SDM College of Engineering & Technology, Dharwad

Date:18-7-2019

It is certified that the scheme and syllabus for VII & VIII semester of UG program in Civil Engineering is recommended by Board of Studies of Civil Engineering Department and approved by the Academic Council, SDM College of Engineering & Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2019-20 till further revision.

Principal Chairman BoS & HoD

Program Educational Objectives (PEOs)

I. **Technical adeptness**: The Civil Engineering Graduates will be technically adept to specific fields and other disciplines. And Management towards Planning, Design, and Costing. Their technical skills and knowledge will enable them to perform their work with a commitment and quality, timeliness with continuous improvement.

II. **Interpersonal Skills**: Civil Engineering Graduates will exhibit effective interpersonal skills in teams and at work place.

III. **Awareness of Social impact:** Graduates will be made aware of causes of impacts due to the development and also to identify remedial measures if necessary.

IV. **Professionalism:** Understanding of professionalism, ethics, quality performance, sustainability and allow them to be professional leaders and contributors to society through their problem solving capabilities and executing the work.

V. **Continuous Learning:** Civil Engineering Graduates will exhibit interest in lifelong learning including studies leading to professional licensure or higher studies in engineering that provides for continued development of their technical ability and management skills

PROGRAMOUTCOMES (POs)

Engineering Graduates will be able to:

PO1. **Engineeringknowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2. **Problemanalysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5. **Moderntoolusage**: Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The Engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principle sand commit to professional ethics and responsibilities and norms of the engineering practice.

PO9.**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10.**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11.**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12.**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and life long learning in the broadest context to technological change.

PROGRAM SPECIFIC OUT COMES (PSOs)

PSO13. **Project inception and design**: Conceptualize projects related to different
fields of Civil Engineering, collect relevant data by direct and indirect methods,
analyze the project requirement and design economically viable and sustainable project.

PSO14.**Draft specification:** Draft specification: Select material, prepare estimates/costing, schedule work plans.

PSO15.**Experimentation: Experimentation and Quality Control:** Apply knowledge of different fields of Civil Engineering, conduct experiments, analyze, interpret data, and design the Civil Engineering systems.

VII Semester B. E.

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
15UCVC700	Advanced Design of RC Structures	4-0-0	4	50	100	3		
15UCVC701	Design of Pre-Stressed Concrete Structures	4-0-0	4	50	100	3		
15UCVC702	Design of Steel Structures-I	3-0-0	3	50	100	3		
15UCVL703	Environmental Engineering Laboratory	0-0-2	1	50			50	3
15UCVL704	Internship /Mini Project	0-0-3	4	50			50	3
15UCVL705	Project Phase – I	0-0-4	2	50			50	3
	Elective – III	4-0-0	4	50	100	3		
	Elective – IV	4-0-0	4	50	100	3		
	Elective – V	4-0-0	4	50	100	3		
Total		**23-0-9**	**30**	**450**	**600**		**150**	

Elective Courses

Course Code	Course Title	Teaching	
		L-T-P-S (Hrs/ Week)	Credits
15UCVE715	Introduction to Bridge Engineering	4-0-0	04
15UCVE716	Structural Dynamics	4-0-0	04
15UCVE717	Underground Structures	4-0-0	04
15UCVE718	Advanced Foundation Design	4-0-0	04
15UCVE719	Design of Industrial Structures	4-0-0	04
15UCVE720	Solid Waste Management	4-0-0	04
15UCVE721	Air Pollution & Control	4-0-0	04
15UCVE722	Traffic Engineering	4-0-0	04
15UCVE723	Waste Water Engineering	4-0-0	04
15UCVE724	Construction Contract Management	4-0-0	04

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.

VIII Semester B. E.

Course Code	Course Title	Teaching		Examination				
		L-T-P-S (Hrs/ Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
				Max. Marks	*Max. Marks	Duration in hours	Max. Marks	Duration In hours
15UCVC800	Design of Steel Structures-II	2-0-0	2	50	100			
15UCVL801	Seminar on current topic	0-0-3	2	50				
15UCVL802	Project Phase – II	0-0-8	10	50			50	3
	Elective-VI	4-0-0	4	50	100	3		
	Elective-VII	4-0-0	4	50	100	3		
	Elective-VIII	4-0-0	4	50	100	3		
Total		**14-0-11**	**26**	300	400		50	

Total number of credits offered for the Fourth year: 56

Interdisciplinary Elective open for all Engineering Branches :
15UMAE875 Applied Numerical Methods (VIII Sem)
15UPHE876 Nanotechnology (VIII Sem)

Elective Courses

Course Code	Course Title	Teaching	
		L-T-P (Hrs/ Week)	Credits
15UCVE815	Advanced Pre stressed Concrete Structures	4-0-0	04
15UCVE816	Earthquake resistant structures	4-0-0	04
15UCVE817	Open channel hydraulics	4-0-0	04
15UCVE818	Principles and Practice of Construction Project Management	4-0-0	04
15UCVE819	Composite Structures	4-0-0	04
15UCVE820	Industrial Waste Water Treatment	4-0-0	04
15UCVE821	Ground Improvement Techniques	4-0-0	04
15UCVE822	Construction Equipment & Management	4-0-0	04
15UCVE823	Reinforced Earth Structures	4-0-0	04
15UCVE824	Urban Transport Planning	4-0-0	04
15UCVE825	Design of Bridges	4-0-0	04
Total			

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.

VII Semester B. E

15UCVC700	Advanced Design of RC Structures	(4-0-0)4

Contact Hours : 52

Course Learning Objective (CLOs): In this course design and drawing of simple portal frame, circular and rectangular water tank, cantilever and counterfort retaining wall and raft and strap beam footings are dealt in detail and also detailed drawings of beam and slab system, staircases, column footing and general layout of a building are dealt in detail. The delivery of topics will be made through lecture classes.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Design and prepare the detailed drawings of portal frames and water tanks.	3,4	2	1
CO-2	Design and prepare the detailed drawings of different types of retaining walls and combined footings.	3,4	2	1
CO-3	Interpret the given data and prepare detailed drawings of staircases, beam and slab systems, column footing and general layout drawing of building.	4	2	
CO-4	Study the drawings and Prepare bar bending schedule		2	1

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	**1**	**2**	**3**	**3**											

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Design of RC structural elements.

Course Contents:

PART – A

(Drawing to be prepared for given structural details including bar bending schedule)

1) Layout Drawing: General layout of building showing, positions of columns, footings, beams, and slabs with notations and abbreviations. **6hrs**

2) Beam and slab system, continuous beam, one way and two way slabs **6hrs**

3) Staircases: Dog legged and open well **6hrs**

4) Column footing: column and footing (square and rectangular) **6hrs**

PART – B

(Design and Drawing of the following)

1) Simple Portal Frames (single bay, single storey). **7hrs**

2) Circular and Rectangular water tanks resting on ground, using IS: 3370 (part IV). **7hrs**

3) Cantilever and Counterfort retaining walls (With and without surcharge). **7hrs**

4) Design of raft and strap beam footings. **7hrs**

Note:

1) All designs except that of water tanks shall be with limit state method only using SP 16.
2) All structural drawings to be prepared in computer aided drafting for which CTA marks will be awarded.

Reference Books/Material:

1) Krishnamurthy, “Structural Design and Drawing (Concrete Structures)”, CBS, publishers, New Delhi.
2) KrishnarajuN.,“Design of RCC Structures”, CBS publishers, New Delhi.
3) Punmia B.C., “Reinforced Concrete Structures”, Vol 1 & 2, Laxmi Publication Pvt. Ltd.
4) Krishnaraju N., “Structural Design and Drawing”, University press, Hyderabad.
5) SP-34, SP-16, IS: 456, IS: 3370 and IS: 875.

15UCVC701 DESIGN OF PRE-STRESSED CONCRETE STRUCTURES (4-0-0)4

Contact Hours:52

Course Learning Objectives (CLOs): In this course, basic material properties, fundamental principles of prestressing, analysis and design of flexural members, loss of prestress, design of end-blocks and design of composite sections are dealt. The delivering of topics will be made through lecture classes.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	To describe the basic properties of pre-stressed concrete constituents.	1	13	
CO-2	To apply the basic knowledge of fundamental principles of pre-stressing, demonstrate the various concepts and different methods of pre-stressing.	1		
CO-3	To analyze and design flexural members under service and ultimate loads.	2		
CO-4	To evaluate the short term and long term losses and deflections in pre-stressing structures.	2		
CO-5	Design of pre-stressed concrete structures using relevant industry codes.	3,8		
CO-6	To analyze stresses in anchorage zones and design the end blocks as per relevant I.S. codes.	2,8		
CO-7	Design of pre-stressed concrete beams and slabs and design tendon as per relevant design codes.	3,8		

CO-8	To analyze the composite beams.								2,8						
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	**3**	**3**	**3**					**3**					**2**		

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Strength of Materials
2) Engineering Mechanics

Course content:

1) **Materials:** High strength concrete and steel, Stress-Strain characteristics and properties **2 hr.**
2) **Basic principles of pre-stressing:** Fundamentals, Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages Load balancing concept, Stress concept, Strength concept, P Line. **4 hr.**
3) **Analysis of sections for flexure:** Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles. **8 hr.**
4) **Losses of pre-stress:** Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force. **6 hr.**
5) **Deflections:** Prediction of shortterm and long term deflections of un-cracked members. **6 hr.**
6) **Limit state of collapse and serviceability:** IS. Code recommendations – Ultimate flexural and shear resistance of sections, shear reinforcement. Limit state of serviceability, control of deflections and cracking. Type of members and flexural tensile stress. **6 hr.**
7) **Design of end blocks:** Transmission of pre stress in pre tensioned members, transmission length, anchorage stress in post-tensioned members. Bearing stress and bearing tensile force-stresses in end blocks-Methods, IS. Code,provision for the designof end block reinforcement, design of bearing plates. **6 hr.**
8) **Design of beams:** Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of pre-stressing force and eccentricity, limiting zone of pre-stressing force cable profile. **8 hr.**
9) **Analysis of composite PSC beams:** Propped and un-propped beams. **6 hr.**

Books/References:

1) Krishna Raju N., "Prestressed Concrete", Tata McGraw.
2) Ned H Burns and T.Y. Lin, "Prestressed Concrete Structures", Wiley India
3) Vanakudre S.B. &AshishYeligar, "Prestressed Concrete Materials, Analysis & Design", Khanna Publishers, New Delhi.
4) IS 1343: 2012 "Code of Practice for Prestressed Concrete".

15UCVC702 DESIGN OF STEEL STRUCTURES-I (3-0-0)3

ontact Hours:39

Course Learning Objective (CLOs): In this course, topics on steel connections-bolted and welded, tension members, truss ties, lug angles, compression members, struts, columns, built-up column sections, laced columns, battened columns, column splices, slab bases, gusseted bases and beams are dealt, based on limit state method of design. The delivery of topics will be through lecture classes using black board & PPT and site visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Define design stresses in structural steel and different fastness.	3,4		
CO-2	Calculate axial forces, BM and SFin different structural components.	3,4		
CO-3	Apply codal provisions and design various types of steel structural components.	3,4		
CO-4	Evaluate the load carrying capacities of given steel sections.	3,4		

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level			**3**	**3**											

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Strength of Materials
2) Structural Analysis - I
3) Structural Analysis - II

Course contents:

1) **Introduction:** Advantages and disadvantages of Steel structures, Loads and load combinations, Structural forms, Discussions of design concepts. IS code provisions, Fire resistance and ductility of steel. **04Hrs.**
2) **Structural Fasteners:** Bolted and welded connections, HSFG Bolts, Standard notations specifications strength of bolts, Strength of HSFG bolts, Design of bolted connections, Bolted bracket connections, Welds —standard notations fillet and Butt welds — Defects, Strength and design of connections, Welded brackets. **12Hrs.**
3) **Design of Tension Members:** Axially loaded tension members and their connections, design of lug angles, Design of truss ties and joints. **06Hrs.**
4) **Design of Compression Members:** Angle struts, Columns including built up sections, Laced and Battened systems, Column splicing. **09Hrs.**
5) **Steel Foundations:** Column bases- simple slab base, gusseted base. **05Hrs.**
6) **Design of beams:** Laterally supported beams. **03Hrs.**

Books/References:

1) N Subramanian, “Steel Structures: Design and practice”, Oxford Publishers.
2) Bhavikatti S.S., Design of Steel Structures”, I.K. Publishers.
3) IS 800: 2007, “Code of construction – Steel Structures”, BIS.
4) Pramod K.V., “Steel Data Handbook”, I.K. International, New Delhi.

15UCVL703 ENVIRONMENTAL ENGINEERING LABORATORY (0-0-2)1

Contact Hours: 36

Course Learning Objective (CLOs): The course deals with testing and characterization of water and waste water parameters learnt in the core environmental subjects. The usage of trimetric and instrumental methods is dealt with. The delivery of topics will be made through instruction classes, demonstration and Laboratory work.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Determine the potability of water as per IS standards	11,15	4	9
CO-2	Determine the level of pollution in water and waste water for different uses	11,15	4	9
CO-3	Utilize the results and observations for decision making		3	9

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level			2	2					1		3				3

Mapping level: 1 = Low, 2=Moderate, 3=Substantial

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Chemistry and laboratory procedures for safety.
2) Environmental Engineering Part I and II

Course contents:

1) Determination of Solids in Sewage: Total Solids, Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids, Settable Solids.
2) Electrical conductivity, Determination of Chlorides and Sulphates.
3) Determination of Alkalinity, Acidity and pH.
4) Determination of Calcium, Magnesium and Total Hardness.
5) Determination of Dissolved Oxygen and Determination of BOD.
6) Determination of COD.
7) Determination of percentage of available chlorine in bleaching powder, Residual Chlorine and Chlorine Demand.
8) Jar Test for Optimum Dosage of Alum, Turbidity determination.
9) Determination of Iron.
10) Determination of Fluorides.
11) Total Count Test & MPN Determination.
12) Determination Nitrates

Reference Books/Material:

1) Manual of Water & Wastewater Analysis, NEERI Publication.
2) Standard Methods for Examination of Water and Wastewater,American Publication, Association, Water Pollution Control Federation, American Water Works Association, Washington DC.
3) IS: 10500- 2011, 2490-1974, 3360-1974, 3307-1974.
4) Sawyor and McCarthy - Chemistry for Environment Engineering

15UCVL704	Internship /Mini Project	(0-0-3)4

Contact Hours: 6Weeks/ 60 Hrs

Note: Students will carry out a Mini Project pertaining to a specific aspect of civil engineering with well-defined limited scope and objectives. Majority of students during their vacation at the end of their VI semester will visit a industry / construction site and will undergo internship at worksite. During this process, they finalize the objectives and scope of mini project, formulate methodology, and collect all the data, carry out experiments if need be, pertaining to their project under the guidance of a supervisor/ representative of the industry. They present the study in the form of a project report under guidance of the faculty member during their VII semester.

Such of students who will not be in a position to do the internship during the vacation due to their academic engagements because of STC will carry out the Mini Project under the guidance of faculty member in their VII semester. However, compared to the major project, the mini project has a smaller study area, lesser scope and lesser number of objectives to be fulfilled.

The students may carry out this work on a topic as a precursor to their major project work to be taken consequently in their VIII semester.

Course Learning Objective (CLOs): Mini Project is carried out under the guidance of a faculty. In this course, the students will finalize the project title, collect the data required by indirect and direct methods and carry out literature review, formulate the methodology and Interpret the test data/ results, draw conclusions and suggest strategies as the case may be.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Identify and define the project.	13	1	9,12
CO-2	Will collect data by direct and indirect methods.	2	13	9,12
CO-3	Collect required literature survey and organize them.	1		9,12
CO-4	Formulate the methodology	2	2	9,12
CO-5	Conduct required experiment.		15	9,12
CO-6	Interpret the test data/ results, draw conclusions and suggest strategies as the case may be.	15	5	9,12

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	**2.5**	**2.66**							**1**			**1**	**2.5**		**2.5**

15UCVL705	Project Phase – I	(0-0-4) 2

Contact Hours: 36

Course Learning Objective (CLOs): Project phase-I is carried out under the guidance of a faculty. In this course, the students will finalize the project title, collect the data required by indirect and direct methods and carry out literature review and formulate the methodology.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Identify and define the project.	13	1	9,12

CO-2	Collect data by direct and indirect methods.								2				13		9,12
CO-3	Collect required literature survey and organize them.								1						9,12
CO-4	Formulate the methodology								2				2		9,12
CO-5	Conduct required experiment.												15		9,12
CO-6	Interpret the test data/ results, draw conclusions and suggest strategies as the case may be.								15				5		9,12
POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	**2.5**	**2.66**			**2**				**1**			**1**	**2.5**		**2.5**

ELECTIVE SUBJECTS

15UCVE715 INTRODUCTION TO BRIDGE ENGINEERING (4-0-0)4

Contact Hours: 52

Course Learning Objective (CLOs): Bridge Engineering is to introduce the basics of reinforced concrete, PSC and steel bridges. The course focuses on understanding of linear waterway, scour, afflux, loadings on highway and railway bridges, stability of abutments and piers, types of bearings, types of foundations and concepts of load distributions in bridges. The delivery of topics will be made through lecture classes.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Summarize and appreciation for basic concepts in selection of type of bridge for a given geography, functions of different components of bridges	1, 2, 7	13,14	
CO-2	Plan and Design linear waterway, economic span for a bridge.	1, 2,13,15	7	

CO-3	Define standard loadings and identify loads on bridges.								1, 2, 13, 15						
CO-4	Analyze and Design Abutments and Piers; Analyze load distribution to main structural components of bridges								1, 2,13,15				14		
POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	**3**	**3**					**2.5**						**2.75**	**2**	**3**

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Design of RC Structures
2) Design of Pre-stressed Concrete Structures
3) Design of Steel Structures
4) Hydrology & Water Resource Engineering

Course Contents:

1) **Introduction:** Components of Bridges, classification of bridges, masonry, arches, RCC, PSC, Steel and composite, brief description of different types and proportionate sketching, preliminary design principles **08Hrs**

2) **Investigation:** Site selection criteria, collection of design data, road, stream, surrounding area etc. linear waterway, afflux, economic span, determination of flood discharge. **08Hrs**

3) **Standard Loadings:** IRC and Railway loading, equivalent loadings for preliminary design. **06Hrs**

4) **Foundations:** Depth of scour, depth of foundation, types of foundation, Pile, Raft, Well, Caisson - sketches and brief description, Cofferdam. **04Hrs**

5) **Substructure:** Abutments, piers, wing walls, types (sketches), forces acting on them, stability consideration and empirical design. **10Hrs**

6) **Bearings:** Metallic, Concrete and Elastomeric bearings - types & sketches. **06Hrs**

7) **Design of Pipe Culvert:** With final detailed sketch. **05Hrs**

8) **Load Distribution Concepts:** Courbon's load distribution, Pigeaud's curves. **05Hrs**

Books/References:

1) Victor D.J. and Johnson, "Essentials of Bridge Engineering", Oxford and IBH.

2) Bindra S.P., "Bridge Engineering", Dhanpat Rai Publications.

15UCVE716	STRUCTURAL DYNAMICS	(4-0-0)4

Contact Hours:52

Course Learning Objectives (CLOs): In this course, mathematical model for single degree, multi degree of freedom systems for un-damped, damped forced and free vibrations are created. The delivery of topics will be made through lecture classes.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Develop the equations of motion for vibratory systems and solve for the free and forced response required for modeling structures for dynamic analyses.	1		
CO-2	Analyze and modify a vibratory structure order to achieve specified requirements by developing a model.	2		
CO-3	Emphasize the role of damping and its influence upon structural response to limit the possibility of their structures being influenced by resonance that may affect the structural safety and reliability of engineering systems.	6,8		
CO-4	Create model on continuous systems using lumped masses, generalized co-ordinates or a combination of these;	4		

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	3	3		3		3		3							

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Engineering Mechanics
2) Structural Analysis – I
3) Structural Analysis – II

Course Contents:

1) Single degree of freedom system- degrees of freedom, un-damped system, springs in parallel or in series, Newton's law of motion, free body diagram, D'Alembert's principle, solution of the differential equation of motion, frequency and period, amplitude of motion. Damped Single degree of freedom system, viscous damping, equation of motion, critically damped system, over damped system, under damped system, logarithmic decrement. Response of one degree of freedom system to harmonic loading, un-damped harmonic excitation, damped harmonic excitation, evaluation of damping at resonance, bandwidth method (Half power) to evaluate damping, response to support motion, force transmitted to the foundation, seismic instruments. **10Hrs.**

2) Response to general dynamic loading – Impulsive loading and Duhamel's integral, numerical evaluation of Duhamel's integral, un-damped system, numerical evaluation of Duhamel's integral, damped system. Fourier analysis and response in frequency domain – Fourier analysis, fourier coefficients for piece-wise liner functions, exponential form of Fourier series, discrete Fourier analysis, fast Fourier transform. **10Hrs.**

3) Generalized co-ordinates and Rayleigh's method – principle of virtual work, generalized single degree of freedom system (rigid body and distributed elasticity), Rayligh's method. Hamilton's principle. **08Hrs.**

4) Structural response –Response spectra – construction of a response spectrum, response spectrum for support disturbance tripartite response spectra, response spectra for inelastic design. **08Hrs.**

5) Multistory shear building. Free vibration – natural frequencies and normal modes. Forced motion – modal superposition method – response of a shear building to base motion. Damped motion of shear building – equations of motions – uncoupled damped equation – conditions for damping uncoupling. **10Hrs.**

6) Dynamic analysis of beams – stiffness matrix, mass matrix (lumped and consistent) equations of motions for the beam in matrix form and its solutions. **06Hrs.**

Books/References:

1) Mario Paz,"Structural dynamics: Theory and Computation", CBS Publisher and Distributors, New Delhi.
2) Clough and Penzien, "Dynamics of Structures", McGraw-Hill, New Delhi.
3) Mukhopadya, "Vibration, Dynamics and Structural problems", Oxford IBH Publishers, New Delhi.

15UCVE717 UNDERGROUND STRUCTURES (4-0-0)4

Contact Hours:52

Course Learning Objective (CLOs): In this course, topics on design and construction of diaphragm walls, tunneling, underground missile silos, power stations, craft hansoms, deep mines, and geological characterization are dealt. The delivery of topics will be made through lecture classes and field visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain about the soil structure interaction	1,2		
CO-2	Explain about the characteristics of soil at different levels.	1		
CO-3	Explain about the tunneling.	1,2		
CO-4	Design of foundation for different soil and water table condition.	2		
CO-5	Design of various underground structures-for vehicular traffic and pedestrian traffic.	2		

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	3	3													

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Geotechnical Engineering –I
2) Geotechnical Engineering –II
3) Design of RC Structures

Course contents:

1) Design and construction of diaphragm walls.	**08Hrs.**
2) Tunneling	**08Hrs.**
3) Underground missile silos	**08Hrs.**
4) Underground power stations	**08Hrs.**
5) Undergroundhangar	**08Hrs.**
6) Deep mines, construction safety	**06 Hrs.**
7) Explanation and geological characterization.	**06 Hrs.**

Reference books:

1)Sinha.R.S., "Underground Structures: Design and Construction".,Mcgraw Higher Ed.

2)Other relevant IS codes.

15UCVE718	Advanced Foundation Design	(4-0-0)4

Contact Hours:52

Course Learning Objective (CLOs): This course is intended to impart the expertise the students in designing the foundations for different types of structures. It covers the topics on shallow foundations, deep foundations such as piles, piers, caissons and well foundations. Foundations for special structures such as for antenna, radar, chimney and for black cotton soils are also covered. The course requires the completion of Geotechnical Engineering-I and II subjects as its pre-requisite. The delivery of the topics is achieved through lecture classes, problem solving and demonstrations.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain bearing capacity and factors affecting it, Calculate the dimensions of different types of shallow foundations based on bearing capacity values.		2,3	1
CO-2	Explain the necessity, classification, settlement and negative skin friction of pile foundations, Calculate the load bearing capacity / efficiency of pile group, Explain pile load test and under reamed piles.		2, 3, 4	1
CO-3	Explain drilled piers, their construction, advantages/ disadvantages, Explain and design caissons.		1, 3	
CO-4	Explain shapes, characteristics, components, sinking of wells, Explain causes and remedies of tilts and shifts.		1, 2	
CO-5	Define and explain the expansive soils and their identification methods. Explain the construction of foundations for structures in expansive soils.		1, 2, 4,15	
CO-6	Explain and design foundations for special structures such as the antenna/ radar/ transmission towers / tall chimneys.	2, 3		

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	**1.6**	**2.2**	**2.25**	**2**											**2**

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Building Engineering Science
2) Geotechnical Engineering - II

Course Contents:

1) **Shallow foundations:** Presumptive Bearing Capacity according to BIS, Factors affecting bearing capacity and settlement. Factors influencing selection of depth of foundation, types of shallow foundation - isolated footing.Combined footing, Strap footing, Strip footing and Raft (Proportioning only). **09Hrs.**
2) **Pile foundations:** Necessity, Classification, Loa4 bearing capacity by Static formula, Dynamic formula, Pile load, test and Penetration tests, pile groups, group capacity of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, under reamed piles. **09Hrs.**
3) **Drilled piers and caissons:** Introduction, construction, advantages and disadvantages of drilled piers. Design of open, pneumatic and floating caissons. Advantages and disadvantages of floating caissons. **08Hrs.**
4) **Well foundation**: Different shapes and characteristics of wells. Components of well foundation. Forces acting on well foundation. Sinking of wells.Causes and remedies of tilts and shifts. **08Hrs.**
5) **Foundations in expansive soils:** Definition, Identification, Structure, Index properties of expansive soils, Swell potential and Swell pressure, Free swell, CNS layer, foundation treatment for structures in expansive soil. **09Hrs.**
6) **Special foundation design:** Design of foundation for antenna and radar towers, tallchimneys. **09Hrs.**

Books/References:

1) Murthy V.N.S., “Soil Mechanics & Foundation Engineering”, CBS Publishers.
2) Bowles J.E., “Foundation Analysis and Design”, McGraw Hill Pub. Co., New York.
3) Purushotham Raj, “Geotechnical Engineering”, Pearson.
4) VenkataramaiahC., “Geotechnical Engineering”, New Age Publications.

15UCVE719	DESIGN OF INDUSTRIAL STRUCTURES	(4-0-0)4

Contact Hours:52

Course Learning Objective (CLOs): In this course, topics on Design of open web structures, Design Methods, Design of beams, Tubular structures,

permissible stresses, tube columns, compression members, tube tension members, design of members of tubular roof truss, joints in tubular trusses, design of tubular beams and purlins, design of plate girder, industrial frames with and without gantry, moment resisting basis, design of light gauge steel structures, design of roof trusses, open web steel construction and industrial and platform sheds are dealt. The delivery of topics will be through lecture classes using black board & PPT and site visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Specify design stresses in various industrial structures.	3,4		
CO-2	Identify and interpret codal provisions for industrial structures (IS).		4	
CO-3	Analyze the loadings on different types IS.	3,4		
CO-4	Calculate BM, SF Torsion, Axial force in various components of IS.	3,4		
CO-5	Design different types of IS.	3,4		

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level			3	2.8											

Prerequisites:

1) Design of structures – RCC
2) Pre-stressed concrete design
3) Design of steel structures

Course content:

1) Design of open web structures, Advantages, Design Methods, Design of beams. **10Hrs.**

2) Tubular structures- Introduction, permissible stresses, tube columns and compression members, tube tension members. Design of members of tubular roof truss for given member forces and their combinations joints in tubular trusses, design of tubular beams and purlins. **12 Hrs.**

3) Design of plate girder, industrial frames with and without gantry, moment resisting basis. **10Hrs.**

4) Design of light gauge steel structures **10Hrs.**

5) Design of roof stresses, open web steel construction and industrial and platform sheds. **10Hrs.**

Books/References:

1)BankerJ.F.andHeyman.,"Introduction to Plastic Analysis of Steel Structures".
2)Beedle,"Plastic Analysis of steel structures".
3)Baker.J.F.,"Steel structures".
4)Pramod K.V., "Steel Data Handbook", IK International, New Delhi.

15UCVE720	Solid Waste Management	(4-0-0)4

Contact Hours:52

Course Learning Objective (CLOs): In this course, students are given exposure to sources, impacts, treatment, disposal of solid waste, design aspects of landfills and monitoring and leachates and gases. The delivery of topics will be made through lecture classes and field visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Enumerate the quantitate of Solid wastes from different sources and recognize the possible health hazards of their disposal	1,2,13	2	-
CO-2	Analyze the physical, chemical and biological characteristics and energy content of solid wastes	2,3,4,13	2,3	4

CO-3	Plan for Optimizing the route for disposal							2,3,4,13			3,4			2	
CO-4	Analyze different disposal methods for Bio degradable and non-biodegradable solid wastes							2,3,4,13			3,4			2	
CO-5	Differentiate between hazardous and noon hazardous wastes and their disposal method							3,4,6,13			4,6			3	
CO-6	Design a Engineered land fill							3,4,6,13			4,6			3	
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	**3**	**2.25**	**2.3**	**2.4**		**2.5**							**3**		

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Environmental Engineering – I
2) Environmental Engineering - II

Course Contents:

1) **Introduction:** Solid waste- Definition, Land Pollution - scope and importance of solid waste management, functional elements of solid waste management. **06Hrs.**

2) **Sources:** Classification and characteristics- municipal, hospital/ biomedical waste, Quantity —, Generation rate, methods. **06Hrs.**

3) **Collection and transportation:** Systems of collection, collection equipment, garbage chutes, transfer stations — bailing and compacting, route Optimization **06Hrs.**

4) **Treatment / processing techniques:** Components separation, volume reduction, size reduction, chemical reduction and biological processing **06Hrs.**

5) **Incineration:** Processes - 3 T's, factors affecting incineration process, incinerators — types, prevention of air pollution, pyrolsis. **06Hrs.**

6) **Composting:**Aerobic and anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes. Vermicomposting. **06Hrs.**
7) **Sanitaryland filling:** Definition, methods, trench area, Ramp, and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate collection and control methods, gas collection systems. **06Hrs.**
8) **Disposal methods:** Open dumping - selection of site, ocean disposal, feeding to hogs, incineration, composting, sanitary land filling, merits and demerits. **06Hrs.**
9) **Recycle and reuse**: Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance and reuse. **04Hrs.**

Books/References:

1) Tehobanoglous,"Integrated Solid Waste Management", McGraw Hill.
2) PavoniJ.L., "Hand book on Solid Waste Disposal", Van nostrand Reinhold Company.
3) Edmed B. B., "The treatment of industrial wastes", TataMcGraw Hill, New Delhi.
4) Trived P.R &Garedeep R., "Solid Waste Pollutions", Aakashdeep Publishing House, New Delhi.

15UCVE721	Air Pollution and Control	(4-0-0)4

Contact Hours: 52

Course Learning Objective (CLOs): In this program, the knowledge of Air Pollution, Air pollutants, effects on man and surroundings will be taught. The course includes sampling, measurement, analysis and design of control methods of air pollution. The delivery of topics will be made through lecture classes and demonstrations.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Classify primary and secondary Air Pollutants, Identify their sources and	2	2	

	describe their effects on environment														
CO-2	Analyze the effects of air pollution on man, material and vegetation.								4				4		
CO-3	Predict changes in atmosphere by meteorological variables.												7		
CO-4	Analyze and control global effects of air pollution.												12		
CO-5	Design air pollution control methods for gaseous and particulate matter.								3				15		
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level		**2.5**	**3**	**2.5**			**2**					**2**			**2**

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Environmental Engineering – I
2) Environmental Engineering - II

Course Contents:

1) **Introduction: Definition** - Classification and properties of Air pollutants, Primary and secondary Air pollutants, Concentrations of Air pollutants and sources, behavior and Fate of Air Pollution: Chemical reaction in the Atmosphere, photochemical Smog **06Hrs.**
2) **Effects of air pollution:** On Human Health, Animals, Plant and properties, major Episodes. **06Hrs.**
3) **Meteorology: Introduction** - Meteorological Variables. Lapse Rate- Adiabatic- Dispersion/ inversion, Stability Conditions, windrows, General characteristics of stack plumes **06Hrs.**
4) **Sampling and analysis of air pollutants:** Sampling and measurement of Gaseous and particulate pollutants stack sampling, smoke and its measurements. **06Hrs.**

5) **Control of air pollutants:** control methods - Particulate emission control, gravitational settling chambers, cyclone separators, fabric filters, Electrostatic precipitators, wet scrubbers, control of gaseous emissions. **06Hrs.**
6) **Air pollution due to automobiles:** Air pollution due to gasoline driven and Diesel driven engines, effects, control - direct and indirect methods. **06Hrs.**
7) **Global environmental issues:** Acid rain, Green House effect, Global warming, Ozone layer Depletion, Environmental Impact Assessment in industrial plant locations and planning **10Hrs.**
8) Standards and legislation - Air quality and emission standards - legislation and regulation. Air pollution index. **06Hrs.**

Books/References:

1)Rao.M.N., "Air Pollution", Tata McGraw Hill Education.
2)Rao.C.S., "Environmental pollution control", Wiley Eastern Ltd.
3)Stem.A., "Air Pollution", Academic Press.
4)Henry.P., "Air pollution", Tata McGraw Hill Education.

15UCVE722	Traffic Engineering	(4-0-0)4

Contact Hours:52

Course Learning Objective (CLOs): In this course, students are given exposure to measure various traffic flow parameters, design traffic control devices, apply statistical methods for transport planning. The delivery of topics will be made through lecture classes and field visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Use Engineering science to determine the power performance of the vehicle under various resisting forces.		1	

CO-2	Illustrate and apply traffic flow parameters to develop an efficient transport system.									**1**					
CO-3	Examine the transport system problems and apply statistical methods to overcome.									**1**					
CO-4	Illustrate various traffic regulation and control devices and develop suitable traffic signal system.									**1**					
CO-5	Design rotary intersection to provide channelized movement at intersections.									**1**					
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	**2.4**														

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Transportation Engineering
2) Probability and statistics

Course Contents:

1) **Introduction**: Definition, Objectives, Scope of Traffic Engineering. **06Hrs.**
2) **Road User and Vehicle Characteristics**: Static and Dynamic characteristics, Power performance of vehicles, Resistances to the motion of vehicles, Reaction time of driver, Problems on above. **09 Hrs.**
3) **Traffic Parameter Studies and Analysis:** Objectives and Method of study, Definition of study area, Sample size, Data Collection and Analysis - Interpretation of following Traffic Studies, Volume, Spot Speed, Origin and Destination, Speed and Delay, Parking on Street and off Street Parking, Accidents, Causes, Analysis (right angle collision only with parked vehicle), Measures to reduce Accident. Problems. **09 Hrs.**
4) **Traffic Flow Theories:** Traffic flow theory Green shield theory, Goodness of fit, correlation and regression analysis (linear only), Queuing theory, Car following theory and relevant Problems on above **09 Hrs.**

5) **Probability Distribution:** Poisson's Distribution and application to Traffic Engineering, Normal Distribution, Significance tests for observed Traffic Data, Chi square test, Problems on above, Sample size, traffic forecast, simulation technique. **09 Hrs.**

6) **Traffic Regulation and Control:** Vehicle and Road controls, Traffic Regulations, One Way, Traffic Signs, Traffic Markings, Traffic signals, Vehicle actuated and synchronized signals, Signal Coordination, Intelligent Transport system, Webster's method of signal Design, IRC Method, Traffic Rotary elements and traffic operation, Street lighting, Road Side Furniture, Arboriculture, Relevant Problems on above. **10Hrs.**

Books/References:

1)Khanna and Justo, "Highway Engineering", Nemchand Bros.

2) Kadiyali.L.R.,"Traffic Engineering and Transport Planning", Khanna Publishers, New
Delhi.

3) Matson,Smith and Hard., "Traffic Engineering", McGraw Hill and Co.

4)Pignataro, "Traffic Engineering", Prentice Hall.

15UCVE723	Waste Water Engineering	(4-0-0)4

Contact Hours: 52

Course Learning Objective (CLOs): In this course, students are given exposure to systems of sewage, sewer materials, joints, excavations for sewers and maintenance. The delivery of topics will be made through lecture classes and field visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Forecast possible health hazards, classify sewage systems and quantify the sewage.	1,2	-	-

CO-2	Select suitable sewer materials, joints and repair and maintenance required.							2,3			-				-
CO-3	State the significance of providing appurtenances along with their construction details.							3,4			5,6				2
CO-4	Detail out requirement of pumping stations, design suitable type of pumps for economic diameters.							3,4,15			5,6				2
CO-5	Carry out excavation for sewers and dewatering, laying of pipes and repairs & maintenance.							3,4,15			5,6				2
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	**3**	**1.8**	**3**	**3**	**2**	**2**									**3**

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Environmental Engineering - II

Course contents:

1) **Sewerage-General:** Introduction. Definitions. General Considerations. Combined vs. Separate Sewers. Liability for Damages Caused by Sewage Estimation of Storm Flow. The Rational Method. Runoff Coefficients. Time of Concentration. Rainfall Intensity. Intensity Curves and Formulas. Use of Intensity-Duration-Frequency Data. Other Techniques. **15Hrs.**
2) **Sewer Pipes:** Pipe Materials. Clay Sewer Pipe. Strength and Loading of Vitrified Clay Pipe. Plain Concrete Sewer Pipe. Reinforced Concrete Sewer Pipe. Asbestos Cement Pipe. Plastic Truss Pipe. Other Sewer Materials. Infiltration and Sewer Joints. Sewers Built in Place. Corrosion of Sewers. **10Hrs.**
3) **Sewer Appurtenances:** Operational Requirements. Manholes. Inlets. Catch Basins. Flushing Devices. Sand. Grease and Oil Traps. Regulators. Junctions. Sewer Outlets. Inverted Siphons. Sewer Crossings. Need for

Pumping. Pumps for Sewage. Pumping Stations. Sump Pumps. Sewage, Ejector][s. Vacuum Collection Systems. Grinder Pumps. **10Hrs.**

4) **Construction and maintenance of sewers:** Responsibility. Lines and Grades. Classification of Excavation. Hand Excavation. Machine Excavation. Rock Excavation. Sheeting and Bracing. Removal of Sheeting and Bracing. Dewatering of Trenches. Pipe Laying. Jointing. Jacking and Boring. Backfilling. Concrete Sewers. Tunneling Scope and Cost. Protective Ordinances. Equipment. Stoppage Clearing. Sewer Cleaning. Inspection Practice. Making Repairs and Connections. Cleaning Catch Basins. Gases in Sewers. **17Hrs.**

Books/References:

1) Garg.S.K.,"Water Supply Engineering, Khanna Publishers", New Delhi.
2) Birdie.G.S.,"Water supply and sanitary engineering", DhanpatRai and Sons, New Delhi.
3) Steel E.W.,"Water supply And Sewerage", M. Hill Publishers, Tokyo.

15UCVE724	Construction Contract Management	(4-0-0)4

Contact Hours:52

Course Learning Objective (CLOs): In this course, silent features of India Contract Act, general conditions of contract for domestic and international works are dealt. Further, aspects related to contract administration and laws applicable to construction industry, including dispute resolution techniques are taught. The delivering of topics will be made through lecture classes.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Contracts: Salient features of contracts, essentials for legally valid contract and related documents, application of Indian Contracts Act, 1872 to construction industry.	1	2	

CO-2	General conditions of contract: Domestic, international and comparative study.							2							
CO-3	Contract administration: Various aspects related to administration of contract.							3				5			7
CO-4	Dispute resolution techniques: Various techniques and dispute minimization.							8				4			5
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	**3**	**2.5**	**3**	**2**	**1.5**		**1**	**3**							

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Building Construction.
2) Quantity Surveying and Estimation.

Course Content:

1. Introduction to legal system: Introduction and controls it exerts on the activities of engineers and managers in practice. **2Hrs**
2. Indian Contract Act 1872: Salient features of Act and its Applicability to construction industry. **6Hrs**
3. Contracts: Definitions, Salient features of a contract, Essentials for a legally valid contract, documents for an Engineering Contract. **6Hrs**
4. General conditions of contract- Domestic - CPWD and International Contract – FIDIC; Special conditions of contract; Comparative study of contract conditions; Problems in the operation of contracts. **8Hrs**
5. Contract Administration: Performance / Discharging of a contract, Obligations of Employer and contractor, Breach of contract - Definition and Classification, Common Breaches by – Employer, Contractor;
   Delay and extension of time, extras, variation in quantity, price escalation. Construction claims and their management: Claims for Damages and liquidated damages; Quantum Meruit, Force Majeure, compensation and Tort. **14Hrs**
6. Laws applicable to construction activity: Need and broad provisions of following Acts including case laws.

The Building and Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996; Industrial Disputes Act, 1947;Workmen's Compensation Act, 1952;Employers' Liability Act, 2008;Payment of Wages Act, 1936;The Employees Provident Fund, 1952;Contract Labor (Regulation and Abolition) Act, 1970;Minimum Wages Act, 1948;Interstate Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979; And other applicable Acts. **8 Hrs**.

7. Disputes and Resolution Techniques: Methods for dispute resolution − Negotiations, Mediation, Conciliation, Dispute Resolution Boards, Arbitration, Arbitration and Conciliation Act 1996: Act of 1996 and Arbitration Case Studies. Litigation / Adjudication by courts, Approach to dispute minimization. **8 Hrs**.

Books/References:

1) Markanda P. C., "Building and Engineering Contracts, Vol 2", LexisNexis, Butterworths, Wadhwa, Nagpur.

2) Jimmie Hinze, "Construction Contracts", McGraw Hill.

3) KishorGajria, "G.T. Gajria's Laws relating to Buildings and Engineering Contracts in India", LexisNexis.

4) Joseph T. Bockrath, "Contracts and the Legal Environment for Engineers and Architects", McGraw Hill.

5) Kwaku, A., Tenah, P.E. Jose M. Guevara, P.E., "Fundamentals of Construction Management and Organization", Prentice Hall.

6) AnupamKurlwal, "An Introduction to Alternative Dispute Resolution System(ADR)", Central Law Publications, Allahabad.

7) Government of India, "CPWD Works Manual 2014".

8) General Conditions of Contract, Central Public Works Department 2014, New Delhi.

9) "Conditions of Contract for Construction for Building and Engineering Woks Designed by the Employer", FIDIC, 1999.

10) Bare Acts: Arbitration Act, Indian Contract Act and other relevant Acts.

VIII Semester B.E.

15UCVC800	Design of Steel Structures– II	(2-0-0)2

Contact Hours: 26

Course Learning Objective (CLOs): In this course, topics on design of welded Plate Girder with and without stiffness, Gantry Girder with overhead crane, Roof Truss (loads and forces given), member design – top chord, bottom chord, web members are dealt. The delivery of topics will be through lecture classes using black board & PPT and site visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Interpret and use the core provisions to design Plate Girder, Gantry Girder and Roof Truss.	3,4		
CO-2	Analyze and calculate the shear force, bending moment, axial forces, lateral loadings for the design of Plate Girder, Gantry Girder and Roof Truss.	3,4		
CO-3	Arrange different components of Plate Girder, Gantry Girder and Roof Truss to resist the external forces-shear forces, bending moment and axial forces.	3,4		
CO-4	Calculate resisting capacities of various components and revise, if necessary, the section to ensure safety and economy.	3,4		
CO-5	Design safe economic section for Plate Girder, Gantry Girder and Roof Truss.	3,4		

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level			3	3											

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Design of Steel Structures-I

Course Contents:

1) Design of plate girder: Introduction, Basic assumptions, depth to thickness ratio of web, approximate depth of web, area of flanges, check for moment, shear, deflection, design of welded connection between web and flanges. **10 Hrs.**

2) Design of gantry girder: Introduction impact effect, calculations of vertical moment and shear, horizontal moment and shear, selection of section, calculations of impressions flange section modulus, check for vertical and horizontal moments and shear capacities, check for biaxial moment and shear, check for deflection, check for buckling and crippling strength of web, design of welded connections between I and channel section. **08 Hrs.**

3) Design of Truss: Introduction, types, design of top- chord members, design of bottom chord members, design of typical intermediate members for several of stresses check for slenderness ratio for reversal of stresses design of connections. **08 Hrs.**

Books/References:

1) BhavikattiS.S.,"Design of Steel Structures", I.K. Publishers.
2) IS:800– 2007, "General Construction in steel: Code of practice".
3) Pramod K.V., "Steel Data Handbook", IK International, New Delhi.

15UCVL801	Seminar on Current Topic	(0-0-3) 2

Contact Hours:36

Course Learning Objective (CLOs): In this course, students will collect information on current issues being practiced in different fields of Civil Engineering like Structural Engineering, Water Resources, Geotechnical Engineering, Environmental Engineering, Transportation Engineering etc. Seminar consists of filed visits, collection of data, compilation of data, literature review.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Select a topic relevant to Civil Engineering on recent development/ case studies.	4	1,2,5	12
CO-2	Carry out the literature review.	4	1,2,5	12
CO-3	Collect data by direct and indirect methods.			
CO-4	Assemble / Organize the data and prepare report.	4,9	1,2,5	12
CO-5	Presentations.	4,9	1,2,5	

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	2	2		3	2				3			1			

15UCVL802 Project Phase-II (0-0-12) 10

Contact Hours: 100

Course Learning Objective (CLOs): In this course, the students will analyze the data collected, interpret the results, draw conclusions, design project components, evaluate/ assess the project and redesign if necessary, following relevant codes/ standards of practice, if applicable.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Analyze and interpret the data collected and draw conclusions.	13,14,15	3,4	8,11,12
CO-2	Design different components of the project following relevant IS codes if applicable.	13,14,15	3,4	8,11,12

CO-3	Project evaluation and redesign.								13,14,15				3,4		8,11,12
CO-4	Project Report								13,14,15				3,4		11
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level			**2**	**2**				**1**			**1**	**1**	**3**	**3**	**3**

Elective Subjects

15UCVE815	Advanced Pre-stressed Concrete Structures	(4-0-0)4

Contact Hours: 52

Course Learning Objectives (CLOs): In this course, basic material properties, fundamental principles of pre-stressing, analysis and design of flexural members, loss of pre-stress, design of end-blocks and design of composite sections are dealt. The delivering of topics will be made through lecture classes.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Describe the basic properties of pre-stressed concrete constituents.	1	13	
CO-2	Apply the basic knowledge of fundamental principles of pre-stressing, demonstrate the various concepts and different methods of pre-stressing.	1		
CO-3	Analyze and design flexural members under service and ultimate loads.	2		
CO-4	Evaluate the short term and long term losses and deflections in pre-stressing structures.	2		

CO-5	Design of pre-stressed concrete structures using relevant industry codes.							3,8							
CO-6	Analyze stresses in anchorage zones and design the end blocks as per relevant I.S. codes.							2,8							
CO-7	Design of pre-stressed concrete beams and slabs and design tendon as per relevant design codes.							3,8							
CO-8	Analyze the composite beams.							2,8							
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	**3**	**3**	**3**					**3**					**2**		

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Strength of Materials
2) Engineering Mechanics

Course content:

1) **Materials:** High strength concrete and steel, Stress-Strain characteristics and properties **2 hrs.**
2) **Basic principles of pre-stressing:** Fundamentals, Load balancing concept, Stress concept, centre of Thrust. Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages **4 hrs.**
3) **Analysis of sections for flexure:** Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles. **8 hrs.**
4) **Losses of pre-stress:** Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force. **6 hrs.**
5) **Deflections:** Prediction of shortterm and long term deflections of un-cracked members. **6 hrs.**
6) **Limit state of collapse and serviceability:** IS. Code recommendations – Ultimate flexural and shear resistance of sections, shear reinforcement. Limit state of serviceability, control of deflections and cracking. Type of members and flexural tensile stress. **6 hrs.**

7) **Design of end blocks:** Transmission of pre stress in pre tensioned members, transmission length, and anchorage stress in post-tensioned members. Bearing stress and bearing tensile force-stresses in end blocks-Methods, IS. Codes, provision for the design of end block reinforcement. **6 hrs.**
8) **Design of beams:** Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of pre-stressing force and eccentricity, limiting zone of pre-stressing force cable profile. **8 hrs.**
9) **Analysis of composite PSC beams:** Propped and un-propped beams. **6 hrs.**

Books/References:

1. Sinha N.C & Roy S.K., "Fundamental of pre-stressed concrete", John Wiley & Sons, New York.
2. Krishna Raju N.,"Prestressed Concrete", Tata McGraw Publishers.
3. Daynrathnam P., "Prestressed Concrete", Oxford and IBH publishing Co.
4. References/IS Codes: IS 1343-1980, "Design of Prestressed Concrete Structures".

15UCVE816	Earthquake Resistant Structures	(4-0-0)4

Contact Hours: 52

Course Learning Objective (CLOs): In this course, topics on Seismic hazard assessment, Earthquake effects on structures, Concepts of earthquake resistant design of earthen buildings, Geotechnical earthquake engineering are dealt. The delivery of topics will be made through lecture classes and field visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Understand Engineering seismology and Seismic hazard assessment.	1,7	8	
CO-2	Explains earthquake effects on structures, evaluation of earthquake forces and effect of earthquake of on different types of structures.	1,3,7,	8	

CO-3	Understand the philosophy and principle of earthquake resistance design of structures.							1,7			8				
CO-4	Explains Earthquake Resistance design of low strength masonry buildings.							3,7			8				
POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	**3**		**3**				**3**	**2**							

Course Contents:

1) **Seismic hazard assessment:** Engineering Seismology, Definitions, Introduction to Seismic hazard, Earthquake phenomenon, Seism tectonics and seismic zoning of India, Earthquake monitoring and seismic instrumentation, Characteristics of strong Earthquake motion, Estimation of Earthquake parameters, Microzonation. **15 Hrs.**
2) **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 base isolated buildings, earthquake response of inelastic structures, allowable ductility demand Response Spectra / Average response Spectra, Design Response Spectra, Evaluation of earthquake forces (IS 1893 – 2016). Effect of earthquake of on different types of structures – Lesson learnt from past earthquakes. **15 Hrs.**
3) Ductile detailing of RC Structures IS 13920:2016 **06Hrs.**
4) **Concepts of earthquake resistant design**: Structural Systems / Types of buildings, Causes of damage, Planning consideration/Architectural Concept (IS 4326–1993) (Do's and Don'ts for protection of life and property), Philosophy and principle of earthquake resistance design, Guidelines for Earthquake Resistant Design. **10Hrs**.
5) **Earthquake resistant design of earthen and masonry buildings (IS13827–1993):** Earthquake Resistant low strength masonry buildings. **06Hrs**.

Reference Books:

1) Chopra, A.K.,"Dynamics of structures", Prentice-Hall of India Pvt. Ltd. New Delhi.
2) Clough, R.W. and Penzien J., "Dynamics of Structures", McGraw Hill Book Co. New York.
3) Biggs M., "An Introduction to Structural Dynamics", McGraw Hill Book Co. New York.

15UCVE817	Open Channel Hydraulics	(4-0-0)4

Contact Hours:52

Course Learning Objectives (CLOs): In this course difference between pipe and open channel flow. Momentum equation, uniform flow, design of channel sections, gradually varying flow and rapidly varied flow along with sediment transport are dealt with. The delivery of topics will be made through lecture classes and field visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Differentiate between pipe flow and open channel flow and equations like energy and momentum.		1,2	
CO-2	Understand concepts of uniform/ critical flow and design of channel for uniform/critical flow.	3		
CO-3	Study different forms of gradually varied flow and their flow profiles.	3	5	
CO-4	Compute gradually varied flow by applying direct integration and Bresse's and Chow's solution, Etc.	3	5	

CO-5	Understand concepts like length, height, location of Hydraulic jump and their application.								3				5		
CO-6	Understand the mechanism of sedimentation.														1
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	1.5	**2**	**3**		2										

Prerequisites:

Strength of materials

Course contents:

1) **Introduction:** Introduction, difference between pipe flow and open channel flow, classification of flow, energy equation, momentum equation, kinetic energy and momentum factors. **4 Hrs.**
2) **Uniform Flow:** Concepts, uniform flow equations, conveyance, hydraulic exponent for uniform flow, design of channels for uniform flow. **9 Hrs.**
3) **Critical Flow:** Concepts, specific energy, classification of flow, design of channels, section factor, hydraulic exponent for critical flow, and critical depth as a flow measuring consent. **10 Hrs.**
4) **Gradually Varied Flow:** Concepts, GVF equation, its different forms, classification and analysis of flow profiles, control sections. **7 Hrs.**
5) **Gradually Varied Flow Computations**: Different methods, direct integration method, Bresse's & Chow's solution, direct step method, standard step method. **10 Hrs.**
6) **Rapidly Varied Flow:** Concepts, hydraulic jump in rectangular channels, classification of jumps, characteristics of jumps, length, location, height, applications of hydraulic jump, stilling basins, shape type 2 and type 4.. **4 Hrs.**
7) **Sediment Transport** **8 Hrs.**

Reference books:

1) Ven Tee Chow, "Open Channel Hydraulics", Blackburn.
2) Henderson,"Open Channel Hydraulics", Pearson.

15UCVE818	Principles and Practice of Construction Project Management	(3-0-2)4

Contact Hours: 52

Course Learning Objective (CLOs): This course provides theoretical as well as practical knowledge for the students in the various concepts of construction project management. This course leads the students through inputs of Construction project management concepts viz. planning, scheduling, resource analysis, optimizing and executing; followed by hands-on practical training using project management software, which facilitates to create and track an entire project from planning to completion. The course is taught through lecture classes and computer laboratory practicals.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Understand about Construction projects, Project Management and Techniques			11
CO-2	Understand the Planning and Scheduling Principles, Methods of Scheduling with reference to Construction projects.			1,11
CO-3	Create a Network schedule for a construction project using the defined rules.		2,11	
CO-4	Understand and create a PERT Network diagram for a construction project		3,11	
CO-5	Understand and create a CPM Network diagram for a construction project		3,11	

CO-6	Understand costs and Resources of a construction project and to effect Resource smoothing, leveling and updating of the Project.												11		
CO-7	Create a project, build a work break down structure, add activities, create relationships, assign resources, analyze schedule dates and resource allocation, execute the project plan and create reports.							2,3,5,11							
PO s→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	1	2.5	2.3		3						1.71				

Course Content:

1. Introduction: Introduction about Construction Projects and Project Management, Project Phases & Life Cycle of a Project. Introduction to Project management techniques- CPM, PERT and Project Management Software. **3hrs**
2. Planning and Scheduling for Construction Projects: Introduction, Steps involved in Planning, Objectives, Principles and Advantages of Planning, Preparation of construction schedules, Uses and advantages of scheduling, Methods of scheduling – Bar charts, Mile stone charts, Job lay out, Work break down structure, Line of balance technique. **5hrs**
3. Project Management through networks: Introduction and definition of a network, Objectives, Interrelationship of events, Interrelationship of activities, Types of networks, Assumptions for creating a network schedule, Rules for drawing a network. Fulkerson's rule **6hrs**
4. Program Evaluation and Review Technique(PERT): Introduction, Time estimates, Earliest expected time, Latest allowable occurrence time, Tabular format and computations, Slack, Critical path, Probability of completion time for a project **10hrs**

3) Critical Path Method (CPM):Introduction, Difference between CPM and PERT, Earliest and latest event times, Activity time, Float, Criticality and critical activity, Tabular format and computations **10hrs**

4) Time – Cost Relationship and Resource Allocation: Introduction, Direct costs, Indirect costs, Total Project costs, Optimization of cost through network contraction, Resource smoothing and leveling, Project updating, Methods of updating. **5hrs**

Laboratory Practical using Project Management software:

(Required Prerequisites: Knowledge of Project Management Principles)

7) Structuring of the Project: Create a Project, Describe the Enterprise Project Structure (EPS),Set up and understand the Organizational Breakdown Structure (OBS), Set up User Preferences, Navigate in the Project window, Modify Project Information, Create a Work Breakdown Structure (WBS) and Multiple levels of WBS hierarchy, Understand Activity types, Describe Activity components, Add activities, Set up Project Parameters, Assign Project Codes, Resource Codes, Activity Codes, Modify activity Information. **4 hrs**

8) Scheduling and Resource Management of the Project: View Network logic diagram, Apply activities relationships (Logical connection), Describe Relationship Types, Scheduling, Describe the Forward and Backward Pass, Understand Total Float, Calculate schedule, Assign constraints, Describe and Apply activity level Constraints, Format schedule data, Create layouts, Utilize grouping, sorting and filtering, Understand Resource types, Assign Resource to activities, Analyze and resolve resource over allocation. **4hrs**

9) Optimizing, Executing and Reporting of the Project: Optimize the Project Plan- Analyze schedule dates, Shorten the Project Plan, Analyze Resources and Cost, Create a Baseline Plan, Assign the baseline to the Project, Display baseline bars in the Gantt chart, Project Execution- Describe methods of applying Progress, Progress Update, Update activity information, Set up Project Thresholds, Level the Project Resources, Project Tracking, Reporting- Describe available Reporting Methods, Run a schedule Report, Procurement Report, Project Progress Report, Schedule Comparison Report, Weekly Report, Project Cost Report, Project Closing Report, Client Report **5hrs**

Books/References:

1) Chitkara, K.K.,"Construction Project Management: Planning, Scheduling and Control", McGraw Hill Publishing Company, New Delhi, 1998.
2) S. Seetharaman, "Construction Engineering and Management", Umesh Publications, Delhi,2005
3) Feigenbaum, L.,"Construction Scheduling with Primavera Project Planner", Prentice Hall Inc.
4) Raina,V.K., "Construction Management Practices : The inside story", Tata McGraw Hill Publishing Company Ltd. New Delhi 1998.
5) Project Management Software and relevant user manuals.

15UCVE819	Composite Structures	(4-0-0)4

ontact Hours:52

Course Learning Objective (CLOs): This course deals with a great deal of fundamental and developmental research has been made to bring composite materials in various applications such as automobile, space, medical, automotive, building construction, etc. The advent of composite materials has introduced a new dimension in application of energetic, smart and reactive materials. The objective of this course is to know the fundamental concepts, theory and method of analysis of composites.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Identify and classify Composites		2,7	
CO-2	Compose and Analyze Laminated Composites	2,7,14		
CO-3	Analyze Cross-ply and Angle-ply Laminates	2,7,15		
CO-4	Failure theories of composites and Analysis	2,7,14,15		

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level		2.75					2.75							3	3

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Strength of Materials
2) Structural Analysis-I

Course Content:

1) **Introduction to Composite materials:** Classifications and applications of composites basic concepts and terminology of fibers and matrix, Laminate and laminates. Volume, weight, fraction and load distribution among constituents, Minimum & critical volume fraction, compliance& stiffness matrices, coupling. **15 Hrs.**
2) **Anisotropic elasticity:** Unidirectional and anisotropic lamina, thermo-mechanical properties, micro- mechanical analysis, classical composite lamination theory. **15 Hrs.**
3) **Cross and angle–ply laminates:** Symmetric, anti-symmetric and general asymmetric laminates, mechanical coupling, and laminate stacking. **10 Hrs.**
4) **Analysis of simple laminated structural elements:** Ply-stress and strain, lamina failure theories - first fly failure, environmental effects, manufacturing of composites. **12 Hrs.**

Books/References:

1. Madhujit Mukhopadhyay, “Mechanics of Composite Materials and Structures”, Universities Press.
2. Robart M Jones, “Mechanic of Composite Materials”, McGraw Hill Publishing Co.
3. Bhagwan D Agaraval, and Lawrence J Brutman, “Analysis and Performance of Fiber Composites”, John Willy and Sons.

15UCVE820	Industrial Waste Water Treatment	(4-0-0)4

Contact Hours: 52

Course Learning Objective (CLOs): In this course, topics on industrial waste water/effluent generation, health hazards, and characterization and treatment methods, effect of disposal on streams water bodies, significance of DO and governing factors, effluent treatment plant unit flow diagrams, safe disposal of effluents and sludge are dealt. The delivery of topics will be made through lecture classes and site visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Distinguish between domestic and industrial waste water and their effects on streams.	1,2	7	6
CO-2	State significance of Streeter Phelps equation and detail out the significance of each term.	1,2	7	6
CO-3	Quantify and characterize industrial waste water and apply suitable treatment method.	1,3,13	7	6
CO-4	Design treatment units/processes by selecting appropriate method of unit operation.	3,13	7	6
CO-5	Co-relate the effluent standards with BIS specifications and select suitable disposal method like disposal on land /water bodies like rivers or marine environment.	3,14	7	6
CO-6	Draw flow diagram of effluent treatment plants of an industry and detail out the procedure of effluent treatment.	3,4, 14	7	6

POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	**3**	**3**	**3**	**3**		**1**	**2**						**3**	**3**	

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Environmental Engineering – I
2) Environmental Engineering - II

Course Content:

1) **Introduction:** Difference between Domestic and Industrial Wastewater, Effect on Streams and on Municipal Sewage Treatment Plants. Stream Quality, Dissolved Oxygen Sag curve in Stream, Streeter - Phelps formulation, Stream Sampling, effluent and stream Standards and Legislation to Control Water Pollution. **11Hrs.**
2) **Treatment methods:** Volume Reduction, Strength Reduction, Neutralization, Equalization and Proportioning. Removal of Inorganic suspended solids, Removal of Organic Solids, Removal of suspended solids and colloids. Treatment and Disposal of Sludge Solids. **15Hrs.**
3) **Combined treatment:** Feasibility of combined Treatment of Industrial Raw Waste with Domestic Waste, Discharge of Raw, Partially Treated and completely treated Wastes to Streams. **11Hrs.**
4) **Treatment of selected industrial wastes:** Process flow sheet showing origin / sources of waste waters, Characteristics of waste alternative treatment methods, disposal, reuse and recovery along with flow sheet. Effect of waste disposal on water bodies: Sugar, Diary, pharmaceutical, textile, brewery, distillery, leather industries. **15Hrs.**

Books/References:

1)Nelson L., "Industrial Waste Water Treatment : Contemporary practice and vision for future", Elseviar.
2)Rao M.N., and DuttaA.K.,"Industrial Waste Treatment", Oxford and IBH publishing CO.PVT.LTD.
3)MahajanS.P.,"Pollution Control Processes in industries",Mcgraw higher Ed.
4)RelevantI.S. Codes

15UCVE821	Ground Improvement Techniques	(4-0-0)4

Contact Hours:52

Course Learning Objective (CLOs): The course refers to the improvement in or modification to the engineering properties of a soil or rock that are carried out at a site where the soil or rock in its natural state does not possess properties

that are acceptable to the engineers for the proposed construction activity. The improved or modified soil exhibits satisfactory performance. The various topics on mechanical modification, hydraulic modification, chemical modification, grouting and other miscellaneous methods are covered along with typical field problems and their remedial measures. The delivery of the topics is achieved through lecture classes, problem solving and demonstrations.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Define & explain the objectives of ground improvement and classify various methods of GIT.		1,2	12
CO-2	Explain different methods of mechanical modification and their applications.		1,2	12
CO-3	Explain different methods of hydraulic modification and assess ground conditions for their applications.		1,2	12
CO-4	Define & Explain different methods of chemical modification and their applications.		1,2	12
CO-5	Describe the grouting technique of modifying the ground, procedures and applications grouting.		1,2	12
CO-6	Discuss the concepts of miscellaneous methods of GIT and their usage.		1,2	12

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	**2**	**2**										**1**			

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Geotechnical Engineering – I
2) Geotechnical Engineering - II

Course Contents:

1) **Ground improvement:** Definition, Objectives of soil improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique. **04Hrs**.
2) **Mechanical modification:** Type of mechanical modification, Aim of modification, compaction, Principle of modification for various types of soils, Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil, micaceous soil, Effect of compaction on engineering behavior like Compressibility, Swelling and Shrinkage, Permeability, relative density, liquefaction potential, Field compaction - static, dynamic, impact and vibratory type, Specification of compaction, Tolerance of compaction, Shallow and deep compaction **12Hrs.**
3) **Hydraulic modification:** Definition, aim, principle, techniques, gravity drain, lowering of water table, multistage well point, vacuum dewatering, Drainage of slopes, preloading, vertical drains, sand drains, Assessment of ground condition for preloading, Electro kinetic dewatering. **10Hrs.**
4) **Chemical modification:** Definition, aim, special effects, and methods, Techniques - sandwich technique, admixtures, cement stabilization. Hydration - effect of cement stabilization on permeability, Swelling and shrinkage, Criteria for cement stabilization, Lime stabilization-suitability, process, special effects, criteria for lime stabilization, Other chemicals, chlorides, hydroxides, lignin, hydrofluoric acid, Fly ash in cement stabilization, Properties of chemical components, reactions and effects, Bitumen, tar or asphalt in stabilization **12Hrs.**
5) **Grouting:** Introduction, Effects of grouting, Chemicals and materials used, Types of grouting, Grouting procedure, Applications of grouting. **06Hrs.**
6) **Miscellaneous methods (only Concepts):** Introduction, Soil reinforcement, Thermal methods, Ground improvement by confinement - Crib walls, Gabions & Mattresses, Anchors, Rock bolts and soil nailing. **08Hrs.**

Books/References:

1) Manfred Hausmann,“Engineering principles of ground modification”, McGraw Hill Pub. Co., New York.

2) Bell, F.G., "Methods of treatment of unstable ground", Butterworths, London.
3) Ingles, C.G and Metcalf.J.B., "Soil Stabilization; Principles and Practice", Butterworths, London.
4) Purushottam Raj P., "Ground Improvement Technique", Laxmi Publications

15UCVE822 Construction Equipment and Management (4-0-0)4

Contact Hours: 52

Course Learning Objective (CLOs): In this course, topics on construction industry and management, construction planning, construction equipment and construction safety are dealt. The delivery of topics will be made through lecture classes and site visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Identify, plan and prepare for the construction processes.	1,9,11	10	12
CO-2	Analyze problem scenario, monitor and manage the project.	3	4	5,8
CO-3	Implement departmental procedures, specifications, contracts and bidding.	2	6	8
CO-4	Identify and propose suitable machinery and equipment for particular works.	5	6	10,11
CO-5	Understand various safety and precautionary measures at site.	11	12	8

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	3	3	3	2	2	2		1	3	1.5	2.33	1			

Course Contents:

1) **Construction industry and management:** Introduction, Value engineering time management, Labor and Material management, tendering and bidding, contract and contractor, organization and administration, industrial financial management. **12 Hrs.**
2) **Construction planning:** Introduction, planning methods of projects, Bar and Mile stone charts, PERT and CPM network analysis, cost model, Direct cost, indirect cost, total cost, optimum cost optimum duration of project problems, Line of Balance Technique, Resource Allocation and Updating. **16Hrs.**
3) **Construction equipment:** Introduction, various earth moving equipment, hoisting equipment, concrete mixer and plants, conveyors and rollers, trenching machines, equipment for Highway construction, factor for selecting equipment, special equipment, economic life. **12Hrs.**
4) **Construction safety:** Introduction, causes of accidents, approaches to improve construction safety, organizational approval, physical approach, behavioral and economic incentive approach, safety measures for fire, noise, vibration etc. **12 Hrs.**

Reference Books:

1) Seetharaman.S, “Construction Engineering and Management”,Umesh publication, Delhi
2) Peurifoy R.L., Ledbetter W.B., Schexnayder. C., “Construction Planning, Equipment and Methods”, Tata McGraw Hill, New Delhi.
3) Sharma S.C., “Construction Equipment and Management”, Khanna Publishers, New Delhi.
4) Deodhar S.V., “Construction Equipment and Job Planning”, Khanna Publishers, New Delhi.
5) SP 7:2005, “National Building Code of India”, Bureau of Indian Standards, New Delhi.
6) SP 70:2001, “Handbook on Construction safety Practices”, Bureau of Indian Standards, New Delhi.
7) S.S.Chitkara,“Construction project management: Planning, scheduling and controlling”, McGraw Higher Ed.

15UCVE823	Reinforced Earth Structures	(4-0-0)4

Contact Hours: 52

Course Learning Objective (CLO): In this course, topics on design of reinforced earth construction, geo-synthetics, geo-synthetics in foundations are dealt. The delivery of topics will be made through lecture classes and site visits.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Explain the principles of reinforced earth and applications of reinforced earth techniques.	7	3,1	
CO-2	Design of reinforced earth structures-earth dams, retaining wall, embankments.	3	1	
CO-3	Explain the properties and functions of Geo synthetics in foundations.	7		

POs→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	2		2.5				3								

Prerequisites: Students taking this course shall have the knowledge of following:

1) Strength of Materials
2) Geotechnical Engineering – I
3) Geotechnical Engineering – II

Course contents:

1) **Reinforced Earth Constructions:** Historical background, Principles of reinforced earth, Effect of reinforcement of soil, Mechanism of reinforced earth, Applications of reinforced earth, Anchors, Tiebacks and Soil nailing Technique, Economic advantage of reinforced earth structure over similar structure. **10Hrs.**

2) **Components:** Soil, Reinforcement bars, Metallic strips, Metallic grids, Facing Elements **10Hrs.**
3) **Design of reinforced earth structure:** Internal and overall stability, Reinforced earth dams, slopes, Reinforced Earth foundation, Soil Nailing-typical design of retaining wall and embankment **12Hrs.**
4) **Geo-synthetics:** Introduction and an overview, Historical Development, Classification based on material, Methods of Manufacturing process, Types and properties of different types of Geo-synthetics and determination its properties, Functions of Geo-synthetics. **10Hrs.**
5) **Geo-synthetics In foundations:** Improvement of the bearing capacity with introduction of geo-textiles and geo-grids, Case histories. **10Hrs.**

Reference Books:

1) Koerner, R. M.,"Design with Geo-synthetics" Prince Hall Publication.
2) Koerner, R. M., &Wesh, I. P., "Construction and Geotechnical Engineering using Synthetic Fabrics", Wiley Inter Science, New York.
3) Venkattappa Rag G.& Suryanarayana Raju G. V.S., "Engineering with Geosynthetics", Tata McGraw Hill publishing Company Limited, New Delhi.
4) Ingold T. S. & Millar K. S., "Geo-textile Hand Book", Thomas Telford, London,

15UCVE824	Urban Transport Planning	(4-0-0)4

Contact Hours:52

Course Learning Objective (CLOs): In this course, system approach to urban transport planning, transport survey, trip generation, trip distribution, modal split, trip assignment are dealt. The delivering of topics will be made through lecture classes.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Discuss System Approach for transport planning process.			1
CO-2	Summarize various surveys for an efficient transit system.		13	
CO-3	Develop a multiple regression equation to predict trip generation rate.		3	

CO-4	Evaluate trip distribution between internal zonal movements.											1			
CO-5	Analyze the trip rate by modal split in the study area.											3			
CO-6	Examine the trip interchanges in different parts of road network.											3			
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	**1.5**		**2**										**2**		

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Transportation Engineering
2) Traffic Engineering

Course Contents:

1) **Introduction:** Scope of Urban Transport Planning-Inter dependence of land use and traffic-system approach to Urban Transport Planning. **04 Hrs.**
2) **Stages in Urban Transport Planning:** Trip generation-Trip production-Trip distribution-modal - split-trip assignment, Fratar and Furnace methods. **06 Hrs.**
3) **Urban Transport Survey:** Definition of study area-zoning-types of surveys-inventory of Transport facilities - expansion of data from sample. **06 Hrs.**
4) **Trip Generation:** Trip purpose-factors governing trip generation and attraction-category analysis - problems **06 Hrs.**
5) **Trip Distribution:** Methods-Growth factor methods-synthetic methods-Fratar Method and Furness method- problems. **06 Hrs.**
6) **Modal Split:** factors affecting- characteristics of split- modal split in Urban Transport Planning and Problems. **06 Hrs.**
7) **Trip Assignment:** Assignment techniques-traffic forecasting, problems **04 Hrs.**
8) **Land Use Transport Models:** Lowry Model-Garin-Lowry model-applications in India **06 Hrs.**
9) **Urban Transport Planning For Small And Medium Cities:** Introduction-difficulties in Transport planning-recent studies. **06 Hrs.**

10) Urban transport systems – Introduction to urban transport systems.

02 Hrs.

Reference Books:

1) Black John, "Urban Transport Planning", Croom Helm Ltd., London

2)Flutchinson A G., "Urban and Regional Models in Geography & Planning", John Wiley and Sons, London

3) Wilson A G.,"Entropy in Urban and Regional Modeling", Pion Ltd., London.

4) Kadiyali L. R.,"Traffic Engineering and Transport Planning", Khanna Publishers.

15UCVE825	Design of Bridges	(4-0-0)4

Contact Hours:52

Course Learning Objective (CLOs): The course focuses on designing and understanding the structural behavior of reinforced concrete, PSC and steel components of highway and railway bridges subjected to static and dynamic loads.. The delivery of topics will be made through lecture classes.

Course Outcomes (COs):

ID	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1,12)/ PSOs (13,15)		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Analyze and design slab and box culvert for highways	1,2,13,15		
CO-2	Arrange cross and main girders of Tee-Beam Bridge; distribute wheel loads to the girders for worst positions of loads; calculate bending moments and shears for wheel loads; structural design of the slab and girders	1, 2, 13,15		
CO-3	Design the geometrics of steel foot-bridge as per codal provisions and analyze and design structural components of foot-bridge	1, 2, 13,15		

CO-4	Design RCC and elastomeric bridge bearings								1, 2, 13,15						
POs→	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Mapping Level	**3**	**3**											**3**		**3**

Prerequisites:

Students taking this course shall have the knowledge of following:

1) Design of RC Structures
2) Design of Prestressed Concrete Structures
3) Design of Steel Structures
4) Basics of Bridge Engineering

Course Contents:

1) Introduction to Design of Bridges - Relevant Codes **02Hrs**
2) Design of RCC Slab Culvert **06Hrs**
3) Design of Box Culvert (single vent only) **08Hrs**
4) Design of Tee-Beam Bridge **14Hrs**
5) Design of Steel Foot-Bridge-a)Geometry b) Structural (loads to be given) **12Hrs**
6) Design of Bridge Bearings : a)Elastomeric-plain and reinforced b)RCC bearings **10Hrs**

Books/References:

1) Victor D.J and Johnson, “Essentials of Bridge Engineering”, Oxford and IBH.
2) Krishnaraju N., “Design of bridges”, Oxford & IBH Publishers.
3) Bindra S.P., “Bridge Engineering”, DhanpatRai Publications.

15UMAE875	**Applied Numerical Methods**	**(4-0-0) 4**

Contact Hours: 52

Course Learning Objectives (CLOs):

Study the numerical methods to solve algebraic, transcendental equations, partial differential equations and boundary value differential equations.

Course Outcomes (Cos):

COs	Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to Pos (1-12)		
		Mastering 3	Moderate 2	Introductory 1
CO-1	Apply the techniques of QR and singular value decomposition, least square approximation in solving inconsistent linear systems.		1	
CO-2	Employ interpolation and extrapolation to analyze the experimental data and predict.		1	
CO-3	Apply Numerical method to solve boundary valued differential equation.	1		
CO-4	Apply Numerical Integration to compute Area.	2		
CO-5	Apply the concept of Rank to solve Engineering Application Problems.	1		
CO-6	Apply suitable Numerical method to solve partial differential equation.		1	

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

Contents:

1) **Linear Algebra -I:** Condition number of a matrix L-U factorization method (Crout's method), Partition method. Bounds for Eigen values, Jacobi's method. Given's method. **10 Hrs**
2) **Linear Algebra:** Gram-Schmidt orthogonalization process. QR decomposition, singular value decomposition, least square approximations. Applications of SVD-PCA (Principal component analysis. Multi-regression analysis. **10 Hrs**

3) **Interpolation and extrapolation:** Central differences, central difference interpolation formulae. Gauss's forward interpolation formula. Gauss's backward interpolation formula, Stirling's interpolation formula, Everett's interpolation formula, Bessel's interpolation formula. Cubic Spline interpolation.

Numerical Differentiation: Derivatives using Stirling's formula, Bessel's formula.

Numerical Integration: Romberg integration, Gaussian quadrature, double integration by Trapezoidal and Simpson's I/3rd rules. **12 Hrs**

4) **Numerical solution of ODE:** Picard's method, Taylor's series method for simultaneous first order ordinary differential equations and second order Oedinary differential equations. Runge-Kutta method for simultaneous first order O.D.E and second order O.D.E, Linear Shooting method. Finite difference method. **10 Hrs**

5) **Numerical solution of PDE:** Numerical solution of one dimensional heat equation. Bendre-Schmidt's method. Crank-Nicolsen method. Numerical solution of one dimensional wave equation; explicit method problems. Numerical solution of two dimensional Laplace equation. **10 Hrs**

Reference Books:

1. Richard. L. Burden, J. Douglas Faires, Numerical Analysis, Thompson Publishing Company edition - 2001.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain - Numerical methods for scientific and Engineering computation New Age Internationa! Publisher - 5lh edition - 2007.
3. Anthony Ralston, Philip Rabinowitz - A first course in Numerical Analysis - McGraw Hill Publication - 2"J edition – 2001
4. B.S.Grewal-Numerical methods in engineering and science- Khanna Publishers 9th edition- 2010.

15UPHE876	Nanotechnology	(4-0-0) 4

Contact Hours: 52

Course Learning Outcomes (CLOs): At the end of the course, the student will be able to **:**

Course Outcomes (COs)

COs	Description of the course outcomes **At the end of the course student can able to:**	Mapping to Pos (1-12)		
		Mastering 3	Moderate 2	Introductory 1
CO-1	Specify the holistic view of nanoscience, nanotechnology and the effect of quantum confinement in nanostructures.		2	3
CO-2	Describe the importance of basic scientific concepts related to the behavior of matter at the nanoscale.	1	2	
CO-3	To impart the basic knowledge on various preparation techniques involved in nanotechnology and interpret the importance of carbon clusters.	1		3
CO-4	Demonstrate the different lithographic techniques and applications of characterization techniques.	1	2	
CO-5	Evaluate the merit of nanocomposites materials and different applications of nanomaterials.	1	2	

Pos-	**PO-1**	**PO-2**	**PO-3**
Mapping Level	3.0	2.0	1.0

Contents:

1) **Basics of Nanoscale Materials:** Introduction: Quantum size effect. Effect of confinement – Specific surface area and its effects in nanosize, dangling bonds – surface energy meaning expression, Classification of nanomaterials – shape

and intrinsic. variation of density of states, size and shape dependent properties of nanomaterials.

Metal and Semiconductor Nanocrystals: Metal nanocrystals – Plasmons, Surface Plasmon Resonance (SPR) - Gold, silver & iron nanoparticles. Semiconductor nanocrystals (Quantum Dots) and their importance – Variation of energy gap with particle size. Organic capping, core shell structures and self assembly-Intermolecular forces. **(8 L+ 2 T) Hrs**

2) **Carbon Nanoclusters and Synthesis of Nanomaterials: Carbon clusters:** Fullerenes, graphene and carbon nanotubes - types of carbon nanotubes: Synthesis, Properties - electrical, thermal, Mechanical and chemical properties. Importance of carbon clusters.

Top-down and Bottom-up approaches: Chemical vapour deposition (CVD), ion sputtering, laser ablation, molecular beam epitaxy, chemical precipitation, solvothermal synthesis, micelles & green nanotechnology. **(8 L+ 2 T) Hrs**

3) **Fabrication and Characterization of Nanostructures: Nanolithography:** Introduction, photo lithography (Optical, UV & EUV), Electron beam, X- ray lithography, Dip-pen lithography, immersion lithography, Nanoimprint lithography and Soft lithography.

Characterization Techniques: Optical and photoluminescence spectroscopy, field emission scanning electron microscopy (FESEM), Scanning Tunneling Microscopy, transmission electron microscopy (TEM), HR TEM, SAED, EDAX, X-ray diffraction and electron diffraction, Atomic Force Microscopy, Scanning Tunneling Microscopy. **(8 L+ 2 T) Hrs**

4) **Nanocomposite Materials:** Introduction - Ceramic based composites, metal-matrix nanocomposites, polymer-based nanocomposites, graphene and carbon nanotube based nanocomposites. Thermal and electrical properties nanocomposites. **(8 L+ 2 T) Hrs**

5) **Applications of Nanomaterials:** Fundamentals of Charge transport, concept of mobility, self-assembly, assembly components Coulomb Blockade and single-electron tunneling. Hybrid solar cells based on different types of nanostructures. Fuel cells and nanosensors. **(8 L+ 2 T) Hrs**

Beyond the Syllabus Coverage (Suggestive): Seminars on relevant topics.

Reference Books:

1. Sulabha K Kulkarni, Nanotechnology-Principles and Practices, Capital Publishing Company, 2007.

2. T. Pradeep, “Nano: The Essentials” Tata McGraw Hill Education Pvt Ltd., 2013.
3. James Murday, “Textbook of Nanoscience and Nanotechnology” Universities Press-IIM, 2012.
4. Charles. P. Poole and F. J. Owens, Introduction to Nanotechnology, John Wiley & Sons, Inc. 2003.
5. P. Mukhopadhyay and R. K. Gupta, Graphite, Graphene and their polymer nanocomposites. CRC Press, Taylor & Francis Group. 2012.

SDM College of Engineering & Technology, Dharwad

Odd Semester 2019-20

Academic Calendar for UG Programmes

Sl. No.	Particulars	Date
1	Registration	27-07-2019 to 31-07-2019
2	Induction program for First Semester (Tentative)	01-08-2019 to 14-08-2019
3	Teaching Commences for odd semester except I Sem	01-08-2019
4	Last date for registration with late fee	06-08-2019
5	Teaching Commences for I semester	16-08-2019
6	Display of attendance	16-09-2019
7	Internal Assessment – IA– I	18-09-2019 to 20-09-2019
8	Communication of performance to the parents	26-09-2019
9	Last date to drop the course	27-09-2019
10	Display of attendance	02-11-2019
11	Internal Assessment –IA– II	04-11-2019 to 06-11-2019
12	Students Feedback	11-11-2019 to 15-11-2019
13	Communication of performance to the parents	13-11-2019
14	Last date to withdraw the course	13-11-2019
15	Teacher – Parents Meet	16-11-2019
16	Internal Assessment –IA– III	27-11-2019 to 29-11-2019
17	Last day of teaching for Odd Semester	30-11-2019
18	Final Lab Assessments	03-12-2019 to 10-12-2019
19	Display of consolidated Continuous Internal Evaluation (CIE) & Attendance	05-12-2019
20	Communication of performance to the parents	05-12-2019
21	Semester End Examination	13-12-2019 to 27-12-2019
22	Inter Semester Recess	28-12-2019 to 12-01-2020
23	Declaration of Results	09-01-2020
24	Communication of performance to the parents by putting on website	10-01-2020
25	Makeup SEE for odd semesters	11-01-2020 to 18-01-2020
Commencement of Even Semester :		**13-01-2020**

Dean (Academic Program) **PRINCIPAL**

Academic Calendar (Tentative) for Even Semester 2019-20
B.E. & M.Tech

Sl. No.	Particulars	Date
1	Registration	09-01-2020 to 11-01-2020
2	Commencement of Teaching	13-01-2020
3	Last date for registration with late fee	18-01-2020
4	Display of attendance	18-02-2020
5	Internal Assessment – IA– I	24-02-2020 to 26-02-2020
6	Communication of performance to the parents	03-03-2020
7	Last date to drop the course	04-03-2020
8	Parents Meet	14-03-2020
9	Insignia – 2020	20-03-2020 & 21-03-2020
10	Display of attendance	30-03-2020
11	Internal Assessment – IA– II	01-04-2020 to 03-04-2020
12	Last date to withdraw the course	08-04-2020
13	Communication of performance to the parents	11-04-2020
14	Feedback by Students	20-04-2020 to 25-04-2020
15	Internal Assessment –IA– III	04-05-2020 to 06-05-2020
16	Last day of teaching for Even Semester	06-05-2020
17	Final Lab Assessments	09-05-2020 to 20-05-2020
18	Display of consolidated Continuous Internal Evaluation (CIE) marks & Attendance for 8th semester	09-05-2020
19	Semester End Examination for 8th semester	11-05-2020 to 19-05-2020
20	Display of consolidated CIE marks & Attendance for 2nd, 4th & 6th semesters (Both for UG & PG)	13-05-2020
21	Communication of performance to the parents	14-05-2020
22	Project exam for 8th semester	21-05-2020 to 26-05-2020
23	Semester End Examination for 2nd, 4th & 6th semesters (Both for UG & PG)	22-05-2020 to 05-06-2020
24	Results for 8th semester	30-05-2020
25	Summer vacation	06-06-2020 to 31-07-2020
26	Announcement of Results for 2nd, 4th & 6th semester (Both for UG & PG)	12-06-2020

Supplementary Semester: 12-06-2020 to 27-07-2020

Commencement of next Academic Year 2020 - 21: 01-08-2020

Dean (Academic Program) **PRINCIPAL**

Supplementary Semester Calendar for B.E./M.Tech/MBA – 2020

Sl. No.	Particulars	VII & VIII Sem (B.E.)	I to VI Sem (B.E.), M.Tech & MBA
1	Registration	01-06-2020 to 03-06-2020	06-06-2020 to 08-06-2020
2	Teaching Commences	01-06-2020	12-06-2020
3	Registration with special permission by Principal	04-06-2020	12-06-2020
4	Internal Assessment (IA) – I	13-06-2020 & 15-06-2020	24-06-2020 & 25-06-2020
5	Internal Assessment (IA) – II	25-06-2020 & 26-06-2020	03-07-2020 & 04-07-2020
6	Internal Assessment (IA) – III	10-07-2020 & 11-07-2020	13-07-2020 & 14-07-2020
7	Display of consolidated Continuous Internal Evaluation (CIE) marks & Attendance	13-07-2020	16-07-2020
8	Supplementary SEE	14-07-2020 to 17-07-2020	18-07-2020 to 23-07-2020
9	Declaration of results	22-07-2020	27-07-2020

Dean (Academic Program) **PRINCIPAL**

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