COURSE INFORMATION SHEET

Course code: CE 504
Course title: STRUCTURAL DESIGN LABORATORY I
Pre-requisite(s):
Co- requisite(s):
Credits: 2 L: 0 T: 0 P: 4
Class schedule per week: 4
Class: M. Tech
Semester / Level: 1ST SEMESTER/ LEVEL 5
Branch: STRUCTURAL ENGINEERING
Name of Teacher:

Course Objectives

A.	To design and prepare working drawings for various reinforced concrete structural members.
B.	To use the relevant software in the analysis and design of reinforced concrete members.

Course Outcomes

After the completion of this course, students will be able to:

1.	Produce design calculations and compute the design loads on typical RCC structures.
2.	Design different component of various RCC structures.
3.	Prepare working drawings for carrying out construction activity.
4.	Use various techniques, engineering knowledge and skill, and modern engineering tools necessary for analysis and designing of engineering projects related to RCC structure construction.
5.	Understand professional and ethical responsibilities.

Syllabus

Introduction

Basis of Structural Design, Review of RCC Design of various structural elements, Good detailing and construction practices, Introduction to analysis and design software for Model Projects.

RCC Problems

Design and prepare working drawing of beam, column, Slabs, Staircase, reinforced concrete foundation, Retaining wall and special structural elements for the given problems.

Model Project

A. Design and prepare working drawing of a structure for a given college/School building.

B. Design and prepare working drawing of underground tunnel for the given data.

Textbooks:

1. Unnikrishna Pillai, S. & D. Menon, " Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.
2. Dayaratnam, P,"Reinforced Concrete Design", Oxford & IBH
3. Jain, A.K., "Reinforced Concrete: Limit State Design", Nem Chand & Bros., Roorkee
4. Gambhir, M L ,"Design of Reinforced Concrete Structures", Prentice Hall of India.
5. Subramanian, N.,"Design of Reinforced Concrete Structures", Oxford University Press

Reference books:

1. I.S- 456-2000, SP 34, SP 16, I.S. 875

Gaps in the syllabus (to meet Industry/Profession requirements)
POs met through Gaps in the Syllabus
Topics beyond syllabus/Advanced topics/Design
POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods	
Lecture by use of boards/LCD projectors/OHP projectors	✓
Tutorials/Assignments	✓
Seminars	
Mini projects/Projects	✓
Laboratory experiments/teaching aids	
Industrial/guest lectures	
Industrial visits/in-plant training	
Self- learning such as use of NPTEL materials and internets	✓
Simulation	✓

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	**% Contribution during CO Assessment**
Progressive Evaluation Marks	60
End Examination Marks	40

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Progressive Evaluation Marks	✓	✓	✓	✓	✓
End Examination Marks	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student feedback on teaching quality and teaching methods adopted
2. Student feedback on course syllabus and course outcome

Mapping of Course Outcomes onto Program Outcomes and Program Specific Outcomes

Course Outcome	Program Outcomes					
	1	**2**	**3**	**4**	**5**	**6**
1	3	3	3	2	2	3
2	3	3	3	3	2	3
3	1	3	3	2	2	3
4	3	3	3	3	3	3
5	3		3	2	3	3

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1, CD4, CD8
CD2	Tutorials/Assignments		CO2	CD1, CD4, CD8
CD3	Seminars		CO3	CD1, CD4, CD8
CD4	Mini projects/Projects		CO4	CD1, CD4, CD8
CD5	Laboratory experiments/teaching aids		CO5	CD4
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

COURSE INFORMATION SHEET

Course code: CE 505
Course title: Numerical Analysis Laboratory
Pre-requisite(s):
Co- requisite(s):
Credits: 2 L: 0 T: 0 P: 4
Class schedule per week: 4
Class: B. Tech
Semester / Level: 1ST SEMESTER / LEVEL 5
Branch: CIVIL ENGINEERING
Name of Teacher:

Course Objectives

This course enables the students to:

1	Develop basic knowledge of numerical analysis so that the students can solve real engineering problems. (K_1, K_2)
2	Understand importance of various numerical tools available for efficiently solving complex problems in civil engineering. (K_1, K_2)
3	Analyse and design safe and sound civil engineering structures. (K_3, K_4)

Course Outcomes

After the completion of this course, students will be able to:

1.	Understand various numerical methods and their applications. (K_1, K_2, K_3)
2.	Identify and evaluate various numerical algorithms required to solve a given engineering problem. (K_1, K_2, K_3)
3.	Use a numerical method/tool/software to solve common problems in civil engineering. (K_5)

List of experiments:

1. Introduction to numerical computing tool/software.
2. Finding roots of a quadratic and/or cubic equation in one variable.
3. Finding minima or maxima of a function in one variable.
4. Finding solution for simultaneous linear equations.
5. Finding eigen values and vectors for a given system.
6. Curve Fitting / Nonlinear regression over experimental data.
7. Numerical differentiation up to second degree.
8. Numerical integration using Simpson's 1/3 rule and/or Gauss quadrature.
9. Finding solution for ordinary differential equations: IVP using standard 4^{th} order RK method.
10. Finding solution for ordinary differential equations: BVP using finite difference method.
11. Mini project on any common civil engineering problem requiring advanced numerical methods.

Reference books:

1. Applied Numerical Methods with MATLAB by S. C. Chapra

Gaps in the syllabus (to meet Industry/Profession requirements)
POs met through Gaps in the Syllabus
Topics beyond syllabus/Advanced topics/Design
POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods	
Lecture by use of boards/LCD projectors/OHP projectors	✓
Tutorials/Assignments	✓
Seminars	
Mini projects/Projects	✓
Laboratory experiments/teaching aids	
Industrial/guest lectures	
Industrial visits/in-plant training	
Self- learning such as use of NPTEL materials and internets	✓
Simulation	✓

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	**% Contribution during CO Assessment**
Continuous Evaluation	60
End Sem Examination Marks	40

Assessment Components	**CO1**	**CO2**	**CO3**
Continuous Evaluation	✓	✓	✓
End Sem Examination Marks	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program outcomes

Course Outcome #	**Program outcomes**					
	1	**2**	**3**	**4**	**5**	**6**
1	**3**	**2**	**3**	**3**	**2**	**2**
2	**3**	**2**	**3**	**3**	**2**	**2**
3	**3**	**3**	**3**	**3**	**2**	**2**

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD:1,2,4,8 and 9
CD2	Tutorials/Assignments		CO2	CD:1,2,4,8 and 9
CD3	Seminars		CO3	CD:1,2,4,8 and 9
CD4	Mini projects/Projects			
CD5	Laboratory experiments/teaching aids			
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

COURSE INFORMATION SHEET

Course code: CE 509
Course title: STRUCTURAL DESIGN LABORATORY II
Pre-requisite(s):
Co- requisite(s):
Credits: 2 L: 0 T: 0 P: 4
Class schedule per week: 4
Class: M. Tech
Semester / Level: 2ND SEMESTER/ LEVEL 5
Branch: STRUCTURAL ENGINEERING
Name of Teacher:

Course Objectives

A.	To design and prepare working drawings for various steel structural members.
B.	To use the relevant software in the analysis and design of structural steel members.

Course Outcomes

After the completion of this course, students will be able to:

1.	Produce design calculations and compute the design loads on typical Steel structures.
2.	Design different component and connection of various steel structures.
3.	Prepare working drawings for carrying out construction activity.
4.	Use various techniques, engineering knowledge and skill, and modern engineering tools necessary for analysis and designing of engineering projects related to steel structure construction.
5.	Understand the professional and ethical responsibilities.

Syllabus

1. Computation of Wind pressure on Building/Structures.
2. Design and prepare working drawing for:
   a) Truss Joint
   b) Seat angle connection
   c) Web angle connection
   d) Web side plate connection
   e) Moment Resistant connection
   f) Beam Splices
   g) Column Splices

3. Design sag rods of a roof truss system
4. Design of tower structure for the water tank.
5. Design purlins on the sloping roof.
6. Design a castellated beam.

7. Design base plates and caps.

Model Project

A. Design and prepare working drawing for a roof truss for an automobile shed/Industrial building/ railway platform.
B. Design welded plate girder for a bridge deck/ Design gantry girder in an industrial building.

Textbooks:

6. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.
7. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
8. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005

Reference books:

1. IS800 :2007, General Construction In Steel – Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007
2. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications

Gaps in the syllabus (to meet Industry/Profession requirements)
POs met through Gaps in the Syllabus
Topics beyond syllabus/Advanced topics/Design
POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods	
Lecture by use of boards/LCD projectors/OHP projectors	✓
Tutorials/Assignments	✓
Seminars	
Mini projects/Projects	✓
Laboratory experiments/teaching aids	
Industrial/guest lectures	
Industrial visits/in-plant training	
Self- learning such as use of NPTEL materials and internets	✓
Simulation	✓

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Progressive Evaluation Marks	60
End Examination Marks	40

Assessment Components	CO1	CO2	CO3	CO4	CO5
Progressive Evaluation Marks	✓	✓	✓	✓	✓
End Examination Marks	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student feedback on teaching quality and teaching methods adopted
2. Student feedback on course syllabus and course outcome

Mapping of Course Outcomes onto Program Outcomes and Program Specific Outcomes

Course Outcome	Program Outcomes					
	1	2	3	4	5	6
1	3	3	3	2	2	3
2	3	3	3	3	2	3
3	1	3	3	2	2	3
4	3	3	3	3	3	3
5	3		3	2	3	3

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1, CD4, CD8
CD2	Tutorials/Assignments		CO2	CD1, CD4, CD8
CD3	Seminars		CO3	CD1, CD4, CD8
CD4	Mini projects/Projects		CO4	CD1, CD4, CD8
CD5	Laboratory experiments/teaching aids		CO5	CD4
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

COURSE INFORMATION SHEET

Course code: CE 510
Course title: CAD in structural engineering
Pre-requisite(s):
Co- requisite(s):
Credits: 2 L: 0 T: 0 P: 4
Class schedule per week: 4
Class: M. Tech
Semester / Level: 2ND SEMESTER / LEVEL 5
Branch: STRUCTURAL ENGINEERING
Name of Teacher:

Course Objectives

This course enables the students to:

1	Develop basic knowledge of structural analysis and design software so that the students can solve real engineering problems. (K_1, K_2)
2	Understand importance of various structural engineering tools available for efficiently solving complex problems in civil engineering. (K_1, K_2)
3	Analyse and design safe and sound civil engineering structures. (K_3, K_4)

Course Outcomes

After the completion of this course, students will be able to:

1.	Understand and use various structural analysis and design tools. (K_1, K_2, K_3)
2.	Identify and evaluate various methods required to solve a given engineering problem. (K_1, K_2, K_3)
3.	Use an engineering tool/software to solve common problems in civil engineering. (K_5)

List of experiments:

12. Introduction to civil engineering software.
13. Analysis of a plane truss system.
14. Design of a plane truss system.
15. Analysis of a space truss system.
16. Design of a space truss system.
17. Analysis of a plane frame system.
18. Design of a plane frame system.
19. Analysis of a space frame system.
20. Design of a space frame system.
21. Analysis and design of any common civil engineering structure.
22. Analysis of a plate.
23. Analysis of a dam cross section.

Gaps in the syllabus (to meet Industry/Profession requirements)
POs met through Gaps in the Syllabus
Topics beyond syllabus/Advanced topics/Design
POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods	
Lecture by use of boards/LCD projectors/OHP projectors	✓
Tutorials/Assignments	✓
Seminars	
Mini projects/Projects	✓
Laboratory experiments/teaching aids	
Industrial/guest lectures	
Industrial visits/in-plant training	
Self- learning such as use of NPTEL materials and internets	✓
Simulation	✓

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	**% Contribution during CO Assessment**
Continuous Evaluation	60
End Sem Examination Marks	40

Assessment Components	**CO1**	**CO2**	**CO3**
Continuous Evaluation	✓	✓	✓
End Sem Examination Marks	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program outcomes

Course Outcome #	**Program outcomes**					
	1	**2**	**3**	**4**	**5**	**6**
1	**3**	**2**	**3**	**3**	**2**	**2**
2	**3**	**2**	**3**	**3**	**2**	**2**
3	**3**	**3**	**3**	**3**	**2**	**2**

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD:1,2,4,8 and 9
CD2	Tutorials/Assignments		CO2	CD:1,2,4,8 and 9
CD3	Seminars		CO3	CD:1,2,4,8 and 9
CD4	Mini projects/Projects			
CD5	Laboratory experiments/teaching aids			
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

COURSE INFORMATION SHEET

Course code: CE 512
Course title: ADVANCED CONCRETE LAB
Pre-requisite(s):
Co- requisite(s):
Credits: 2 L: 0 T: 0 P: 4
Class schedule per week: 4
Class: M. Tech
Semester / Level: 3RD SEMESTER/ LEVEL 5
Branch: STRUCTURAL ENGINEERING
Name of Teacher:

Course Objectives

A.	Evaluate fresh and hardened properties of conventional and cement-based composites using traditional and innovative non-destructive evaluation methods

Course Outcomes

After the completion of this course, students will be able to:

1.	Carry out test procedures for significant laboratory properties of materials for concrete.
2.	Design specialized concrete mix and use of supplementary cementitious material in concrete.
3.	Conduct quality parameter test on concrete for its strength and durability.
4.	Interpret the test results and prepare a report.
5.	Describe microstructure of hydrated cement

Syllabus

A) **Basic Test of Materials**
   1. Test on Cement.
   2. Test on CA and FA aggregate.

B) **Mix design of concrete**
   1. OPC cement/PSC cement/PPC cement.
   2. Blended cement (OPC + emerging supplementary cementitious material).

Air content in fresh concrete, Workability, Compressive strength, split tensile strength, Flexural test, RCPT test, Sorptivity test, Permeability test on designed mix concrete, Accelerated curing test on concrete samples.

Interpretation of the data of OPC and Blended cement concrete

C) **NDT tests and Heat of hydration test.**

Project work

Study the microstructure of hydration products by XRD, SEM, and TGA.

Textbooks:

Reference books:

Gaps in the syllabus (to meet Industry/Profession requirements)
POs met through Gaps in the Syllabus
Topics beyond syllabus/Advanced topics/Design
POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods	
Lecture by use of boards/LCD projectors/OHP projectors	
Tutorials/Assignments	
Seminars	
Mini projects/Projects	✓
Laboratory experiments/teaching aids	✓
Industrial/guest lectures	
Industrial visits/in-plant training	
Self- learning such as use of NPTEL materials and internets	✓
Simulation	

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	**% Contribution during CO Assessment**
Progressive Evaluation Marks	60
End Examination Marks	40

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Progressive Evaluation Marks	✓	✓	✓	✓	✓
End Examination Marks	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student feedback on teaching quality and teaching methods adopted
2. Student feedback on course syllabus and course outcome

Mapping of Course Outcomes onto Program Outcomes and Program Specific Outcomes

Course Outcome	**Program Outcomes**					
	1	**2**	**3**	**4**	**5**	**6**
1	3	2		2	2	3

2	3	3	3	2	3	3
3	3	1		2	2	3
4		3		3	3	3
5	3	3	3	3	3	2

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD5, CD8
CD2	Tutorials/Assignments		CO2	CD5, CD8
CD3	Seminars		CO3	CD5, CD8
CD4	Mini projects/Projects		CO4	CD5, CD8
CD5	Laboratory experiments/teaching aids		CO5	CD4, CD8
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			