Academic Program: UG

Academic Year 2025-26 Syllabus

VII & VIII Semester B.E.

(Civil Engineering)

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY,

DHARWAD – 580 002

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

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SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for 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 2025-26 till further revision.

Principal

Chairman BoS & HoD

SDM College of Engineering & Technology, Dharwad

Department of Civil Engineering

Vision and Mission of the Institute

SDMCET –Vision

To develop competent professionals with human values.

SDMCET – Mission

- To have contextually relevant Curricula.
- To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
- To enhance Research Culture.
- To involve the Industrial Expertise for connecting Classroom contents to real-life situations.
- To inculcate Ethics and soft skills leading to overall personality development.

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DEPARTMENT OF CIVIL ENGINEERING

VISION AND MISSION

Vision:

To be the center of excellence providing the state of art civil engineering education developing competent engineers responsible for serving modern society.

Mission:

The stated vision can be achieved through:

- The development of robust curricula to meet industrial expectations.
- Interactive teaching-learning process with modern educational tools and soft skills.
- Establishing synergy between teaching and research
- Industry-Institute interaction.

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 workplace.

III. **Awareness of Social impact:** Graduates will be made aware of causes of impacts due to the development and 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

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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

PO2. **Problem analysis**: 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 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. **Modern tool usage**: 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 contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

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

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

PO9. **Individual and teamwork**: 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, making effective presentations, and giving and receiving 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 lifelong learning in the broadest context to technological change.

PROGRAM SPECIFIC OUTCOMES (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 the project.

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

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

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY DHARWAD

Department of Civil Engineering

Seventh Semester

Scheme of Teaching and Examinations 2025-26

Sl. No	Course	Course code	Course Title	TD/PSB	Teaching Hours/Week			Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	PCC	22UCVC700	Design of Steel Structures	CV	4	0	0	03	50	100	100	4
2	PEC	22UCVE7XX	Program Elective Course -IV	CV	3	0	0	03	50	100	100	3
3	PEC	22UCVE7XX	Program Elective Course -V	CV	3	0	0	03	50	100	100	3
4	OEC	22UCVO7XX	Open Elective Course -II	CV	3	0	0	03	50	100	100	3
5	PCCL	22UCVL701	Environmental Engineering laboratory	CV	0	0	2	03	50	50	100	1
6	PROJ	22UCVL702	Major Project-I	CV	0	0	12	03	50	50	100	6
								Total	**300**	**500**	**600**	**20**
Program Elective Course -IV												
1	PEC-IV	22UCVE721	Advanced design of RC Structures	CV	3	0	0	03	50	100	100	3
2	PEC-IV	22UCVE722	Earthquake resistant structures	CV	3	0	0	03	50	100	100	3
3	PEC-IV	22UCVE723	Construction Management and Equipment	CV	3	0	0	03	50	100	100	3
4	PEC-IV	22UCVE724	Hydraulic & Hydraulic Machines	CV	3	0	0	03	50	100	100	3
Program Elective Course -V												
2	PEC-V	22UCVE731	Urban Transport Planning	CV	3	0	0	03	50	100	100	3
3	PEC-V	22UCVE732	Solid waste Management	CV	3	0	0	03	50	100	100	3
5	PEC-V	22UCVE733	Water resource Engineering	CV	3	0	0	03	50	100	100	3
6	PEC-V	22UCVE734	Wastewater Engineering	CV	3	0	0	03	50	100	100	3
Open Elective Course-II												
1	OEC-II	22UCVO741	Traffic Engineering & Management	CV	3	0	0	03	50	100	100	3

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. PEC: Program elective course, OEC: Open elective course, PROJ: Project. TD: Teaching department, PSB: Paper setting Board.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum numbers of students' strength for offering Open Elective Course are as prescribed by the DAP.

Open Elective Courses (OEC): Students belonging to a particular stream of Engineering and Technology are entitled to opt for the open electives offered by their parent Department and other departments if they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor. The minimum numbers of students' strength for offering Open Elective Course are as prescribed by the DAP.

Major Project-I: The objective of the project work is to encourage development of independent learning, innovative attitude, communication skills, organisation, time management, presentation skills, teamwork, punctuality, setting and meeting deadlines. In Major project the students are expected to identify the state-of-the-art technology in their domain of interest by an extensive literature survey and select a topic from an emerging area relevant to their branch/interdisciplinary and define the problem for the project work. The project shall consist of a team of students not more than 2-4. Each batch shall be assigned with a faculty member. A committee constituted by HOD consisting of minimum 2 faculty members shall evaluate for CIE. There is SEE, a viva voce examination which shall be examined by two examiners constituted by the HoD. The rubric of evaluation includes objectives defined, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.

AICTE activity point: Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the student's VIII semester grade card. The activities to earn the points can be spread over the duration of the program. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY DHARWAD

Department of Civil Engineering

Eighth Semester

Scheme of Teaching and Examinations 2025-26

Sl. No	Course	Course code	Course Title	TD/PSB	Teaching Hours/Week			Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	TS	22UCVL800	Technical Seminar/Independent study	CV	0	0	2	-	50	-	50	1
2	PROJ or INT	22UCVL801	Major Project-II/Internship	CV	12 Weeks			03	50	50	100	10
3	INT	22UCVL802	Summer Internship	CV	4 Weeks			03	50	50	100	3
								Total	**150**	**100**	**250**	**14**

L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation., TD: Teaching department, PSB: Paper setting Board.

Technical Seminar/Independent study (TS): Students are expected to learn how to conduct a literature survey to identify the state-of-the-art technology in their chosen engineering domain. They are required to select an emerging topic beyond the syllabus relevant to their branch of study, understand the concept, analyse it, and present it effectively with technical innovations or novel work in a 15–20-minute session, followed by a 5-minute question and answers with their classmates and faculty. Additionally, students must develop effective communication skills and understand the modalities of technical interactions. They are required to submit a seminar report following the format provided by the DUGC. The technical seminar is evaluated for CIE based on the rubrics prescribed by the DUGC.

Summer Internship: Students must undergo an internship in private industries, R&D organizations, Centre of Excellence, laboratories of reputed institutions, government and semi-government organizations, PSUs, construction companies, or entrepreneurial organizations to gain exposure to the external professional environment. The internship should be completed over a period of four weeks during the summer vacation after the IV or VI semester and must be completed before the VII semester. Students are required to prepare a report on the work carried out during the internship and submit both the report and the internship certificate during the VIII semester. The internal

faculty will monitor student performance and award CIE marks in the VIII semester. Additionally, there will be a SEE, in which students must present their work before a panel of two examiners constituted by the HoD during the SEE of the VIII semester.
Major Project-II: This project work is intended for students who do not undertake an internship. The objective of the project is to foster independent learning, an innovative mindset, communication skills, organization, time management, presentation skills, teamwork, punctuality, and the ability to set and meet deadlines. In this project, students are expected to conduct an extensive literature survey to identify state-of-the-art technology in their domain of interest, select a topic from an emerging area relevant to their branch or an interdisciplinary field, and define the problem for their project work. Each project team shall consist of 2 to 4 students and will be assigned a faculty mentor. The department shall conduct three project reviews as per the schedule provided by DAP, which must be recorded as part of the project evaluation for CIE, along with marks awarded by the faculty guide. A committee constituted by the HoD, consisting of a minimum of two faculty members, shall conduct the reviews and evaluate the CIE. For SEE, students must appear for a viva-voce examination, which will be assessed by a panel of two examiners—one internal and one external—constituted by the HoD. The rubrics of evaluation includes objectives defined, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.
Internship: The internship is intended for students who do not undertake a project. Students must undergo an internship in private industries, R&D organizations, Center of Excellence, laboratories of reputed institutions, government and semi-government organizations, PSUs, construction companies, or entrepreneurial organizations to gain exposure to the external professional environment. The internship shall be for a duration of 12 weeks during the VIII semester, either through placement or on an individual basis. Students are required to prepare a report on the work carried out during the internship and submit both the report and the internship certificate during the VIII semester. The department shall conduct three project reviews as per the schedule provided by DAP, which must be recorded as part of the project evaluation for CIE. A committee constituted by the HoD, consisting of a minimum of two faculty members, shall conduct the reviews and evaluate the CIE. For SEE, students must appear for a viva-voce examination, which will be assessed by a panel of two examiners—one internal and one external—constituted by the HoD. The rubric of evaluation includes objectives defined, literature review, demonstration of the work carried out, report, project presentation, communication skill and question and answer session.
AICTE activity point: Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the student's VIII semester grade card. The activities to earn the points can be spread over the duration of the program. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

Total credits for 4th year: 34

22UCVC700	Design of Steel Structures	(4-0-0)4

Contact Hours: 52

Course Learning Objectives (CLOs): Design of steel structures is taught as a core course in Civil Engineering program. In this course, topics on steel connections-bolted and welded, tension members, truss ties, compression members, struts, columns, built-up column sections, column splices, slab bases, and beams are dealt, based on limit state method of design. The delivery of topics will be through lecture classes using blackboard & PPT and site visits. The evaluation will be carried out through IAs and Semester End Examination.

Course Outcomes (COs):

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 fasteners as per IS:800-2007 and analyze / design of Bolted connections.	3,4		
CO-2	Analyze / design welded connections and design tension members with bolted or welded end connections.	3,4		
CO-3	Analyze / design simple compression members and column splices.	3,4		
CO-4	Design of built-up columns and column bases.	3,4		
CO-5	Analyze / design laterally supported beams subjected to low and high shear by Plastic Analysis method as per IS:800-2007.	3,4		

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

Contents:

Unit - I

Introduction: Advantages and disadvantages of Steel structures, Loads and load combinations, Structural forms, Discussions of design concepts. IS code provisions.
Structural Fasteners: Bolted connections, strength of bolts, design of bolted connections, lap joints and double cover butt joints, **10 Hrs**

Unit - II

Welds: Fillet and Butt welds — Strength and design of connections.
Design of Tension Members: Axially loaded tension members and their connections, design of lug angles-Comparison, Design of truss ties-Single and Double Angle- and joints **10 Hrs**

Unit - III

Design of Compression Members: Effective length, Radius of gyration, Design Compressive Stress, Single and Double Angle struts, I-Section Columns
Column splicing: Type-1 and Type-2 **12 Hrs**

Unit - IV

Built-up Columns, I-Sections with Cover Plates on Flanges.
Double Channel Built-up Column: Back-to-Back.
Steel Foundations: Column bases-simple slab-base. **10 Hrs**

Unit - V

Design of beams: Introduction to Plastic Analysis, Plastic Section Modulus, Low Shear and High Shear Beams, moment of resistance of low shear and high shear beam as per IS 800:2007.
Design of Laterally supported beams: Low and High shear Beams **10 Hrs**

Reference Books:

1) N Subramanian, “Steel Structures: Design and practice”, Oxford Publishers. 2018.
2) Bhavikatti S.S., “Design of Steel Structures”, I.K. Publishers. 5th Edition, 2019.
3) IS 800: 2007, “Code of construction – Steel Structures”, BIS.
4) Pramod K.V., “Steel Data Handbook”, I.K. International, New Delhi.

22UCVL701	Environmental Engineering Laboratory	(0-0-2)1

Contact Hours: 26

Course Learning Objective (CLOs): The course deals with testing and characterization of water and wastewater 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 and interpret the results as per IS standards.	15	7	9
CO-2	Determine the level of pollution in water & wastewater and interpret the results for different uses.	15	7	9

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

Course contents:

1. Determination of solids in sewage: Total, suspended, dissolved, volatile, fixed, settleable.
2. Determination of turbidity: By Jackson, Nephelo, Aplab turbidity meters.
3. Determination of electrical conductivity, Chlorides and Sulphates.
4. Determination of Alkalinity, Acidity and pH.
5. Determination of calcium, magnesium and total hardness.
6. Determination of Dissolved Oxygen and BOD.
7. Determination of COD.
8. Determination of percentage of available chlorine in bleaching powder, Residual Chlorine and Chlorine Demand.
9. Jar Test for Optimum Dosage of Alum.
10. Determination of Iron.
11. Determination of Fluorides and Nitrates.
12. Total Count Test & Determination of MPN.

Reference Books/Manuals/ IS Codes:

1) IS: 10500- 2012, “Drinking water — specification”.
2) “Standard Methods for Examination of Water and Wastewater”, APHA, AWWA, WPCF.
3) “Manual of Water & Wastewater Analysis”, NEERI Publication.
4) Sawyer and Mc Carty, “Chemistry for Environment Engineering and Science”, McGraw Hill. 5th Edition, 2017.

22UCVL702	Major Project – I	(0-0-12) 6

Contact Hours: 156

Course Learning Objective (CLOs): Major 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):

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	Carry out literature survey.	1		9,12
CO-4	Formulate the methodology.	2	2	9,12
CO-5	Conduct required experiment. Interpret the test data/ results, draw conclusions.		15	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

Major Project-I: The objective of the project work is to encourage development of independent learning, innovative attitude, communication skills, organization, time management, presentation skills, teamwork, punctuality, setting and meeting deadlines. In Major project the students are expected to identify the state-of-the-art technology in their domain of interest by an extensive literature survey and select a topic from an emerging area relevant to their branch/interdisciplinary and define the problem for the project work. The project shall consist of a team of students not more than 2-4. Each batch shall be assigned with a faculty member. A committee constituted by HOD consisting of a minimum of 2 faculty members shall evaluate for CIE. There is SEE, a viva voce examination which shall be examined by two examiners constituted by the HOD. The rubric of evaluation includes defined objectives, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.

22UCVE721	Advanced Design of RC Structures	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): Advanced design of RC structure is taught as one of the elective courses in Civil Engineering program. In this course, design and drawing of simple portal frame, circular and rectangular water tank, cantilever and counter fort retaining wall and raft and strap beam footings are dealt along with detailed drawings of structural components. The delivery of topics will be made through lecture classes. The evaluation will be carried out through IAs and Semester End Examination.

Course Outcomes (COs):

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 detail Portal frame as per codal provisions.		2,13	1
CO-2	Design and detail water tank as per codal provisions.		2,13	1
CO-3	Design and detail retaining wall as per codal provisions.		2,13	1
CO-4	Design and detail foundation as per codal provisions.		2,13	1
CO-5	Prepare the structural drawings for staircase, continuous beam, column footing, slab, prepare layout drawings for the components of the structure.		2,13	1

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

Contents:

Unit - I

Portal frames: Design and Drawing of the single bay, single storey portal frame as per codal provisions. **7 Hrs**

Unit - II

Water tank: Design and Drawing of the water tanks (circular and rectangular resting on the ground) as per IS code method. **8 Hrs**

Unit - III

Retaining wall: Design and Drawing of the cantilever and counterfort retaining walls as per codal provisions. **8 Hrs**

Unit - IV

Foundation: Design and Drawing of the combined, raft and strap beam footing as per codal provisions. **8 Hrs**

Unit - V

Detailing: Prepare detailed drawings of staircases, beam and slab systems, column footing and layout drawing for a structure. **8 Hrs**

Reference Books:

1) IS 456-2000 “Plain and Reinforced Concrete Code of Practice”.
2) SP16 - 1980 “Design Aids for Reinforced Concrete”
3) Krishnamurthy, “Structural Design and Drawing (Concrete Structures) - Volume 2”, CBS, Publications, New Delhi,1st Edition, 2018.
4) Krishnaraju N., “Structural Design and Drawing”, University press, Hyderabad, 3rd edition, 2009.
5) SP-34: 1987, “Handbook on concrete reinforcement and detailing”.
6) IS 3370: 2009, “Concrete Structures for Storage of Liquids-Code of Practice”.
7) IS: 875 :1987 Part I to V, “Code of Practice for Design Loads (Other than earthquake) For Buildings and Structures”.

22UCVE722	Earthquake Resistant Structures	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): Earthquake Resistant Structures is taught as one of elective courses for Civil Engineering Program. In this course, topics on Seismic hazard assessment; Earthquake effects on structures, Concepts of earthquake resistant design of masonry and earthen buildings are dealt with. The delivery of topics will be made through lecture classes. The evaluation will be carried out through IAs & SEE.

Course Outcomes (COs):

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 Engineering seismology, seismic instruments, Structural behavior under seismic load, dampers and base isolation techniques.		6	
CO-2	Discuss characteristics of earthquake force by response spectrum, tripartite plot, calculate seismic forces using standard procedures.	2,3		

CO-3	Discuss structural configuration and concepts for earthquake resistant masonry buildings as per codal provisions.	2,3		
CO-4	Design reinforced concrete buildings.	2,3		
CO-5	Carry out seismic evaluation and select appropriate retrofitting method.		6	

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

Contents:

Unit - I

Seismic Hazard assessment: Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments. Earthquake Hazards in India, Earthquake Risk Evaluation and Mitigation. Structural behavior under gravity and seismic loads, Lateral load resisting structural systems, Requirements of efficient earthquake resistant structural system, damping devises, base isolation systems. **10 Hrs**

Unit - II

Earthquake effects on structure: The Response history and strong motion characteristics. Response Spectrum – elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design. Computation of seismic forces in multi-storied buildings – using procedures (Equivalent lateral force only) as per IS1893. **8 Hrs**

Unit - III

Concepts of earthquake resistant design: Structural Configuration for earthquake resistant design, Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modeling concepts of infill masonry walls. Behavior of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls, concepts for earthquake resistant masonry buildings – codal provision. **7 Hrs**

Unit - IV

Design of earthquake resistant RC structures: Design of Reinforced concrete buildings for earthquake resistance-Load combinations, Ductility and energy

absorption in buildings. Confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS code. Structural behavior, design and ductile detailing of shear walls. **8Hrs**

Unit - V

Seismic response control: Seismic demand, seismic capacity, Overview of linear and nonlinear procedures of seismic analysis. Performance Based Seismic Engineering methodology, Seismic evaluation and retrofitting of structures. **6 Hrs**

Reference Books:

1) Pankaj Agarwal and Manish Shrikande" Earthquake Resistant Design of structures", published by PHI Learnings", year 2006 ,1st edition.
2) S.K.Duggal," Earthquake Resistant Design of structures", published by Oxford University Press, year 2007,2nd edition.
3) IS 1893(part1):2016" criteria for Earthquake Resistant Design of structures" 6th revision BIS 2016
4) IS 13920:2016 "Ductile detailing of reinforced concrete structures subjected to seismic forces"-code of practice 1st revision, BIS 2016.

22UCVE723 Construction Management and Equipment (3-0-0)3

Contact Hours: 39

Course Learning Objectives (CLOs): Construction, Equipment and Management is taught as one of the elective courses in Civil Engineering program. 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. The evaluation will be carried out through IAs and Semester End Exam.

Course Outcomes (COs):

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 importance of construction industry, various aspects of material, labor, and financial management.	1,8,11	10	12
CO-2	Prepare project schedule using PERT and CPM.	2	4	5
CO-3	Explain project costs resource management.	2	6	
CO-4	Explain construction equipment and		6	10,11

	their suitability for different works.			
CO-5	Explain causes of accidents, safety measures and methods of improvements of safety at site.	6	8	12

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	3	3	2	1	2.33	2.5	1.5	2	1						

Contents:

Unit - I

Construction industry: Introduction to construction industry, labor, material, time and financial management. **8 Hrs**

Unit - II

Construction planning: Introduction, Project planning methods, Bar and Milestone chart.

Network Analysis: Introduction to PERT and CPM. Numerical problems. **8 Hrs**

Unit - III

Project Cost: Cost model, direct, indirect and optimum costs, optimum duration and numerical problems.

Resource Management: Introduction, types of resources, resource allocation, updating and line of balance technique. **8 Hrs**

Unit - IV

Introduction to Equipment: Types of equipment, factors for selection of equipment, efficiency, output and maintenance of equipment.

Construction Equipment: Earth moving equipment, concrete mixer and plants, highway construction equipment, hoisting equipment, conveyors and rollers, trenching machines. **8 Hrs**

Unit - V

Construction safety: Introduction, causes of accidents, common hazards, occupational health & hygiene, risks to health at work, general safety precautions.

Improvement in Safety: Approaches to improve construction safety, organizational approval, physical approach, behavioral and economic incentive approach, safety measures for fire and noise. **7 Hrs**

Reference Books:

1) Seetharaman S., “Construction Engineering and Management”, Umesh publication, Delhi. 5th Edition, 2017.
2) Peurifoy R.L., Ledbetter W.B., Schexnayder C., “Construction Planning, Equipment and Methods”, Tata McGraw Hill, New Delhi. 6th Edition, 2001.

3) Sharma S.C., "Construction Equipment and Management", Khanna Publishers, New Delhi. 1st Edition, 2019.
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. 2nd Revision, 2005.
6) SP 70:2001, "Handbook on Construction safety Practices", Bureau of Indian Standards, New Delhi. 1st Reprint, 2007.
7) S.S. Chitkara, "Construction project management: Planning, scheduling and controlling", McGraw Higher Ed. 3rd Edition, 2014.

22UCVE724 Hydraulics and Hydraulic Machines (3-0-0)3

Contact Hours: 39

Course learning objectives (CLOs): Hydraulic and Hydraulic Machines is taught as one of the core courses in the Civil Engineering program. In this course, topics on dimensional analysis & model testing, open channel flow design of economical sections, energy concepts of fluid in open channel, the working principles of the hydraulic machines like turbines and pumps are dealt with. The delivery of topics will be made through lecture classes. The evaluation is made by means of the internal assessment tests and semester end examination.

Course Outcomes (COs):

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	Apply dimensional analysis techniques to develop mathematical models and compute the parametric values in prototype by analyzing the corresponding model parameters.	1,2		
CO-2	Explain uniform flow in open channels and design most economical cross sections, including economical channel sections, apply energy concepts to flow in open channels and calculate specific energy.	1,2		
CO-3	Explain the phenomenon of hydraulic jump, calculate sequential depths, differentiate between	1,2		

	different types of flows.			
CO-4	Classify turbines, explain working principles of turbines, draw velocity triangles and explain various characteristics.	1,2		
CO-5	Classify pumps, define different heads, explain working principles of pumps and calculate efficiencies.	1,2		

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

Contents:

Unit - I

Dimensional analysis: Dimensional analysis and similitude: Dimensional homogeneity, non-dimensional parameter, Rayleigh methods and Buckingham ð theorem, dimensional analysis, choice of variables, examples on various applications. Model analysis, similitude, types of similarities, force ratios, similarity laws, model classification, Reynolds model, Froude's model, Euler's Model, Webber's model, Mach model, scale effects, Distorted models. Numerical problems on Reynolds's, and Froude's Model. **07 Hrs**

Unit - II

Open Channel Flow: Uniform Flow; Introduction, Classification of flow through channels, Chezy's and Manning's equation for flow through open channel, most economical channel sections and uniform flow through open channels. Specific energy and specific energy curve, critical flow and corresponding critical parameters and metering flumes. **08 Hrs**

Unit - III

Non-Uniform Flow: Suddenly varied flow; Hydraulic Jump, Expressions for conjugate depths and Energy loss. Gradually varied flow equation, Back water curve and afflux, Description of water curves or profiles, mild, steep, critical, horizontal, and adverse slope profiles, Control sections.

Impact of jet on vanes: Introduction, Impulse-Momentum equation. Impact of jet on stationary and moving curved vanes. Introduction to concept of velocity triangles, impact of jet on series of curved vanes- Problems. **10 Hrs**

Unit - IV

Turbines: Impulse Turbines-Introduction to turbines, general layout of a hydroelectric plant, Heads and Efficiencies, classification of turbines. Pelton wheel

components, working principle, velocity triangle, maximum power, efficiency and working proportions. Reaction Turbines: Radial flow reaction turbines: (i) Francis turbine Descriptions, working proportions and design. (ii) Kaplan turbine-Descriptions, working proportions and design. Draft tube theory and unit quantities. **08 Hrs**

Unit - V

Pumps: Components and working of centrifugal pumps, Types of centrifugal pumps, Work done by the impeller, Heads and Efficiencies, Minimum starting speed of centrifugal pump, Numerical problems, multi-stage pumps. Working of different types of reciprocating pumps. **06 Hrs**

Reference books:

1. P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi.
2. R.K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi.
3. S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi.
4. K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co.Ltd.
5. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press.

22UCVE731	Urban Transport Planning	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): Urban Transport Planning is taught as one of the elective subjects for Civil Engineering program. In this course, system approach to urban transport planning, transport survey, trip generation, trip distribution, modal split, trip assignment is dealt. The delivery of topics will be made through lecture classes. The evaluation will be carried out through IAs and Session End Examination.

Course Outcomes (COs):

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.			1,2
CO-2	Summarize various surveys for an	1,2,12		

	efficient transit system and develop multiple regression equations to predict trip generation rate.			
CO-3	Evaluate trip distribution between internal zonal movements.			1,2
CO-4	Analyze the trip rate by modal split in the study area.		1,2,12	
CO-5	Examine the trip interchanges in different parts of road network.			1,2,12

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

Contents:

Unit - I

Introduction: Scope of Urban Transport Planning, Inter dependence of land use and traffic, System approach to Urban Transport Planning.

Stages in Urban Transport Planning: Trip Generation-Trip Production-Trip distribution-modal - split-trip assignment, Fratar and Furnace methods **10 Hrs**

Unit - II

Urban Transport Survey: Definition of study area-zoning-types of surveys-inventories of Transport facilities - expansion of data from sample.

Trip Generation: Trip purpose-factors governing trip generation and attraction-category analysis - problems **7 Hrs**

Unit - III

Trip Distribution: Methods-Growth factor methods-synthetic methods-Fratar Method and Furness method- problems. **7 Hrs**

Unit - IV

Trip Assignment: Assignment techniques-traffic forecasting, problems

Modal Split: factors affecting- characteristics of split- modal split in Urban Transport Planning and Problems. **8 Hrs**

Unit - V

Urban Transport Planning for Small and Medium Cities: Introduction-difficulties in Transport planning-recent studies.

Urban transport systems – Introduction to urban transport systems. **7 Hrs**

Reference Books:

1) Kadiyali L.R., "Traffic Engineering and Transport Planning", Khanna Publishers, New Delhi, Ninth Edition, 2017.
2) Papacostas C.S., Prevedouros P.D., "Transportation Engineering and Planning", Prentice-Hall of India, Pvt. Ltd, New Delhi, Third Edition, 2009.
3) Wilson A G.,"Entropy in Urban and Regional Modeling", Pion Ltd., London. First Edition, 2012.

22UCVE732	Solid Waste management	(3-0-0)3

Contact Hours: 39

Course Learning Objectives (CLOs): Solid Waste Management is taught as one of elective courses for Civil Engineering Program. In this course, topics on sources, impacts, treatment, disposal of solid waste, design aspects of landfills and monitoring leachates and gases are dealt with. The delivery of topics will be made through lecture classes and field visits. The evaluation will be carried out through IAs and Semester End Examination.

Course Outcomes (COs):

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	Estimate the quantities of Solid wastes from different sources and recognize the possible health hazards of their disposal.		1, 2	-
CO-2	Analyze physical, chemical biological and energy characteristics of solid wastes and differentiate hazardous and non-hazardous wastes.	2,3	4,6,7	13
CO-3	Plan for Optimizing the route for disposal.	4,13		
CO-4	Analyze different disposal methods for bio-degradable and non-biodegradable, hazardous and non-hazardous solid wastes.	2,3,4	13	
CO-5	Design Engineered land fill for MSW and Industrial wastes.	3,4,13	6	

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	2	2.66	3	2.75		2	2						2.25		

Contents:

Unit - I

Introduction: Solid waste- Definition, Land Pollution - scope and importance of solid waste management, Integrated Solid waste Management, Hierarchy and future trends, functional elements of solid waste management.

Sources of solid waste: Classification and characteristics- municipal, hospital/ biomedical waste, Quantity — Generation rate, methods. Hazardous and Non-hazardous waste found in MSW; e-waste; C&D waste. **8Hrs.**

Unit - II

Collection and transportation: Systems of collection, collection equipment, garbage chutes, transfer stations — bailing and compacting, route Optimization, hauled contained and stationary system, Collection Routes-Guidelines for laying out routes.

Recycle and reuse: Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance, and reuse. **8 Hrs.**

Unit - III

Treatment / processing techniques: Components separation, volume reduction, size reduction, chemical reduction and biological processing.

Thermal processes: Incineration - 3 Ts, factors affecting incineration process, incinerators - types, prevention of air pollution, pyrolysis. Biomedical waste. **8 Hrs.**

Unit - IV

Composting: Aerobic and anaerobic composting, factors affecting composting, Mulching, Indore and Bangalore processes, mechanical and semi mechanical composting processes.

Vermi-culture Biotechnology: Environmental factors governing Vermi-culture biotechnology; Types of earthworms and their classification; Substrates for earthworms; Applications and advantages of vermicast. **7 Hrs.**

Unit - V

Sanitary land filling: Definition, methods, trench area, Ramp, and pit method, site selection, basic steps involved, cell design, prevention of site pollution, collection and processes used for treatment of leachate, control methods - land fill

liners, Vadose monitoring probe- gas collection systems. Closure and post closure operations.

Disposal methods: Open dumping, selection of site, Hog feeding; Sludge drying beds; Ocean disposal of solid wastes; nuclear waste disposal; Organic waste management in food process industries, case studies. **8 Hrs.**

Reference Books:

1) George Tehobanoglous, "Integrated Solid Waste Management", McGraw Hill. 2nd Edition, 2002.
2) George Tehobanoglous, Frank Kreith, "Handbook on Solid Waste Disposal", McGraw Hill, New Delhi. 2nd Edition, 2002.
3) M S Bhat, Asheref Illiyan, "Solid Waste Management", Synergy Books India. 2nd Edition, 2012.
4) Pandey G N Carney G C, "Environmental engineering", Tata McGraw Hill, New Delhi. 1st Edition, 2004.

21UCVE733	Water Resources Engineering	(3-0-0) 3

Contact Hours: 39

Course Learning Objective (CLOs): Water Resources Engineering is taught as one of the core courses in Civil Engineering program. Topics on Irrigation and methods of irrigation system, water requirements of crops, canals, canal works, diversion work, gravity dam, earthen dams and spillways are dealt. The delivery of topics will be made through lecture classes. The evaluation will be carried out through IAs and Semester End Exam.

Course Outcomes (COs):

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 Irrigation and Irrigation systems. Calculate the water requirement of crops and evaluate Duty, Delta and Base Period for the Crop.		1,2	
CO-2	Explain the canal system and canal works such as regulators, canal drops, and types of cross drainage works.		1	

CO-3	Understand the Diversion head work and design of impermeable floors. Reservoir planning and yield of catchment		1,2	3
CO-4	Analyze safety, modes of failure of gravity Dam.	3	2	
CO-5	Analyze earthen Dam for safety, modes of failure, understand construction methods of earthen dam and Explain importance of spillway, location of spillway, components of spillway.	3	2	1

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	1.75	2	2.33												

Content:

Unit - I

Irrigation and water requirements of crops: Definition of irrigation, Types of irrigation-surfaces and lift irrigation, advantages and disadvantages of irrigation, quality standards of irrigation water, Methods of applying water to crops for irrigation. Water requirements of crops, Duty, Delta and Base period of crop, and relation between them. Factors affecting duty of water, crop and crop seasons, Crop rotation, Irrigation efficiencies, Depth and Frequency of irrigation. Consumptive use of crops. **8 Hrs**

Unit - II

Canal and canal work: Definition of gross command area, cultural command area, intensity of irrigation Types of canals, lined and unlined canals, Alignment of canals, time factor, crop factor, Standard sections of canals, Design of canals by Lacey's and Kennedy's theory. Classification and suitability of canal regulators, Canal drop, Canal escape, Types of cross drainage works, Hydraulic principles of cross drainage works. **8 Hrs**

Unit - III

Diversion work: Definition and objectives of diversion head works, Layout of diversion, components and functions of head works, Weir and barrages, Design of impermeable floors - Bligh's and Khosla's theories, Silt control works - silt ejectors and silt excluder. **4 Hrs**

Reservoir Planning: Introduction, classification of Reservoirs, Storage zones of a reservoir, Mass curve, fixing capacity of a reservoir, safe yield, problems, density

currents, Trap efficiency, life of a reservoir, economic height of a dam, problems. 3 **Hrs**

Unit - IV

Gravity dams: Introduction, forces on a gravity dam, stress analysis in gravity dam, Problems, combination of forces for design. Elementary & practical profiles of a gravity dam, stability analysis, problems, galleries in gravity dams. **8 Hrs**

Unit - V

Earthen Dams: Introduction, types of Earth dams, construction methods, Design criteria for Earth dams, causes of failure of earth dams, section of dam, preliminary design criteria, problems, control of seepage through earth dams, Safety measures. **4 Hrs**

Spillways: Essentials of a spillway, spillway components, factors affecting type & design of spillways. Ogee spillway (simple design problems), Energy dissipation below spillways (hydraulic jump- No design). **4 Hrs**

Reference books:

1. Modi P. N., "Water Resources and Waterpower Engineering"-. Standard book house, Delhi. 11th edition, 2019.
2. Garg S. K., "Irrigation Engineering and Hydraulic Structures" Khanna publications, New Delhi. 27th Revised Edition, 2013.
3. Punmia and Lal Pandey, "Irrigation and Waterpower Engineering" Lakshmi publications, New Delhi. 17th Edition, 2021.
4. Sharma R. K., "Irrigation Engineering and Hydraulics", S Chand Publishing; 1st Edition, January 2017.

22UCVE734	Wastewater Engineering	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): Wastewater Engineering is taught as a core course in Civil Engineering program. In this course, topics on wastewater, its generation, disposal, quantification and characterization of sewage to design sewers and treat sewage to the required standards, are dealt with. The evaluation will be carried out through IAs and Semester End Examination.

Course Outcomes (COs):

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 necessity for sanitation, types of sewerage systems, compute the quantity of		1,6	

	sewage.			
CO-2	Describe sewer appurtenances, design the sewers.	3	2	6
CO-3	Analyze sewage for various parameters, design the pumping system.		4	
CO-4	Describe self-purification, design sewage disposal systems.	7	9	12
CO-5	Analyze various treatment methods for sewage, design various treatment units.	13	4	12

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

Contents:

Unit - I

Introduction - Necessity for sanitation, methods of sewage disposal, types of sewerage systems and their suitability.

Quantity of Sewage: Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system, computation of design flow, estimation of storm flow, time of concentration, rational method and empirical formulae of design of storm water drain. **8 Hrs**

Unit - II

Design of Sewers: Hydraulic formulae for velocity, self-cleansing and non-scouring velocities, design of hydraulic elements for circular sewers flowing full and for partially full**.**

Materials of Sewers and Sewer Appurtenances: Sewer materials, shapes of sewers, laying of sewers, jointing and testing of sewers, ventilation and cleaning of sewers. Catch basins, manholes, drainage traps, basic principles of house drainage, typical layout plan showing house drainage connections. 7 **Hrs**

Unit - III

Analysis of Sewage: Physical, chemical and biological characteristics, concepts of aerobic and anaerobic activity, CNS cycles, with emphasis on BOD and COD.

Sewage Pumping: Need, types of pumps, design of pumps. 7 **Hrs**

Unit - IV

Disposal of Effluents: By dilution, self-purification, phenomenon, design sewage disposal systems - oxygen sag curve, zones of purification, sewage farming, sewage sickness, disposal standards on land and water. **9 Hrs**

Unit - V

Treatment of Sewage: Flow diagram of municipal sewage treatment plant**,** primary treatment, screening, grit chambers, primary sedimentation tanks, designs, secondary treatment: trickling filter, theory and operation, types and designs, activated sludge process, principle and flow diagram, methods of aeration, designs of ASP, methods of sludge disposal, sludge drying beds.
Miscellaneous Treatment Methods: Septic tanks, oxidation ponds – design. Introduction to RBC, UASB, anaerobic filters. **8 Hrs**

Reference Books:

1) CPHEEO-Manual on Wastewater Treatment, Ministry of Urban Development, New Delhi, 6th Edition 2007.
2) E.W. Steel and Terence J. McGee, “Water Supply and Sewage”, Tata McGraw Hill Publications, New Delhi.
3) Ethlers Victor M, Schroeder Edward D and Steel E.W, “Water and Wastewater treatment”, McGraw Hill, New Delhi,1977.
4) Garg S.K, “Sewage Disposal and Air Pollution Engineering”, Khanna Publishers, New Delhi, 39th Edition 2019.

22UCVO741	Traffic Engineering & Management	(3-0-0)

Contact Hours: 39

Course Learning Objectives (CLOs): Traffic Engineering is taught as one of elective courses for Civil Engineering Program. 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. The evaluation will be carried out through IAs & SEE.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1,12)/ PSO (1,2,3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Use Engineering science to determine the power performance of the vehicle under various resistance forces.			1,2
CO-2	Illustrate and apply traffic flow parameters to develop an efficient transport system.	1,2,3		
CO-3	Summarize the Traffic Flow			1,2

	theories applied to understand the traffic pattern.			
CO-4	Examine the transport system problems and apply statistical methods to overcome.		1,2	
CO-5	Illustrate various traffic regulation and control devices and develop suitable traffic signal system.	1,3,12		

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Mapping Level	2	1.75	3									3			

Contents:

Unit - I

Definition, Objectives, Scope of Traffic Engineering. **02 Hrs**

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 **05 Hrs**

Unit - II

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. **10 Hrs**

Unit - III

Traffic Regulation and Control: Vehicle and Road controls, Traffic Regulations, One Way, Traffic Signs, Traffic signals, Vehicle actuated and synchronized signals, Webster's method of signal Design, IRC Method, Problems. **07 Hrs**

Unit - IV

Traffic Island: Traffic Rotary elements and traffic operation, Relevant Problems on above. Traffic markings. **07 Hrs**

Unit - V

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. **08 Hrs**

Reference Books:

1) Khanna S.K. and Justo C E G.,“Highway Engineering”, Nemchand and Bros, Roorkee.
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.

VIII Semester

22UCVL800	Technical Seminar/Independent Study	(0-0-2) 1

Contact Hours:26

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. by referring journals and other online sources leading to a comprehensive study of the topic selected. Students may also visit the field for collection of data or any kind of validation the chosen study topic requires. The evaluation will be carried out through presentation and viva-voce.

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 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	Compile data by direct and indirect methods.	9	1,2	12
CO-4	Organize the data and prepare report.	4,9	1,2,5	12
CO-5	Defend the presentation.	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			

Technical Seminar: The students are expected to learn how to carry out literature surveys to locate the state-of-the-art technology in engineering domain of their interest. They are required to carry out selection of an emerging topic beyond the syllabus relevant to the branch of study, understand the concept, analyze and present effectively for 15-20 minutes followed by 5 minutes of questions and answers before their classmates and faculty. They can also present the technical innovative/novel work carried out in the laboratory. Students are also required to learn the effective communication and modalities of technical interactions.

22UCVL801	Major Project Phase – II/ Internship	10 Credits

12 Weeks

Course Learning Objective (CLOs): Project Phase-II is carried out under the guidance of a faculty. 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. The evaluation will be carried out through presentation and viva-voce.

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.	9,13,14,15	3,4	8,11,12
CO-2	Design different components of the project following relevant IS codes if applicable.	9,13,14,15	3,4	8,11,12
CO-3	Evaluate and redesign if required.	9,13,14,15	3,4	8,11,12
CO-4	Prepare project report.	9,13,14,15	3,4	11
CO-5	Defend the presentation.	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	2	2.2	2			1	3		1	1	3	3	3

Major Project-II: This project work is intended for students who do not undertake an internship. The objective of the project is to foster independent learning, an innovative mindset, communication skills, organization, time management, presentation skills, teamwork, punctuality, and the ability to set and meet deadlines. In this project, students are expected to conduct an extensive literature survey to identify state-of-the-art technology in their domain of interest, select a topic from an emerging area relevant to their branch or an interdisciplinary field, and define the problem for their project work. Each project team shall consist of 2 to 4 students and will be assigned a faculty mentor. The department shall conduct three project reviews as per the schedule provided by DAP, which must be recorded as part of the project evaluation for CIE, along with marks awarded by the faculty guide. A committee constituted by the HoD, consisting of a minimum of two

faculty members, shall conduct the reviews and evaluate the CIE. For SEE, students must appear for a viva-voce examination, which will be assessed by a panel of two examiners—one internal and one external—constituted by the HoD. The rubric of evaluation includes defined objectives, literature review, demonstration of the project work carried out, report, project presentation, communication skill and question and answer session.

22UCVL802	Summer Internship	(0-0-4) 3

Duration: 4 Weeks

Course Learning Objective (CLOs):

1. The purpose of internship is student should be able to learn how to apply the knowledge acquired during internships in his future workplace.
2. The student should demonstrate work in the interdisciplinary approach and in a team with good communication skills.

Course Outcomes (COs):

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 problem.	13	1	9,12
CO-2	Will collect data by direct and indirect methods.	2	13	9,12
CO-3	Collect the 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 data/ results, draw conclusions and suggest strategies.	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

Internship: Students must undergo an internship in private industries, R&D organizations, Centre of Excellence, laboratories of reputed institutions, government and semi-government organizations, PSUs, construction companies, or entrepreneurial organizations to gain exposure to the external professional environment. The internship should be completed over a period of four weeks during the summer vacation after the IV or VI semester and must be completed before the VII semester. Students are required to prepare a report on the work

carried out during the internship and submit both the report and the internship certificate during the VIII semester. The internal faculty will monitor student performance and award CIE marks in the VIII semester. Additionally, there will be a SEE, in which students must present their work before a panel of two examiners constituted by the HoD during the SEE of the VIII semester.

CIE and SEE Evaluation (from 2023-24 batch)

Courses with LTP 3-0-0 and 4-0-0 or 2-2-0/3-2-0

Continuous Internal Evaluation (CIE):

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two subdivisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.
- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course each of 5marks. Total CTA marks-10
- CIE=40 (from tests) +10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question has a maximum of three subdivisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.

ASC(IC)/PCC with LTP 2-0-2, 3-0-2 and 2-2-2

Continuous Internal Evaluation (CIE):

Theory CIE component:

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two subdivisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.

Course Teacher Assessment (CTA): Totally based on conduction of experiments as set by the course teacher.

Laboratory component assessment:

- 5 marks: for conduction, regularity, involvement, journal writing, etc. A minimum of 75% attendance is compulsory. If the performance is not satisfactory in the laboratory the student shall be detained and required to reregister for the course whenever offered next.
- 5 marks: Lab Test. A Lab test as per the class timetable has to be conducted at the end for 50 marks and scale down to 5 marks.
- CIE for integrated course =40 (from IA tests) +10 (from CTA i.e. lab component) =50 marks.
- There will not be any remuneration for the Final Lab Test since it is CTA of integrated course.
- Copy of the Marks list to be sent to the concerned course instructor immediately after the completion of test for that batch. Original Marks list to be maintained in the department.
- CIE=40(from tests) +10(from CTA i.e., lab component) =50 marks

Semester End Examination (SEE):

- SEE is conducted for100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question has a maximum of three subdivisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.

Semester End Examination (SEE):

- SEE is conducted for 50 marks of 1 hour duration. There will be 50 MCQs.
- Question Paper pattern for SEE: The question paper will contain 12 MCQ questions drawn from each Unit.
- Students must answer a maximum of 10 questions from each unit.
- All five units are to be answered compulsorily.