOLATED FOOTING</p>	<p>6.1 Numerical to design & to detail Isolated Pad and Slope Foundation for assigned limit state compression load of column and SBC of soil for Bending Moment, One Way Shear, Punching or Double Shear, Load Transfer from Column to Footings (Clause 34).</p>	<p>6a. Design Isolated Slope and Pad Footing and provide reinforcement details of footing.</p>	<p style="text-align: center;">05</p>	<p style="text-align: center;">05</p>
<p style="text-align: center;">UNIT-7 DESIGN OF SLAB</p>	<p>7.1 Slab –Spanning in Shorter Span, Steel for Bending Moment, Distribution Steel, Depth of Slab as per Deflection, Effective span as per IS 456-2016 (Clause 22.2), Dead Load, Live Load on Slab, Shear and Cracking in Slab.</p> <p>7.2 Numerical to design and detail Simply Supported One Way Slab for Bending Moment, Shear, Deflection, Cracking for the assigned Floor Finish & Live Load.</p> <p>7.3 Numerical to design and detail One Way Continuous Slab for Bending Moment, Shear, Deflection, Cracking for the assigned Floor Finish & Live Load using IS 456 -2016 B.M and S.F coefficients(Table 12 & 13).</p> <p>7.4 Numerical to design and detail Two Way Simply Supported Slab with and without Torsion Steel for Bending Moment, Shear, Deflection, Cracking for the assigned Floor Finish & Live Load using IS 456 -2000.</p>	<p>7a Design Slab for Spanning under Dead Load & Live Load.</p> <p>7b Design & Detail Cantilever Slab, One Way Simply Supported Slab, One Way Continuous Slab & Two Way Simply Supported Slab.</p>	<p style="text-align: center;">15</p>	<p style="text-align: center;">11</p>
		<p>Total</p>	<p style="text-align: center;">60</p>	<p style="text-align: center;">45</p>

List of Practical		
No.	Unit	Name of Practical
1	VII	Draw One Way Simply Supported Slab in Plan and in Longitudinal cross section along shorter span with reinforcement and its bent up details in A2 Size Drawing Sheet.
2	VII	Draw One Way Continuous Slab in Plan and in Longitudinal cross section having five equal spans with reinforcement and its curtailment and its bent up details in A2 Size Drawing Sheet.
3	VII	Draw Two Way Simply Supported Slab with Torsion Steel in Plan having longitudinal cross sections along shorter and longer span with reinforcement , bent up bars details in A2 Size Drawing Sheet
4	-	Prepare following sketches in sketch book: 1. Longitudinal and cross section elevation along Length of Singly Reinforced Simply Supported Beam. 2. Longitudinal and cross section elevation along Length of Cantilever Beam 3. Longitudinal and cross section elevation along Length of Simply Supported Tee Beam. 4. Plan & c/s elevation along shorter span of One Way Simply Supported Slab. 5. Plan & c/s elevation along shorter span & Longer span of Two Way Simply Supported Slab without torsion steel. 6. Plan of Circular Slab with reinforcement. 7. Column and Beam ductile connection. 8. Column to Column Connection when size of Upper column is reduced. 9. Circular Water Tank with flexible joint. 10. Cantilever Retaining Wall.
5	-	Prepare design report having designs of First, Second, Third
6	-	Visit nearby residential and commercial construction and prepare brief having sketches/photographs of site including reinforcements, structure drawing of site, concrete work etc.

List of Instruments/Equipment/Trainer Board	
1	Drawing Hall having Drawing Facilities
2	Models of one way slab, two way slab, different types of columns and footings.

List of Text Books			
No	Title of Books	Authors	Publication
1	IS-456 – 2016	-----	Bureau of Indian Standard
2	Design Aid – SP - 16	-----	Bureau of Indian Standard
3	R C C Detailing – SP - 34	-----	Bureau of Indian Standard
4	Reinforced Concrete	Dr. H J shah	Charotar Publication
5	Limit State Design of Reinforce Concrete	Dr. Punamia, A K Jain, Arun K Jain	Laxmi Publications

List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Design of Concrete Structures	A.K. Jain	-----
2	Limit State Theory & Design of Reinforced Concrete	Shah & Karve	-----

Link of Learning Web Resource	
1	https://www.sefindia.org
2	www.civilengineersforum.com
3	www.nptel.ac.in

PO & CO Mapping						
Sr.No.	Name of PO	Description	Co1	Co2	Co3	Co4
1	PO 1	Acquire fundamental knowledge of mathematics, science, and civil engineering.	Moderate	Slight	Slight	None
2	PO 2	Design and conduct experiments, as well as analyze and interpret data.	Slight	Moderate	None	Slight
3	PO 3	Use the techniques, skills, and modern engineering tools necessary for engineering practice	Slight	Moderate	None	Slight
4	PO 4	Function in multi-disciplinary teams and identify, formulate, and solve engineering problems.	Slight	None	Slight	Moderate
5	PO 5	Clear understanding of his duties and responsibilities as a civil engineer.	Moderate	Slight	Slight	Moderate
6	PO 6	Develop effective communication skill and provide leadership for professional development.	Moderate	None	Slight	Moderate
7	PO 7	Engage in life-long learning in civil engineering field and comprehend issues related to environment and sustainable development.	Slight	Slight	Moderate	None
8	PO 8	Graduate will demonstrate knowledge of professional and ethical responsibilities.	None	Moderate	Slight	Moderate
9	PO 9	Incorporate economics and business practice including project and risk management.	None	None	Slight	Moderate