Syllabus for the Academic Year 2019 - 2020

Department: Civil Engineering, M.Tech CADS

Semester: III

Sl. No.	Subject Code	Subject Name	L	T	P	C
1	18MCAD31	Internship	0	0	0	10
2	18MCAD32	Project Work Phase – I	0	0	0	9
		Total Contact Hours	**0**	**0**	**0**	**19**

Subject Name: INTERNSHIP

Subject Code: 18MCAD31 **L-T-P-C: 0-0-0-10**

Course Objectives:

Course Objectives
TO LEARN
Students are permitted to take up any Civil Engineering Construction field project or office works for a period of 90 days after the 2nd Semester end term examination for the curriculum of 3rd sem.

Course Outcomes

Course outcome	**Descriptions**
CO1	Team spirit is cultivated and leadership qualities are acquired.
CO2	Ability to collect the various parameters involved in the work.
CO3	Motivation is imparted.
CO4	Ability to apply theoretical knowledge based on field requirements.

- Internship : Report evaluation on internship (50 marks) Viva Voce and evaluation of internship
(50 marks)

Subject Name: PROJECT WORK PHASE I

Subject Code: 18MCAD32 **L-T-P-C: 0-0-0-9**

Course Objectives

Sl. No	Course Objectives
1	This work will enable student to gain in deep knowledge on the project related topic.
2	This course will enable student to present seminars with power point presentation and overcome the stage fear problems, which helps in career development process and getting jobs in concerned organizations and inculcate entrepreneurship qualities.

Course Outcomes

Course outcome	Descriptions
CO1	Understand the literature survey & identifying the problem of the project work
CO2	Ability to collect the various parameters involved

- Project Phase-I : Literature review / visit industry to finalize the project and presentation of the same (50 marks)

Syllabus for the Academic Year 2019 - 2020

Department: Civil Engineering, M.Tech CADS

Semester: IV

Sl. No.	Subject Code	Subject Name	L	T	P	C
1	18MCAD41X	**Elective – III**	4	0	0	4
2	18MCAD42X	**Elective – IV**	4	0	0	4
3	18MCAD43	Project Work Phase-II	0	0	0	15
		Total Contact Hours	**8**	**0**	**0**	**23**

Elective – III

18MCAD411 Earthquake Resistant Design of Structures

18MCAD412 Dynamics of Soil-Structure Interaction

18MCAD413 Advanced Design of Steel Structures

Elective – IV

18MCAD421 Advanced Mechanics of Materials

18MCAD422 Advance Design of Prestressed Concrete Structures

18MCAD423 Advance R C Design

Subject Name: EARTH QUAKE RESISTANT DESIGN OF STRUCTURES

Subject Code: 18MCAD411 **L-T-P-C: 4-0-0-4**

Course Objectives :

Sl.No	Course Objectives
	The objective of this course is to make students to learn principles of engineering seismology, To design the reinforced concrete buildings for earthquake resistance. To evaluate the seismic response of the structures

Course Outcomes

Course outcome	Descriptions
CO1	Achieve Knowledge of design and development of problem solving skills.
CO2	Understand the principles of engineering seismology
CO3	Understand the concepts of earthquake resistance of earthen masonry and reinforced concrete buildings.
CO4	Design and develop analytical skills

UNIT	Description	Hours
I	**Seismic Hazard Assessment**: Engineering Seismology – Definitions, Introduction to Seismic hazard ,– Characteristics of strong Earthquake motion - Estimation of Earthquake parameters – Microzonation. Earthquake phenomenon – Seismotectonics and seismic zoning of India – Earthquake monitoring and seismic instrumentation.	10
II	**Earthquake Effects on Structures:** Response to ground acceleration – response analysis by mode superposition – torsional response of buildings - response spectrum analysis – selection of design earthquake – earthquake response of inelastic structures, allowable ductility demand Response Spectra / Average response Spectra - Design Response Spectra - Evaluation of earthquake forces – Effect of earthquake of on different types of structures – Lesson learnt from past earthquakes	12
III	**Concepts of Earthquake Resistant Design**: Structural Systems / Types of buildings – Causes of damage – Planning consideration / Architectural Concept (IS 4326 – 1993) (Do's and Donts for protection of life and property) – Philosophy and principle of earthquake resistance design – Guidelines for Earthquake Resistant Design.	10
IV	**Earthquake Resistant Earthen and Masonry Buildings**: Earthquake Resistant low strength masonry buildings, Strength and Structural properties of masonry – lateral load – Design Considerations	10
V	**Earthquake Resistant design of RCC Buildings**: Material properties – lateral load analysis – design and detailing. Basic concept of seismic base isolation – Seismic Isolation systems.	10

Question paper Pattern:

Question paper consists of 08 questions of 20 marks each. Out of 08, students have to answer any 5 full questions.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Dynamics of structures	Chopra, A.K	Prentice-Hall of India Pvt. Ltd. New Delhi
2	Earthquake Resistant Design of Structures	Pankaj Agarwal and Manish Shrikhande	Prentice Hall of India, 2006
3	"Earthquake Resistant Design of Structures	S K Dugga	Oxford University Press, 2007

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	"Earthquake Resistance Design of Concrete Structures	Ghose, S.K.	SDCPL –R&D Center – New Mumbai 73
2	Elements of Earthquake Engineering	Jaikrishna et al	South Asia Publishers, New Delhi

Subject Name: DYNAMICS OF SOIL-STRUCTURE INTERACTION

Subject Code: 18MCAD412 **L-T-P-C: 4-0-0-4**

Course Objectives :

Sl.No	Course Objectives
1	To apply the knowledge of soil structure interaction in civil engineering field for dynamic analysis

Course Outcomes

Course outcome	Descriptions
CO1	Students are able to understand the fundamentals and importance of SSI
CO2	Students are able to do modeling of structure to analyze and apply the dynamic SSI
CO3	Students are able to do modeling of soil to analyze and apply the dynamic SSI
CO4	Students are able know engineering applications of Dynamic Soil-Structure Interaction

UNIT	Description	Hours
I	Introduction: Objectives and practical significance and importance of soil structure interaction (SSI); Fixed base structure, structures on soft ground; Modeling of unbounded media. Fundamentals of Soil-Structure Interaction: Direct and substructure methods of analysis; Equation of motion for flexible and rigid base; Kinematic interaction, inertial interaction and effect of embedment	10
II	Modeling of Structure: Temporal and spatial variation of external loads (including seismic loads); Continuous models, discrete models (lumped mass) and finite element models. Wave Propagation for SSI: Waves in semi-infinite medium – one, two and three-dimensional wave propagation; Dynamic stiffness matrix for out-of plane and in-plane motion.	10
III	Free-Field Response of Site: Control point and control motion for seismic analysis; Dispersion and attenuation of waves; Half-space, single layer on half-space; Parametric studies. Modeling of Boundaries: Elementary, local, consistent and transmitting boundaries. 8 Hours Module -4 Modeling of Soil: Green's influence functions, boundary-element method, finite element model; Dynamic stiffness coefficients for different types of foundations – surface foundation, embedded foundation, shallow (strip) foundation and deep (piles) foundations. Soil Structure Interaction in Time Domain: Direct method; Substructure method (using dynamic stiffness and Green's functions of soil); Hybrid frequency-time domain approach	12
IV	Nonlinear Analysis: Material nonlinearity of soil (including plasticity and strain hardening), geometrical nonlinearity (slip and separation of foundation with soil); Nonlinear structure with linear soil considering both soil and structure nonlinearity	10
V	Engineering Applications of Dynamic Soil-Structure Interaction: Low-rise residential buildings, multistory buildings, bridges, dams, nuclear power plants, offshore structures, soil-pile structure interactions. Course outcomes: After studying this course, students will be able to: • Predict type of waves and its movement • Predict the behaviour of structures in such movements	10

Question paper Pattern:

Question paper consists of 08 questions of 20 marks each. Out of 08, students have to answer any 5 full questions.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Dynamic Soil-Structure Interaction	Wolf, J. P	1985
2	Soil-Structure Interaction	Cakmak, A.S	1987
3	Soil-Structure Interaction in the Time-Domain	Wolf, J. P	1988

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Finite Element Modeling of Unbounded Media	Wolf, J.P. and Song C.	2000
2	Boundary Element Method for Soil-Structure Interaction	Hall, W.S. and Oliveto G	2003
3	Geotechnical-Earthquake Engineering	Kramer, S.L.,	1996

Subject Name: ADVANCED DESIGN OF STEEL STRUCTURES

Subject Code: 18MCAD413 **L-T-P-C: 4-0-0-4**

Course Objectives:

Sl.No	Course Objectives
1	This course will enable students to 1. Understand the background to the design provisions for hot-rolled and cold formed steel structures, including the main differences between them. 2. Proficiency in applying the provisions for design of columns, beams, beam columns 3. Design structural sections for adequate fire resistance

Course Outcomes

Course outcome	Descriptions
CO1	Students will be able to understand the behavior of Laterally Unrestrained Beams.
CO2	Students will be able to understand the concept of Beam- Columns in Frames.
CO3	Students will be able to understand the concept of Steel Beams with Web Openings.
CO4	Students will be able to understand the concept of Cold formed steel sections and fire resistance.

UNIT	Description	Hours
I	Laterally Unrestrained Beams: Lateral Buckling of Beams, Factors affecting lateral stability, IS 800 code provisions, Design Approach. Lateral buckling strength of Cantilever beams, continuous beams, beams with continuous and discrete lateral restraints, Mono- symmetric and non- uniform beams – Design Examples.	10
II	Beam- Columns in Frames: Behaviour of Short and Long Beam - Columns, Effects of Slenderness Ratio and Axial Force on Modes of Failure, Biaxial bending, Strength of Beam Columns, Sway and Non-Sway Frames, Strength and Stability of rigid jointed frames, Effective Length of Columns-, Methods in IS 800 – Examples.	12
III	Steel Beams with Web Openings: Shape of the web openings, practical guide lines, and Force distribution and failure patterns, Analysis of beams with perforated thin and thick webs(Concepts), Design of laterally restrained castellated beams for given sectional properties, Structural behaviour of Vierendeel girders (Concepts).	10
IV	Cold formed steel sections: Techniques and properties, Advantages, Typical profiles, Stiffened and unstiffened elements, Local buckling effects, effective section properties, IS 801& 811 code provisions, numerical examplesbeamdesign, column design.	10
V	Fire resistance: Fire resistance level, Period of Structural Adequacy, Properties of steel with temperature, Limiting Steel temperature, Protected and unprotected members-Numerical Examples, Methods of fire protection, Fire resistance ratings.	10

Question paper Pattern:

Question paper consists of 08 questions of 20 marks each. Out of 08, students have to answer any 5 full questions.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Design of Steel Structures By Limit State Method	S. S. Bhavikatti	Second Edition, I K International Publishing House, India, 2010
2	Limit State Design of Steel Structures	S. K. Duggal,	Tata McGraw Hill Education Private Limited, New Delhi, India, 2015
3	Design of Steel Structures	N. Subramanyam	Oxford University Press, New Delhi, india, 2008.

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Design of steel structures	Rama Chandra and VirendraGehlot,	Scientific Publishers, india , 2009
2	Steel Structures	J.F. Baker	Vol - 1 and 2
3	Design of Steel Structures	Dr N.Ramachandra.	Vol 2 standarad book house new Delhi

Subject Name: ADVANCED MECHANICS OF MATERIALS

Subject Code: 18MCAD421 **L-T-P-C: 4-0-0-4**

Course Objectives:

Sl.No	Course Objectives
1	To study mechanics of Curved Beams Beams on Elastic Foundations, Shear Centre, and Torsion.

Course Outcomes

Course outcome	Descriptions
CO1	Students are able to understand the curved beams and to solve the problems involving stresses of curved beams.
CO2	Students are able to understand concepts of shear centre and bending of beams.
CO3	Students are able to understand Beams on Elastic Foundations and are able to solve the problems beams.
CO4	Students are able to understand Torsion and are able to do analysis of Structures subjected to out of plane loading

UNIT	Description	Hours
I	**Curved Beams**: Introduction, Circumferential stress in a curved beam, Radial stresses in curved beams, Correction for circumferential stresses in curved beams having I, T, or similar cross sections, Deflections of curved beams, Statically indeterminate curved beams, Closed ring subjected to a concentrated load.	11
II	**Shear center for thin-wall beam cross sections**: Definition of shear center in bending approximations employed for shear in thin-wall beam cross sections, shear flow in thin-walled beam cross sections, shear center for singly symmetric and unsymmetrical sections. nonsymmetrical bending of straight beams:, symmetrical and nonsymmetrical bending, bending stresses in beams subjected to nonsymmetrical bending, deflections of straight beams subjected to nonsymmetrical bending	10
III	**Beams on Elastic Foundations:** 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.	11
IV	**Torsion**: Torsion of straight bars of elliptic cross section – St.Venants semi-inverse method and Prandtl's function approach – membrane analogy – torsion of a bar of narrow rectangular cross section torsion of thin walled open cross sections – torsion of thin walled tubes.	10
V	**Structures subjected to out of plane loading:** Analysis of simple bents, frames, grids and beams circular in plan – cantilever beams, semicircular continuous beams with three equally spaced supports, circular beams with different number of equally spaced supports.	10

Question paper Pattern:

Question paper consists of 8 questions of 20 marks each. Out of 8, students have to answer any 5 full questions.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Advanced Mechanics of Materials	Arthur P. Boresi Omar M. Sidebottom	Fourth Edition,1985
2	Advanced Mechanics of Solids and Structures	N Krishna Raju	First Edition. August 2018

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Mechanics of Materials	James M. Gere and Barry J Goodno	Eighth Edition,2012
2	Advanced Strength of material and Applied Elasticity"	A.C. Ugural and S. K. Fenster	Sixth Edition, 2019
3	Mechanic of Structures	S.B. Junnarkar H J Shah	Volume I, 32nd Edition, 2012

Subject Name: ADVANCED DESIGN OF PRESTRESSED CONCRETE STRUCTURES

Subject Code: 18MCAD422 **L-T-P-C: 4-0-0-4**

Course Objectives :

Sl. No.	Course Objectives
	The objective of this course is 1. Design pre-stressed elements 2. Understand the behavior of pre-stressed elements. 3. Understand the behavior of pre-stressed sections

Course Outcomes

Course outcome	Descriptions
CO1	Understand the concept of prestressed and post tensioned concrete
CO2	Analyze, Design and detail PSC elements
CO3	Achieve Knowledge of design and development of problem solving skills
CO4	Design and develop analytical skills.

UNIT	Description	Hours
I	**Anchorage Zone stress in post-tensioned members:** Introduction to PSC, stress distribution in end block, investigations on anchorage zone stress, Magnel and Guyon's methods, comparative analysis, anchorage zone reinforcement.	10
II	**Shear and torsional resistance:** Shear and principal stresses, ultimate shear resistance, design of shear reinforcement, torsion, design of reinforcement for torsion	10
III	**Composite Beams:** Introduction, types of composite beams, analysis for stress, differential shrinkage, serviceability limit state, design for flexural and shear strength	10
IV	**Tension members and compression members:** Introduction, ties, Columns, Short columns, long columns, biaxially loaded columns, pre stressed concrete piles. Slab and grid floors- Types of floor slabs, design of one way, two way and flat slabs. Distribution of prestressed tendons, analysis and design of grid floors.	10
V	**Precast elements:** Introduction, pre-stressed concrete poles, manufacturing techniques, shapes and cross sectional properties, design loads, design principles. Railway sleepers-classification and manufacturing techniques, design loads, analysis and design principles. Pre-cast bridge girders and segmental constructions, external pre-stressing	12

Question paper Pattern:

Question paper consists of 08 questions of 20 marks each. Out of 08, students have to answer any 5 full questions.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Pre-stressed concrete	N.Krishnaraju	Tata McGraw-Hill,4rd edition,2012
2	Design of pre-stressed concrete structures	Lin.T.Y and H.Burns	John Wiley and sons,1982.

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Pre-stressed concrete structures	.P.Dayaratnam	Oxford and IBH, 5th edition, 1991
2	Pre-stressed concrete structures	Guyon,	Contractors Record books,1963
3	IS:1343:2012		

Subject Name: ADVANCED R.C. DESIGN

Subject Code: 18MCAD423 **L-T-P-C: 4-0-0-4**

Course Objective:

Course Objectives
To make students to understand the advanced of design of RCC and to apply the knowledge of RCC in civil engineering field

Course Outcomes

Course outcome	**Descriptions**
CO1	Students are able to calculate the defections of beam and columns
CO2	Students are able to estimate the crack width in reinforced concrete members
CO3	Students are able to design of reinforced concrete deep beams and design of ribbed (voided) slabs and find redistribution of moments of RC beams
CO4	Students are able to design of reinforced concrete members for fire resistance

UNIT	Description	Hours
I	**Deflection of Reinforced Concrete Beams and Slabs** Introduction – Short term Deflection of Beams and Slabs – Deflection due to Imposed Loads – Short-term Deflection of Beams due to Applied Loads – Calculation of Deflection by IS 456 – Calculation of Deflection by BS 8110 – Deflection Calculation by Euro code – ACI Simplified Method – Deflection of Continuous Beams by IS 456 – Deflection of Cantilevers – Deflection Slabs	10
II	**Estimation of Crack width in Reinforced Concrete Members** Introduction – Factors affecting Crack width in Beams – Mechanism of Flexural Cracking – Calculation of Crack widths – Simple Empirical Method – Estimation of Crack width in Beams by IS 457 and BS 8110 – Shrinkage and Thermal Cracking	10
III	**Redistribution of Moments in Reinforced Concrete Beams** Introduction –Redistribution of Moments in a Fixed Beam – Positions of Points of Contraflexrues – conditions for Moment Redistribution – Final shape of redistributed bending moment diagram – Moment redistribution for a two-span continuous beam – Advantages and disadvantages of Moment redistribution – Modification of clear distance between bars in beams (for limiting crack width) with redistribution – Moment – curvature (M-) Relation of Reinforced Concrete sections – ACI conditions for redistribution of negative moments – conclusion	10
IV	**Design of Reinforced Concrete Deep Beams and Design of Ribbed (Voided) Slabs: Introduction** – Minimum Thickness – Steps of Designing Deep beams – design by IS 456 – Design according to British practice – ACI procedure for design of deep beams – checking for local failures – Detailing of Deep beams**.** Design of Ribbed (Voided) Slabs Introduction – Specification regarding the slabs – Analysis of the slabs for moment and shears – Ultimate Moment of Resistance – Design for shear – Deflection – Arrangement of Reinforcements – Corrosion of Steel with Clay blocks	12
V	**Design of Reinforced Concrete Members for Fire Resistance**: Introduction – ISO 834 Standard Heating Conditions – Grading or Classifications – Effect of High temperature on steel and concrete – Effect of High temperatures on different types of structural members – Fire resistance by structural detailing from tabulated data – Analytical determination of the ultimate bending moment capacity of reinforced concrete beams under fire – other considerations	10

Question paper Pattern:

Question paper consists of 08 questions of 20 marks each. Out of 08, students have to answer any 5 full questions.

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Advanced Reinforced Concrete design	P.C. Varghese	2nd edition 2002
2	Advanced R.C. Design	Krishna Raju	3rd edition 2016
3	Design of Reinforced Concrete Structures	N Subramanian	2013

Reference Book:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Ultimate Strength Design for Structural Concrete	Ramakrishnan, V.	1969
2	Limit State theory and design of Reinforced Concrete	Karve. S.R. and Shah V.	5th edition 2010
3	Reinforced and Prestressed Concrete	Evans R.H	3rd edition 1987

Subject Name: PROJECT WORK PHASE II

Subject Code: 18MCAD43 **L-T-P-C: 0-0-0-15**

Course Objectives

Sl. No	Course Objectives
1	This work will enable student to gain in deep knowledge on the project related topic.
2	This course will enable student to present seminars with power point presentation and overcome the stage fear problems, which helps in career development process and getting jobs in concerned organizations and inculcate entrepreneurship qualities.

Course Outcomes

Course outcome	Descriptions
CO1	Understand the literature survey & identifying the problem of the project work
CO2	Ability to collect the various parameters involved

Project Work Phase-II
Project Work Seminar-I : Presentation of the project work carried out for the first 6 weeks (50 marks)
Project Work seminar-II : Presentation of the project work carried out for the next 8 weeks (50 marks)
Project Work evaluation taken up at the end of the 4th semester.
Report evaluation: average of the marks evaluated by internal and external examiners (125 marks)
Viva voce : conducted and evaluated jointly by internal and external examiners (75 marks)