Academic Program: PG

Academic Year 2018-19

Syllabus

III & IV Semester M.Tech.

COMPUTER AIDED DESIGN OF STRUCTURES

Department of Civil Engineering

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY, DHARWAD – 580 002

(An Autonomous Institution recognized by AICTE & Affiliated to VTU, Belagavi)

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SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for III&IV semester M.Tech. Computer Aided Design of Structures is recommended by Board of Studies of Civil Engineering and approved by the Academic Council, SDM College of Engineering &Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2018-19 till further revision.

Principal Chairman BoS&HoD

SDM College of Engineering & Technology, Dharwad
Department of Civil Engineering

COLLEGE VISION AND MISSION

VISION:

To develop competent professionals with human values

MISSION:

- To have contextually relevant curricula.
- To promote effective teaching learning practices supported by modern educational tools and techniques.
- To enhance research culture.
- To involve industrial expertise for connecting classroom content to real life situations.
- To inculcate ethics and impart soft-skills leading to overall personality development.

DEPARTMENT VISION AND MISSION

VISION:

To be a Centre of excellence, practice state-of-art civil engineering education and developing high quality engineers to serve society.

MISSION:

The stated vision can be achieved through

- Development of robust curriculum to meet the expectations of industry.
- Interactive teaching-learning process with modern educational tools.
- Establishing synergy between teaching and research.
- Networking with industry.
- Interactive teaching-learning process with modern educational tools.
- Establishing synergy between teaching and research.
- Networking with industry.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

The Masters Program in M.Tech(CADS) during 24 months term aims to

1. To provide proficiency in the basic principles and advanced courses of technology in Structural Engineering so that students are able to formulate, analyze and solve the societal problems for sustainable development related to structural Engineering.

2. To expose the students to the latest innovations and trends with a view to inculcate strong research orientation in structural engineering as well as in multidisciplinary streams.

3. To create a congenial environment that promotes learning, growth and imparts ability to work with inter-disciplinary groups in professional, industry and research organizations.

4. To produce Structural Engineers who integrate and build on the program's core curricular concepts in the pursuit of professional leadership, teamwork, life-long learning, and successful career advancement.

PROGRAMME OUTCOMES (PO):

PO1: An ability to independently carry out research/investigation and development work to solve practical problems

PO2: An ability to write and present a substantial technical report/document

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

Scheme of Teaching and Examination

IIISemester M. Tech.

Course Code	Course Title	Teaching		Examination				
				CIE	Theory (SEE)		Practical (SEE)	
		L-T-P (Hrs/Week)	Credits	Max. Marks	*Max. Marks	Duration in hours	Max. Marks	Duration in hours
18PCDSC301	Analysis and Design of Shell Roof Structures – Classical and FE Approach	4-0-0	4	50	100	3		
18PCDSExxx	Elective-7	4-0-0	4	50	100	3		
18PCDSL302 /18PCDSExxx	Internship in Industry/R&D organization/ Elective 8	** Min 4 weeks during vacation after 2nd sem / 3-0-0	3	50/50	-/100	-/3	50/-	-/3
18PCDSL303	*** Project phase -1	0-0-15	9	50		-	50	3
Total		**11-0-15**	**20**	**200**	**200/300**		**50**	

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

L: Lecture **T**: Tutorials **P**: Practical

***SEE** for theory courses is conducted for 100 marks and reduced to 50 marks.

****** The students are expected to undergo training in industry for a period of four weeks during the vacation immediately after completion of II Semester examination. A faculty is to be allotted to guide the student. A committee consisting of three faculty members shall evaluate the work carried out and the knowledge the students have acquired. **OR The students can take one elective course if they do not undergo internship.**

******* Project phase-I: The students are expected to formulate the problem and carry out the intensive literature survey along with preliminary investigations supporting the project phase-II in IV semester.

Course Code	Elective Courses
18PCDSE325	Design of Precast & Composite Structures
18PCDSE326	Advanced Mechanics of Materials
18PCDSE327	Advanced Design of Pre-Stressed Concrete Structures
18PCDSE328	Design of Substructures
18PCDSE329	Design of Structural Systems In Bridges

IV Semester M. Tech.

Course Code	Course Title	Teaching		Examination				
		L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
				Max. Marks	*Max. Marks	Duration in hours	Max. Marks	Duration in hours
18PCDSL401	Project Phase II	0-0-24	22	100	-	-	100	3
Total		0-0-24	**22**	**100**	**-**	**-**	**100**	**-**

CIE: Continuous Internal Evaluation**SEE**: Semester End Examination
L: Lecture **T**: Tutorials **P**: Practical
***** SEE for theory courses is conducted for 100 marks and reduced to 50 marks.
****** Project phase-II: The students are expected to work on a project for the full semester in an industry or an institution

Detailed Syllabus

III Semester

18PCDSC301Analysis and Design of Shell Roof Structures – Classical and FE Approach(4-0-0) 4

Contact Hours: 50

Course Learning Objectives: The primary objective of this course is to learn classical methods in theory of shell structures. Focus will be given to the use of general relationships in the solution of shell membrane and bending problems. Solution to practical problems will be emphasized including integration with finite element analysis.

Course Outcomes:

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Summarize and illustrate shell surfaces	**1**	**3**	
CO-2	Formulate, analyze and design Membrane theory of cylindrical shells and spherical domes	**1**	**3**	
CO-3	Formulate, analyze and design Membrane theory for shells of revolution	**1**	**3**	
CO-4	Formulate, analyze and design	**1**	**3**	

	Bending theory of cylindrical shells			
CO-5	Formulate, analyze and design Folded plate roofs	**1**	**3**	
CO-6	Formulate and Apply finite element method for shell element	**1**	**3**	

POs	PO-1	PO-2	PO-3
Mapping Level	**3**		**2**

Prerequisites:

1. Strength of Materials
2. Structural Analysis I & II

Contents:

Module 1: Module 1: Introduction to shells: Classification of Shell Surfaces — Geometry, Shell Curvature, Geometrical developability. Thick and Thin Shells, Historical developments of shell theory, Load carrying Mechanism of shells, Advantages and disadvantages of shells.

10 Hours

Module 2: Membrane Theory of Cylindrical Shells and Spherical Domes: Cylindrical Shells: Elements, IS 2210 specifications, equations of equilibrium, Stresses in a Simply Supported Shell, Stress Resultants under Dead Load and Live Load for circular, cycloid, catenary, parabola and semi ellipse directrix. Spherical Domes: Notations, equations of equilibrium, expressions for stress resultants and ring tension for Dead, Live and Concentrated Load in domes with and without skylight, Proportioning and general detailing rules. Design Examples with and without skylight.

10 Hours

Module 3: : Membrane Theory for shells of Revolutions: Geometry of shell of revolutions, Equation of equilibrium for axi-symmetrically loaded shells, Solution of equation of equilibrium, Membrane Analysis and design of Conical shells, HyperbolicParaboloid

10 Hours

Module 4: Bending Theory of Cylindrical Shells: : General bending theory, equations of equilibrium, Stress- Strain and Moment — Curvature relations. Analysis and Design of Cylindrical shells as per ASCE Manual No. 31.Design of Edge beams and Traverses. Rebar Detailing.

10 Hours

Module 5: Folded Plate Roofs: Types, Structural behavior- Slab and Plate Action, Analysis of Folded Plates: Stress distribution, Whitney and Simpsons method for analysis. Design Example: V Type and Trough Type, Detailing of Rebars.

FE approach: Shell elements, four and eight noded shell element and finite elements formulation

10 Hours

Reference Books:

[1] Timoshenko and Krieger, “Theory of Plates and Shells”, McGraw-Hill International Book Company
[2] P.C. Varghese, “Design of Reinforced Concrete Shells and Folded Plates, PHI
[3] S SBhavikatti, “ Theory of Plates and Shells”, New Age International Publishers
[4] Robert D Cook et al, “Concepts and Applications of Finite Element Analysis”, 3rd Edition, John Wiley and Sons, New York
[5]Chandrashekara K, “Theory of Plates”, University Press
[6] Ugural A C, “Stress in Plates and shells”, McGraw-Hill International Book Company

18PCDSE325Design of Precast & Composite Structures(4-0-0) 4

Contact Hours: 50

Course Learning Objectives: In this course, topics on Conceptsandcomponentsofprecastconstruction**,** PrecastSystems**,** design of composite floors and beam elements are dealt.

Course Outcomes:

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain the concepts and techniques of precast construction.	**1**		
CO-2	Design precast elements suitable for project specific requirements.	**1,3**		
CO-3	Design precast systems to ensure integrity and safety of structures.	**1**		
CO-4	Design composite floors and beam elements.	**3**		

POs	PO-1	PO-2	PO-3
Mapping Level	**3**		**2**

Contents:

Module 1: Concepts and components of precast construction: Need and types of precast construction, Modular coordination, basic module, planning and design modules, modular grid systems, National Building Code Specifications, Precast Elements- Hollow Core Slabs, TT, ST, Joists and Planks, Beams and Girders — R, L, I, IT, U shapes, Columns — Single

Storey, Multi Storey (continuous), Wall Panels — Solid, Hollow core, Ribbed, Sandwich.

10 Hours

Module 2: Design of precast elements: Design Examples - Wall Panels, Hollow core slabs, Columns with corbels

10 Hours

Module 3: Precast Systems: Large panels, frames, Slab-column systems with walls, mixed. Connections in precast structures — Classification, Design considerations, Details- wall panel connection, column splices, Foundation connection, Beam, Slab. Handling and assemblage considerations, Structural integrity and avoidance of progressive collapse.

10 Hours

Module 4: Composite Floors: Structural Elements, Profiled Sheeting with concrete topping, Design method, Bending and Shear Resistance of Composite Slabs, Serviceability Criteria, Analysis for Internal forces and Moments, Design Steps

10 Hours

Module 5: CompositeBeams: Elastic Behaviour — No and Full interaction, Shear connectors, Load bearing Mechanism, Ultimate Load behavior of Composite beams, Stresses and deflection in service and vibration, Basic Design Considerations, Design Example of Simply Supported and Continuous Composite beams

10 Hours

Reference Books:

[1] Hass A.M. — Precast Concrete — Design and applications Applied Science, 1983.
[2] David Sheppard — "Plant cast, Precast and Prestressed concrete — McGraw Hill; 1989
[3] NBC— 2005 (Part I to Part VII) BIS Publications, New Delhi, IS 15916-2011,IS 11447,IS6061 — Iand III
[4]R.P.Johnson: Composite Structure of Steel and Concrete (Volume 1), Blackwell Scientific Publication(Second Edition), U.K., 1994.
[5] IS: 11384-1985, Code of Practice for Composite Construction inStructural Steel and Concrete.
[6] INSDAG Teaching Resource Chapter 21 to 27: www.steel-insdag.org

18PCDSE326 Advanced Mechanics of Materials(4-0-0) 4

Contact Hours: 50

Course Learning Objectives: The primary objective of this course is to learn classical methods in advanced mechanics of materials. Focus will be given to the use of general relationships in the solution of mechanics problems.

Course Outcomes:

Description of the Course Outcome:	Mapping to POs

		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Solve and analyze torsion of different cross sections	**3**	**1**	
CO-2	Evaluate stress deflection of curved beams	**3**	**1**	
CO-3	Define and explain thin wall beam and nonsymmetrical bending of straight beam	**3**	**1**	
CO-4	Analyze and evaluate beams on elastic foundations	**3**	**1**	
CO-5	Analyze and evaluate bents, frames, grids and beams circular in plan, types of beams with equally spaced supports	**3**	**1**	

POs	PO-1	PO-2	PO-3
Mapping Level	**2**		**3**

Prerequisites:

1. Strength of Materials
2. Structural Analysis I & II

Module1:Torsion:TorsionofstraightbarsofEllipticCross-section– St.Venantssemi-inversemethodandPrandtl'sfunctionApproach– Membraneanalogy– TorsionofabarofnarrowrectangularcrosssectionTorsionofthinwalledopencrosssections– Torsionofthinwalledtubes.

(10 Hours)

Module2:CurvedBeams:Introduction,Circumferential stressinacurvedbeam,Radialstressesincurvedbeams, Correction forcircumferential stressesincurvedbeamshavingI,Torsimilarcrosssections,Deflectionsofcurvedbeams,Staticallyin determinatecurvedbeams,Closedringsubjectedtoaconcentratedload.

(10 Hours)

Module3:ShearCenterforThin-WallBeamCrossSections:Definitionofshearcenterinbending Approximationsemployedforshearinthin-wallbeamcrosssections,Shearflowinthin-walledbeamcrosssections,Shearcenterforsinglysymmetricandunsymmetricalsections.

Nonsymmetrical Bending of Straight Beams: Symmetrical and nonsymmetrical bending, Bending stresses inbeams subjected to nonsymmetrical bending, Deflections of straight beams subjected tonon-symmetricalbending.

(10 Hours)

Module4:

BeamsonElasticFoundations:Generaltheory,Infinitebeamsubjectedtoconcentratedload, Boundaryconditions,Infinitebeamsubjectedtoadistributedloadsegment,Semi-infinitebeamwithdifferentend conditionssubjectedtoconcentratedloadandmomentatitsend-Shortbeams.

(10 Hours)

Module5:Structures subjectedtooutofplaneloading:Analysisofsimplebents,frames,gridsandbeamscircularinplan–Cantileverbeams,semicircularcontinuousbeamswiththreeequallyspacedsupports,circularbeams withdifferentnumberofequallyspacedsupports.

(10 Hours)

Reference Books:

[1]ArthurP.Boresi and OmarM.Sidebottom:"AdvancedMechanicsof Materials"FourthEdition,JohnWiley&Sons,1985

[2]JamesM.GereandS.P.Thimoshenko:"AdvancedMechanicsofMaterials"SecondEdition,CBSPublishers,NewDelhi,2000.

[3]Ugural.A.C.andFenster.S.K"AdvancedStrengthofmaterialandAppliedElasticity "ArnoldPublishers,1981.

[4]Junnarkar.S.B.,"MechanicsofStructures",Volume-III, CharotarPublications,Anand,

18PCDSE327Advanced Design of Pre-Stressed Concrete Structures(4-0-0) 4

Contact Hours: 50

Course Learning Objectives: Concept of shear and torsion in PSC. To study different types of composite beam and its behavior in flexural and shear. To discuss the precast bridge girders, segmental constructions and external prestressing.

Course Outcomes:

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Design and Analyze Anchorage Zone stress in post-tensioned members	**1**		**3**
CO-2	Design and Analyze Shear and torsional resistance	**1**		**3**

CO-3	Design and Analyze Composite Beams	**1**		**3**
CO-4	Illustrate and evaluate Tension members and compression members Slab and grid floors	**1**		**3**
CO-5	Design and Analyze Precast elements, Railway sleepers	**1**		**3**

POs	PO-1	PO-2	PO-3
Mapping Level	**3**		**1**

Prerequisites:

1. Strength of Materials
2. Structural Analysis I & II

Contents:

Module 1: 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 Hours

Module 2: Shear and torsional resistance- Shear and principal stresses, ultimate shear resistance, design of shear reinforcement, torsion, design of reinforcement for torsion.

10 Hours

Module 3: Composite Beams-Introduction, types of composite beams, analysis for stress, differential shrinkage, serviceability limit state, design for flexural and shear strength

10 Hours

Module 4: 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 Hours

Module 5: 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.

10 Hours

Reference Books:

[1] Lin.T.Y and H.Burns, "Design of pre-stressed concrete structures"-John Wiley and sons,1982.
[2] N.Krishnaraju, "Pre-stressed concrete"- Tata McGraw-Hill,3rd edition,1995.
[3]P.Dayaratnam, "Pre-stressed concrete structures"-Oxford and IBH, 5th edition, 1991.

[4]G.S.Pandit and S.P.Gupta, "Pre-stressed concrete structures"-CBS Publishers, 1993.
[5]Guyon, "Pre-stressed concrete structures", Contractors Record books,1963.
[6] IS:1343:1980

18PCDSE328Design of Substructures (4-0-0) 4

Contact Hours: 50

Course Learning Objectives: To know the bearing capacity of soil and design parameters of substructures. Design of pile and special foundations.

Course Outcomes:

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain and Illustrate Bearing capacity of soils	**1**		**3**
CO-2	Explain and Illustrate Design parameters for substructures	**1**		**3**
CO-3	Explain and Illustrate Pile foundations	**1**		**3**
CO-4	Explain and Illustrate Special foundations	**1**		**3**
CO-5	Explain and Illustrate Elements of soil dynamics and design of machine foundations	**1**		**3**

POs	PO-1	PO-2	PO-3
Mapping Level	**3**		**1**

Prerequisites:

1. Geotechnical Engineering
2. Structural Analysis I & II

Contents:

Module 1: Bearing capacity of soils: Generalized bearing capacity equation, field tests for bearing capacity and settlement estimation, settlement of shallow foundations-elastic and consolidation settlements, settlement estimation from penetration tests, settlement tolerance, allowable bearing pressure.

10 Hours

Module 2: Design parameters for substructures: factors influencing selection of depth of

foundation, subgrade reaction, Winkler hypothesis and beams on elastic foundation, soil line method, foundations on expansive soils, geotechnical failure of foundations during earthquake-earth quake resistant design of shallow foundations, liquefaction and remedial measures

10 Hours

Module 3: Pile foundations-classification of pile foundation and general consideration of design, ultimate load capacity of piles, pile settlement, analysis of single pile and pile group, laterally loaded piles and ultimate lateral resistance, uplift resistance of piles and under reamed pile, pile load tests, design examples

10 Hours

Module 4: Special foundations-foundation for transmission line towers-necessary information, forces on tower foundation , general design criteria, choice and type of foundations, design procedure and design problems. soil-structure interaction in frame structures.

10 Hours

Module 5: Elements of soil dynamics and design of machine foundations- IS 2974: Part I to IV machine foundation system, block foundation, frame foundation, design criteria, tuning foundation, DOF of rigid block foundation, linear elastic spring, elastic half space analog, parameter influencing dynamic soil parameter, soil mass participation, vibration isolation system

10 Hours

Reference Books:

[1]Swamy Saran, "Analysis and Design of Substructures", 5th edition, Oxford and IBH Publishing co., Pvt, Ltd, New Delhi,1996.

[2] Swami Saran (1999), "Soil Dynamics and Machine Foundations", Galgotia publications pvt Ltd, New Delhi.

[3]Dr.B.C. Punmia, "Soil Mechanics and Foundation Engineering".Laxmi Publications,113, Golden House, Darya Ganj, New Delhi - 110002, India

[4] Varghese P.C., "Foundation engineering", Prentice hall of India, New Delhi

[5]Das B.M., "Principles of foundation Engineering", Thomson Brooks/ Cole Publishing Company, Singapore

18PCDSE329 Design of Structural Systems In Bridges(4-0-0) 4

Contact Hours: 50

Course Learning Objectives: This course constitutes a transition from general building systems topics to specific applications within the context of structural engineering. It provides the foundation for advanced design and bridge analysis and integrates the finite element approach.

Course Outcomes:

Description of the Course Outcome: At the end of the course the student will	**Mapping to POs**		
	Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**

be able to:				
CO-1	Use the basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality	**1**		**3**
CO-2	Assess the load flow mechanism and loads on bridges	**1**		**3**
CO-3	Design of Elevated bridge	**1**		**3**
CO-4	Design of underpass bridge	**1**		**3**
CO-5	Apply finite element method for Bridge element	**1**		**3**

POs	PO-1	PO-2	PO-3
Mapping Level	**3**		**1**

Prerequisites:

1. Strength of Materials
2. Structural Analysis I & II

Contents:

Module 1: Introduction to bridge engineering Historical background of bridges and types. Bridge aesthetics and proportioning. Bridge geometry.Conceptual design of various structural forms.Foundations with or without piles; abutments, retaining wall sand wing walls; columns and cap beams; bearings.

10 Hours

Module 2: Loads on bridges (IRC6-2010) Class 70 R, Class AA, Class A , Class B , Tracked Vehicle, Wheeled Vehicle, Load Combinations, Impact, Wind, Water Currents, Longitudinal Forces: acceleration, breaking and frictional resistance, Centrifugal forces, temperature, Seismic forces, Snow Load, Collision Loads. Load Combinations

10 Hours

Module 3: Design of Elevated Bridges: Solid slab bridges, Simple Girder bridges, PSC Girder Bridges

10 Hours

Module 4: Design of Underpass - Box Culverts

10 Hours

Module 5: FE Concepts: Discrete and Continuum models of Bridge Deck — Spine, Grillage, Surface models, Bridge Piers, Support and Loading conditions, Soil-Structure Interaction

10 Hours

Reference Books:

[1] Krishna Raju N " Design of Bridges," Oxford, IBH Publications New Delhi.
[2]JohnsonVictor, " Essential of Bridge Engineering," Oxford, IBH Publications, New Delhi
[3]Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, 2008.
[4] IRC112 - 2011 Code of Practice for Concrete Road Bridges and Railway Board Codes
[5]Jagadeesh. T.R. and Jayaram. M.A., "Design of Bridge Structures", Prentice Hall of India
[6] Raina V.K." Concrete Bridge Practice" Tata McGraw Hill Publishing Company, New Delhi, 1991.
[7] IITK-RDSO GUIDELINES ON SEISMICDESIGN OF RAILWAY BRIDGES- Provisions withCommentary and Explanatory Examples , 2010

18PCDSL302Industrial Training (4-Weeks) 3

Course Learning Objectives: To provide the structure and framework for learning outside of the classroom during training experience. The objective of training is to illustrate how a student will DO something and should be specific, strong and clear to provide an understanding of his/her needs and course they are pursuing.

Course Outcomes:

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Experience of applying existing engineering knowledge in similar or new situations	1,3	2	
CO-2	Ability to identify when new engineering knowledge is required, and apply it	1,3	2	
CO-3	Ability to integrate existing and new technical knowledge for industrial application	1,3	2	
CO-4	Ability to demonstrate the impact of the internship on their learning and professional development	1,3	2	
C0-5	Understanding of lifelong learning processes through critical reflection of internship experiences.	1,3	2	

POs	**PO-1**	**PO-2**	**PO-3**
Mapping Level	3	2	3

Evaluation:

1. Final internal evaluation of Industrial training - To be conducted by the internal guide of the college (After the completion of internship). **(50 marks).**
2. Viva-Voce on Internship Report- To be conducted internally is the internship guide (from the college) and external guide under whose supervision the student has carried out the internship **(50 marks).**

18PCDSL303Project phase - I (0-0-15) 9

Contact Hours:120

Course Learning Objectives:

The students are expected to learn carrying out literature survey to locate the state of the art technology while formulating/defining the project problem in computer aided analysis and design of structures. The students are expected select a topic from an emerging area relevant to analysis and design of structures and/or other relevant branches and define the problem for the project work. The literature survey, visits, data collection, preliminary design, analysis etc. is to be done in this phase. The same work is to be continued in the next phase in IV sem.

Course Outcomes:

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Carry out the literature survey to locate the state of the art technology in computer aided analysis and design of structures	1,3	2	
CO-2	Define/formulate the problem for the project work	1,3	2	
CO-3	Design, develop, analyze, test, interpret the results, fabricate, simulate, write code etc. relevant to his/her project work	1,3	2	
CO-4	Summarize the work and write a project report and present.	2		

PO's	PO-1	PO-2	PO-3
Mapping Level	3	2.25	3

Prerequisites: Knowledge of both theory and practical courses learnt in all the previous Semesters and relevant value added information.

Contents:
1) The students are expected to locate the state of the art technology in computer aided analysis and design of structures through proper literature survey and select a topic from an emerging area relevant to structural engineering and/or other relevant branches and define the problem for the project work. The literature survey, visits, data collection, preliminary design, analysis etc. is to be done in this phase.

2) Know the current challenges in analysis and design of structures and try suggesting solutions.

Reference materials/books:

Engineering books.
International reputed Journals.
Manuals and data sheets.
Software packages.
Previous project reports.
Product information brochures.
Interaction with academia and industrial experts.
Internet

Project Phase-I Evaluation

- Presentation on formulating/defining the project problem, literature survey, visits, data collection, preliminary design, analysis etc.Will be evaluated for 100 marks by a committee formed by DPGC.

IV Semester

18PCDSL401Project phase - II (0-0-20)22

Contact Hours: 200

Course Learning Objectives:

The students are expected to find out solutions individually in computer aided analysis and design of structures. They are expected to carry out the intensive literature survey to locate the state of the art technology in structural engineering. They must learn to formulate/define/locate real time problem for the project work. They will also learn to design, develop, analyze, test, interpret the results, fabricate, simulate, write code, and convert report in to papers for publication in journals to add value to the existing literature. They are also expected to acquire the skills of summarizing the work and writing a project report and present the same.

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Carry out the literature survey to locate the state of the art technology in structural engineering.	1,3,2		
CO-2	Define/formulate/locate real time problem for the project work	1,3		
CO-3	Design, develop, analyze, test, interpret the results, fabricate, simulate, write code, prepare papers etc.	1,3		
CO-4	Summarize the work and write a project report and present the same	2		

PO's	PO-1	PO-2	PO-3
Mapping Level	3	3	3

Prerequisites: Knowledge of both theory and practical courses learnt in all the previous Semesters and relevant value added information.

Contents:

1) The students are expected to locate the state of the art technology in his domain of structural engineering and select a topic from an emerging area relevant to computer aided analysis and design and define the problem for the project work. The literature survey, visits, data collection, preliminary design, analysis etc. is to be done in this phase.

2) Structure related analysis and design challenges and providing feasible solutions.

Reference materials/books:

1. Engineering books.
2. International reputed Journals.
3. Manuals and data sheets.
4. Software packages.
5. Previous project reports.
6. Product information brochures.
7. Interaction with academia and industrial experts.
8. Internet etc.

Project Phase-II Evaluation

- Presentation on detailed design, implementation, validation, demonstration and reportwill be evaluated by internal guide for 100 marks.
- Final viva voce will be conducted by two examiners (Internal and an external member nominated by DPGC)for 100 marks.