Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Scheme of Teaching and Examination for I/II Semester B.E. CBCS, Academic Year: 2022-23

2022 Scheme: CIVIL ENGINEERING

Physics Cycle										**SEMESTER: I**				
Sl. No.	**Course Category**	**Course Code**	**Course Title**	**Teaching Department**	**Teaching Hours/Week**					**Examination**				**Credits**
					L	**T**	**P**	**SS**	**Total**	**Duration (Hrs)**	**CIE Marks**	**SEE Marks**	**Total Marks**	
1	ASC(IC)	22MAU101A	Mathematics - 1	Maths	2	2	2	0	4+2	03	50	50	100	04
2	ASC(IC)	22PHU102A	Applied Physics	Physics	3	0	2	0	3+2	03	50	50	100	04
3	ESC	22CVT103	Engineering Mechanics	Civil	3	0	0	0	3	03	50	50	100	03
4	ESC-1	22ESX104X	Engineering Science Course	Respective Engg. dept	3	0	0	0	3	03	50	50	100	03
5	ETC-1	22ETT105X	Emerging Technology Course - I	Any Engg. Dept.	3	0	0	0	3	03	50	50	100	03
6	AEC	22ENT106	Communicative English	Humanities	1	0	0	0	1	02	50	50	100	01
7	HSS	22SKT107 / 22BKT107	Samskrutika Kannada / Balake Kannada	Humanities	1	0	0	0	1	02	50	50	100	01
8	HSS	22IDT108	Innovation and Design Thinking	Any dept.	1	0	0	0	1	02	50	50	100	01
9	MC	22CDN109	Career Development Skills - I	Placement Cell	2	0	0	0	2	-	50	---	---	NP/PP
Total									**26**		**450**	**400**	**800**	**20**

TD/PSB- Teaching Department / Paper Setting Board, **SS**-Self Study, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSS**-Humanity and Social Science Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination,

IC – Integrated Course (Theory Course Integrated with Practical Course)

Credit Definition: 1-hour Lecture **(L)** per week=**1Credit** 2-hoursTutorial**(T)** per week=**1Credit** 2-hours Practical / Drawing (**P**) per week=**1Credit**	04- Credits courses are to be designed for 50 hours of Teaching-Learning Session 04- Credits (IC) are to be designed for 40 hours' theory and 12-14 hours of practical sessions 03- Credits courses are to be designed for 40 hours of Teaching-Learning Session 02- Credits courses are to be designed for 25 hours of Teaching-Learning Session 01- Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions

Student's Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer to the ANNEXURE I of Induction Programs notification of the University published at the beginning of the 1st semester.

AICTE Activity Points to be earned by students admitted to B.E. day college program (For more details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4 years Degree programs through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, any time during the semester, weekends, and holidays, as per the liking and convenience of the student from the year of entry to the program. However, the minimum hour's requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth Semester Grade Card shall be issued only after earning the required activity points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

***22MAU101A** Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers

#- 22PHU102A SEE shall have the 03 hours of theory examination), however, practical sessions question shall be included in the theory question papers.

ESC or ETC, of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature the of course required practical learning then the syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0). **All PLC courses are Integrated courses.**

All 01 Credit - courses shall have the SEE **of 02 hours duration and the pattern of the question paper shall be MCQ**

(ESC - I) Engineering Science Courses - I					(ETC-I) Emerging Technology Courses -I				
Code 22ESX104X	**Title**	**L**	**T**	**P**	**Code 22ETT105X**	**Title**	**L**	**T**	**P**
22EST104A	Introduction to Civil Engineering	3	0	0	22ETT1051	Introduction to Cyber Security	3	0	0
22EST104B	Introduction to Electrical Engineering	3	0	0	22ETT1052	Introduction to Internet of Things (IOT)	3	0	0
22EST104C	Introduction to Electronics Engineering	3	0	0	22ETT1053	Renewable Energy Sources	3	0	0
22EST104D	Introduction to Mechanical Engineering	3	0	0	22ETT1054	Basics of Waste Management	3	0	0
22ESU104E	Introduction to C Programming	2	0	2	22ETT1055	Green Buildings	3	0	0
					22ETT1056	Smart Materials and Systems	3	0	0
					22ETT1057	Introduction to Nanotechnology	3	0	0
					22ETT1058	Introduction to Sustainable Engineering	3	0	0
					22ETT1059	Introduction to Embedded System	3	0	0

(PLC-I) Programming Language Courses-I					Applied Science Course (IC)				
Code 22PLU105X	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22PLU105A	Introduction to Web Programming	2	0	2	22MAU101A	Mathematics – 1 for CV stream	3	0	2
22PLU105B	Introduction to Python Programming	2	0	2	22PHU102A	Applied Physics for CV stream	3	0	2
22PLU105C	Basics of JAVA programming	2	0	2					
22PLU105D	Introduction to C++ Programming	2	0	2					

The course 22ESU104E:
Introduction to C Programming, and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT

- The student has to select one course from the ESC-I group.
- Civil Engineering Students shall opt for any one of the courses from the ESC-I group except, **22EST104A - Introduction to Civil Engineering**
- The students have to opt for the courses from ESC group without repeating the course in either 1st or 2nd semester
- The students must select one course from either ETC-I or PLC-I group.
- If students study the subject from ETC-I in 1st semester he/she has to select the course from PLC-II in the 2nd semester and vice-versa

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Scheme of Teaching and Examination for I/II Semester B.E. CBCS, Academic Year: 2022-23

2022 Scheme: CIVIL ENGINEERING

Chemistry Cycle										**SEMESTER: II**				
Sl. No.	**Course Category**	**Course Code**	**Course Title**	**Teaching Department**	**Teaching Hours/Week**					**Examination**				**Credits**
					L	**T**	**P**	**SS**	**Total**	**Duration (Hrs)**	**CIE Marks**	**SEE Marks**	**Total Marks**	
1	ASC(IC)	22MAU201A	Mathematics - II	Maths	2	2	2	0	4+2	3	50	50	100	4
2	ASC(IC)	22CHU202C	Applied Chemistry	Chemistry	3	0	2	0	3+2	3	50	50	100	4
3	ESC	22MED203	Computer Aided Engg. drawing	Civil/Mech.	2	0	2	0	2+2	3	50	50	100	3
4	ESC-II	22ESX204X	Engineering Science Course - II	Respective Engg. dept	3	0	0	0	3	3	50	50	100	3
5	ETC-II	22PLU205X	Programming Language Course	Any Engg. Dept	2	0	2	0	3	3	50	50	100	3
6	AEC	22ENT206	Professional writing skill	Humanities	1	0	0	0	1	2	50	50	100	1
7	HSS	22CIT207	Constitution of India	Humanities	1	0	0	0	1	2	50	50	100	1
8	HSS	22SFT208	Scientific Foundation of Health	Humanities	1	0	0	0	1	2	50	50	100	1
9	MC	22CDN209	Career Development Skills - II	Placement Cell	2	0	0	0	2	-	50	---	---	NP/PP
								Total	**26**		**500**	**450**	**800**	**20**

TD/PSB- Teaching Department / Paper Setting Board, **SS**-Self Study, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSS**-Humanity and Social Science Course, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

Credit Definition: 1-hour Lecture **(L)** per week=**1Credit** 2-hoursTutorial**(T)** per week=**1Credit** 2-hours Practical / Drawing (**P**) per week=**1Credit**	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session 04-Credits (IC) are to be designed for 40 hours' theory and 12-14 hours of practical sessions 03-Credits courses are to be designed for 40 hours of Teaching-Learning Session 02- Credits courses are to be designed for 25 hours of Teaching-Learning Session 01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions

Student's Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer to the ANNEXURE I of Induction Programs notification of the University published at the beginning of the 1st semester.

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***-22MAU201A** Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers
#- 22CHU202C SEE shall have the 03 hours of theory examination however, practical sessions question shall be included in the theory question papers
ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature the of course required practical learning then the syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0). All **PLC** courses are Integrated courses.
All 01 Credit- courses shall have the SEE **of 02 hours duration and the pattern of the question paper shall be MCQ**

(ESC-II) Engineering Science Courses II					(ETC-II) Emerging Technology Courses - II				
Code 22ESX204X	**Title**	**L**	**T**	**P**	**Code 22ETT205X**	**Title**	**L**	**T**	**P**
22EST204A	Introduction to Civil Engineering	3	0	0	22ETT2051	Introduction to Cyber Security	3	0	0
22EST204B	Introduction to Electrical Engineering	3	0	0	22ETT2052	Introduction to Internet of Things (IOT)	3	0	0
22EST204C	Introduction to Electronics Engineering	3	0	0	22ETT2053	Renewable Energy Sources	3	0	0
22EST204D	Introduction to Mechanical Engineering	3	0	0	22ETT2054	Basics of Waste Management	3	0	0
22ESU204E	Introduction to C Programming	2	0	2	22ETT2055	Green Buildings	3	0	0
					22ETT2056	Smart Materials and Systems	3	0	0
					22ETT2057	Introduction to Nanotechnology	3	0	0
					22ETT2058	Introduction to Sustainable Engineering	3	0	0
					22ETT2059	Introduction to Embedded System	3	0	0
(PLC-II) Programming Language Courses-II					**Applied Science Course (ASC)**				
Code 22PLU205X	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
22PLU205A	Introduction to Web Programming	2	0	2	22MAU201A	Mathematics – II for CV	3	0	2
22PLU205B	Introduction to Python Programming	2	0	2	22CHU202C	Applied Chemistry for CV	3	0	2
22PLU205C	Basics of JAVA programming	2	0	2					
22PLU205D	Introduction to C++ Programming	2	0	2					

The course 22ESU204E:
Introduction to C Programming, and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT

- The student has to select one course from the ESC-II group.
- Civil Engineering Students shall opt for any one of the courses from the ESC-II group except, **22EST204A - Introduction to Civil Engineering.**
- The students have to opt for the courses from ESC group without repeating the course in either 1st or 2nd semester
- The students must select one course from either ETC-II or PLC-II group.
- If students study the subject from ETC-I in 1st semester he/she has to select the course from PLC-II in the 2nd semester and vice-versa

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Scheme of Teaching and Examination for III Semester B.E. CBCS, Academic Year: 2023-24

2022 Scheme: CIVIL ENGINEERING

III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC	22CVT301	Building Materials & Construction	Civil	3	0	0	-	3	50	50	100	3
2	IPCC	22CVU302	Engineering Survey	Civil	3	0	2	-	3	50	50	100	4
3	IPCC	22CVU303	Strength of Materials	Civil	3	0	2	-	3	50	50	100	4
4	PCC	22CVT304	Fluid Mechanics & Machinery	Civil	3	0	0	-	3	50	50	100	3
5	PCCL	22CVL305	Computer Aided Building Planning and Drawing	Civil	0	0	2	-	3	50	50	100	1
6	ETC	22CVT306X	ESC / ETC / PLC	Civil	3	0	0	-	3	50	50	100	3
7	UHV	22HST307	Social Connect and Responsibility	Civil	0	0	2	-	1	100	-	100	1
8	AEC/ SEC	22CVT308X or 22CVL308X	Ability Enhancement Course / Skill Enhancement Course – III	Civil	If the course is a Theory				1	50	50	100	1
					1	0	0	-					
					If a course is a laboratory				2				
					0	0	2	-					
9	HS	22CDN309	Aptitude and Verbal Ability Skill - I	Placement Cell	2	0	0	-	-	50	-	50	PP/ NP
10	MC	22NSN310	National Service Scheme (NSS)	NSS coordinator	0	0	2	-	-	100	-	100	PP/ NP
		22PEN310	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YON310	Yoga	Yoga Teacher									
									Total:	**600**	**350**	**950**	**20**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, S= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. K: This letter in the course code indicates common to all the streams of Engineering. ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course

Emerging Technology Course (ETC) 22CVT306X			
22CVT306A	Green Buildings	22CVT306C	Pavement Materials and Construction
22CVT306B	Environmental Protection & Management	22CVT306D	Basics of Structural Analysis
Ability Enhancement Course (AEC) – III 22CVT308X **OR** 22CVL308X			
22CVT308A	Engineering Geology	22CVT308C	Subsurface Exploration
22CVT308B	Economics for Civil Engineers	22CVT308D	Fire safety in Buildings

Professional Core Course (IPCC):

Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

National Service Scheme /Physical Education/Yoga:

All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056
Scheme of Teaching and Examination for IV Semester B.E. CBCS, Academic Year: 2023-24
2022 Scheme: CIVIL ENGINEERING

IV SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department & Question Paper Setting Board	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC	22CVT401	Structural Analysis	Civil	3	0	0	-	3	50	50	100	3
2	IPCC	22CVU402	Highway Engineering	Civil	3	0	2	-	3	50	50	100	4
3	IPCC	22CVU403	Concrete Technology	Civil	3	0	2	-	3	50	50	100	4
4	PCCL	22CVL404	Fluid Mechanics and Machinery Laboratory	Civil	0	0	2	-	3	50	50	100	1
5	ETC	22CVT405X	ESC / ETC / PLC	Civil	3	0	0	-	3	50	50	100	3
6	AEC/ SEC	22CVT406X or 22CVL406X	Ability Enhancement Course / Skill Enhancement Course - IV	Civil	If the course is Theory				1	50	50	100	1
					1	0	0	-					
					If the course is a lab				2				
					0	0	2	-					
7	BSC	22BIT407	Biology for Engineers	TD / PSB: BT, CHE.	3	0	0	-	3	50	50	100	3
8	UHV	22HST408	Universal Human Values	Any Department	1	0	0	-	1	50	50	100	1
9	HS	22CDN409	Aptitude and Verbal Ability Skill - II	Placement Cell	2	0	0	-	-	50	-	50	PP/NP
10	MC	22NSN410	National Service Scheme (NSS)	NSS coordinator	0	0	2	-	-	100	-	100	PP/NP
		22PEN410	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		22YON410	Yoga	Yoga Teacher									
									Total	**550**	**400**	**950**	**20**

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, S= Self-Study, CIE: Continuous Internal Evaluation, SEE:

Semester End Evaluation. TD: Teaching Department, PSB: Paper Setting Board.

Professional Core Course (IPCC):

Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

National Service Scheme /Physical Education/Yoga:

All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses is mandatory for the award of Degree.

Emerging Technology Course (ETC) 22CVT405X OR 22CVL405X			
22CVT405A	Advanced Surveying	22CVT405C	Applied Hydraulics
22CVT405B	Road Safety & Engineering	22CVT405D	Ground Improvement Techniques
Ability Enhancement Course (AEC) - IV 22CVT406X OR 22CVL406X			
22CVT406A	Construction Methods and Equipment	22CVT406C	Codal Provisions in Civil Engineering
22CVT406B	Civil Engineering Entrepreneurship and Development	22CVT406D	Metro and Seaport Engineering

Dr. Ambedkar Institute of Technology, Bengaluru - 560056
Scheme of Teaching and Examination for V Semester B.E. CBCS, Academic Year: 2025-26
2022 Scheme: CIVIL ENGINEERING

V SEMESTER

Sl. No	Course Category and Course Code		Course Title	Teaching Dept.	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSMS	22CVT501	Construction Project and Management	Civil	3	0	0	-	03	50	50	100	3
2	IPCC	22CVU502	Geotechnical Engineering	Civil	3	0	2	-	03	50	50	100	4
3	IPCC	22CVU503	Design of RC Structural Elements	Civil	3	0	2	-	03	50	50	100	4
4	PCCL	22CVL504	Advanced Surveying Laboratory	Civil	0	0	2	-	03	50	50	100	1
5	PEC	22CVT505X	Professional Elective Course	Civil	3	0	0	-	03	50	50	100	3
6	PROJ	22CVM506	Extensive Survey Project	Civil	0	0	4	-	03	50	-	50	2
7	AEC	22RMT507	Research Methodology and IPR	TD: CV PSB: EEE	3	0	0	-	03	50	50	100	3
8	MC	22CVT508	Environmental Studies	Civil	2	0	0	-	02	50	50	100	2
9	HS	22CDN509	Aptitude and Verbal Ability Skills	Placement	2	0	0	-	-	50	-	50	PP/NP
10	MC	22NSN510	National Service Scheme (NSS)	NSS	0	0	2	-	-	100	-	100	PP/NP
		22PEN510	Physical Education (PE) (Sports and Athletics)	Physical Education									
		22YON510	Yoga	Yoga Teacher									
									Total	**550**	**350**	**900**	**22**

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, S= Self-Study CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K: The letter in the course code indicates common to all the stream of Engineering. PROJ: Project /Mini Project. PEC: Professional Elective Course

Professional Elective Course 22CVT505X

22CVT505A	Solid Waste Management	22CVT505C	Pavement Design
22CVT505B	Advanced Concrete Technology	22CVT505D	Masonry Structures

Professional Core Course (IPCC):

Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga:

All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

Mini-project work:

Mini Project is a laboratory-oriented/hands-on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications etc. Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini-project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

(i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

No SEE component for Mini-Project.

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 that 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 number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056
Scheme of Teaching and Examination for VI Semester B.E. CBCS, Academic Year: 2025-26
2022 Scheme: CIVIL ENGINEERING

VI SEMESTER

Sl. No	Course Category and Course Code		Course Title	Teaching Department	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	22CVU601	Design and Drawing of Steel Structural Elements	Civil	3	0	2	-	03	50	50	100	4
2	PCC	22CVT602	Hydrology and Water Resources Engineering	Civil	4	0	0	-	03	50	50	100	4
3	PEC	22CVT603X	Professional Elective Course	Civil	3	0	0	-	03	50	50	100	3
4	OEC	22CVT604X	Open Elective Course	Civil	3	0	0	-	03	50	50	100	3
5	PROJ	22CVP605	Major Project Phase - I	Civil	0	0	4	-	03	100	--	100	2
6	PCCL	22CVL606	Software Application Lab	Civil	0	0	2	-	03	50	50	100	1
7	AEC / SDC	22CVT607X OR 22CVL607X	Ability Enhancement Course / Skill Development Course - V	Civil	If the course is offered as a Theory				01	50	50	100	1
					1	0	0	-					
					If course is offered as a practical								
					0	0	2	-					
8	HS	22CDN608	Analytical and Reasoning Skills	Placement	2	0	0	-	-	50	-	50	PP/NP
9	MC	22NSN609	National Service Scheme (NSS)	NSS	0	0	2	-	-	100	-	100	PP/NP
		22PEN609	Physical Education (PE) (Sports and Athletics)	Physical Education									
		22YON609	Yoga	Yoga Teacher									
									Total	**550**	**300**	**850**	**18**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability

Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, **S**= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **PROJ**: Project /Mini Project. **PEC**: Professional Elective Course. **PROJ**: Project Phase -I, **OEC**: Open Elective Course.

Professional Elective Course 22CVT603X			
22CVT603A	Air Pollution and Control	22CVT603D	Railways, Airport, Tunnel and Harbour Engineering
22CVT603B	Structural Health Monitoring	22CVT603E	Pre-Stressed Concrete
22CVT603C	Foundation Engineering	22CVT603F	Alternate Building Materials and Technologies
Open Elective Course 22CVT604X			
22CVT604A	Integrated Solid Waste Management	22CVT604C	Urban Transport System
22CVT604B	Air Pollution and Control Methods	22CVT604D	Natural Disaster Mitigation and Management

Ability Enhancement Course / Skill Enhancement Course – V 22CVT607X OR 22CVL607X			
22CVT607A	Introduction to Technical Paper Writing	22CVT607C	Industrial Visit
22CVT607B	Introduction to Real Estate Management	22CVT607D	MS Office for Civil Engineers

Professional Core Course (IPCC):

Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23

National Service Scheme /Physical Education/Yoga:

All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.

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 that 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 number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided 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 number of students' strength for offering an Open Elective Course is 10. However, this condition
shall not be applicable to class where the admission to the program is less than 10.

Project Phase-I :

Students have to discuss with the mentor /guide and with their help he/she has to complete the literature survey and prepare the report and finally define the problem statement for the project work.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056
Scheme of Teaching and Examination for VII Semester B.E. CBCS, Academic Year: 2025-26
2022 Scheme: CIVIL ENGINEERING

VII SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical	Self – Study	Duration hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	IPCC	22CVU701	Water and Wastewater Treatment	Civil	3	0	2	-	3	50	50	100	4
2	IPCC	22CVU702	Estimation and Valuation	Civil	3	0	2	-	3	50	50	100	4
3	PCC	22CVT703	Design of RC and Steel Structures	Civil	3	2	0	-	3	50	50	100	4
4	PEC	22CVT704X	Professional Elective Course	Civil	3	0	0	-	3	50	50	100	3
5	OEC	22CVT705X	Open Elective Course	Civil	3	0	0	-	3	50	50	100	3
6	PROJ	22CVP706	Major Project Phase – II	Civil	0	0	12	-	3	100	100	200	6
									Total:	**350**	**350**	**700**	**24**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **PEC**: Professional Elective Course, **OEC**: Open Elective Course PR: Project Work, **L:** Lecture, **T**: Tutorial, **P**: Practical **S**= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting Board, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work

Professional Elective Course 22CVT704X

22CVT704A	Environmental Impact Assessment	22CVT704D	Natural Disaster Mitigation and Management
22CVT704B	Reinforced Earth Structures and Geo-synthetics	22CVT704E	Traffic Engineering
22CVT704C	Irrigation and Hydraulic Structures	22CVT704F	Matrix Method of Structural Analysis

Open Elective Course 22CVT705X

22CVT705A	Ecology and Environmental Impact Assessment	22CVT705C	Intelligent Transport System
22CVT705B	Occupational Safety and Health Administration	22CVT705D	Conservation of Natural Resources

Note: VII and VIII semesters of IV years of the program

(1) Institutions can swap the VII and VIII Semester Schemes of Teaching and Examinations to accommodate research internships/ industry internships after the VI semester**.**

(2)Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether the VII or VIII semesters are completed during the beginning of the IV year or the later part of IV years of the program.

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 that 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 number of students' strengths for offering professional electives is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

Open Elective Courses:

Students belonging to a particular stream of Engineering and Technology are not entitled to the open electives offered by their parent Department. However, they can opt for an elective offered by other Departments, provided 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 number of students' strength for offering an Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

PROJECT WORK (21CVP75): The objective of the Project work is

(i) To encourage independent learning and the innovative attitude of the students.

(ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills.

(iii) To impart flexibility and adaptability.

(iv) To inspire team working.

(v) To expand intellectual capacity, credibility, judgment and intuition.

(vi) To adhere to punctuality, setting and meeting deadlines. To install responsibilities to oneself and others.

(vii) To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE procedure for Project Work:

(1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

(2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE procedure for Project Work:

SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056
Scheme of Teaching and Examination for VIII Semester B.E. CBCS, Academic Year: 2025-26
2022 Scheme: CIVIL ENGINEERING

VIII SEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PEC	22CVT801X	Professional Elective (Online Course)	--	3	0	0	-	-	-	-	-	3
2	OEC	22CVT802X	Open Elective (Online Course)	--	3	0	0	-	-	-	-	-	3
3	INT	22CVI803	Internship (Industry/Research) (14 - 20 Weeks)	--	0	0	12	-	03	100	100	200	10
									Total:	**100**	**100**	**200**	**16**

L: Lecture, **T**: Tutorial, **P**: Practical S= Self-Study, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **TD-** Teaching Department, **PSB**: Paper Setting department, **OEC**: Open Elective Course, **PEC**: Professional Elective Course. **PROJ**: Project work, **INT**: Industry Internship / Research Internship / Rural Internship.

Professional Elective Course (Online courses) 22CVT801X			
22CVT801A	Municipal Solid Waste Management	22CVT801C	Hydrological Measurements and Analysis of Data
22CVT801B	Advanced Foundation Engineering	22CVT801D	Sustainable Transportation Systems
Open Elective Courses (Online Courses) 22CVT802X			
22CVT802A	Environmental Remediation of Contaminated Sites	22CVT802C	Applied Seismology for Engineers
22CVT802B	Fundamentals of Artificial Intelligence	22CVT802D	Retrofitting & Rehabilitation of Civil Infrastructure

Note: VII and VIII semesters of IV years of the program Swapping Facility

- Institutions can swap VII and VIII Semester Scheme of Teaching and Examinations to accommodate **research internships/ industry internships/Rural Internship** after the VI semester**.**
- Credits earned for the courses of VII and VIII Semester Scheme of Teaching and Examinations shall be counted against the corresponding semesters whether VII or VIII semester is completed during the beginning of IV year or later part of IV year of the program.

Elucidation:

At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester **Research Internship /Industrial Internship / Rural Internship** shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend Research Internship or Industrial Internship or Rural Internship.

Research/Industrial /Rural Internship shall be carried out at an Industry, NGO, MSME, Innovation center, Incubation center, Start-up, center of Excellence (CoE), Study Centre established in the parent institute and /or at reputed research organizations/institutes.

The mandatory Research internship /Industry internship / Rural Internship is for 14 to 20 Weeks. The internship shall be considered as a head of passing and shall be considered for the award of a Degree. Those who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent University examination after satisfying the internship requirements.

Research internship: A research internship is intended to offer the flavor of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research.

Industry internship: Is an extended period of work experience undertaken by students to supplement their Degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints.

Rural Internship: Rural development internship is an initiative of Unnat Bharat Abhiyan Cell, RGIT in association with AICTE to involve students of all departments studying in different academic years for exploring various opportunities in techno-social fields, to connect and work with Rural India for their upliftment.

The faculty coordinator or mentor has to monitor the student's internship progress and interact with them to guide for the successful completion of the internship. The students are permitted to carry out the internship anywhere in India or abroad. University shall not bear any expenses incurred in respect of the internship.

- With the consent of the internal guide and Principal of the Institution, students shall be allowed to carry out the internship at their home town (**within or outside the state or abroad**), provided favorable facilities are available for the internship and the student remains regularly in contact with the internal guide.
  University/Institute shall not bear any cost involved in carrying out the internship by students. However, students can receive any financial assistance extended by the organization

Total 160 Credit Distributions for all semester B.E. (Civil Engineering) Programme.

Semester	I	II	III	IV	V	VI	VII	VIII	**Total Credits**
Credits	20	20	20	20	18	22	24	16	**160**

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**BUILDING MATERIALS & CONSTRUCTION**						
Course Code	**CVT301**						
Category	**Professional Core Course (PCC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand engineering properties of various materials used in civil engineering construction & their applications, the techniques & requirements involved in designing the components of buildings and method of construction and gain the knowledge in the field of civil engineering and to achieve economy in the construction.

UNIT – I **8 Hours**

ROCKS: Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks.

STONES: Quarrying of stones, Tests on stones, properties and uses, Deterioration and preservation of stone work,

TIMBER: Timber, classification, seasoning of timber, Defects in timber, preservation of timber, uses and their properties, Plywood, Block Board, Particle Board, Laminates.

UNIT – II **8 Hours**

BRICKS: Ingredients of good brick earth, manufacturing of Bricks, classification and qualities of bricks, Test on Bricks.

CEMENT: Introduction, Ingredients, Manufacturing, Types.

MORTAR: Definition, types, Proportions and Requirements of a good Mortar.

UNIT – III **8 Hours**

FOUNDATION: Function and requirements of a good foundation, Types of foundations, Preliminary investigation of soil, Safe Bearing Capacity of Soil, Introduction to spread, combined, strap, mat and pile foundations.

MASONRY: Classification of Masonry, Definition of terms used in Masonry, Classification of stone masonry, Joints in stone masonry, Bonds in Brick work - English Bond & Flemish Bond, Characteristics and requirements of good brick masonry.

UNIT – IV **8 Hours**

ARCHES: Elements of an arch, Classification of arches, Stability of arch.

LINTELS: Definition and classification of Lintels, Definition and functions of Chejja, Canopy & Balcony.

DOORS AND WINDOWS: Doors and windows, Definition of technical terms, Types of Doors, Types of windows, commercially available windows and doors (PVC, CPVC and Aluminium).

UNIT – V **8 Hours**

STAIRS: Definition of technical terms, Requirements of good stair, Types of Stairs, Geometrical design of RCC Dog-legged and open well stairs (Plan and sectional elevation).

PLASTERING, PAINTING AND DAMP PROOFING: Purpose of plastering, Methods of plastering, Materials of plastering. Paints, Constituents of paints & types. Purpose of Painting, Application of Paints to new and old surfaces. Damp Proofing - Causes of Dampness, Effects of Dampness, Methods of Damp Proofing.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the material science and behaviour of various building materials used in construction.
CO2	Identity suitable materials for buildings and adopt suitable construction techniques.
CO3	Provide procedural knowledge of the testing methods of brick, cement and mortar.
CO4	Demonstrate suitable type of foundations, masonry structures, arches, lintels and their applications.
CO5	Exhibit the knowledge of construction of staircase and building finishes.

Text Books:	
1	Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain. "Building construction", Firewall Media, 2005.
2	Sharma, Sudesh Kumar. "A textbook of building construction", S. Chand Publishing, 1987.
3	Rangawala S. C. "Engineering Materials", Charter Publishing House, Anand, India. 2003
4	S.K. Duggal, "Building Materials", 4th Edition, New Age International (P) Limited, 2016 National Building Code (NBC) of India

Reference Books:	
1	Jagadish. K.S, "Alternative Building Materials Technology", New Age International, 2007.
2	Varghese, P. G. "A Text Book of Building Materials", 2010
3	Building Materials and Components, CBRI, 1990, India

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.

- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											1
CO2	3											1
CO3	3											1
CO4	3	2										1
CO5	3											1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ENGINEERING SURVEYING**						
Course Code	**CVU302**						
Category	**Integrated Professional Core Course (IPCC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**2**	**0**	**5**	**50**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives:

To provide basic knowledge about principles of surveying for location, design and construction of civil engineering projects, develop skills for using surveying instruments including, levelling instruments, plane tables, theodolite, compass and to familiarize in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works which are used for abstracting the information of earth Surface

UNIT-I **08 Hours**

INTRODUCTION TO SURVEYING:

Importance of surveying in Civil Engineering, Classification of surveys, Concepts of plane and geodetic surveying, Principles of surveying – Plans and maps, conventional symbols – Surveying equipment.

UNIT-II **08 Hours**

COMPASS SURVEYING:

Basic definitions, Meridians, Bearings, Dip, Declination, Prismatic and surveyor's compasses, temporary adjustments. Quadrantal bearings, whole circle bearings, Calculation of bearings and included angles, Local attraction, problems on relevant.

PLANE TABLE SURVEYING:

Plane table and accessories, Advantages and limitations of plane table survey, Orientation and methods of orientation.

UNIT-III **08 Hours**

LEVELLING:

Principles and basic definitions, Types of Levels, Types of adjustments and objectives, Types of levelling, Simple, Differential, Fly, Reciprocal, Profile, Cross sectioning, Bookingof levels – Rise & fall and H. I methods, problems on relevant.

THEODOLITE:

Theodolite, Fundamental axes and parts of theodolite, uses of theodolite, Temporary adjustments of theodolite, measurement of horizontal and vertical angles.

MODERN SURVEYING EQUIPMENT:

Electronic distance measurement (EDM), Principles of EDM, Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.

UNIT-IV **08**

Hours

AREAS AND VOLUMES:

Measurement of area – by dividing the area into geometrical figures, area from offsets, midordinate rule, trapezoidal and Simpsons one third rule, introduction to planimeter, digital planimeter. Measurement of volumes - trapezoidal and Prismoidal formula, problems on relevant.

CONTOURING:

Contours and their characteristics, Methods of contouring, direct and indirect methods, Interpolation techniques, Uses of contours.

UNIT-V **8**

Hours

CURVE SURVEYING:

Curves – Necessity – Types, Simple curves, Elements, Designation of curves, setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankine's deflection angle method (numerical problems). Compound curves, Elements, Design of compound curves, Setting out of compound curves (numerical problems). Reverse curve between two parallel straights (numerical problems on Equal radius and unequal radius).

Expt. No	LABORATORY EXPERIMENTS:	No. of Sessions
1	To set regular geometric figure (Pentagon) using chain, tape and prismatic compass.	**10**
2	To find the distance between two inaccessible points, using chain, tape and prismatic compass.	
3	To locate the points using Radiation and Intersection method of Plane table Surveying.	
4	To determine the difference in elevation between various points by differential levelling using Auto level.	
5	To find the true difference in elevation between various points by profile levelling and Cross-section method using Auto level.	
6	To establish contour of a given area by Block leveling using Auto level	
7	To find the distance between two inaccessible points shown in the field using Theodolite.	
8	To establish simple circular curve using Rankine's deflection method using Theodolite	
9	To set out a compound curve using Deflection angle method using Theodolite.	
10	Demo: Total Station, GPS	
Virtual lab 1) To locate the points using Radiation and Intersection method of Plane table Surveying. 2) To find the true difference in elevation between various points by profile levelling and Cross-section method using Auto level.		

Course Outcomes: At the end of the course the student will be able to

1	Relate the importance, principles, basic and advanced equipment required for surveying.
2	Outline the bearing system and plane table surveying using the instrument for simple field survey.
3	Explain the modern surveying equipment required for the surveying various fields of civil engineering.
4	Examine the level of ground surface, Calculation of area, volumes and contours using basic and advanced surveying equipment.
5	Analyze the different types of curves for deviating type of alignments using basic and advanced surveying equipment.

Teaching-Learning Process
Chalk and talk, Videos, PowerPoint Presentation, Animations and Experimental learning in laboratory.

Text Books:	
1	Surveying Vol. 1, 2 & 3. 17th edition, B. C. Punmia, Ashok Kumar Jain, Arun Kuma Jain, lakshmi publication, 2015.
2	Surveying and leveling, 3rd edition, T P Kanetkar, Pune Vidyarthi Griha Prakashan publisher, 2019.
3	Fundamentals of Surveying, 3rd edition, - Milton O. Schimidt – Wong, Thomson, Cengage Learning Publishing, 2016.

Reference Books:	
1	Surveying and Leveling, 2nd edition – R Subramanian. Oxford University Press (2007) Publisher.
2	Surveying Vol. I, 5th edition, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi, 2015.

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(i) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(ii) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.

- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(iii)Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

CIE score = (Test 1 + Test 2) × 0.6 + Laboratory Component

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

High-3, Medium-2 & Low-1.

Course Title	**STRENGTH OF MATERIALS**						
Course Code	**CVU303**						
Category	**Integrated Professional Core Course (IPCC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**2**	**0**	**5**	**50**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand the basic concepts of the stresses and strains for different materials and strength of structural elements, interpret different internal forces and stresses induced due to representative loads on structural elements, determine slope and deflections of beams and evaluate the behavior of torsion members, columns and struts.

UNIT – I **08 Hours**

SIMPLE STRESS AND STRAIN:

Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress – Strain Diagram for structural steel and non-ferrous materials, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections

UNIT – II **08 Hours**

SIMPLE STRESS AND STRAIN (CONTINUED):

Elongation of member due to self– weight, Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants, Thermal stresses (including thermal stresses in compound bars).

UNIT – III **08 Hours**

BENDING MOMENT AND SHEAR FORCE IN BEAMS:

Introduction, Types of beams loadings and supports, Shearing force in beam, Bending moment, Sign convention, Relationship between loading, shear force and bending moment, SFD and BMD with salient values for cantilever beams, simply supported beams and overhanging beams considering point loads, UDL, UVL and Couple.

UNIT – IV **08 Hours**

BENDING STRESS AND SHEAR STRESS IN BEAMS:

Introduction – Bending stress in beam, Assumptions in simple bending theory, Pure bending derivation of Bernoulli's equation, Modulus of rupture, section modulus, Flexural rigidity, Expression for shear stress in beam, Shear stress diagram for rectangular, Symmetrical 'I' and 'T' section.

UNIT – V **08 Hours**

TORSION OF CIRCULAR SHAFTS:

Introduction – Pure torsion-Torsion equation of circular shafts, Strength and stiffness, Torsional rigidity and polar modulus, Power transmitted by shaft of solid and hollow circular sections.

ELASTIC STABILITY OF COLUMNS:

Introduction – Short and long columns, Euler's theory on columns, Effective length, slenderness ratio, radius of gyration, buckling load, Assumptions, Limitations of Euler's theory, Rankine's formula and numericals.

Expt. No	LABORATORY EXPERIMENTS:	No. of Sessions
1	Shear Test on Mild steel.	**10**
2	Impact test on Mild Steel (Charpy and Izod).	
3	Hardness tests on ferrous and non-ferrous metals – Brinell's method	
4	Hardness tests on ferrous and non-ferrous metals – Rockwell method	
5	Tension test on Mild steel and HYSD bars.	

6	Compression test on Mild Steel and Cast iron.	
7	Torsion test on Mild Steel circular sections.	
8	Bending Test on Wood under two point loading.	
9	Virtual Lab – Vicker's Hardness test and Compression test on Spring.	
10	Innovative experiment – Assessment of Young's Modulus by Hanging Weight Method.	

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: At the end of the course the student will be able to:	
CO1	Comprehend the fundamental concepts of material behaviour under different types of loading conditions.
CO2	Apply principles of stress, strain, and elasticity to analyze deformation in structural elements.
CO3	Construct internal force diagrams and interpret their significance in the design of load-bearing members.
CO4	Evaluate stresses and strains in beams, shafts, and columns using appropriate mechanical theories.
CO5	Solve engineering problems related to the strength and stability of structural components.

Text Books:	
1	Strength of Materials, R K Bansal, Lakshmi Publications (P) Ltd., 6th Edition 2018.
2	Strength of Materials, S Ramamrutham, Dhanpath Rai, Publishing Co., 20th Edition, 2020.
3	Strength of Materials, Bhavikatti S S, Vikas Publishing house (P) Ltd., 4th Edition 2013.

Reference Books:	
1	Elements of Strength of Materials, Timoshenko and Young Affiliated East-West Press.3rd Edition 2021.
2	Strength of Materials, R Subramanyam, Oxford University Press, 3rd Edition 2016.
3	Strength of Materials, B C Punmia, Ashok Jain, Arun Jain, Lakshmi Publications (P) Ltd., 10th Edition, 2018.

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(iv) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(v) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.

- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(vi) Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

CIE score = (Test 1 + Test 2) × 0.6 + Laboratory Component

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										1
CO2	3	3										1
CO3	3	3										
CO4	3	3										
CO5	3	3										

High-3, Medium-2 & Low-1.

Course Title	**FLUID MECHANICS & MACHINERY**						
Course Code	**CVT304**						
Category	**Professional Core Course (PCC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand fundamentals of fluid properties, to gain knowledge on fluid kinematics & dynamics, to measure flow of fluid using different devices and basic design of flow through pipes.

UNIT – I **08 Hours**

BASIC PROPERTIES OF FLUIDS:

Mass density, Specific weight, Specific gravity, Viscosity, Surface tension, Capillarity, Numericals, Classification of fluids.

PRESSURE AND ITS MEASUREMENT:

Pascal's law, Hydrostatic law, Types of pressure, Measurement of pressure using piezometer, U tube manometers (Simple, inverted and differential), Numericals.

UNIT – II **08 Hours**

HYDROSTATIC FORCES ON SURFACES:

Definition, Total pressure, Centre of pressure, Total pressure on Horizontal, Vertical and Inclined plane surface and Curved surfaces, Water pressure on gravity dams, Lock gates, Numerical Problems.

FUNDAMENTALS OF FLUID FLOW (KINEMATICS):

Introduction, Methods of describing fluid motion. Velocity and Total acceleration of a fluid particle. Types of fluid flow, Rate of flow, Three-dimensional continuity equation, Velocity and Acceleration, Velocity potential function and Stream function, flow net, types of motion.

UNIT – III **08 Hours**

DYNAMICS OF FLUID FLOW:

Introduction, Forces acting on fluid in motion, Euler's equation of motion along a streamline and Bernoulli's equation, Assumptions and limitations of Bernoulli's equation, Modified Bernoulli's equation, Problems on applications of Bernoulli's equation (with and without losses).

APPLICATIONS:

Venturimeter, Orifice meter and Pitot tube, Numericals. The momentum equation - Forces exerted by a flowing fluid on a pipe bend

UNIT – IV **08 Hours**

MEASUREMENT OF DISCHARGE:

ORIFICE:

Flow through small and large orifice, Hydraulic coefficients, Experimental determination of Coefficients, flow through fully submerged and partially submerged orifice.

FLOW OVER NOTCHES:

Rectangular, Triangular, Trapezoidal and Stepped, Error measurement in the head, Numericals.

FLOW OVER WEIRS:

Rectangular, Cippoletti, Narrow-crested, Broad-crested, Sharp-crested, Ogee and Submerged, End contraction, Velocity approach in weirs, Numericals.

UNIT – V **08 Hours**

FLOW THROUGH SIMPLE PIPES:

Losses of head of liquid flowing in a pipe, Major loss - Friction and Minor losses in pipe flow - Sudden enlargement, Sudden contraction, Entrance in a pipe, Exit of a pipe, Hydraulic gradient line and Total energy line, Numericals**.**

FLOW THROUGH COMPOUND PIPES:

Flow through pipes in series, Equivalent Pipe, Flow through parallel pipes, Pipe networks, Hardy Cross

method.

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: The students will be able to	
CO1	Understand fundamental properties of fluids and solve problems on hydrostatics.
CO2	Understand the Hydrostatic forces on different surfaces and the principles of Kinematics for problem solving.
CO3	Analyse the concept of Bernoulli's principles and its application in venturimeter, orifice meter and pitot tube.
CO4	Understand the basics of flow rate measurements using orifice, notches and weirs.
CO5	Understand the basic design of pipes and pipe networks considering flow, pressure and its losses.

Text Books:	
1	'Text Book Of Fluid Mechanics & Hydraulic Machines'- R.K. Bansal, Laxmi Publications, New Delhi, 2008 Edition.
2	A Text Book of Fluid mechanics & Hydraulic Machines'- R.K. Rajput, S. Chand & Co, New Delhi, 2006 Edition.
3	Hydraulics and Hydraulic Machines- Dr. P. N. Modi and Seth, McGraw Hill Publications, 23rd Edition, 2022

Reference Books:	
1	Fundamentals of Fluid Mechanics – Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, Wiley India, New Delhi, 2009 Edition.
2	'Introduction To Fluid Mechanics' – Edward j. Shaughnessy, Ira m. Katz, James P Schaffer, Oxford University Press, New Delhi, 2005 Edition.
3	Fluid Mechanics' – Streeter, Wylie, Bedford New Delhi, 2008(Ed)

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.

- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2					1	1			1
CO2	3	3	2					1	1			1
CO3	3	3	2					1	1			2
CO4	3	3	2	1				1	1		1	
CO5	3	3	2	1				1	1		1	

High-3, Medium-2 & Low-1.

Course Title	**FLUID MECHANICS & MACHINERY LABORAORY**						
Course Code	**CVL305**						
Category	**Professional Core Course Laboratory (PCCL)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	0	**0**	**2**	**0**	**2**	**24**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To study the measurement of flow of fluid in a pipe, notches and weirs, calibration of measuring devices and their applications and study the performance of Pumps and Turbines.

Sl. No.	**Syllabus Contents**	**No. of Sessions**
1	Verification of Bernoulli's equation.	12
2	Determination of Hydraulic coefficients of a Vertical orifice.	
3	Calibration of Venturimeter and Orificemeter.	
4	Calibration of Rectangular and Triangular notch.	
5	Calibration of Broad- crested and Ogee weir.	
6	Determination of Darcy's friction factor for a GI and PVC straight pipe.	
7	Determination of vane coefficients for a flat vane, inclined and semi-circular vane.	
8	Performance characteristics of Single stage and Multi-stage Centrifugal Pump.	
9	Performance characteristics of Pelton wheel Turbine.	
10	Performance characteristics of Francis turbine.	
11	Performance characteristics of a Kaplan turbine.	
Virtual Lab: Performance characteristics of a Turbines.		

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: The students will be able to	
CO1	Explain the principles of flow measuring devices by conducting the experiments.
CO2	Illustrate the calibration of velocity and discharge measuring equipment in pipes.
CO3	Illustrate the calibration of velocity and discharge measuring equipment in channels.
CO4	Demonstrate the performance of Pumps.
CO5	Demonstrate the performance of Turbines.

Text Books:	
1	A Text Book of Fluid mechanics & Hydraulic Machines- R.K. Rajput, S. Chand & Co, New Delhi, 2006 Edition.
2	Principles of Fluid Mechanics and Fluid Machines'- N. Narayana Pillai, Universities Press (India), Hyderabad, 2009 Edition.
3	Text Book Of Fluid Mechanics & Hydraulic Machines'- R.K. Bansal, Laxmi Publications, New Delhi, 2008 Edition.
4	Hydraulics and Hydraulic Machines- Dr. P. N. Modi and Seth, McGraw Hill Publications.

Reference Books:	
1	Fundamentals of Fluid Mechanics – Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, Wiley India, New Delhi, 2009 Edition.
2	'Introduction to Fluid Mechanics' – Edward j. Shaughnessy, Ira m. Katz, James P Schaffer, Oxford University Press, New Delhi, 2005 Edition.
3	Fluid Mechanics' – Streeter, Wylie, Bedford New Delhi, 2008(Ed)

4	Fluid Mechanics and Turbomachines'- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.

Question paper pattern:
The candidate has to conduct one experiment which carries 70 % of the total marks and viva-voce for 30 % of the total marks.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1						2	3	3		3
CO2	2	1						2	3	3		2
CO3	2	1						2	3	3		2
CO4	2	1						2	3	3		2
CO5	2	1						2	3	3		2

High-3, Medium-2 & Low-1.

Course Title	**EARTH RESOURCES & ENGINEERING**						
Course Code	**CVT306A**						
Category	**Emerging Technology Course (ETC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**40**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: An Earth Resources and Engineering course aims to equip students with the knowledge and skills to understand and manage Earth's resources, including natural resources and environmental issues.

UNIT – I **8 Hours**

INTRODUCTION, SCOPE OF EARTH SCIENCE IN ENGINEERING

Earths internal dynamics, plate tectonics, Earthquake types, causes iso-seism line, seismic zonation map, seismic proof structures, Numerical problems on location of epicentre, volcanic eruption, types, causes, landslides, causes types, preventive measures, tsunamis causes consequences, mitigation, cyclones, causes management.

UNIT – II **8 Hours**

EARTH RESOURCES:

Minerals- Industrial, rock forming and ore minerals. Physical properties, composition and uses Rocks as a construction material - physical properties, texture, composition, applications for aggregate, decorative (facing/polishing), railway ballast, rocks for masonry work, monumental/architecture.

UNIT – III **8 Hours**

SURFACE INVESTIGATION FOR CIVIL ENGINEERING PROJECTS:

Weathering type, causes, soil in-situ, drifted soil, soil profile, soil minerology, structure, types of soil, weathering on monumental rocks, River morphology and basin investigation for engineering projects like earthen dam, gravity dam, arch dam.

UNIT – IV **8 Hours**

GROUND WATER:

Terms, types aquifers, ground water movement, hydraulic coefficients, well hydraulics, unconfined and confined aquifers and other sources of ground water.

UNIT – V **8 Hours**

SUBSURFACE INVESTIGATION FOR DEEP FOUNDATION:

Borehole data, Dip and strike and outcrop problems, , Electrical Resistivity meter, depth of water table, seismic studies, faults, folds, unconformity, joints types, recognition and there significance in Civil engineering projects.

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Apply geological knowledge in different civil engineering practices.
CO2	Acquire knowledge on durability and competence of foundation rocks and confidence enough to use the best building materials.
CO3	Competent to provide services for the safety, stability, economy and life of the structures that they construct.
CO4	Acquire knowledge about well hydraulics.
CO5	Solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems.

Text Books:	
1	Engineering Geology by Parthasarthy et al, 2013, Wiley India publications, New Delhi.
2	A textbook of Engineering Geology by Chenna Kesavalu, 2009, Mac Milan India Ltd.
3	Physical and Engineering Geology by S K Garg, 2005, Khanna Publishers.
4	Principles of Engineering Geology by KVGK Gokhale, 2016, BS Publishers.

Reference Books:	
1	Introduction to Environmental Geology by Edward A Keller, 2011, Pearson publications.
2	Engineering Geology and Rock Mechanics by BP Verma, 2016, Khanna Publishers.
3	Principles of Engineering Geology & Geotechnics, Krynine and Judd, 2015, CBS Publications.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1					1	1					
CO2	1			2		2	1					
CO3	1					2	1					
CO4	1					2						
CO4	1					2						

High-3, Medium-2 & Low-1.

Course Title	**ENVIRONMENTAL PROTECTION AND MANAGEMENT**						
Course Code	**CVT306B**						
Category	**Emerging Technology Course (ETC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**40**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To gain knowledge in Environmental protection and Management systems. Understand and evaluate the environmental problems and Reflect on their roles, responsibilities as citizens and consumers. Environmental management is necessary for environmental planning which implies the optimal utilisation of the earth's resources and preservation of the quality of environment for the healthy growth of society.

UNIT – I **8 Hours**

ENVIRONMENTAL MANAGEMENT STANDARDS:

Unique Characteristics of Environmental Problems – Systems approach to Corporate environmental management - Classification of Environmental Impact Reduction Efforts - Business Charter for Sustainable Production and Consumption – Tools, Business strategy drivers and Barriers - Evolution of Environmental Stewardship. Environmental Management Principles - National Policies on Environment, abatement of pollution and conservation of resources - Charter on Corporate Responsibility for Environmental Protection.

UNIT – II **8 Hours**

ENVIRONMENTAL MANAGEMENT OBJECTIVES:

Environmental quality objectives – Rationale of Environmental standards: Concentration and Mass standards, Effluent and stream standards, Emission and ambient standards, Minimum national standards, environmental performance evaluation: Indicators, benchmarking. Pollution control Vs Pollution Prevention - Opportunities and Barriers – Cleaner production and Clean technology, closing the loops, zero discharge technologies.

UNIT – III **8 Hours**

ENVIRONMENTAL MANAGEMENT SYSTEM:

EMAS, ISO 14000 - EMS as per ISO 14001– benefits and barriers of EMS – Concept of continual improvement and pollution prevention - environmental policy – initial environmental review – environmental aspect and impact analysis – legal and other requirements- objectives and targets – environmental management programs – structure and responsibility – training awareness and competence-communication – documentation and document control – operational control – monitoring and measurement – management review.

UNIT – IV **8 Hours**

ENVIRONMENTAL AUDIT:

Environmental management system audits as per ISO 19011- – Roles and qualifications of auditors - Environmental performance indicators and their evaluation – Non-conformance – Corrective and preventive actions -compliance audits – waste audits and waste minimization planning – Environmental statement (form V) - Due diligence audit.

UNIT – V **8 Hours**

APPLICATIONS:

Applications of EMS, Waste Audits and Pollution Prevention Control- Textile, Sugar, Pulp & Paper, Electroplating, Tanning industry. Hazardous Wastes - Classification, characteristics Treatment and Disposal Methods, Transboundary movement, disposal.

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the elements of Corporate Environmental Management systems complying with international environmental management system standards.
CO2	Perceptive to pollution prevention assessment team and implement waste minimization options.
CO3	Develop, Implement, maintain and Audit Environmental Management systems for Organizations.
CO4	Understand, analyse and evaluate industrial wastes.
CO5	Apply and evaluate various environmental auditing methodologies and develop corrective action plans for identified non-conformities to ensure continuous improvement of environmental performance.

Text Books:	
1	Christopher Sheldon and Mark Yoxon, "Installing Environmental management Systems – a step by step guide" Earthscan Publications Ltd, London, 1999.
2	Paul L Bishop „Pollution Prevention: Fundamentals and Practice, McGraw- Hill International, Boston, 2000.
3	Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations, Second Edition, NSF International, Ann Arbor, Michigan, January 2001.

Reference Books:	
1	ISO 14001/14004: Environmental management systems – Requirements and Guidelines – International Organisation for Standardisation, 2004
2	ISO 19011: 2002, "Guidelines for quality and/or Environmental Management System auditing, Bureau of Indian Standards, New Delhi, 2002

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.

- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3					2	1					
CO2		3				3				2		
CO3	3						1		3		3	
CO4												
CO5												

High-3, Medium-2 & Low-1.

Course Title	**PAVEMENT MATERIALS & CONSTRUCTION**						
Course Code	**CVT306C**						
Category	**Emerging Technology Course (ETC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**			**Duration of SEE: 03 hours**	

Course Learning Objective: Expose students to different materials which are used in pavement construction, impart knowledge about the engineering properties required, to train students to perform various types of bituminous mix designs as per the guidelines (MORTH), Student to get knowledge about different highway construction equipment with their suitability and adaptability in various field scenarios, expose students to construction practice and quality control aspects of embankment, flexible and rigid pavement as per the required specifications (MORTH) and to introduce students to possible improvisation in various layers of pavement to increase the structural strength by the use of non-basic materials (DLC, polythene sheets).

UNIT – I **8 Hours**

PAVEMENT MATERIALS AGGREGATES:

Origin, Classification, Requirements, properties and tests on Road aggregates, Concepts of size and gradation- design gradation, maximum aggregate size, aggregate blending by different methods to meet specification. Bitumen and Tar- Origin, Preparation, Properties and Chemical Constitution of bituminous road binders, Requirements.

UNIT – II **8 Hours**

BITUMINOUS EMULSION AND CUTBACKS:

Preparation, Characteristics, uses and test. Adhesion of bitumen binders to road aggregates, Adhesion failure, Mechanism of stripping, tests and methods of improving adhesion.

UNIT – III **8 Hours**

BITUMINOUS MIXES:

Mechanical properties, dense and open textured mixes, flexibility and brittleness, (No Hveem stabilometer and Hubbar- field tests) bituminous mixes, Design methods using Rothfutch's method only and specification, Marshall mix design criteria, voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen. Problems on above.

UNIT – IV **8 Hours**

EQUIPMENT IN HIGHWAY CONSTRUCTION:

Various types of equipments for excavation, grading and compaction- their working principles, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

Sub grade: Earthwork grading and Construction of embankments and cuts for roads, Preparation of subgrade, quality control tests.

UNIT – V **8 Hours**

FLEXIBLE PAVEMENTS:

Specifications of materials, Construction method and field control checks for various types of flexible pavement layers.

Cement Concrete Pavements: Specifications and method of cement concrete pavement construction (PQC, importance of providing DLC as sub base and polythene thin layer between PQC and sub base). Quality control tests, Construction of various types of joints.

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the suitability of any pavement material to be used in various components of pavement by conducting required tests as per IS, IRC specifications.
CO2	Explain the types of bituminous materials used in the construction and methods of improving adhesion failure.
CO3	Formulate the proportions of different sizes of aggregates to suit gradation criteria for various mixes as per MORTH and also design bituminous mixes.
CO4	Differentiate various types of equipments used for construction and execute the construction of pavements.
CO5	Analyse the different type of materials to be used in the pavements.

Text Books:	
1	Highway Engineering- S.K. Khanna and C.E.G Justo, Nem Chand and Bros. Roorkee Publisher, Revised 10th Edition, 2018.
2	Construction Equipment and its Management- Sharma S.C, Khanna Publishers -2013

Reference Books:	
1	Hot Mix Asphalt Materials, Mixture Design and Construction- Freddy L. Roberts, E. R Brown, Prithvi S Kandhal, NAPA Education Foundation Lanham, Maryland Publisher-2015, Third Edition.
2	DSIR / RRL (1963). Bituminous Materials in Road Construction, HMSO, London. R. N. Traxler (1961). Asphalt, Its Composition, Properties and Uses, Reinhold Publishing Corporation, New York. A. J. Hoiberg (1964/5/6)
3	Relevant IRC codes and MORT& H specifications, 5th revision.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.

- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				2						1	1
CO2	2				1						1	1
CO3	3	2			2							1
CO4	3	2			2							1
CO5	2	2										1

High-3, Medium-2 & Low-1.

Course Title	**BASICS OF STRUCTURAL ANALYSIS**						
Course Code	**CVT306D**						
Category	**Emerging Technology Course (ETC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand the concept of determinate, indeterminate structures, degree of freedom & degree of redundancy, determine principle stress by using Mohr circle concept, gain knowledge regarding thin & thick cylinders pressure, analysis of simple trusses and analyze determinate beams & frames by strain energy & Castigliano's methods.

UNIT – I **8 Hours**

BASICS OF STRUCTURAL ENGINEERING:

Nature of structures, Structural systems, Forms of structures, Equilibrium, Compatibility and Boundary Conditions, Linearity, Stability and loading.

COMPOUND STRESSES:

Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes, Mohr's circle of stresses, Theory Numerical examples.

UNIT – II **8 Hours**

THIN & THICK CYLINDERS:

Introduction, Thin cylinders subjected to internal pressure, Hoop stresses, Longitudinal stress and change in volume, Thick cylinders subjected to both internal and external pressure, Lame's equation, radial and hoop stress distribution, Numerical examples.

UNIT – III **8 Hours**

ANALYSIS OF DETERMINATE STRUCTURES BY STRAIN ENERGY METHOD:

Strain Energy Method - Derivation of Strain energy due to Bending, Shear and Torsion, Analysis of Cantilever beam and Frame due to Point load by Strain energy method to calculate Deflection.

UNIT – IV **8 Hours**

ANALYSIS OF DETERMINATE STRUCTURES BY CASTIGLIANO'S METHOD:

Castigliano's method - Theorems, Analysis of Beams and Frame due to Point and UDL loads by Castigliano's method to calculate Slope and Deflection.

UNIT – V **8 Hours**

ANALYSIS DETERMINATE STRUCTURES BY UNIT LOAD METHOD:

Analysis of Beams - Simply supported, Cantilever and Over hanging beams, Frames and Truss by Unit load method, subjected to Point load and UDL.

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the basic structural systems, classification and parameters required for structural analysis.
CO2	Interpret the concepts of compound stresses by using Mohr's Circles.
CO3	Study on thin and thick cylinders pressure.
CO4	Analyse and solve problems on Simple Trusses.
CO5	Analyse and Solve problems on Indeterminate Beams and Frames by Strain energy and Castigliano's and unit load method.

Text Books:	
1	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
2	Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB.
3	Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.
4	Bhavikatti S S, Engineering Mechanics, 2019, New Age International.
5	Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS Publication.

Reference Books:	
1	Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
2	Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
3	Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.

• The students will have to answer five full questions, selecting one full question from each unit.												
CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1		3								1
CO2	3	2		1								1
CO3	1			2								1
CO4		3		2								1
CO5		3		2								1

High-3, Medium-2 & Low-1.

Course Title	**ENIGNEERING GEOLOGY LABORATORY**						
Course Code	**CVL308A**						
Category	**Ability Enhancement Course (AEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	0	**0**	**2**	**0**	**2**	**24**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**			**Duration of SEE: 03 hours**	

Course Learning Objective: An Engineering Geology Laboratory aims to develop practical skills in identifying minerals and rocks, interpreting geological maps and applying geological knowledge to engineering problems.

Sl. No.	**Syllabus Contents**	**No. of Sessions**
1	Evaluation of minerals based on physical properties for basic raw material for construction, industrial application.	12
2	Investigation of rock based on physical, textural and mineralogical properties for construction.	
3	Geological map studies, Cross-section studies of geological maps for suitability evaluation.	
4	Subsurface investigation of geological conditions for dams, tunnels, water harvesting and aqua duct.	
5	Bridges under conditions of horizontal strata and inclined strata.	
6	Folded, Faulted beds and Unconformity.	
7	Intrusion relevant – Construction / generation of Geological maps based on borehole data.	
8	Geospatial data analysis: Interpretation of toposheets.	
9	Geospatial data analysis: Visual interpretation of FCC's (Geomorphology and land use / Land cover mapping). and TCC's.	
10	Geospatial data analysis: Visual interpretation of TCC's.	
11	Geospatial data analysis: Software application (QGIS)	
12	Geophysical exploration: Electrical resistivity methods for subsurface investigation and its interpretation, lateral and vertical sounding.	

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: The students will be able to	
CO1	Comprehend the relations between minerals and rocks based on their physical properties.
CO2	Assess the suitability of materials used in building construction.
CO3	Differentiate geological investigations necessary for the construction of dams, bridges and tunnels.
CO4	Understand the applications of Geospatial technology in Civil Engineering.
CO5	Describe the groundwater investigation using resistivity methods.

Text Books:	
1	Engineering Geology by Parthasarthy et al, 2013, Wiley India publications, New Delhi.
2	A textbook of Engineering Geology by Chenna Kesavalu, 2009, Mac Milan India Ltd.

3	Physical and Engineering Geology by S K Garg, 2005, Khanna Publishers.
4	Principles of Engineering Geology by KVGK Gokhale, 2016, BS Publishers.

Reference Books:	
1	Introduction to Environmental Geology by Edward A Keller, 2011, Pearson publications.
2	Engineering Geology and Rock Mechanics by BP Verma, 2016, Khanna Publishers.
3	Principles of Engineering Geology & Geotechnics, Krynine and Judd, 2015, CBS Publications.

Question paper pattern:
The candidate has to conduct one experiment which carries 70 % of the total marks and viva-voce for 30 % of the total marks.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1			2		1						
CO2	1				2							
CO3	1			2		2						
CO4	1		3		3							
CO5	1			2	3							

High-3, Medium-2 & Low-1.

Course Title	**ECONOMICS FOR CIVIL ENGINEERS**						
Course Code	**CVT308B**						
Category	**Ability Enhancement Course (AEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	1	**0**	**0**	**0**	**1**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**			**Duration of SEE: 02 Hrs**	

Course Learning Objective:

This course is to understand the fundamental economic concepts applicable to civil engineering used to evaluate the feasibility, cost-effectiveness, and profitability of different construction projects. To learn the basic concepts of principle Cash flow, techniques of incorporating inflation factor in economic decision making, Understand the project planning with a specific view on project Financing, depreciation methods and replacement analysis.

UNIT – I **3 Hours**

BASIC CONCEPTS OF ENGINEERING ECONOMICS:

Definition of Economics, Concept of Costs, Break Even Analysis, Law of Supply and Demand, Budget and budgetary provisions in Micro and Macro Economies, Applications of economics in civil engineering.

UNIT – II **3 Hours**

METHODS OF ECONOMIC EVALUATION:

Benefit Cost ratio, Cash flow, financial ratios, Discounted Cash flows, Sinking Fund, Single payment compound amount factor. Single payment, present worth factor, Equal payment series, Equal payment series payment, Present worth factor, Net Present Value.

UNIT – III **3 Hours**

COST ENGINEERING:

Capital Cost, Operational costs, Estimation and Estimation Techniques, Approximate estimates, Unit estimate, Time Value of Money Concept.

UNIT – IV **3 Hours**

FINANCING OF PROJECTS:

Introduction to Micro and Macro Economics, Financial Statements-Profit and loss, Balance sheets, Working capital management, Sinking Fund factor and Return on Investment, Job cost report.

UNIT – V **3 Hours**

DEPRECIATION AND REPLACEMENT ANALYSIS:

Depreciation methods and calculation. Equipment costs, Ownership and operating costs Buy/Rent/Lease options, Replacement analysis.

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos

Course Outcomes: The students will be able to	
CO1	Understand the fundamental concepts of Economics and application of economics in civil Engineering.
CO2	Describe the different methods of economic evaluation.
CO3	Explain the cost of capital, estimation techniques and Time Value of Money Concept in engineering concepts.
CO4	Discuss the project planning with a specific view on project Financing.
CO5	Summarize the different depreciation and replacement analysing techniques.

Text Books:

1. Panneer Selvam, R. "Engineering Economics", 5th Edition, 2016, Prentice Hall of India Ltd, New Delhi,

2	Chopra PN." Principles of Economics", 2nd Edition,, 2005, Kalyani Publishers,
3	Donald G. Newman, Jerome P Lavelle, "Engineering Economics and analysis", 5th Edn, 2000, Engineering Press, Texas.

Reference Books:	
1	Degumo, E.P., Sullivan, W.Grand Canada, I.B. Tagineering Economy, 2nd Edition, 2001, Macuillan New York.
2	Zahid A kian Engineering Economy, 6th Edition, 1997, Engineering Economy, Prentice Hall.
3	Thuesen H. G., Fabrycky W. J., and G. J.Thuesen G. J., Engineering Economy, Prentice Hall International, Paul E. De Garmo, and Canada. 1. R. (1997),

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

Question paper pattern:

- ✓ The question paper will have fifty objective questions carrying equal marks.
- ✓ Each objective question will be for one mark.
- ✓ The students will have to answer fifty questions.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											
CO2	1	2										2
CO3	2										2	2
CO4	2											3
CO5	2											

High-3, Medium-2 & Low-1.

Course Title	**CONSTRUCTION METHODS AND EQUIPMENT**						
Course Code	**CVT308C**						
Category	**Ability Enhancement Course (AEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	1	**0**	**0**	**0**	**1**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 02 hours**		

Course Learning Objective: To learn the basic principles of construction techniques & methods, understand terminologies and units of measurement related to equipment usage in different construction projects and perform cost analysis, selection, application and utilization of equipment.

UNIT – I **3 Hours**

CONSTRUCTION METHODS:

Introduction, Conventional and Modern methods of construction of building elements. Different stages of construction. Types of formworks. Elements of pre-cast and Pre-fabricated construction.

UNIT – II **3 Hours**

MECHANIZATION:

General data on mechanized construction equipment. Construction equipment and their characteristics. Advantages and disadvantages of Mechanization.

UNIT – III **3 Hours**

EQUIPMENT- I:

Excavating and earth moving equipment, Piles and Pile driving equipment.

UNIT – IV **3 Hours**

EQUIPMENT- II:

Lifting equipment, Drilling equipment and Boring equipment.

UNIT – V **3 Hours**

EQUIPMENT MANAGEMENT:

Planning process and estimation of cost of equipment. Cost of owning and operating construction equipment. Equipment life and replacement analysis.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand various construction methods and techniques.
CO2	Identify and select appropriate construction equipment.
CO3	Analyze the cost and performance of construction equipment.
CO4	Apply construction techniques in practical scenarios.
CO5	Summarize the principles of equipment management.

Text Books:	
1	Sharma, S.C., "Construction equipment and its management", Khanna Publishers., 6th Edition
2	Peurifoy R L, "Construction Planning, Equipment and Methods", Mc Graw Hill, 8th Edition.

Reference Books:	
1	Spence, W.P. and Kultermann, E., "Construction materials, methods and techniques", Cengage Learning.
2	Illingworth, J.R., "Construction methods and planning", CRC Press, 2nd Edition.

3	Construction methods and equipment management https://nptel.ac.in/courses/105103206

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

Question paper pattern:

- The question paper will have 50 questions carrying equal marks.
- Each question will be for 01 marks.
- Each question will have four options and one right answer.
- The students will have to answer all 50 questions.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2					2						1
CO2		2		2	1							
CO3	1		2	1	2						2	
CO4	2			2		3						
CO5	2					3					2	1

High-3, Medium-2 & Low-1.

Course Title	**FIRE SAFETY IN BUILDINGS**						
Course Code	**CVT308D**						
Category	**Ability Enhancement Course (AEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	1	**0**	**0**	**0**	**1**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 02 hours**		

Course Learning Objective: Illustrate the objectives of fire safety in buildings, fire hazard analysis and classification of fire. Understanding of fire prevention, detection and alarm systems including emergency measures for control of fire. Discuss the firefighting arrangements, risk management. Extinguishing principles, agents, appliances and firefighting services in buildings.

UNIT – I **3 Hours**

FIRE:

Introduction, Effects of Fire, Basic concepts of fire protection, Fire as a process of combustion, planning for fire protection, fire resistance Ventilation and fuel controlled fire, process of combustion.

UNIT – II **3 Hours**

FIRE SAFETY:

Urban planning, escape and refuge, internal planning, detection and suppression Introduction to lift design, expected stop and floor of reversal, different cases, simulation, arrangements and escalators.

UNIT – III **3 Hours**

FIRE PREVENTION AND PROTECTION:

Fire Triangle, Fire Development and its Severity, Effect of Enclosures, Early detection of Fire, Classification of Fire and Fire Extinguishers, Electrical Safety.

UNIT – IV **3 Hours**

HEALTH EVALUATION OF BUILDINGS:

Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey.

UNIT – V **3 Hours**

FIRE SAFETY REGULATIONS AND RISK ASSESSMENT

National building codes (NBC) - part4, IS codes related to fire safety- IS 2189, IS 1646, Risk assessment and mitigation strategies.

Teaching & Learning Process:

Chalk and talk, videos, PowerPoint Presentation, animations and the online courses available should be shared with students. Field visit to fire stations and understand various fire accidents.

Course Outcomes: The students will be able to	
CO1	Understand the definition of fire, fire triangle, combustion process and fire stages. Fire hazard analysis and assessment. Acquire the knowledge of fire prevention, protection and control systems.
CO2	Describe different firefighting arrangements in the building.
CO3	Illustrate fire risk analysis and management including fire safety signs and notifications.
CO4	Apply Fire Safety Standards and Codes for design of firefighting devices and components.
CO5	Evaluate the health of the building after fire accident.

Text Books:	
1	S. C. Sharma & Vineet Kumar, Safety, Occupational Health and Environmental Management in Construction, Khanna Publisher ISBN No. 978-81-7409-270-0, 2nd edition 2019.
2	N. Sesha Prakash, Manual of Fire Safety, CBS Publishers & Distributors Pvt. Ltd, 2020.
3	Charles D Reese, Occupational Safety and Health Fundamental Principles and Philosophies, CRC

	Press, 2017.
4	V K Jain, Fire Safety in Buildings, New Age International Private Limited; Third edition, 2020.

Reference Books:	
1	Fire protection, services and maintenance management of building, NPTEL video lecture, IIT, Delhi
2	Bureau of Indian Standards, "Hand Book of Functional Requirements Of Buildings, (SP-41 & SP-32)", BIS 1987 and 1989.
3	Building Services Design - T. W. Mever, Published by RIBA Publications, 1971.
4	Building Engineering & System Design - F. S. Merrit & J. Ambrose, U. S Department of Energy Office of Scientific and Technical Information, 1990.
5	National Building Code of India- Part: 4, Fire and Life safety, Bureau of Indian Standard.
6	Concept of building fire safety - D. Egan, Krieger Publishing Company, 2006.
7	Design of fire resisting structures - H. L. Malhotra. Surrey University Press, 1982.
8	https://www.ilo.org/wcmsp5/groups/public/ed_dialogue/lab_admin/documents/genericdocument/wcms_828851.pdf
9	https://dgfscdhg.gov.in/national-building-code-india-fire-and-life-safety

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5^{th} week of the semester
2. Second test at the end of the 10^{th} week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4^{th} week of the semester
2. Second assignment at the end of 9^{th} week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

Question paper pattern:

- ✓ The question paper will have fifty objective questions carrying equal marks.
- ✓ Each objective question will be for one mark.
- ✓ The students will have to answer fifty questions.

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				1	1	1						1
CO2				2	3	1						1
CO3				2		2						1

CO4				2		1						1
CO5				3		3						1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**STRUCTURAL ANALYSIS**						
Course Code	**CVT401**						
Category	**Professional Core Course (PCC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Objective: To understand the concept of determinate structures, indeterminate structures, deflection and strain energy, influence line diagram for beams subjected to rolling loads and analysis of truss, arches and cables and analysis of beams and frames by moment distribution method, slope deflection method and Matrix methods.

UNIT – I **8 Hours**

STRUCTURAL SYSTEMS:

Forms of structures, Conditions of equilibrium, Degree of freedom, Linear and Nonlinear behaviour, One, two, three dimensional structural systems, Determinate and indeterminate structures.

DEFLECTION OF BEAMS:

Moment area method, Conjugate beam method. Analysis of simply supported, Cantilever and Overhanging beams subjected to Point load and Uniformly distributed loads (UDL), Calculations.

UNIT – II **8 Hours**

ROLLING LOAD AND INFLUENCE LINES:

Rolling load analysis for simply supported beams for several point loads and UDL, Influence line diagram for reaction, SF and BM at a given section.

ARCHES AND CABLES:

Three hinged circular and parabolic arches with supports at same levels and different levels, Determination of thrust, shear and bending moment, Analysis of cables under point loads and UDL, length of cables (Supports at same levels and at different levels).

UNIT – III **8 Hours**

MOMENT DISTRIBUTION METHOD:

Introduction, Definition of terms- Distribution factor, Carry over factor, Analysis of beams and orthogonal rigid jointed plane frames (non-sway) with kinematic indeterminacy less than/equal to three.

SLOPE DEFLECTION METHOD:

Analysis of continuous beams only.

KANI'S METHOD:

Analysis of sway frames with kinematic indeterminacy less than/equal to three.

UNIT – IV **8 Hours**

STIFFNESS MATRIX METHOD OF ANALYSIS:

Introduction, Development of stiffness matrix for prismatic beam element and plane truss element and Analysis of continuous beams, plane truss and axially rigid plane frames by stiffness method with kinematic indeterminacy less than/equal to three.

UNIT – V **8 Hours**

FLEXIBILITY MATRIX METHOD OF ANALYSIS:

Introduction, Development of flexibility matrix for prismatic beam and relationship between stiffness and flexibility matrix, analysis of continuous beams and frames.

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Course Outcomes: At the end of the course the student will be able to	
CO1	Understand the basic structural systems, classification and parameters required for structural analysis.
CO2	Calculate the deflection of beams subjected to various loads.
CO3	Interpret influence line diagrams for different beams and the concept of strain energy, moving loads, lateral and gravity loads applied in the structural systems.
CO4	Evaluate the forces in three-hinged arches and cables under point loads and UDLs, considering different support levels.
CO5	Apply classical (Moment Distribution, Slope Deflection, Kani's methods) and matrix methods (Stiffness, and Flexibility Methods) to analyse statically determinate and indeterminate beams and frames.

Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation, Animations.

Text Books :	
1	Basic Structural Analysis, C S Reddy, Tata McGraw Hill Education Pvt. Ltd., 3rd Edition ISBN-13: 978-0070702769.
2	Theory of Structures, S Ramamrutham & R Narayan, Dhanpat Rai & Co., 9th Edition, ISBN – 13: 978-934378103.
3	Structural Analysis Vol-2, S S Bhavikatti, Vikas Publishing House Fourth Edition, ISBN-13-978-9325968806.
4	Structural Analysis, R C Hibbler, Pearson Publication, 8th edition, ISBN-13: 978-0132570534.

Reference Books :	
1	Elementary Structural Analysis, Norris C H, Wilbur J B, International Student edition, McGraw Hill International Book, ISBN-13: 978-8131721414.
2	Structural Analysis, Devdas Menon, Narosa Publishing House, ISBN: 978-8173197505.
3	Theory of Structures, Volume 2, S P Gupta, G S Pandit & R Gupta, Tata McGraw Hill Publication Company Ltd.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.

- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										1
CO2	3	1										1
CO3	3	1										1
CO4	3	1										1
CO5	3	1										1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**HIGHWAY ENGINEERING**						
Course Code	**CVU402**						
Category	**Integrated Professional Core Course (IPCC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**2**	**0**	**5**	**50**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective:
To comprehend the knowledge of different modes of transportation systems, history, development of highways and the organizations associated with research and development in INDIA. To understand the Highway planning and development considering the essential criteria's such as Engineering and financial aspects, regulations and policies, socio economic impact and the design consideration for drainage. To illustrate the different aspects of horizontal and vertical geometric elements for safe and efficient movement of vehicles. To evaluate pavement and its components, design aspects and its requirements to evaluate the highway economics by B/C, NPV, IRR methods.

UNIT – I **8 Hours**

PRINCIPLES OF TRANSPORTATION ENGINEERING:
Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute.

HIGHWAY DEVELOPMENT AND PLANNING:
Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals, Salient Features of 3rd and 4th twenty year road development plans and Policies, Present scenario of road development in India (NHAI, NHDP & PMGSY) and in Karnataka (KSHIP & KRDCL) Road development plan - Vision 2021**,** DPR of roads.

UNIT – II **8 Hours**

HIGHWAY ALIGNMENT AND SURVEYS:
Ideal Alignment, Factors affecting the alignment, Engineering surveys - Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects.

HIGHWAY ECONOMICS:
Highway user benefits, VOC using charts only - Examples, Economic analysis - annual cost method, Benefit Cost Ratio method, NPV-IRR methods with Examples, Highway financing - BOT-BOOT concepts, Tender process.

UNIT – III **8 Hours**

HIGHWAY GEOMETRIC DESIGN:
Importance, Terrain classification, Design speed, Factors affecting geometric design, Cross sectional elements – Camber, width of pavement, Shoulders, Width of formation, Right of way with Typical cross sections. Sight Distance-Restrictions to sight distance, Stopping sight distance, Overtaking sight distance, overtaking zones- Examples on SSD and OSD with Sight distance at intersections.

HORIZONTAL ALIGNMENT:
Radius of Curve, Super elevation, Extra widening, Transition curve and its length, setback distance – Examples on the said above. Vertical alignment - Gradient-summit and valley curves with examples.

UNIT – IV **8 Hours**

PAVEMENT MATERIALS:
Subgrade soil - desirable properties - HRB soil classification, determination of CBR and modulus of subgrade reaction with Examples.
Aggregates - Desirable properties and list of tests used in laboratory.
Bituminous materials - Bitumen, cutback and emulsion with List of tests on bituminous materials, PQC.

UNIT – V **8 Hours**

HIGHWAY DRAINAGE:

Significance and requirements, Surface drainage system and design - Examples, sub surface drainage system, design of filter materials with examples.

PAVEMENT DESIGN:

Pavement types, component parts of flexible and rigid pavements and their functions, design factors, Flexible pavement design as per IRC: 37 – 2018, and Design of rigid pavement as per IRC: 58 – 2015.

Expt. No	LABORATORY EXPERIMENTS:	No. of sessions
1	Tests on Aggregates: Specific Gravity and Crushing Strength Test.	**10**
2	Hardness & Toughness Test: Los Angeles abrasion test and Impact test.	
3	Shape tests: Combined index and Angularity number	
4	Tests on Bituminous Materials: Specific gravity test, Viscosity test by tar viscometer, Flash and fire point test.	
5	Penetration test, Ductility test and Softening point test.	
6	Wet sieve analysis test on subgrade.	
7	Density of Soil: Core Cutter and Sand replacement method	
8	CBR Test on soil	
9	Innovative Experiment - Design of flexible pavement as per IRC 37-2018.	
10	Virtual Lab - Bituminous Mix Design by Marshall Method.	

Course Outcomes: The students will be able to	
CO1	Understand the basic principles of transportation engineering, planning process, policies involved in highway development in India and economic analysis of various road projects.
CO2	Apply the knowledge of highway alignment, geometric design, and related parameters to develop effective and safe road layouts.
CO3	Analyse pavement design methods, materials and structural requirements using standard codes
CO4	Evaluate the significance of highway drainage systems and apply design principles for surface and subsurface drainage components.
CO5	Perform standard laboratory tests on highway materials and interpret the results to assess their suitability for road construction.

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Text Books:	
1	Highway Engineering – S K Khanna and C E G Justo, Nem Chand Bros, 10th Edition, Roorkee, 2011.
2	Transportation Engineering, L. R. Kadiyali, Khanna Publishers, 1st edition, 2016.
3	Highway Engineering, Karen K. Dixon and Paul H. Wright, Wiley, 7th edition, 2009.
4	Transportation Engineering, C. Jotin Khisty, B. Kent Lall, Pearson, 3rd edition, 2017.
5	Highway Engineering, Martin Rogers, Bernard Enright, Wiley, 3rd edition, 2016.

Reference Books:	
1	Principles of Highway Engineering and Traffic Analysis, Fred L. Mannering, Walter P. Kilareski, Scott S. Washburn, Wiley, 3rd edition, 2007.
2	Pavement Analysis and Design, Yang Huang, Pearson, 2008.

3	Transportation Engineering and Planning, Papacostas, Pearson, 3rd edition, 2015.
4	A Policy on Geometric Design of Highways and Streets (Green Book), AASHTO, 2011, 7th edition.

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(i) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(ii) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(iii) Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

CIE score = (Test 1 + Test 2) × 0.6 + Laboratory Component

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											1
CO2	3	2										1
CO3	2		2	1								1
CO4		1										1
CO5				1								1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**CONCRETE TECHNOLOGY**						
Course Code	**CVU403**						
Category	**Integrated Professional Core Course (IPCC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**2**	**0**	**5**	**50**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To recognize material characterization of ingredients of concrete and its influence on properties of concrete. Understand proportion ingredients of concrete to arrive at most desirable mechanical properties of concrete. To ascertain and measure engineering properties of concrete in fresh and hardened state which meet the requirement of real time structures.

UNIT – I **8 Hours**

CEMENT AND AGGREGATES:

Introduction to Cement: Chemical Composition, Physical and Chemical properties, Hydration of Cement, Factors influencing and affecting hydration of cement & Types of cement.

Fine Aggregate: Grading, Analysis, Specify Gravity, Bulking, Moisture content.

Coarse Aggregate: Importance of Size, Shape and Texture. Grading of aggregates - Sieve analysis, Specific gravity, Flakiness and Elongation index, Crushing, Impact and Abrasion tests.

UNIT – II **8 Hours**

PROPERTIES OF FRESH AND HARDENED CONCRETE:

Manufacturing Process of Concrete: Batching, Mixing, Transporting, Placing, Compaction, Curing & Finishing.

Fresh Concrete: Workability – Definition and Requirements, Factors affecting workability, Measurement of workability – Slump test, Flow table test, Compaction factor test, Vee-Bee Consistometer tests, Segregation and Bleeding.

Hardened Concrete: Factors affecting strength, W/C ratio, Gel/Space ratio, Maturity concept, Destructive test on hardened concrete.

Admixtures: Types of admixtures and their effect on concrete property in fresh and hardened state. Plasticizers and superplasticizers, Retarders, Accelerators and Air-Entraining Admixtures.

UNIT – III **8 Hours**

Elasticity: Relation between modulus of elasticity and strength, Factors affecting modulus of elasticity, Poisson's ratio.

Shrinkage: Types of shrinkage, Factors affecting shrinkage.

Creep of Concrete: Measurement of creep, Factors influencing creep, Effects of creep.

UNIT – IV **8 Hours**

DURABILITY & PERMEABILITY OF CONCRETE:

Definitions, Causes, Short term and Long-term durability, Carbonation, Freezing and Thawing, Alkali – Aggregate reaction, Sulphate attack, Chloride attack, Acid attack, Effect of Sea water.

Special Concrete: Properties and Application of Self-Compacting Concrete, Light Weight Concrete, High Density Concrete, Fibre-Reinforced Concrete, Geo-Polymer Concrete & Ready Mix Concrete.

UNIT – V **8 Hours**

CONCRETE MIX DESIGN:

Concept of Concrete Mix design, Variables in proportioning, Exposure conditions, Procedure of mix design

as per IS 10262-2019, Numerical examples of Mix Design.

Sl. No	Experiments	No. of Sessions
1	Determination of Fineness and Specific Gravity of cement.	10
2	Consistency test on cement and Compressive strength of cement.	
3	Determination of Setting times of cement.	
4	Determination of Soundness of cement.	
5	Measurement of workability of concrete by Slump cone test.	
6	Measurement of workability of concrete by Compaction factor test.	
7	Measurement of workability of concrete by Vee-bee Consistometer test.	
8	Tests for determination of Compressive strength of concrete.	
9	Tests for determination of Flexural strength of concrete.	
10	Tests for determination of Splitting tensile strength of concrete.	
11	Virtual Lab - Determination of Specific Gravity and Compressive strength of cement.	

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations, Videos and experimental learning in Laboratory.

Course Outcomes: The students will be able to	
CO1	Assess and infer various properties of cement, fine and coarse aggregate as per Codal provision and specifications.
CO2	Understand the production of concrete, importance of curing, admixtures and properties of concrete in fresh and hardened state.
CO3	Acquires the knowledge about elasticity, durability and properties of special concrete.
CO4	Examine and Evaluate properties of Cement and Concrete.
CO5	Design the concrete for different grades as per IS: 10262-2019 provisions.

Text Books:	
1	M.S.Shetty, "Concrete Technology" - Theory and Practice, S.Chand and Company, New Delhi, 2002.
2	"Concrete Technology (Trade, Technology & Industry)", George White, Delmar Cengage Learning, 1991.
3	"Concrete: Microstructure, Properties, and Materials", P. Kumar Mehta, Paulo J. M. Monteiro, McGraw-Hill Education, 2017.
4	Neville, A.M., "Properties of Concrete", ELBS, London, Pearson Education India, 2012.
5	A.R.Santakumar, "Concrete Technology". Oxford University Press (2007)'
6	"Advanced Concrete Technology", Zongjin Li, Wiley; 1st edition, 1990.
7	Gambhir Dhanpat Rai & Sons , "Concrete Manual", 2009, New Delhi
8	N. Krishna Raju, "Concrete Mix Design" , 2005, Sehgal publishers

Reference Books:	
4	IS: 10262-2019, "Recommended guidelines for concrete mix design", Bureau of Indian Standards, 2009, New Delhi.

5	IS: 456-2000, "Plain And Reinforced Concrete", 2000, New Delhi.

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(iv) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(v) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(vi) Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

CIE score = (Test 1 + Test 2) × 0.6 + Laboratory Component

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											1
CO2	3	2										1
CO3	3	2		2								1
CO4	3	2										1
CO5	3	2										1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**COMPUTER AIDED BUILDING PLANNING AND DRAWING**						
Course Code	**CVL404**						
Category	**Professional Core Course Lab (PCCL)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	0	0	2	0	2	15	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To develop skills to prepare civil engineering drawings using Auto-CAD. Understanding the bye-laws, setbacks, computation of carpet area, plinth area and floor area ratio. Apply engineering concepts to draw various components of the structure and to visualize the completed form of the building with the particulars of construction

Sl. No	**Syllabus Contents**	**No. of Sessions**
1	Drawing Basics: Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962. Simple engineering drawings with CAD drawing tools: Lines, Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse, Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet.	12
2	Using Text: Single line text, Multiline text, Spelling, Edit text, Special Features: View tools, Layers concept, Dimension tools, Hatching, Customizing toolbars, Working with multiple drawings.	
3	Functional design of building (Residential, Public and Industrial), positioning of various components of buildings, orientation of buildings, building standards, bye laws, set back distances and calculation of carpet area, plinth area and floor area ratio.	
4	Cross section of SSM Foundation	
5	Lintel and chejja.	
6	Layout plan of Rainwater recharging and harvesting system.	
7	Preparation of site plan of a residential building.	
8	Development of Line diagram for Primary Health Center and School Building.	
9	Development of plan, elevation, section and schedule of openings for Single storied building using AutoCAD.	
10	Development of plan, elevation, section and schedule of openings for Two storied (Ground and First floor) building using AutoCAD.	
11	Development of electrical, plumbing and sanitary services from the given line diagram of residential buildings using AutoCAD for single storied building	
12	Development of electrical, plumbing and sanitary services from the given line diagram of residential buildings using AutoCAD for Two storied building (Ground and First floor).	

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: The students will be able to

CO1	To prepare building components drawings using AutoCAD.
CO2	To develop line diagrams for various buildings.
CO3	To evolve the plan, elevation and section for the buildings
CO4	Read, Prepare and interpret the drawings in a professional set up for various building components
CO5	Draw the buildings as per the planning requirements.

Text Books:	
1	Civil Engineering Drawing, Malik R.S., Meo G.S Computech Publication Ltd New Asian Publishers, 2009, New Delhi ISBN:978- 8173180026.
2	Building Drawing,Shah M.H., Kale C.M, and Patki S.Y., Tata Mcgraw Hill, 5th edition, New Delhi, 2002. ISBN: 9780074638767.
3	A Course in Civil Engineering Drawing, V.B.Sikka, S.K.Kataria & Sons, 11 th Edition, 2015.
4	Building Planning and Drawing, Dr. Swamy Kumara N; Rao Kameshwara A Charotar Publication, ANAND ISBN: 978- 93-85039-12-6 (Ed.2015).
5	Introduction to AutoCAD 2024 for Civil Engineering Applications, Nighat Yasmin Ph.D. SDC Publications, ISBN: 978-1-63057-607-3.
Reference Books	
1	IS: 962-1989 (Code of practice for architectural and building drawing).
2	National Building Code, BIS, New Delhi.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				3			3				1
CO2	2				3							1
CO3	2				3							1
CO4	2				3							1
CO5	2				3							1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ADVANCED SURVEYING**						
Course Code	**CVT405A**						
Category	**Emerging Technology Course (ETC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**3**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: To provide basic knowledge levelling for location, design and construction of civil engineering projects, develop skills for using modern surveying instruments and methods such as Total station, GPS, Photogrammetric and UAV and to familiarize in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works which are used for abstracting the information of earth Surface.

UNIT-I **08 Hours**

TRIGONOMETRIC LEVELLING:

Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, Distance and difference in elevation between two inaccessible objects by double plane method.

UNIT-II **08 Hours**

TACHEOMETRY:

Basic principle, Types of tacheometric survey, Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, Anallactic lens in external focusing telescopes, Reducing the constants in internal focusing telescope, Moving hair method and tangential method, Subtance bar, Beaman stadia arc.

UNIT-III **08 Hours**

GLOBAL POSITIONING SYSTEM:

Definition, Principles of GPS, DGPS and its applications.

PHOTOGRAMMETRIC SURVEYING:

Principle, Scale, Number of Photographs, Deduction of distance & height, Elements of Astronomical survey, Solution of problems dealing with celestial triangle.

UNIT-IV **08 Hours**

REMOTE SENSING:

History, advantages and disadvantages, types of remote sensing, application of remote sensing,

GEOGRAPHIC INFORMATION SYSTEM:

Definition of GIS, Key Components of GIS, Functions of GIS, Data mode of GIS, application of GIS.

UNIT-V **08 Hours**

UAV SURVEYING:

Definitions of UAV, RPA, Quad copters -Basic Components and Categories – Applications, Principles of Flight Planning, Mapping and Surveying, Comparison with other aerial vehicles

Course Outcomes: At the end of the course the student will be able to	
CO1	Understand the different methods of trigonometric levelling using various surveying equipment.
CO2	Find the distance between the points using tachometry and modern surveying equipment for simple field survey.
CO3	Explain the modern methods of surveying using GPS and photogrammetry for field application.
CO4	Identifies the application of remote sensing and GIS with other modern surveying equipment.
CO5	Select the types of UAV equipment required for various applications in engineering in compare with modern surveying equipment.

Teaching-Learning Process	Chalk and talk, PowerPoint Presentation, animations and videos.

Text Books :	
1	Surveying Vol. 1, 2 & 3. 17th edition, B. C. Punmia, Ashok Kumar Jain, Arun Kuma Jain, lakshmi publication, 2015.
2	Surveying and leveling, 3rd edition, T P Kanetkar, Pune Vidyarthi Griha Prakashan, Pune Vidyarthi Griha Prakashan publisher, 2019.
3	Fundamentals of Surveying, 3rd edition, - Milton O. Schimidt – Wong, Thomson, Cengage Learning Publishing, 2016.

Reference Books:	
1	Higher Surveying, 3rd edition, A.M. Chandra, New age international (Publisher) Ltd, 2019
2	Surveying Vol. I, 5th edition, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi, 2015.
3	https://nptel.ac.in/courses/105107122
4	https://archive.nptel.ac.in/courses/105/104/105104101/

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).

- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				2						1	1
CO2	2				2						1	1
CO3	3	2			2							1
CO4	3	2			2							1
CO5	2	2			2							1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ROAD SAFETY & ENGINEERING**						
Course Code	**CVT405B**						
Category	**Emerging Technology Course (ETC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To explain the causes of accidents, statistical measures of accident data analysis and computer application in data analysis. Explain different parameters responsible for providing road safety in the construction of new roads. Explain road reconstruction principle and improvement of road considering the different components of road and intersections. Explain road safety and maintenance measures for road in operation considering pedestrian, cyclists and road furniture. Explain road safety audit principle and procedure, various traffic management techniques and their effectiveness.

UNIT – I **8 Hours**

INTRODUCTION TO SAFETY:

Road accidents, Trends, causes, Collision and Condition diagrams,

Highway safety, human factors, Vehicle factors Road Safety Management System: Multicausal dynamic systems approach to safety, crash versus accident, road safety improvement strategies, elements of a road safety plan, Safety Data Needs

UNIT – II **8 Hours**

STATISTICAL INTERPRETATION AND ANALYSIS OF CRASH DATA:

Before-after methods in crash analysis, Advanced statistical methods, Black Spot Identification & Investigations, Case Studies.

UNIT – III **8 Hours**

ROAD SAFETY AUDITS:

Key elements of a road safety audit, Road Safety Audits & Investigations, Crash investigation and analysis, Describe methods for identifying hazardous road locations, Case Studies.

UNIT – IV **8 Hours**

CRASH RECONSTRUCTION:

Describe the basic information that can be obtained from the roadway surface, Understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and acceleration scenarios, variables involved in jump and flip crashes, variables involved in pedestrian crashes, Case Studies.

UNIT – V **8 Hours**

MITIGATION MEASURES:

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety.

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the effect of driver and roadway characteristics, climatic factors on highway safety.
CO2	Design a road safety improvement program.
CO3	Explain the crash reconstruction behaviour with basic physics.
CO4	Conduct the road safety audit for identifying the hazardous road locations.
CO5	Analyze accident data and suggest safety measures.

Text Books:	
1	Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 2015.
2	Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 2013.
3	J. Stannard Baker, Traffic Collision Investigation, Northwestern University Center for Public Safety, 2014

Reference Books:	
1	Leonard Evans, Traffic Safety, Science Serving Society, 2004. Lynn B. Fricke, Traffic Accident Reconstruction, Northwestern University Center for Public Safety, 2014.
2	Popkess C.A, Traffic Control and Road Accident Prevention, Chapman and Hall, 1997, Rune Elvik and Truls Vaa, The Handbook of Road Safety Measures, Elsevier, 2004.
3	Simon Washington, Matthew Karlaftis, and Fred Mannering, Statistical and Econometric Methods for Transportation Data Analysis, Chapman & Hall/CRC Press, 2003.
4	Towards Safe Roads in Developing country, TRL – ODA, 2004

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

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Department of Civil Engineering

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2				1					1	1
CO2	2	2		2		1					1	1
CO3	2	2				1						1
CO4	2	2				1						1
CO5	2	2				1						1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**APPLIED HYDRAULICS**						
Course Code	**CVT405C**						
Category	**Emerging Technology Course (ETC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objectives: To understand the components of behavior of fluids in moving condition, gain knowledge on fluid dynamics and basic design of flow through open channels, to understand the working principles and performance of hydraulic turbines.

Unit: I **08 hours**

DIMENSIONAL ANALYSIS

Dimensional analysis and similitude: Dimensional homogeneity, Non Dimensional parameter, Rayleigh methods and Buckingham π theorem, dimensional analysis, choice of variables, examples on various applications.

MODEL ANALYSIS:

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 Reynold's, and Froude's Model.

Unit: II **08 hours**

BUOYANCY AND FLOTATION:

Buoyancy, Force and Centre of Buoyancy, Metacentre and Metacentric height, Stability of submerged and floating bodies, Determination of Metacentric height. Experimental and theoretical method, Numerical problems.

OPEN CHANNEL FLOW HYDRAULICS:

Uniform flow: Introduction, Classification of flow through channels, Chezy's and Manning's equation for flow through open channel, Most economical channel sections, Uniform flow through Open channels, Numerical Problems.

Unit: III **08 hours**

SPECIFIC ENERGY:

Specific Energy and Specific energy curve, Critical flow and corresponding critical parameters, Metering flumes, Numerical Problems.

NON-UNIFORM FLOW:

Hydraulic Jump, Expressions for conjugate depths and Energy loss, Numerical Problems. Gradually varied flow, Equation, Back water curve and afflux, Description of water curves or profiles, Mild, steep, critical, horizontal and adverse slope profiles, Numerical problems, Control sections.

Unit: IV **08 hours**

IMPACT OF JET ON CURVED VANES:

Introduction, Impulse-Momentum equation. Direct impact of a jet on stationary and moving curved vanes, Introduction to concept of velocity triangles, impact of jet on a series of curved vanes- Problems.

IMPULSE TURBINES:

Introduction to turbines, General lay out of a hydro-electric plant, Heads and Efficiencies, classification of turbines. Pelton wheel-components, working principle and velocity triangles. Maximum power, efficiency, working proportions – Numerical problems.

Unit: V **08 hours**

REACTION TURBINES:

Radial flow reaction turbines: (i) Francis turbine- Descriptions, working proportions and design, Numerical problems. (ii) Kaplan turbine- Descriptions, working proportions and design, Numerical problems. Draft tube theory and unit quantities. (No problems).

CENTRIFUGAL 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.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Apply dimensional analysis to develop mathematical modelling and compute the parametric values in prototype by analysing the corresponding model parameters.
CO2	Design the open channels of various cross sections including economical channel sections.
CO3	Apply Energy concepts to flow in open channel sections, Calculate Energy dissipation, Compute water surface profiles at different conditions.
CO4	Compute the water surface profiles at different conditions.
CO5	Design the turbines for given data and to know its operation characteristics under different operating conditions.

Text Books:	
1	Text Book of Fluid Mechanics and Hydraulic Machines- R.K. Bansal, Laxmi Publications, New Delhi, 2019 10th Edition.
2	Hydraulics and Hydraulic Machines – Dr. P. N. Modi and Seth, Standard Book House 2022, 22nd Edition.
3	Fundamentals of Fluid Mechanics – Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, Wiley India, New Delhi, 2021 6th Edition.
4	Introduction to Fluid Mechanics – Edward J. Shaughnessy, Ira m. Katz, James P Schaffer, Oxford University Press, New Delhi, 2005 Edition.

Reference Books:	
1	A Text Book of Fluid mechanics & Hydraulic Machines- R.K. Rajput, S. Chand & Co, New Delhi, and 2016 Edition.
2	Principles of Fluid Mechanics and Fluid Machines'- N. Narayana Pillai, Universities Press (India), Hyderabad, 2009 Edition.
3	Fluid Mechanics – Streeter, Wylie, Bedford, McGraw Hill Education; 2017 9th edition.
4	Fluid Mechanics and Turbomachines- Madan Mohan Das, PHI Learning pvt. Limited, New Delhi. 2009 Edition.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

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- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2	2									1
CO3	3	2	2									1
CO4	3	2	2									1
CO5	3	2	2									1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**GROUND IMPROVEMENT TECHNIQUES**						
Course Code	**CVT405D**						
Category	**Emerging Technology Course (ETC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To introduce the concepts, need of ground improvement techniques and apply various alternate ground improvement techniques to suit the field requirements.

UNIT-I **08 Hours**

FORMATION OF SOILS:
Introduction, Formation of soil and Soil distribution in India.

GROUND IMPROVEMENT:
Historical development, Objectives of soil improvement, Classification of ground improvement techniques and Factors affecting the selection of best ground improvement technique.

COMPACTION:
Introduction, Compaction mechanics, Field procedure, surface compaction, Dynamic Compaction, selection of field compaction procedures, compaction quality control.

UNIT-II **08 Hours**

HYDRAULIC MODIFICATION:
Introduction, Seepage, filter requirements, ground water and seepage control, methods of dewatering systems, Design of dewatering system including pipe line effects of dewatering. Drains, different types of drains.

PRE-COMPRESSION AND VERTICAL DRAINS:
Importance, Vertical drains, Sand drains, Drainage of slopes, Electro kinetic dewatering, Preloading.

UNIT-III **08 Hours**

CHEMICAL MODIFICATIONS:
Definition, cement stabilization, sandwich technique, admixtures. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage and strength and deformation characteristics. Criteria for cement stabilization. Stabilization using Fly ash, Lime stabilization – suitability, process, criteria for lime stabilization. Other chemicals like chlorides, hydroxides, lignin and hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.

UNIT-IV **08 Hours**

VIBRATION METHODS:
Introduction, Vibro compaction – blasting, vibratory probe, Vibro displacement compaction – displacement piles, vibroflotation, sand compaction piles, stone columns, heavy tamping.

GROUTING AND INJECTION:
Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting.

UNIT-V **08 Hours**

GEOSYNTHETICS:
Introduction, Geo-synthetic types, properties of Geo-synthetics – materials and fibre properties, Geometrical

aspects, mechanical properties, Hydraulic properties, Durability, Applications of Geosynthetics - Separation, Filtration and Fluid Transmission, Reinforcement.

MISCELLANEOUS METHODS (ONLY CONCEPTS & USES):

Ground improvement by confinement – Crib walls, Gabions and Mattresses, Anchors, Rock bolts, concepts of reinforced earth and soil nailing, Concept of thermal methods - Ground freezing and heating.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Know about the formation of soils and soil distributions in India.
CO2	Give solutions to solve various problems associated with soil having low bearing strength.
CO3	Use effectively the various ground improvement techniques depending upon the site requirements.
CO4	Understand the significance, principles of various ground improvement techniques.
CO5	Choose appropriate ground improvement technique as per the requirement of the site conditions and project.

Text Books:	
1	Purushothama Raj P, "Ground Improvement Techniques", Laxmi Publications, 2nd Edition, 2016, New Delhi.
2	Koerner R.M, "Construction and Geotechnical Method in Foundation Engineering", Mc Graw Hill Pub. Co., 1985.
3	Manfred Hausmann, "Engineering principles of ground modification", Mc Graw Hill Pub. Co., 1989

Reference Books:	
1	Bell, F.G., "Methods of treatment of unstable ground", Butterworths, London, 1975.
2	Nelson J.D. and Miller D.J, "Expansive soils", John Wiley and Sons, 1992
3	Ingles. C.G. and Metcalf J.B , "Soil Stabilization; Principles and Practice", Butterworths, 1972

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.

- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1					1	1					1
CO2	1	3	1	1								1
CO3	1	3	1									1
CO4	1	3	1	1								1
CO5	1		1	1								1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ADVANCED SURVEYING LABORATORY**						
Course Code	**CVL406A**						
Category	**Ability Enhancement Course (AEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	0	**0**	**2**	**0**	**2**	**24**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To provide basic knowledge of levelling using total station and can be applied in construction of civil engineering projects which helps in developing skills for using modern surveying instruments and methods such as Total station and to familiarize in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works which are used for abstracting the information of earth surface.

Sl. No.	Syllabus Contents	No. Sessions
1	Determination of height and remote elevation of an object using Total station.	12
2	Determination of distance and gradient between inaccessible points using Total station.	
3	Setting out the section in the field using Total station (T & L sections).	
4	Setting out the section in the field using Total station (C & U sections).	
5	Setting out of pentagon using Total station.	
6	Determination of area using Total station and drawing map.	
7	Perform the longitudinal and cross-sectional levelling.	
8	Traversing using Total station for drawing contour map.	
9	Setting out simple curve using Total station.	
10	Setting out work for a given plan of a building.	
11	Setting out work for marking the column position using Total station.	
12	Virtual Lab – GPS.	

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: The students will be able to	
CO1	Understand how to find distance, height, difference in elevation and area using Total station.
CO2	Develop the profile of the ground and curve setting in the transportation network system.
CO3	Setting out the various sections in the field using Total station.
CO4	Perform longitudinal, cross-sectional levelling and traversing using Total station.
CO5	Applying the stake out operation in marking the position of the column and other in the construction work.

Text Books:	
1	Surveying Vol. 1, 2 & 3. B. C. Punmia, Ashok Kumar Jain, Arun Kuma Jain, Lakshmi publication, 17th edition, (2015)
2	Surveying and leveling, T P Kanetkar, Pune Vidyarthi Griha Prakashan, Pune Vidyarthi Griha Prakashan publisher, 3rd edition, (2019).
Reference Books:	
1	Surveying and leveling, 2nd edition – R Subramanian. Oxford University Press (2007) Publisher.
2	Fundamentals of Surveying, Milton O. Schimidt – Wong, Thomson, CengageLearning Publishing, 3rd

	edition (2013).

Question paper pattern:
The candidate has to conduct one experiment which carries 70 % of the total marks and viva-voce for 30 % of the total marks.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1				1				1			1
CO2	1				1				1			1
CO3	1				1				1			1
CO4	1				1				1			1
CO5	1				1				1			1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**CIVIL ENGINEERING ENTERPRENEURSHIP AND DEVELOPMENT**						
Course Code	**CVT406B**						
Category	**Ability enhancement Course (AEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	1	**0**	**0**	**0**	**1**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 02 hours**		

Course Learning Objective: To create awareness on entrepreneurship among the students, To Fostering and developing entrepreneurship among the student community, To Enhancing innovative thinking in order to develop new products, To get the innovative product, Provide advisory services to the budding Entrepreneurs, Encourage to set Campus Company / start- up company within the campus.

UNIT – I **3 Hours**

INTRODUCTION TO ENTREPRENEURSHIP:

Definition of Entrepreneur, Entrepreneurial Traits, and Entrepreneur vs. Manager, Entrepreneur vs. Entrepreneur. Ethics and Social responsibility of Entrepreneurs. Creating and Starting the Venture Sources of new Ideas, Methods of generating ideas. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur

UNIT – II **3 Hours**

SELF-EMPLOYMENT FOR CIVIL ENGINEERS:

Start-up of Building material supplier, Land surveys, Project management, Bricks Manufacturing. Building material supply. Property development business. Low cost cervices-Drilling bore hole, Roofing materials supply, haulage services, Lawn Care Service, Paving Consulting.

UNIT – III **3 Hours**

FINANCING AND MANAGING THE NEW VENTURE:

Sources of capital, Record keeping, recruitment, motivating and leading teams, and financial controls. Marketing and sales controls. Business expenses, Invoicing, Accounting software, E-commerce and Entrepreneurship, Internet usage and advertising related to Civil Engineering Products.

UNIT – IV **3 Hours**

NEW VENTURE EXPANSION STRATEGIES AND ISSUES:

Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits.

UNIT – V **3 Hours**

INSTITUTIONAL SUPPORT TO ENTREPRENEURSHIP:

Role of Directorate of Industries, District Industries, Centers (DICs), Industrial Development Corporation (IDC), State Financial corporation (SFCs), Commercial banks Small Scale Industries Development Corporations (SSIDCs), Khadi and village Industries Commission (KVIC), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the procedure to evaluate your entrepreneurial traits as a career option for the given product to be manufactured or services to be rendered.
CO2	Explain the salient features of the resources required for starting the specified enterprise.
CO3	Arrive at a business opportunity on the basis of given data/circumstances with justification.
CO4	Describe the market study procedure of the specified enterprise.

CO5	Establish as ethical entrepreneur as Civil engineer.

Text Books:	
1	Sharma, Ravindra, and Geeta Rana. "An overview of entrepreneurship development programs in India." International Journal of Environmental Policy and Decision Making 3.1 (2021): 16-26.
2	Prasad, Rajendra. "Entrepreneurship-Concepts, Characters and Theories." Technology Commercialization, Incubation and Entrepreneurship Development: 43.
3	Kuratko, Donald F. "Entrepreneurship theory, process, and practice in the 21st century." International Journal of Entrepreneurship and Small Business 13.1 (2011): 8-17.

Reference Books:	
1	The National Institute for Entrepreneurship and Small Business Development Publications http://niesbud.nic.in/Publication.html
2	Entrepreneur.com https://www.entrepreneur.com/lists
3	GOVT. SPONSORED SCHEMES https://www.nabard.org/content l.aspx?id=23an dcatid=23andmid=530
4	Market Review http://www.businesstoday.in/markets
5	Business Plans: A Step-by-Step Guide https://www.entrepreneur.com/article/247574

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5^{th} week of the semester
2. Second test at the end of the 10^{th} week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4^{th} week of the semester
2. Second assignment at the end of 9^{th} week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

Question paper pattern:

- The question paper will have 50 questions carrying equal marks.
- Each question will be for 01 marks.
- Each question will have four options and one right answer.
- The students will have to answer all 50 questions.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		1		2			2			1
CO2	2	2	3	2		2			2			1
CO3	2	2				2			2			1
CO4	2	2				2			2			1
CO5	2	2		1		2			2			1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**APPLICATIONS OF AI IN CIVIL ENGINEERING**						
Course Code	**CVT406C**						
Category	**Ability Enhancement Course (AEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	1	**0**	**0**	**-**	**1**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 02 hours**		

Course Learning Objective:

To understand the basic concepts of Artificial Intelligence (AI) and its key areas along with Machine Learning (ML) types and their applications in civil engineering. Students will also learn about Artificial Neural Networks (ANNs) and fuzzy logic to handle uncertainty in engineering problems.

UNIT – I	**03 Hours**
Introduction to AI: Introduction to AI, definition of AI, Historical evolution of AI, AI types, brief introduction to the branches of AI. Applications of AI in Civil Engineering.	
UNIT – II	**03 Hours**
Machine Learning: Introduction to ML, Machine learning process model, Concept learning, introduction to different kinds of machine learning, Applications of different ML techniques in Civil Engineering.	
UNIT – III	**03 Hours**
Artificial neural networks (ANN): Introduction, biological motivation, appropriate problems in ANN learning. Applications of ANN in Civil Engineering.	
UNIT – IV	**03 Hours**
Learning under uncertainty and ambiguity, fuzzy logic, linguistic variables, fuzzy sets, membership functions. Applications of fuzzy logic with specific reference to Civil Engineering.	
UNIT – V	**03 Hours**
Introduction to Computer Vision: Definition and scope, history and evolution, Image acquis ion, image representation (grey scale and color). Applications of computer vision in Civil Engineering.	

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: At the end of the course the student will be able to:	
CO1	Understand the role of AI in modern civil engineering practices and how it can enhance decision-making and efficiency.
CO2	Use the Acquired knowledge of basic Machine Learning algorithms and techniques for solving complex Civil engineering problems.
CO3	Comprehend the structure and functioning of Artificial Neural Networks (ANN) and its applications.
CO4	Apply the principles of Fuzzy Logic in handling uncertainties.
CO5	Implement computer vision and image processing techniques in assessing Civil infrastructure.

Text Books:	
1	Margaret A Boden, Artificial Intelligence, Academic Press London, 1996.
2	Stuart Russel, Peter Norvig, Artificial Intelligence- A modern approach, II Edition, Pearson Education, 2003.
3	Tom.M.Mitchel, Machine Learning, Indian Edition, McGraw Hill, 2017.
4	Timoty.J.Ross, Fuzzy Logic and Engineering Applications, III edition, Wiley Publications, 2011.

Reference Books:	
1	Richard Selizski, Computer Vision –Algorithms and Applications, Spinger Publications, 2011.
2	Kothari Dwarkadas Pralhaddas, SamuiPijush, Artificial Intelligence in Civil Engineering, Lambert Academic Publishing, 2012.
3	Nikos D. Lagaros and Vagelis Plevris, Artificial Intelligence Applied in Civil Engineering, MDPI, 2022.
4	Paul D.Harrison, Artificial Intelligence Applications in Material Science and Engineering, Kindle Edition, 2023.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1			1							1
CO2	3	2			1							1
CO3	3	1			1							1
CO4	3	2			1							1
CO5	3	1			1							1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**METRO AND SEA PORT ENGINEERING**						
Course Code	**CVT406D**						
Category	**Ability Enhancement Course - IV (AEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	1	**0**	**0**	**0**	**1**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 01 hours**		

Course Learning Objective: To understand the fundamental of metro system, basic planning and development. Learning the construction methods and signalling systems for various operations in metro system. Study the characteristics, site selection and surveys to be carried out in planning the seaport.

UNIT – I **3 Hours**
INTRODUCTION TO METRO SYSTEMS:
Overview of Metro Systems, Need for Metro, Routing studies; Basic Planning and Financials.

UNIT – II **3 Hours**
PLANNING AND DEVELOPMENT:
Overview and construction methods for Elevated and underground Stations, Viaduct span sand bridges, Underground tunnels, Depots, Initial Surveys & investigations.

UNIT – III **3 Hours**
SIGNALING SYSTEMS:
Introduction to Signaling systems, Automatic fare collection, Operation Control Centre (OCC and BCC), SCADA and other Control systems, Platform Screen Doors.

UNIT – IV **3 Hours**
INTRODUCTION TO SEA PORT:
Introduction, Characteristics of good seaport and principles of seaport, size of seaport, site selection criteria and layout of seaport.

UNIT – V **3 Hours**
SEA PORT PLANNING:
Surveys to be carried out for seaport planning, regional and intercontinental transportation development.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the overview, planning and financial studies of metro system.
CO2	Discuss the planning and development for different construction methods.
CO3	Compare the signalling systems for various operations of metro systems.
CO4	Explain the principles and site selection criteria in sea port.
CO5	Analyse the planning surveying development in sea port engineering.

Text Books	
1	R. Srinivasan and S. C. Rangwala, Harbour, Dock and Tunnel Engineering, 1995, Charotar Pub.House, Anand
2	S. P. Bindra, A Course in Docks and Harbour Engineering, 1992, DhanpatRai & Sons, NewDelhi
3	Alonzo Def. Quinn, Design and Construction of Ports and Marine Structure, 2015, McGraw - Hill Book Company, New York

Reference Books	
1	Paul Garbutt, World Metro Systems, Capital Transport Pub; 2nd Edition, 1997.

2	General & Technical information of Hyderabad Metro, Handbook
3	General & Technical information of Delhi Metro, Handbook
4	General & Technical information of Bangalore Metro, Handbook

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5^{th} week of the semester
2. Second test at the end of the 10^{th} week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4^{th} week of the semester
2. Second assignment at the end of 9^{th} week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

Question paper pattern:

- The question paper will have 50 questions carrying equal marks.
- Each question will be for 01 marks.
- Each question will have four options and one right answer.
- The students will have to answer all 50 questions.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2										2	1
CO2	2										1	1
CO3	1										1	1
CO4											2	1
CO5	1										2	1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**CONSTRUCTION PROJECT AND MANAGEMENT**						
Course Code	**22CVT501**						
Category	**(HSMS)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: The course will enable students to understand the concept of planning, scheduling, cost and quality control, safety during construction, organization & use of project information necessary for construction project and inculcate Human values to grow as responsible human beings with proper personality, keeping up ethical conduct and discharge professional duties.

UNIT – I **8 Hours**

MANAGEMENT:

Characteristics of management; Functions of management; Importance and purpose of planning process; Types of plans.

CONSTRUCTION PROJECT FORMULATION:

Introduction to construction management; Project organization; Management functions; Management styles; Project communication protocol.

UNIT – II **8 Hours**

CONSTRUCTION PLANNING AND SCHEDULING:

Introduction; Types of project plans; Stakeholders in management, Work breakdown structure; Gaant Chart, Concept of activity on arrow and activity on node; Preparation of network diagram- event and activity based and its critical path; Critical path method; PERT method; Crashing of activities.

UNIT – III **8 Hours**

RESOURCE MANAGEMENT:

Basic concepts of resource management, class of labour; Wages and statutory requirement; Labour Production rate or Productivity; Factors affecting labour output or productivity.

CONSTRUCTION QUALITY AND SAFETY:

Construction quality process; Inspection; Quality control and quality assurance; Cost of quality; ISO standards. Introduction to concept of Total Quality Management.

UNIT – IV **8 Hours**

HEALTH SAFETY AND ENVIRONMENT (HSE):

Introduction to concepts of HSE as applicable to Construction; Importance of safety in construction; Safety measures to be taken during- Excavation; Explosives, Drilling and blasting, Hot bituminous works, Scaffolds / platforms / ladder, Form work and equipment operation, Storage of materials.

Safety through legislation; Safety campaign; Insurances.

MATERIALS:

Introduction to material management; Material management functions; Inventory management.

UNIT – V **8 Hours**

ETHICS & HUMAN VALUES:

Morals; Values; Ethics; Integrity; Trustworthiness; Work ethics; Need of engineering ethics; Professional Duties; Professional and Individual Rights; Confidential and Proprietary Information; Conflict of Interest Confidentiality; Gifts and Bribes; Price Fixing; Whistle Blowing.

Course Outcomes: The students will be able to	
CO1	Prepare a project plan as per requirements, prepare schedule of a project by understanding the

	activities and their sequence.
CO2	Understand labour output and resource allocation required for an activity/project to achieve desired quality and safety.
CO3	Establish as an ethical entrepreneur and establish an enterprise utilizing the provisions offered by the federal agencies.

Teaching & Learning Process:
Chalk and talk, Power point presentations.

Text Books:	
1	Tripathi, Prakash Chandra, David L. Kurtz, and Louis E. Boone. Principles of management. by Mocktime Publication, 1984.
2	Chitkara, K. K. Construction project management. Tata McGraw-Hill Education, 1998.
3	Seetharaman, S. Construction engineering and management. Umesh Publications, 2014.
Reference Books:	
1	Shrivastava, U. K. "Construction Planning and Management." Galgotia Publications Pvt. Ltd. New Delhi (2000).
2	Blagoev, D., and K. Petkov. "EQUITY CROWDFUNDING AS A TYPE OF PROJECT INVESTING." Trakia Journal of Sciences 17 (2019).
3	Charantimath, Poornima M. Entrepreneurship development and small business enterprises. Pearson Education India, 2013.
4	Clough, Richard H., Glenn A. Sears, and S. Keoki Sears. Construction project management. John Wiley & Sons, 2000.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3										2	1
CO2	3		2									1
CO3								3	3		2	1

High: 3, Medium: 2 & Low: 1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**GEOTECHNICAL ENGINEERING**						
Course Code	**22CVU502**						
Category	**Integrated Professional Core Course (IPCC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**2**	**0**	**5**	**50**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand the importance of soil and its properties in Civil Engineering applications. To demonstrate the index properties and engineering properties of different soils. To interpret the various factors influencing the soil behavior. To summarize the significance of soils and its behavior in various applications of Civil Engineering.

UNIT – I **8 Hours**

SOIL IN ENGINEERING PRACTICE:

Phase representation diagram, Basic definitions of terms - Voids ratio, Porosity, Air content, Degree of saturation, Percentage Air Voids, Water content, Specific Gravity of soil solids and soil mass, Unit weights - Dry, Bulk, Saturated and Submerged and their inter relationships.

INDEX PROPERTIES OF SOIL AND THEIR DETERMINATION:

Water content, Specific gravity of soil solids, Particle size distribution, In-situ density, Relative Density, Consistency limits.

UNIT – II **8 Hours**

SOIL CLASSIFICATION SYSTEM:

Field identification of soils, IS classification, IS Plasticity chart.

PERMEABILITY:

Darcy's law - assumption and validity, Seepage velocity, Discharge velocity and coefficient of percolation. Factors affecting permeability, Coefficient of permeability and its determination - laboratory and field.

UNIT – III **8 Hours**

GEO-STATIC STRESSES:

Concept of effective stress under different conditions of soils (Submerged soil mass, Partially submerged, Surcharge and soil mass with Capillary rise), Stresses affected by direction of flow of water (Upward and downward) and Quick sand phenomena.

SEEPAGE ANALYSIS:

Flow nets – characteristics and applications, Flow nets for sheet piles and below dam. Phreatic line – A. Casagrande's method – with and without filter, Pipe failure, Heave failure, Design of dam filters.

UNIT – IV **8 Hours**

COMPACTION OF SOIL:

Standard Proctor's compaction test, Factors affecting compaction, Effect of compaction on different properties of soil, Field compaction control, Proctor's needle, Compacting equipments and their suitability.

CONSOLIDATION OF SOIL:

Terzaghi's Mass - Spring analogy, Terzaghi's 1-D consolidation theory, Pre-consolidation pressure and its estimation by A. Casagrande's method. Laboratory 1-D consolidation test, Determination of consolidation characteristics of soils - Compression index and Coefficient of consolidation.

UNIT – V **8 Hours**

SHEAR STRENGTH OF SOIL:

Concept of shear strength, Mohr's Circle construction, Mohr's - Coulomb's theory, Terzaghi's total and effective stress principle, Classification of shear tests based on drainage conditions and simulate their field conditions, Measurement of shear strength parameters: Direct shear box test, Tri-axial compression test, Unconfined compression test and Vane shear test, Skempton's pore pressrue coefficients.

Expt. No	LABORATORY EXPERIMENTS:	No. of sessions
1	Tests for determination of Specific gravity and Water content.	**10**
2	Wet Sieve analysis and Hydrometer analysis.	
3	Relative density of sand.	
4	Consistency Limits.	
5	Compaction Test and Proctor needle.	
6	Constant head and variable head permeability Test.	
7	Direct Shear Box Test.	
8	Unconfined Compression Strength Test.	
9	Consolidation Test.	
	Demonstrations: ✓ Vane shear test. ✓ Tri-axial Compression Test.	

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: At the end of the course the student will be able to:	
CO1	Understand the index properties of soils and analyse the data to identify and classify the soils.
CO2	Discuss the permeability, effective stresses and seepage in soils.
CO3	Explain the concepts and evaluate compressible characteristics and shear strength parameters of soil.

Text Books:	
1	Punmia, BCe, and Ashok Kumar Jain. *Soil mechanics and foundations*. Firewall Media, 2005.
2	Arora, K. R. *Soil mechanics and foundation engineering (geotechnical engineering): In SI units*. Standard publishers, 2008.
3	Ranjan, Gopal, and A. S. R. Rao. *Basic and applied soil mechanics*. New Age International, 2011.
4	Das, Braja M. *Advanced soil mechanics*. CRC press, 2019.

Reference Books:	
1	Murthy, V. N. S. *Principles of soil mechanics and foundation engineering*. UBSPD, 2001.
2	Bowles, J. E. "Foundation analysis and design." (1988).
3	"Manual of Soil Laboratory Testing", Head K.H., (2006), 3rd Edition, Vol. I, II, III, Princeton Press, London.
4	BIS Codes of Practice: IS: 2720(Part-3/Sec. 1) – 1987; IS: 2720 (Part – 2)- 1973; IS: 2720 (Part – 4) – 1985; IS: 2720 (Part – 5) – 1985; IS: 2720 (Part – 6) – 1972; IS: 2720 (Part – 7) – 1980; IS: 2720 (Part – 8) – 1983; IS: 2720 (Part – 17) – 1986; IS: 2720 (Part - 10) – 1973; IS: 2720 (Part – 13) – 1986; IS: 2720 (Part 11) – 1971; IS: 2720 (Part 15) – 1986; IS: 2720 (Part 30) – 1987; IS: 2720 (Part 14) – 1977; IS: 2720 (Part – 14) – 1983; IS: 2720 (Part – 28) – 1974; IS: 2720 (Part – 29) – 1966, IS: 2720 (Part-60) 1965.

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(i) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(ii) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(iii)Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

$$\textit{CIE score} = (\textit{Test 1} + \textit{Test 2}) \times 0.6 + \textit{Laboratory Component}$$

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.

- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	2	2		2								1
CO3	3	2		2								1

High: 3, Medium: 2 & Low: 1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**DESIGN OF RCC STRUCTURAL ELEMENTS**						
Course Code	**22CVU503**						
Category	**Integrated Professional Core Course (IPCC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**2**	**0**	**4**	**50**	**4**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: Understand the concepts of limiting, short-term, and long-term deflections in structural elements. It includes practical design examples for simply supported and cantilever beams with rectangular and flanged sections, the design of slabs under various boundary conditions, and the design of stairs. Additionally, it addresses the design of columns subjected to uniaxial and biaxial moments.

UNIT – I **08 Hours**

INTRODUCTION

Introduction to Limit State Design and Serviceability: Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety.

Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section.

Limiting deflection, short-term deflection, long-term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slender limits of beams for stability.

UNIT – II **08 Hours**

ANALYSIS AND DESIGN OF BEAMS:

Analysis of singly reinforced, doubly reinforced, flanged sections, shear strength and development length. General Specification for flexure design of beams. Practical requirements, size of beam, cover to reinforcements pacing of bars. General aspects of serviceability and deflection limits as in IS code.

Design procedures for critical sections for moment and Design for shear. Anchorages of bars, check for development length. Reinforcement requirements, Slenderness limits for beams to ensure lateral stability. Design examples for Simply supported and Cantilever beams for Rectangular and Flanged sections.

UNIT – III **08 Hours**

DESIGN OF SLABS

Introduction to one-way and two-way slabs, Design of cantilever, simply supported and one-way continuous slab. Design of two-way slabs for different boundary conditions.

UNIT – IV **08 Hours**

DESIGN OF STAIRS:

Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.

UNIT – V **08 Hours**

DESIGN OF COLUMNS AND FOOTINGS:

Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments. Design concepts of the footings. Design of Rectangular and square column footings with axial load and uniaxial moment

Expt. No	**LABORATORY EXPERIMENTS:**
1.	Detailing of Singly Reinforced Beams-Simply supported and Cantilever.
2.	Detailing of Doubly Reinforced Beams-Simply supported and Cantilever.

3.	Detailing of Flanged Beams.
4.	Detailing of Slabs: One Way Slabs.
5.	Detailing of Slabs: Two Way Slabs (Restrained &Non-Restrained).
6.	Detailing of Slabs: Continuous Slabs.
7.	Detailing of Dog-legged Staircase.
8.	Detailing of Open well Staircase.
9.	Detailing of Isolated Square Column Footing.
10.	Detailing of Isolated Rectangular Column Footing.

Course Outcomes: The students will be able to	
CO1	Differentiate between the Working Stress Method and the Limit State Method, comprehending key concepts such as Modular Ratio, Factor of Safety, Partial Safety Factors and Stress Block Parameters.
CO2	Calculate deflections and crack widths in singly reinforced beams, understanding the factors affecting stability and serviceability in reinforced concrete structures.
CO3	Design critical sections for moment and shear in beams and slabs, including considerations for anchorages, development length, reinforcement requirements and slenderness limits.
CO4	Analyse and design short axially loaded RC columns, columns with uniaxial and biaxial moments, and footings, ensuring structural integrity under various loading conditions.

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	Design of Reinforced Concrete Structures- Unnikrishnan and Devadas Menon, 4th Edition, 2021, McGraw Hill, New Delhi, ISBN 978-9354601026
2	Design of RCC Structural Elements – S. S. Bhavikatti, Vol-I, 4th Edition, 2022, New Age International Publications, New Delhi.
Reference Books:	
1	Design of Reinforced Concrete Structures- Krishnaraju N, 4th Edition, CBS Publishers and Distributors, New Delhi, 2017, eISBN 978-93-890-1701-4
2	Limit State Design of Reinforced Concrete- Varghese P.C, 2nd Edition, Eastern Economy Edition, Prentice –Hall of India Pvt Ltd, New Delhi, 2004, ISBN 9788120320390.
3	Fundamentals of Reinforced concrete Design-by M.L. Gambhir, PHI Learning Private Limited 2008-2009.
4	IS 456:2000, SP 16 Table, SP 34, IS 875 Part (I & II).

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(iv) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum

marks) in the theory component.

- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(v) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(vi) Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

CIE score = (Test 1 + Test 2) × 0.6 + Laboratory Component

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.

• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1			1			1				1
CO2	1	1	3		1			1				1
CO3	1	1	3		1			1				1
CO4	1	1	3		1			1				1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ADVANCED SURVEYING LABORATORY**						
Course Code	**22CVL504**						
Category	**Professional Core Course Laboratory (PCCL)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	0	**0**	**2**	**0**	**2**	**24**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To provide basic knowledge of levelling using total station and can be applied in construction of civil engineering projects which helps in developing skills for using modern surveying instruments and methods such as Total station and to familiarize in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works which are used for abstracting the information of earth surface.

Sl. No.	Syllabus Contents	No. Sessions
1	Determination of height and remote elevation of an object using total station.	10
2	Determination of distance and gradient between inaccessible points using total station.	
3	Setting out the section in the field using total station (T, L, C & U sections).	
4	Setting out of pentagon using total station.	
5	Determination of area using total station and drawing map.	
6	Perform the longitudinal and cross-sectional levelling.	
7	Traversing using total station for drawing contour map.	
8	Setting out simple curve using total station.	
9	Setting out work for a given plan of a building.	
10	Setting out work for marking the column position using total station.	

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: The students will be able to	
CO1	Understand how to find distance, height, difference in elevation and area using total station.
CO2	Develop the profile of the ground and curve setting in the transportation network system.
CO3	Applying the stake out operation in marking the position of the column and other in the construction work.

Text Books:	
1	Punmia, B. C. *Surveying Vol. II*. Laxmi publications, 2005.
2	Surveying and leveling, T P Kanetkar, Pune Vidyarthi Griha Prakashan, Pune Vidyarthi Griha Prakashan publisher, 3rd edition, (2019).
Reference Books:	
1	Surveying and leveling, 2nd edition – R Subramanian. Oxford University Press (2007) Publisher.
2	Fundamentals of Surveying, Milton O. Schimidt – Wong, Thomson, CengageLearning Publishing, 3rd

	edition (2013).

Question paper pattern:

The candidate has to conduct one experiment which carries 70 % of the total marks and viva-voce for 30 % of the total marks.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		3		3							1
CO2	1		1		3							1
CO3	1	2	1		3							1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ENVIRONMENTAL STUDIES**						
Course Code	**22CVT508**						
Category	**Mandatory Course (MC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	1	**0**	**0**	**0**	**1**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 02 hours**		

Course Learning Objective:

Understand the interdisciplinary nature of environmental studies and its importance in addressing global and local environmental challenges. Comprehend the basic ecological principles, components of ecosystems, and the impacts of human activities on ecosystems and biodiversity. Recognize the classification and sustainable management of natural resources, along with the sources and consequences of environmental pollution. Gain knowledge of climate change, renewable energy sources, and their role in mitigating climate change, as well as understand the importance of environmental conservation and sustainable practices for a more sustainable future.

UNIT-1 **3 Hours**

INTRODUCTION TO ENVIRONMENTAL STUDIES:

Definition and scope of environmental studies. Interdisciplinary nature of environmental studies. Environmental issues and challenges at the global and local levels. Importance of sustainable development and environmental conservation.

UNIT-2 **3 Hours**

ECOLOGICAL CONCEPTS AND ECOSYSTEMS:

Basic ecological principles and concepts. Components of an ecosystem: biotic and abiotic factors. Ecological relationships and interactions**.** Human impacts on ecosystems and biodiversity loss

UNIT-3 **3 Hours**

NATURAL RESOURCES AND ENVIRONMENTAL POLLUTION:

Classification and importance of natural resources (water, air, soil, minerals, forests, agricultural land, marine resources). Sustainable use and management of natural resources. Types and sources of environmental pollution (water, air, soil, noise). Impact of pollution on human health and the environment

UNIT-4 **3 Hours**

CLIMATE CHANGE AND RENEWABLE ENERGY:

Causes and consequences of climate change. Mitigation and adaptation strategies for climate change. Introduction to renewable energy sources (solar, wind, hydro, geothermal, biomass, hydrogen fuel). Role of renewable energy in combating climate change

UNIT-5 **3 Hours**

ENVIRONMENTAL CONSERVATION AND SUSTAINABLE PRACTICES:

Biodiversity conservation and endangered species protection**.** Waste management and recycling practices**.** Sustainable agriculture and food systems. Environmental policies, regulations, and international agreements

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Develop a comprehensive understanding of the interdisciplinary nature of environmental studies and its significance in addressing global and local environmental challenges.
CO2	Apply ecological principles and concepts to analyse and evaluate the components of ecosystems, as well as assess the impacts of human activities on ecosystems and biodiversity.

CO3	Demonstrate knowledge of the classification and sustainable management of natural resources, and evaluate the sources and consequences of environmental pollution.
CO4	Recognize the causes and consequences of climate change, identify renewable energy sources, and evaluate their role in mitigating climate change. Additionally, demonstrate an understanding of the importance of environmental conservation and sustainable practices for creating a more sustainable future.

Text Books:	
1	R. Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005.
2	Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", Universities Press (India) Private Limited, 2019.
3	Singh, J.S., Singh, S.P., and Gupta, S.R.). "Ecology, Environmental Science and Conservation". S. Chand Publishing, New Delhi, 2017.
4	D K Asthana, "Text Book of Environmental Studies", S Chand Publishing, 2010

Reference Books	
1	Dr. J. P Sharma, "Environmental Studies", Laxmi Publications Pvt Ltd, 2017.
2	Benny Joseph, "Environmental Studies", Tata McGraw-Hill Publishing company Limited, 2008.
3	G.T.Miller Jr., "Environmental Science", 11th Edition, Cenage Learning Pvt. Ltd., 2008.
4	Singh, J.S., Singh, S.P., and Gupta, S.R.). "Ecology, Environmental Science and Conservation". S. Chand Publishing, New Delhi, 2017.

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5^{th} week of the semester
2. Second test at the end of the 10^{th} week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4^{th} week of the semester
2. Second assignment at the end of 9^{th} week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	3					3	3					3
CO2	3					3	3					3
CO3	3					3	3					3
CO4	3					3	3					3

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**SOLID WASTE MANAGEMENT**						
Course Code	**22CVT505A**						
Category	**Professional Elective Course (PEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objective:

Understand the key principles and concepts of integrated solid waste management (ISWM), including waste generation, collection, treatment, and disposal. Analyze and evaluate different waste management strategies and technologies, considering their environmental, health impacts. Apply practical knowledge of waste reduction, recycling, composting, and energy recovery techniques to develop sustainable waste management plans. Demonstrate the ability to develop and implement comprehensive ISWM plans that align with regulatory requirements, community needs, and sustainability goals.

UNIT – I **8 Hours**

INTRODUCTION AND WASTE GENERATION ASPECTS:

Sources, types, functional elements of solid waste management, factors affecting solid waste generation and management, waste characteristics, health and environmental effects. Numerical on moisture content, density and energy content.

UNIT – II **8 Hours**

WASTE PROCESSING TECHNIQUES:

Purpose of processing, volume and size reduction, component separation, significance of source reduction, product recovery and recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and processes.

COLLECTION, STORAGE, TRANSPORT OF WASTES:

Collection components, storage-containers/collection vehicles, collection operation and route optimization, need and types of transfer stations, location of transfer station. Estimation of solid waste quantities.

UNIT – III **8 Hours**

BIOLOGICAL CONVERSION TECHNOLOGIES:

Definition of compost, classification of composting, key process variables of composting, different types of composting- aerobic composting, windrow composting, in-vessel composting, aerated static pile composting, vermicomposting, anaerobic composting. Site selection and design of composting. Specifications for composting as per Solid Waste Management Rules-2016.

THERMAL CONVERSION TECHNOLOGIES:

Definition of thermal process, categories of thermal conversion, Combustion Systems-Mass fired combustion systems, RDF-Fired combustion system, Fluidized bed combustion. Pyrolysis Systems, Gasification Systems. Environmental and air pollution control systems. Air Quality standards as per Solid Waste Management Rules-2016.

UNIT – IV **8 Hours**

DISPOSAL OF SOLID WASTES:

Sanitary landfills- Definition, environmental impact and its minimization, Landfilling methods-trench method, area method and canyon method. Essential components, site selection, landfill planning and design. Generation, movement and control of landfill gases. Formation, movement and control of leachate. Different types of Liner systems. Landfill closure and post closure care. Numerical on landfill area estimation. Specifications for Sanitary Landfills as per Solid Waste Management Rules-2016.

UNIT – V **8 Hours**

SPECIAL WASTE MANAGEMENT:
Definition, importance of special waste Management, Automotive Wastes, Construction and Demolition Wastes, Electronic Wastes, Industrial Solid Wastes, Medical Wastes, Plastic Wastes, Lead Battery Wastes (environmental significance, recovery, recycle and current management systems). Waste Management Laws in India.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and waste collection and disposal site visit.

Course Outcomes: The students will be able to	
CO1	Narrate the basics of solid waste management towards sustainable development.
CO2	Apply technologies to process waste for product and energy recovery options.
CO3	Comprehend the principles and practices involved in the safe and environmentally sound disposal Technique.
CO4	Analyze the need for special wastes management for safe and sustainable disposal.

Text Books:	
1	Integrated Solid Waste Management: Tchobanoglous: M/c Graw Hill. 2012
2	Solid Waste Management in developing countries. Bhide and Sunderashan. 2017
3	Environmental Engineering – Vol II.: S.K. Garg. 2015

Reference Books:	
1	Ramesha Chandrappa and Diganta Bhusan Das "Solid Waste Management: Principles and Practice", Springer Berlin Heidelberg, 2012.
3	William A. Worrell and P. Aarne Vesilind, "Solid Waste Engineering", Cengage Learning Inc, 2012.
4	Dr. R.Saravanan, "Municipal Solid Waste Management", Suchitra Publications, 2017.
5	P. White, M. Franke, P. Hindle "Integrated Solid Waste Management: A Lifecycle Inventory", 1995.
6	Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, "Environmental Engineering", McGraw Hill International Editions, 1985.
7	Sunil Kumar, "Municipal Solid Waste Management in Developing Countries", CRC Press, 2016.

Process of Assessment (both CIE and SEE):
50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.

- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3						2					1
CO2	3	2					2					1
CO3	3			3			2					1
CO4	3						2					1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ADVANCED CONCRETE TECHNOLOGY**						
Course Code	**22CVT505B**						
Category	**Professional Elective Course (PEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: The course will provide a broad background of concrete construction with modern concrete construction materials with emphasis on performance and sustainability. This course will focus on design and control of concrete proportions to achieve desired properties and performance, particularly those of specialized concrete mixtures such as Light weight concrete, Ferro cement, Fiber-Reinforced Concrete, Self-Compacting Concrete and also to know the properties and applications of other special concrete like HPC, Geopolymer concrete, Bacterial concrete and Nano concrete.

UNIT – I **8 Hours**

CONSTITUENTS OF MODERN CONCRETE:

Role of constituents, Development in cements and cement replacement materials, pozzolona, fly ash, silica fume, rice husk ash, recycled aggregates, chemical admixtures. Mix proportioning of Concrete: Principles and methods.

UNIT – II **8 Hours**

LIGHT WEIGHT CONCRETE:

Introduction, classification, properties, strength and durability, mix proportioning and design problems.

HIGH DENSITY CONCRETE:

Radiation shielding ability of concrete, materials for high density concrete, properties in fresh and hardened state, placement methods.

UNIT – III **8 Hours**

FERRO CEMENT:

Ferro cement materials, mechanical and durability properties, cracking of ferro cement, strength and behaviour in tension, compression and flexure, ferro cement constructions and applications.

UNIT – IV **8 Hours**

FIBRE REINFORCED CONCRETE*:*

Fiber materials, distribution and orientation, properties in fresh state, strength and behavior in tension, compression and flexure of steel fiber reinforced concrete, mechanical properties, crack arrest and toughening mechanism, applications.

UNIT – V **8 Hours**

SELF COMPACTING CONCRETE:

Constituents, mix proportioning, properties in fresh and hardened states, design, applications and limitations.

SPECIAL CONCRETE:

High performance concrete, Geopolymer Concrete, Nano concrete and Bacterial concrete.

Course Outcomes: The students will be able to	
CO1	Understand the range of material types, their properties and how these materials impact the performance of concrete mixtures.
CO2	Summarise the concepts of conventional concrete and its differences with other concretes like ferro cement, light weight concrete, high density concrete, fibre reinforced concrete etc.
CO3	Design and develop a concrete mix design as per codal provisions.

CO4	Discuss the application and use of various special concrete.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	M.S.Shetty, "Concrete Technology" - Theory and Practice, S.Chand and Company, New Delhi, 2002.
2	"Concrete Technology (Trade, Technology & Industry)", George White, Delmar Cengage Learning, 1991.
3	"Concrete: Microstructure, Properties, and Materials", P. Kumar Mehta, Paulo J. M. Monteiro, McGraw-Hill Education, 2017.
4	Neville, A.M., "Properties of Concrete", ELBS, London, Pearson Education India, 2012.
5	A.R.Santakumar, "Concrete Technology" –. Oxford University Press (2007)'
6	"Advanced Concrete Technology", Zongjin Li, Wiley; 1 edition

Reference Books:	
1	Gambhir Dhanpat Rai & Sons , "Concrete Manual" -, New Delhi
2	Rudnai.G. "Light Wiehgt concrete"- Akademiaikiado, Budapest, 1963.
3	Rixom.R. and Mailvaganam.N., "Chemical admixtures in concrete"- E and FN, Spon London 1999
4	Aitcin P.C. "High performance concrete"-E and FN, Spon London 1998
5	IS: 10262-2009, IS: 456- 2000

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1						1					1
CO2	1	2	2									1
CO3	1	1										1
CO4	1	1	2									1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**PAVEMENT DESIGN**						
Course Code	**22CVT505C**						
Category	**Professional Elective Course (PEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: Gain knowledge about collecting data required for design, factors affecting pavement design, and pavement maintenance. Excel in the path of stress, strain, and deflection analysis in pavement. Understand design concepts of flexible pavement by various methods (CBR, IRC 37-2018, Mcleods, Kansas) and rigid pavement by IRC 58-2015. Understand the multiple causes leading to pavement failure and remedies for the same. Develop skills to perform functional and structural evaluation of pavement by suitable methods.

UNIT – I **8 Hours**

INTRODUCTION:

Desirable characteristics of pavement, Types and components, Difference between Highway pavement and Airfield pavement, Design strategies of variables, Functions of subgrade, sub-base, Base course, surface course, comparison between Rigid and flexible pavement Fundamentals of Design of Pavements: Stresses and deflections, Principle, Assumptions, and Limitations of Boussinesq's theory, Burmister theory and Numericals.

UNIT – II **8 Hours**

DESIGN FACTORS:

Design wheel load, contact pressure, Design life, Traffic factors, climatic factors, Road geometry, Subgrade strength, and drainage, ESWL concept Determination of ESWL by equivalent deflection criteria, Stress criteria, EWL concept, and problems on above. Flexible pavement Design: Assumptions, Mcleod Method, Kansas method, CBR method, AASHTO, IRC Method (old), CSA method using IRC-37-2018, Numericals.

UNIT – III **8 Hours**

FLEXIBLE PAVEMENT FAILURES, MAINTENANCE AND EVALUATION:

Types of failures, Causes, Remedial/Maintenance measures in flexible pavements, Functional Evaluation by Visual inspection and unevenness measurements, Structural evaluation by Benkelman beam deflection method, Falling weight deflectometer, GPR method.

UNIT – IV **8 Hours**

STRESSES IN RIGID PAVEMENT:

Types of stress, Analysis of Stresses, Westergaard's Analysis, Modified Westergaard equations, Critical stresses, Wheel load stresses, Warping stress, Frictional stress, combined stresses (using chart/equations), problems on above. Design of Rigid Pavement: Design of CC pavement by IRC: 58-2015 for dual and Tandem axle load, Reinforcement in slabs, Design of Dowel bars, Design of Tie bars, Numericals.

AIRFIELD PAVEMENT:

Design factors for runway pavements, methods for airfield pavement, and Numericals.

UNIT – V **8 Hours**

RIGID PAVEMENT FAILURES, MAINTENANCE AND EVALUATION:

Types of failures, causes, remedial/maintenance measures in rigid pavements, Functional evaluation by Visual inspection and unevenness measurements, wheel load and its repetition, properties of subgrade, properties of concrete. External conditions, joints, Reinforcement, Requirements of joints, Types of joints, Expansion joint, contraction joint, warping joint, construction joint, longitudinal joint, Design of joints,

Numericals.	
Course Outcomes: The students will be able to	
CO1	Understand and generate the required data for design of pavement (Highway and Airfield).
CO2	Analyze stress, strain, and deflection by boussinesq's, burmister's and westergaard's theory.
CO3	Design of rigid pavement and flexible pavement conforming to code of practice.
CO4	Evaluate the performance of the pavement and also develop maintenance statement based on site-specific requirements.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	SK Khanna, CEG Justo, and A Veeraragavan, "Highway Engineering," Nem Chand & Brothers (2019).
2	L.R.Kadiyali and Dr.N.B.Lal, "Principles and Practices of Highway Engineering," Khanna publishers (2013).
Reference Books:	
1	Yang H. Huang, "Pavement Analysis and Design", University of Kentucky, (2009).
2	Yoder & Wit Zorac, "Principles of pavement design," John Wiley & Sons (2010).
IRC Codes	
1	Guidelines For The Design Of Flexible Pavements, IRC: 37 - 2018
2	Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, IRC: 58 – 2015.
3	Tentative guidelines for structural strength evaluation of rigid airfield pavements, IRC: 76 – 1979.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub-questions) from each unit.
• Each full question will have a sub-question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		1			3						1
CO2	2	2	1									1
CO3	2	2	1			3						1
CO4	2	2	1			3						1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**MASONRY STRUCTURES**						
Course Code	**22CVT505D**						
Category	**Professional Elective Course (PEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: To understand the basics of Masonry elements, walls and principles and design philosophy & principles of Masonry Elements as per IS code provisions. To solve the problems on Masonry structural elements subjected to axial load and eccentric load as per IS specifications.

UNIT – I **8 Hours**

INTRODUCTION TO MASONRY STRUCTURES:

Masonry Units, Materials, types and masonry construction: Bricks, Stone and Block masonry units-strength. Masonry as early building elements-Pyramids, Walls, Columns and Towers, Beams and Lintel, Primitive arch, Corbelled arches, Barrel Vaults, Domes. Defects and Errors in Masonry construction – cracks in masonry, types, reason for cracking, methods of avoiding cracks.

STRENGTH AND STABILITY:

Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing and ageing, and workmanship. Compressive strength formulae based on elastic theory and empirical formulae.

UNIT – II **8 Hours**

PERMISSIBLE STRESSES:

Types of walls, permissible compressive stress, stress reduction and shape modification factors, permissible stresses for eccentric and lateral load.

DESIGN CONSIDERATIONS:

Effective height of walls and columns, openings in walls, effective length and thickness, slenderness ratio, eccentricity, load dispersion, and arching action in lintels.

UNIT – III **8 Hours**

BEHAVIOUR OF MASONRY WALLS UNDER LOADS:

Mechanical behaviour of Masonry, Masonry in compression, Deformation properties of masonry in compression, Creep strain in masonry, Load considerations and Masonry design criteria subjected to axial loads. Masonry in Tension, Shear and Biaxial stress: Nature of Bond, Tensile bond strength, Flexural tensile strength, Strength of Masonry in shear and Biaxial loading.

UNIT – IV **8 Hours**

DESIGN OF MASONRY WALLS FOR AXIAL AND ECCENTRIC LOADS:

Design of walls subjected to concentrated axial loads: Solid walls, cavity walls, solid walls supported at the ends by cross walls, design of walls with openings.

Design of walls subjected to eccentric loads: Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls, cavity walls, design of walls with openings.

UNIT – V **8 Hours**

DESIGN OF MASONRY WALLS FOR LATERAL AND TRANSVERSE LOADS:

Design of lateral and transversely loaded walls: Design criteria, design of solid wall under wind loading, design of shear wall – design of compound walls.

In-filled frames: Types – modes of failures – design criteria for masonry retaining walls.

Course Outcomes: The students will be able to

CO1	Understand the concepts and principles of Masonry and Masonry structural elements.
CO2	Analysis of Masonry elements subjected to axial and eccentric loads.
CO3	Design of Masonry structural elements such as Solid Walls and Cavity Walls as per IS code provisions.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Text Books:	
1	Arnold W. Hendry, "Structural Masonry", Second edition, Macmillan Education Press Ltd., 1990.
2	Dayaratnam P, "Brick and Reinforced Brick Structures", Oxford & IBH, 1987.
3	M. L. Gambhir, " Building and Construction Materials", McGraw Hill Education Pvt. Ltd.
Reference Code Books:	
1.	IS 1905–1987 "Code of practice for structural use of un-reinforced masonry- (3rd revision) BIS, New Delhi.
2.	SP-20(S&T) – 1991, "Hand book on Masonry Design and Construction (1st revision), BIS, New Delhi.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3							2		1
CO2	3	2	2									1
CO3	3	2	2							2		1

High: 3, Medium: 2 & Low: 1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**EXTENSIVE SURVEY PROJECT**						
Course Code	**22CVM506**						
Category	**PROJECT**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	0	**0**	**4**	**0**	**4**	**26**	**02**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To train and expose students to gain knowledge in Irrigation engineering, Highway engineering, Water supply and Sanitary Engineering; to locate suitable sites for New Tank Project, to exercise Restoration and Renovation of Old Tank to increase its storage capacity, To train for selection of suitable sites for construction of underground and overhead storage tanks.

General instructions, Reconnaissance of the sites and fly levelling to establish bench marks. **1 Day**

NEW TANK PROJECTS: **3 Day**

The work shall consist of

i) Alignment of center line of the proposed bund, Longitudinal and cross sections of the center line.
ii) Capacity contours.
iii) Details at Waste weir and sluice points.
iv) Canal alignment.

WATER SUPPLY AND SANITARY PROJECT: **2 Day**

Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks underground drainage system surveys for laying the sewers.

HIGHWAY PROJECT: **2 Day**

Preliminary and detailed investigations to align a new road (min. 1 to 1.5 km stretch) between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road**.**

OLD TANK PROJECTS: **2 Day**

The work shall consist of

i) Alignment of center line of the existing bund, Longitudinal and cross sections of the centre line.
ii) Capacity contours to explore the quantity.
iii) Details at existing Waste weir and sluice points.

Course Outcomes: The students will be able to	
CO1	Develop plans, maps and relative drawings for the construction and execution of Hydraulic structures such as New tank Project and Restoration of Old tanks.
CO2	Develop plans, maps and relative drawings for the construction of roads.
CO3	Develop plans, maps and relative drawings for the construction of water supply and sanitation structures.

Text Books:	
1	Surveying Vol–I and II– B.C. Punmia, Laxmi Publications, New Delhi.

2	Surveying Vol. I and II, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi
3	Surveying and Levelling – R Subramanian, Oxford University Press (2007)
4	Text Book of Surveying – C. Venkataramiah, Universities Press.(2009 Reprint)

Reference Books:	
1	Fundamentals of Surveying - Milton O. Schimidt – Wong, Thomson Learning.
2	Surveying , Arora
3	Maps by Survey of India.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1		1	2				3	2		2
CO2	2	1		1	2				3	2		2
CO3	2	1	3	1	2		1		3	2		2

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ENVIRONMENTAL STUDIES**						
Course Code	**22CVT508**						
Category	**Mandatory Course (MC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	2	**0**	**0**	**0**	**2**	**26**	**02**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 02 hours**		

Course Learning Objective:
Understand the interdisciplinary nature of environmental studies and its importance in addressing global and local environmental challenges. Comprehend the basic ecological principles, components of ecosystems, and the impacts of human activities on ecosystems and biodiversity. Recognize the classification and sustainable management of natural resources, along with the sources and consequences of environmental pollution. Gain knowledge of climate change, renewable energy sources, and their role in mitigating climate change, as well as understand the importance of environmental conservation and sustainable practices for a more sustainable future.

UNIT-1 **5 Hours**
INTRODUCTION TO ENVIRONMENTAL STUDIES:
Definition and scope of environmental studies. Interdisciplinary nature of environmental studies. Environmental issues and challenges at the global and local levels. Importance of sustainable development and environmental conservation.

UNIT-2 **5 Hours**
ECOLOGICAL CONCEPTS AND ECOSYSTEMS:
Basic ecological principles and concepts. Components of an ecosystem: biotic and abiotic factors. Ecological relationships and interactions**.** Human impacts on ecosystems and biodiversity loss

UNIT-3 **5 Hours**
NATURAL RESOURCES AND ENVIRONMENTAL POLLUTION:
Classification and importance of natural resources (water, air, soil, minerals, forests, agricultural land, marine resources). Sustainable use and management of natural resources. Types and sources of environmental pollution (water, air, soil, noise). Impact of pollution on human health and the environment

UNIT-4 **5 Hours**
CLIMATE CHANGE AND RENEWABLE ENERGY:
Causes and consequences of climate change. Mitigation and adaptation strategies for climate change. Introduction to renewable energy sources (solar, wind, hydro, geothermal, biomass, hydrogen fuel). Role of renewable energy in combating climate change

UNIT-5 **6 Hours**
ENVIRONMENTAL CONSERVATION AND SUSTAINABLE PRACTICES:
Biodiversity conservation and endangered species protection**.** Waste management and recycling practices**.** Sustainable agriculture and food systems. Environmental policies, regulations, and international agreements

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Develop a comprehensive understanding of the interdisciplinary nature of environmental studies and its significance in addressing global and local environmental challenges.
CO2	Apply ecological principles and concepts to analyse and evaluate the components of ecosystems, as well as assess the impacts of human activities on ecosystems and biodiversity.
CO3	Demonstrate knowledge of the classification and sustainable management of natural resources, and evaluate the sources and consequences of environmental pollution.

CO4	Recognize the causes and consequences of climate change, identify renewable energy sources, and evaluate their role in mitigating climate change. Additionally, demonstrate an understanding of the importance of environmental conservation and sustainable practices for creating a more sustainable future.

Text Books:

1	R. Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005.
2	Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", Universities Press (India) Private Limited, 2019.
3	Singh, J.S., Singh, S.P., and Gupta, S.R.). "Ecology, Environmental Science and Conservation". S. Chand Publishing, New Delhi, 2017.
4	D K Asthana, "Text Book of Environmental Studies", S Chand Publishing, 2010

Reference Books:

1	Dr. J. P Sharma, "Environmental Studies", Laxmi Publications Pvt Ltd, 2017.
2	Benny Joseph, "Environmental Studies", Tata McGraw-Hill Publishing company Limited, 2008.
3	G.T.Miller Jr., "Environmental Science", 11th Edition, Cenage Learning Pvt. Ltd., 2008.
4	Singh, J.S., Singh, S.P., and Gupta, S.R.). "Ecology, Environmental Science and Conservation". S. Chand Publishing, New Delhi, 2017.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 25 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments and Group activity each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 02 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 10 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.

✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.												
CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1					2	3					1
CO2	1					2	3					1
CO3	1					2	3					1
CO4	1					2	3					1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**DESIGN AND DRAWING OF STEEL STRUCTURAL ELEMENTS**						
Course Code	**22CVU601**						
Category	**Integrated Professional Core Course (IPCC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**2**	**0**	**5**	**50**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To know different terminologies related to steel design and construction in accordance with the latest codes. To study limit state concept of steel design and detailing. To understand design of members under axial loads like tension, compression and flexural loads. To acknowledge design of Column bases, simple and gusseted base connections.

UNIT – I **8 Hours**

INTRODUCTION:

Advantages and Disadvantages of Steel structures, Loads and Load combinations, Design considerations, Limit State Method (LSM) of design, Failure criteria for steel, Codes, Specifications and section classification.

BOLTED CONNECTIONS:

Introduction, Behaviour of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG), Pin Connections, Simple Connections, Moment resistant connections, Beam to Beam connections, Beam to Column connections & Semi rigid connections.

UNIT – II **8 Hours**

WELDED CONNECTIONS:

Introduction, Welding process, Welding electrodes, Advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of welds, Simple joints, Moment resistant connections, Continuous Beam to Column connections, Continuous Beam to Beam connections, Beam Column splices.

UNIT – III **8 Hours**

DESIGN OF TENSION MEMBERS:

Introduction, Types of tension members, Design of strands, Slenderness ratio, Behaviour of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, other sections, Design of tension member, Lug angles, Splices, Gussets.

DESIGN OF COMPRESSION MEMBERS:

Introduction, Failure modes, Behaviour of compression members, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members, Built up compression members.

UNIT – IV **8 Hours**

DESIGN OF COLUMN BASES:

Design of simple slab base and gusseted base.

DESIGN OF BEAMS:

Introduction, Beam types, Lateral stability of beams, factors affecting lateral stability, Behaviour of simple and built-up beams in bending(without vertical stiffeners), Design strength of laterally supported beams in Bending, Design strength of laterally unsupported beams, Shear strength of steel beams, Maximum deflection, Design of beams and purlins.

UNIT – V **8 Hours**

PLASTIC BEHAVIOUR OF STRUCTURAL STEEL:

Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorems of Plastic Analysis, Methods of Plastic analysis, Plastic analysis of continuous beams and Portal frames.

Expt. No	LABORATORY COMPONENTS	No. of sessions
1	Beam to beam connections - Bolted & Welded.	10
2	Beam to Column Framed Connections - Bolted and Welded.	
3	Beam to column Unstiffened Connections - Bolted and Welded.	
4	Beam to column Stiffened Connections - Bolted and Welded.	
5	Splices: Bolted and Welded.	
6	Lacings: Bolted and Welded.	
7	Battens: Bolted and Welded.	
8	Slab Base Footing.	
9	Gusseted Base Footing.	
10	Grillage Footing.	

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: At the end of the course the student will be able to:	
CO1	Define the fundamental principles of structural analysis and steel design with welded and bolted Connections.
CO2	Demonstrate the contemporary methodologies, specifications, loads, sections/shapes and current codes are used in the analysis and design of steel structural elements such as tension and compression members, beams, columns, column bases and connections and their detailing (Hand sketch).
CO3	Develop professional competencies in design and application of steel members in relevant Civil Engineering structures.
CO4	Identify the failure modes, safety and serviceability through discussions and analyses of various steel structural members.

Text Books:	
1	Design of Steel Structures, Limit state method, N. Subramanian, 2nd edition, OxfordUniversity Press, 2016.
2	Limit State Design of Steel Structures, S.K Duggal, 3rd edition, Tata Mc Graw Hill Publishers, 2010. ISBN, 1283188783, 9781283188784.
3	Design of Steel Structures, Negi, 2nd edition, Tata Mc Graw Hill Publishers, 1997, ISBN, 0074623052, 9780074623053.
4	Design of Steel Structures, Arya and Ajaman, Nem Chand & Bros Publishers, 2011, ISBN-10. 8185240620
5	Design of steel structures by Limit state method, S.S Bhavikatti, edition, TechSar Publications, 2017. ISBN 13: 978-9385909559.

Reference Books:	
1	" Design of steel structures", by Anand S Arya & Awadhesh Kumar, Nem Chand & Bro Publishers, 6th edition, 2014, ISBN-13 : .8185240732-978

2	"Manual Detailing of steel structures", by S Kanthimathinathan, K International Publishing House Pvt ltd, 2014, ISBN-13 : 978-9381141441.
3	IS 800, Code of practice for General construction in Steel, SP 6-1: ISI Handbook for Structural engineers, IS 875(Part I-IV), coded of practice for Design Loads, Bureau of Indian standards (Steel table) latesh editions, New Delhi.

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(i) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(ii) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(iii) Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

$$\textit{CIE score} = (\textit{Test 1} + \textit{Test 2}) \times 0.6 + \textit{Laboratory Component}$$

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total

marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1				1			1				1
CO2	1		3		1			1				1
CO3	1		3		1			1				1
CO4	1		3		1			1				1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**HYDROLOGY & WATER RESOURCES ENGINEERING**						
Course Code	**22CVT602**						
Category	**PROFESSIONAL CORE COURSE (PCC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	4	**0**	**0**	**0**	**4**	**50**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objectives: The students will learn the basic concepts of hydrology and integrate the physical hydrological processes, measurement and estimation of hydrological components: evaporation, infiltration, estimation of runoff and development hydrograph to apply for engineering practices, estimate the quantity of water required by crops to plan and design irrigation projects, find the canal capacity, design the canal and compute the reservoir capacity.

UNIT: I **10 hours**

ENGINEERING HYDROLOGY:

Introduction, Hydrologic Cycle(Horton's qualitative cycle), Water Budget Equation, World Water Balance, History of Hydrology,Applications of hydrology in Engineering, Sources of Data.

PRECIPITATION:

Forms, Types, Characteristics, Measurement of rainfall, Rain gauge Network, preparation and Presentation of Data, Mean Precipitation over an Area.

UNIT: II **10 hours**

LOSSES FROM PRECIPITATION:

EVAPORATION:

Introduction, process, factors affecting evaporation, measurement using IS class A pan, Meyer's formula, Reservoir Evaporation and Methods for its reduction.

EVAPOTRANSPIRATION:

Introduction, consumptive use, AET, PET, factors affecting, measurement, estimation by Blaney-Criddle equation and problems.

INFILTRATION:

Introduction, factors affecting infiltration capacity, measurement by double ring infiltrometer, Horton's infiltration equation with problems, infiltration indices and problems.

UNIT: III **10 hours**

RUNOFF:

Definition, concept of catchment, factors affecting runoff, rainfall – runoff relationship using regression analysis.

HYDROGRAPHS:

Definition, components of hydrograph, base flow separation, unit hydrograph, assumption, application and limitations, derivation from simple storm hydrographs, S curve and its computations, Conversion of UH of different durations with problems.

UNIT: IV **10 hours**

IRRIGATION:

Definition, Benefits and ill effects of irrigation. Systems of irrigation: surface and ground water, flow irrigation, lift irrigation, Bandhara irrigation.

WATER REQUIREMENTS OF CROPS:

Duty, delta and base period, relationship between them with problems, factors affecting duty of water crops and crop seasons in India, irrigation efficiency, frequency of irrigation.

UNIT: V **10 hours**

CANALS:

Types of canals. Alignment of canals. Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor. Unlined and lined canals. Standard sections. Design of canals by Lacey's and Kennedy's method.

RESERVOIRS:

Definition, investigation for reservoir site, storage zones determination of storage capacity using mass curves, economical height of dam.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes:

CO 1	Understand the basic concepts of hydrology and integrate the physical hydrological processes, measurement and estimation of hydrological components such as evaporation, infiltration, stream flow.
CO 2	Estimate the quantity of water required by crops to plan and design irrigation projects.
CO 3	Find the canal capacity, design the canal and compute the reservoir capacity.

Text Books:

1	Engineering Hydrology – Subramanya. K; Tata McGraw Hill New Delhi-2008 (Ed)
2	A Text Book Of Hydrology - Jayarami Reddy, Laksmi Publications, New Delhi-2007 (Ed)
3	Irrigation, water Resources and water power Engineering- P.N. Modi- standard book house, New Delhi.
4	Irrigation and Water Power Engineering - Madan Mohan Das & Mimi Das Saikia; PHI Learning pvt. Ltd. New Delhi 2009 (Ed).
5	Irrigation Engineering and Hydraulic structures- S. K. Garg, 38th Edition, Vol. (II), Khanna Publication, New Delhi.

Reference Books:

1	Introduction to Hydrology - Viessman, W, and Lewis, G. L, 5th Edition, PHI Learning Private Limited, New Delhi (2003).
2	Applied Hydrology - Chow, V. T., Maidment, D. R., and Mays, L.W, 1st Edition, McGraw-Hill International Edition, Civil Engineering Series, Singapore (1988).

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1						1					1
CO2	1		3				1					1
CO3	1		3				1					1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**AIR POLLUTION AND CONTROL**						
Course Code	**22CVT603A**						
Category	**PROFESSIONAL ELECTIVE COURSE (PEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand primary pollutants and study the formation of secondary air pollutants in the atmosphere. Study the influential factors (meteorological parameters) of air pollutants transportation in the atmosphere. Study the effects of air pollution on receptor (human, different species, and environment, etc., Learn the various air pollution control methods and to create awareness through community participation and legislation.

UNIT – I **8 Hours**

INTRODUCTION:

Definition – Classification and Characterization of Air Pollutants, Emission Sources, Behaviour and Fate of air Pollutants, Chemical Reactions in the Atmosphere, Photo - chemical Smog, Coal-induced smog, Air Pollution Inventories.

EFFECTS OF AIR POLLUTION:

On Human Health, Animals, Plants and Materials – Major Environmental Air Pollution Episodes – London Smog, Los Angeles Smog & Bhopal Gas Tragedy.

UNIT – II **8 Hours**

METEOROLOGY:

Introduction – Meteorological Variables, Primary and Secondary Meteorological Variables, Stability Conditions, Wind rose, General Characteristics of Stack Plumes and Inversions, Dispersion Models – Gaussian Plume Model.

UNIT – III **8 Hours**

METEOROLOGY: (Contd.)

Factors to be considered in Industrial Plant Location and Planning.

SAMPLING AND ANALYSIS:

Sampling and Measurement of Gaseous and Particulate matter, Stack Sampling, Analysis of Air Pollutants, Smoke and Smoke Measurement.

UNIT – IV **8 Hours**

AIR POLLUTION CONTROL METHODS:

Air Pollution Control Methods – Particulate Emission Control; Gravitational Settling Chambers, Cyclone Separators, Fabric Filters, Electrostatic Precipitators, Wet Scrubbers, Selection of a Particulate Collecting Equipment, Control of Gaseous Emissions; Adsorption by Liquids, Adsorption by Solids, Combustion Odours and their control.

UNIT – V **8 Hours**

AIR POLLUTION DUE TO AUTOMOBILES:

Air Pollution due to Gasoline Driven and Diesel Driven Engines, Effects, Direct and Indirect Methods of control.

ENVIRONMENTAL ISSUES:

- ✓ Acid Rain
- ✓ Global Warming
- ✓ Ozone Depletion in Stratosphere
- ✓ Indoor Air Pollution

ENVIRONMENTAL LEGISLATION: Environmental Policy, Environmental Protection Act, Air Pollution Standards.
Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Video.

Course Outcomes: The students will be able to	
1	Identify the various sources and formation of pollutants thoroughly and explain the effect of air pollutants on receptors (human, different species, materials and surrounding environment).
2	Assess the behaviour of pollutants in the atmosphere and the importance of the meteorological parameters and various dispersion Modelling methods.
3	Classify the various air pollutants sampling methods, analysis methods and also the factors to select a suitable industrial plant location to prevent and control the global air pollution.
4	Discus the air pollution episodes, control policies and climate changes like global warming, Ozone depletion, Indoor air pollution, Acid rain and vehicular pollution.

Text Books	
1	Boubel, R.W., Donald, L.F., Turner, D.B., and Stern, A.C. (1994). Fundamentals of Air Pollution. Academic Press.
2	Rajni Kant, Keshav Kant (2019). Air Pollution and Control. Khanna Publishing House.
3	K.V.S.G. Murali Krishna (2017). Air Pollution and Control. USP Publishers.
4	Mackenzie Davis, David Cornwell (2023). Introduction to Environmental Engineering. McGraw-Hill Education.

Reference Books:	
1	Boubel, R.W., Donald, L.F., Turner, D.B., and Stern, A.C., (1994), Fundamentals of Air Pollution – Academic Press.
2	Crawford, M., (1980), Air Pollution Control Theory –TMH Edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi
3	Henry. C. Perkins, (1980), Air Pollution –McGraw Hill.
4	Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986), Environmental Engineering –Mc Graw Hill Book Co
5	Sincero, A.P and Sincero, G.A., (1999), Environmental Engineering – A Design Approach –Prentice Hall of India.
6	Wark, K., Warner, C.F. and Davies, W.T., (1998), Air Pollution- Its Origin and Control –Harper & Row Publishers, New York

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not

attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.

- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3						2					1
CO2		3										1
CO3	3											1
CO4							2					1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**STRUCTURAL HEALTH MONITORING**						
Course Code	**21CVT603B**						
Category	**PROFESIONAL ELECTIVE COURSE (PEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand the fundamental concepts of structural health monitoring for structures, analyse the different instruments and sensors needed for structural health monitoring, and describe various methods of damage detection, conditional assessment, and techniques for strengthening and retrofitting structures.

UNIT – I **8 Hours**

INTRODUCTION TO STRUCTURAL HEALTH MONITORING:

Need of Structural Health Monitoring, Definition & Concept of SHM, SHM & Biomimetic Comparison of SHM with NDT, Types & Components of SHM, Procedure of SHM, Objectives & Operational Evaluations of SHM, Advantages of SHM.

UNIT – II **8 Hours**

HEALTH MONITORING SYSTEMS OF BUILDING STRUCTURES:

Numerical modeling, Use of sensors, Data acquisition techniques, Data Processing, Diagnostic techniques, Wireless sensor network, Rehabilitation techniques.

UNIT – III **8 Hours**

INSTRUMENTATIONS & SENSORS FOR SHM:

Basics of Instrumentations & Measurements, Classifications, Input-Output Configurations of Instruments, Static & Dynamic Characteristics, Functions. Various Types of Electromechanical, Electronics & Digital Instruments for SHM. Data Acquisition Systems-Types, Hardware & It's Components. Basics of Sensors, Transducers & Actuators, Classification of Sensors, Characteristics & Working Principles of Various Types of Sensors like Strain Gauges, LVDT, Accelerometers etc. Concept of Smart Materials & Smart Structures with SHM, Basics of Smart Materials like Piezoelectric, Shape Memory Alloys, ER & MR Fluids etc.

UNIT – IV **8 Hours**

STRUCTURAL ASSESSMENT:

Structural Assessment & Need for retrofitting: Introduction to health assessment of structures, structural damages & failures, Principles of structural assessment, Classification & levels of assessment, Current scenario of infrastructure through case studies.

NON-DESTRUCTIVE EVALUATIONS:

Concrete strength assessment, Rebound hammer test, Ultrasonic pulse velocity tests, penetration resistance, pullout tests, core sampling and testing, chemical tests, carbonation, chloride, content and corrosion problem.

UNIT – V **8 Hours**

RETROFITTING OF STRUCTURES:

Concept of repair, rehabilitation & retrofitting of structures: Case studies of structural & foundation failure, performance problems, responsibility & accountability, causes of distress in structural members, design and material deficiencies, factors causing extensive deterioration.

Fundamentals of retrofitting, flow of retrofitting process, methods of retrofitting, materials for retrofitting (conventional and smart materials), selection of retrofitting methods.

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos.	
Course Outcomes: The students will be able to	
CO1	Understand the concepts of fundamental concepts of structural health monitoring and systems.
CO2	Describe suitable Sensors & Instruments required in SHM for in-service performance of structures
CO3	Assess the health of structures using different techniques of SHM.
CO4	Summarize suitable technique for structural condition assessment, appropriate strengthening & retrofitting techniques to regain the structural strength.

Text Books:	
1	Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, Structural Health Monitoring, Wiley ISTE, 2006.
2	Nagayama, T. and Spencer Jr, B.F., Structural health monitoring using smart sensors, 2007
3	Douglas E Adams, Health Monitoring of Structural Materials and Components-Methods with Applications, John Wiley and Sons, 2007.
4	Adams, John Wiley and Sons, Structural Health Monitoring and Intelligent Infrastructure, Vol1, 2007.

Reference Books:	
1	JJ.P. Ou, H.Li and Z.D. Duan, Structural Health Monitoring and Intelligent Infrastructure, Vol-1, Taylor and Francis Group, London, U.K, 2006.
2	Victor Giurglutiu, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc, 2007.
3	Gangbing Song, Chuji Wang and Bo wang, Structural Health Monitoring(SHM) of civil structures,MDPI, 2018

Reference Codes:	
1	IS 13311-1: Method of Non-destructive testing of concrete

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group

discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.

- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											1
CO2	1	1			1							1
CO3	1	1	1	1								1
CO4	1											1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**FOUNDATION ENGINEERING**						
Course Code	**22CVT603C**						
Category	**Professional Elective Course (PEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objectives: The students will be learn to understand the stress distributions and compressibility characteristics of soil, know the earth pressure against retaining walls and stability of slopes against shear failure and interpret the soil condition at a given location and suggest the suitable type of foundation.

UNIT – I **08 Hours**

STRESS DISTRIBUTION IN SOILS:

Boussinesq's and Westergaard's theories for different types of loads, Pressure distribution diagrams, Approximate and exact methods, Newmark's influence chart, Contact Pressure.

FOUNDATION SETTLEMENTS:

Immediate, Primary consolidation and Secondary settlement.

UNIT – II **08 Hours**

LATERAL EARTH PRESSURE:

Types of earth pressure (Active, Passive and at-rest earth pressure). Rankine's theory of applications (Dry, moist, submerged, partially submerged, uniform surcharge, layered cohesionless, cohesive and cohesive – friction backfill). Graphical methods to compute active earth pressures for cohesionless backfill by Rebhaunn's and Culmann's method.

UNIT – III **08 Hours**

STABILITY OF EARTH SLOPES:

Factor of safety, Stability analysis of Infinite slopes by limiting equillbrium condition, Stability analysis of finite slopes by Swedish slip circle methods, Friction circle method, Fellineous method, Taylor's stability number.

UNIT – IV **08 Hours**

BEARING CAPACITY OF SHALLOW FOUNDATION:

Definitions of bearing capacity terms, Modes of shear failure, Terzaghi's and IS: 6403 method bearing capacity equations, Effect of ground water table and loading eccentricity on footing. Field methods to evaluation of allowable bearing capacity - Plate load test and Standard penetration test.

UNIT – V **08 Hours**

BEARING CAPACITY OF PILE FOUNDATION:

Classification of piles, Load transfer mechanism, Pile capacity by static formulae, dynamic formulae and pile load test, pile group, efficiency, Bearing capacity and settlement of piles on clayey soils, Negative skin friction, Underreamer piles.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Estimate the state of stress below any type of loaded area and compute settlement.
CO2	Estimate lateral earth pressures exerted on retaining walls and estimate factor of safey against shear for slopes.

CO3	Evaluate bearing capacity of soil to design a shallow and deep foundations.

Text Books:	
1	Punmia B C, "Soil Mechanics and Foundation Engineering", Laxmi Publications Co., New Delhi, 16 th Edition 2017.
2	Gopal Ranjan and Rao A.S.R, "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi, 3 rd Edition 2016.
3	Braja, M. Das, "Geotechnical Engineering", Thomson Business Information India (P) Ltd., India, 8 th Edition 2015.
4	Murthy V. N. S, "Principles of Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2018.

Reference Books:	
1	Bowles J. E "Foundation analysis and design", McGraw- Hill Publications. New Delhi, 5th Edition 2001.
2	Karl Terzaghi, Ralph B. Peck, Gholamreza Mesri, "Soil Mechanics in Engineering Practice", John Wiley & Sons Publishers, 5 th Edition 1996
3	B.K. Ramaiah, Purushotham Raj, Krishnamurthy, "A Hand Book of Stress Distribution and Deformation in Soils", Bangalore University 1970.
4	"Code of Practice for Determination of Bearing Capacity of Shallow Foundations", IS: 6403 – 2004, 7th Revision, Bureau of Indian Standards, New Delhi.
5	"Code of Practice for Design and Construction of Pile Foundations", IS: 2911(Part 1/Sec 1) – 2010, 2 nd Revision, Bureau of Indian Standards, New Delhi.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3			2							
CO2	1	3			2							
CO3	1		3				1			1		

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**RAILWAYS, AIRPORT, TUNNEL AND HARBOUR ENGINEERING**						
Course Code	**22CVT603D**						
Category	**Professional Elective Course (PEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: To summarize the various aspects of tracks like, geometrical elements, points and crossings, and significance of maintenance, to plan and design of airport layout, facilities required for runway, taxiway and impart the knowledge about visual aids, to apply the design features of tunnels, harbours, dock and necessary navigational aids; also expose them to various methods of tunneling and tunnel accessories.

UNIT – I **8 Hours**

INTRODUCTION TO RAILWAYS:

Role of railways in transportation, Indian Railways, Selection of Routes, Permanent way and its requirements, Gauges and types, Typical cross sections-single and double line broad gauge (BG) track in cutting, embankment and electrified tracks, Coning of wheels and tilting of rails.

RAILS:

Functions-requirements - types and sections, length-defects-wear-creep-welding-joints, creep of rails.

SLEEPERS AND BALLAST:

Functions, requirements, Types, Track fitting and fasteners-Dog spike, screw spike and Pandrol clip, Fish plates, bearing plates, Calculation of quantity of materials required for laying a track-Examples, Tractive resistances and hauling capacity with examples.

UNIT – II **8 Hours**

GEOMETRIC DESIGN AND POINTS AND CROSSING:

Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings (Explanation & Sketches of Right and Left hand turnouts only), Numercials.

RAILWAY CONSTRUCTION AND MAINTENANCE:

Stations and Types, Types of yards, Signalling-Objects and types of signals, station and yard Equipment-Turn table, Fouling mark, buffer stop, level crossing, track defects, and maintenance.

Earthwork – Stabilization of track on poor soil, Construction and maintenance of tracks, Modern methods of construct ion & maintenance – Urban rail – Infrastructure for Metro, Mono and underground railways.

UNIT – III **8 Hours**

AIRPORT PLANNING:

Air transport characteristics, airport classification, airport planning: objectives, components, layout characteristics, and socio-economic characteristics of the catchment area, criteria for airport site selection and ICAO stipulations, typical airport layouts, Parking and circulation area.

UNIT – IV **8 Hours**

AIRPORT DESIGN:

Runway Design: Orientation, Wind Rose Diagram, Runway length, Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles, Elements of Taxiway Design, Airport Zones, Passenger Facilities and Services, Runway and Taxiway Markings and lighting, Numercials.

UNIT – V **8 Hours**

HARBOUR ENGINEERING:

Harbour classifications, Layout with components, Natural phenomenon affecting the design of harbours -

wind, wave and tide, currents, Breakwater-Types Wharf and Quays, Jetties and Piers, Dry dock and wet docks.

TUNNEL ENGINEERING:

Advantages and disadvantages, Size and shape of tunnels, Surveying-Transferring center line, and gradient from surface to inside the tunnel, Examples, Tunneling in rocks-methods(TBM's), Tunneling methods in soils-Needle beam, Liner plate, Tunnel lining, Tunnel ventilation, vertical shafts, Pilot tunneling, mucking and methods, drilling and drilling pattern, case study on report of geologically disturbed area.

Course Outcomes: The students will be able to	
CO1	Understand the knowledge of geometric design of railways and its considerations with different materials used for the construction of railway track.
CO2	Study the basic components of air craft and airport facilities with the design of run way length and geometrics of various landing aids in an airport.
CO3	Understand the fundamental principles related to methods of tunnelling and harbours with their layout and components.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	Railway Engineering - Saxena and Arora, Dhanpat Rai & Sons, 7th edition (2015), New Delhi.
2	Airport Planning and Design – Khanna Arora and Jain, Nem Chand Bros, 6th edition (2015), Roorkee.
3	Docks and Tunnel Engineering – R Srinivasan, Charaotar Publishing House, 28th edition (2019), New Delhi.

Reference Books:	
1	Docks and Harbor Engineering –H P Oza and G H OzaCharaotar Publishing House, 7th edition, New Delhi.
2	Railway Engineering – J S Mundrey, McGraw Hill Publications, 4th edition, New Delhi.
3	Indian Railway Track – M M Agarwal, Jaico Publications, 2nd edition, oxford university press, Bombay.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.

- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2			1	2						1
CO2	3	2				2						1
CO3	3	1				2						1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

COURSE TITLE	**PRE-STRESSED CONCRETE**						
Course Code	**22CVT603D**						
Category	**Professional Core Course (PCC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: To provide general principles of PSC members and design using the latest IS: 1343 code. To provide methods of design for bending, shear, and torsion of PSC structural elements.

UNIT – I **8 Hours**

INTRODUCTION:

Historic development- general principles of Prestressing, Types of pre stressing, pre- tensioning and post tensioning, advantages and limitation of prestressed concrete, Materials for pre stressed concrete- high strength steel and concrete, properties, Stress-strain characteristics of high strength steel and concrete.

BASIC PRINCIPLES OF PRESTRESSING:

Fundamentals of prestress, Load balancing concept, Stress concept, center of thrust, Pretensioning and post tensioning methods-Analysis of Pretensioning and post tensioning, Systems of pre stressing, End anchorages.

UNIT – II **8 Hours**

ANALYSIS OF SECTIONS FOR FLEXURE:

Elastic analysis of pre stressed concrete beams with straight, parabolic, triangular, trapezoidal cable profiles, Combination of cable profiles, Eccentric and concentric pre stressing,Numerical problems.

UNIT – III **8 Hours**

LOSSES OF PRE-STRESS:

Loss of prestress in pretensioned and post tensioned members due to elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage and frictional losses, Numerical on Losses during Prestress.

DEFLECTIONS:

Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection. Numerical on Short term and Long term deflections.

UNIT – IV **8 Hours**

LIMIT STATE OF COLLAPSE:

Flexure - IS Code recommendations – Ultimate flexural strength of sections. Numerical on Flexure. Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking. Numerical on Shear.

UNIT – V **8 Hours**

DESIGN OF BEAMS:

Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Design of prestressing force and eccentricity, limiting zone of pre-stressing force and cable profile. Transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses in end blocks

Course Outcomes: The students will be able to	
CO1	Explain the basic concept of pre-stressing, post-tensioning, behavior of PSC members and use of

	high tensile strength steel.
CO2	Analyze the pre-stress in pre-Tensioning and Post -Tensioning elements.
CO3	Calculate deflection in PSC members with respect to short and long time application of forces.
CO4	Analyze and design of beams for flexure both serviceability and economic point of view.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	Pre-stressed Concrete- N. Krishna Raju, Tata McGraw Publishers, 6th *Edition* (2022).
2	Pre-stressed Concrete- P Dayaratnam And P Sarah. Medtech Publisher, *7th* Edition *(2017).*
3	Pre-stressed Concrete- N. Rajgopalan, Alpha Sceince Publishers, 2nd *Edition* (2017).

Reference Books:	
1	Code of practice for Prestressed Concrete - IS: 1343: 2012.
2	Design of Pre-Stressed Concrete Structures- T.Y. Lin and Ned H. Burns - John Wiley & Sons, Wiley India Private Limited; 3rd Edition (2010).
3	Design of Pre-Stressed Concrete – Arthus H Nilson. Wiley Publishers, 2nd Edition (1991).
4	Fundamental of Pre-Stressed Concrete- N. C. Sinha & S. K. Roy, S Chand Publishing; 3rd Edition (2011).

Process of Assessment (both CIE and SEE):

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- ✓ Two assignments each of 05 Marks (taken average at the end).
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- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
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• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											1
CO2	1											1
CO3	1											1
CO4	1		3					1				1

High-3, Medium-2 & Low-1.

Course Title	**ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES**						
Course Code	**22CVT603F**						
Category	**Professional Elective Course (PEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: To understand environmental issues due to building materials and the energy consumption in manufacturing building materials, to study the various masonry blocks, masonry mortar and structural behaviour of masonry under compression, to study the alternative building materials in the present context, to understand the alternative building technologies which are followed in present construction field.

UNIT – I **8 Hours**

INTRODUCTION:

Energy in building materials, Environmental issues concerned to building materials, Global warming and construction industry. Environmental friendly and cost effective building technologies. Requirements for building of different climatic regions. Traditional building methods and vernacular architecture.

UNIT – II **8 Hours**

ALTERNATIVE BUILDING MATERIALS:

Characteristics of building blocks for walls, Stones and Laterite blocks, Bricks and hollow clay blocks, Concrete blocks, Stabilized blocks - Mud Blocks, Steam Cured Blocks, Fal-G Blocks and Stone Masonry Block, M-Sand.

LIME-POZZOLANA CEMENTS:

Raw materials, Manufacturing process, Properties and uses, Fibre reinforced concretes, Matrix materials, Fibres: metal and synthetic, Properties and applications, Fibre reinforced plastics, Matrix materials, Fibres: organic and synthetic, Properties and applications, Building materials from agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes,

UNIT – III **8 Hours**

ALTERNATIVE BUILDING TECHNOLOGIES:

Alternative for wall construction, Types, Construction method, Masonry mortars, Types, Preparation, Properties, Ferro cement and Ferro concrete building components.

Materials and specifications, Properties, Construction methods, Applications Alternative roofing systems, Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes

UNIT – IV **8 Hours**

STRUCTURAL MASONRY:

Compressive strength of masonry elements, Factors affecting compressive strength. Strength of units, prisms/wallets and walls, Effect of brick work bond on strength.

Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry. IS Code provisions, Design of masonry, compression elements and Concepts in lateral load resistance

UNIT – V **8 Hours**

COST EFFECTIVE BUILDING DESIGN:

Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost Analysis : Case studies using alternatives

EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS:

Machines for manufacture of concrete, Equipment for production of stabilized blocks, Moulds and methods of production of precast elements.

Course Outcomes: The students will be able to	
1	Explain the need of Alternative Building Materials in Construction industry.
2	Evaluate properties of mortar and other alternative construction materials.
3	Design methods for cost effective buildings by adopting cost effective materials and cost saving techniques.

Text Books:	
1	Alternative building methodologies for engineers and architects, lecture notes edited: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of Science, Bangalore.
2	Structural Masonry- Henry, A.W: Macmillan Education Ltd., 1990.
3	Alternative building methodologies for engineers and architects, lecture notes edited: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of Science, Bangalore.
4	Structural Masonry- Henry, A.W: Macmillan Education Ltd., 1990.

Reference Books:	
1	RJS Spence and DJ Cook, "Building Materials in Developing Countries", Wiley pub.
2	LEED India, Green Building Rating System, IGBC pub.
3	IGBC Green Homes Rating System, CII pub.

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- ✓ Two assignments each of 05 Marks (taken average at the end).
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- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.

- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
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CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											1
CO2	1											1
CO3	1		3									1

High-3, Medium-2 & Low-1.

Course Title	**INTEGRATED SOLID WASTE MANAGEMENT**						
Course Code	**22CVT604A**						
Category	**Open Elective Course (OEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objective:

Understand the key principles and concepts of integrated solid waste management (ISWM), including waste generation, collection, treatment, and disposal. Analyze and evaluate different waste management strategies and technologies, considering their environmental, health impacts. Apply practical knowledge of waste reduction, recycling, composting, and energy recovery techniques to develop sustainable waste management plans. Demonstrate the ability to develop and implement comprehensive ISWM plans that align with regulatory requirements, community needs, and sustainability goals.

UNIT – I **8 Hours**

INTRODUCTION AND WASTE GENERATION ASPECTS:

Sources, types, functional elements of solid waste management, factors affecting solid waste generation and management, waste characteristics, health and environmental effects. Numerical on moisture content, density and energy content.

UNIT – II **8 Hours**

WASTE PROCESSING TECHNIQUES:

Purpose of processing, volume and size reduction, component separation, significance of source reduction, product recovery and recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and processes.

COLLECTION, STORAGE, TRANSPORT OF WASTES:

Collection components, storage-containers/collection vehicles, collection operation and route optimization, need and types of transfer stations, location of transfer station. Estimation of solid waste quantities.

UNIT – III **8 Hours**

BIOLOGICAL CONVERSION TECHNOLOGIES:

Definition of compost, classification of composting, key process variables of composting, different types of composting- aerobic composting, windrow composting, in-vessel composting, aerated static pile composting, vermicomposting, anaerobic composting. Site selection and design of composting. Specifications for composting as per Solid Waste Management Rules-2016.

THERMAL CONVERSION TECHNOLOGIES:

Definition of thermal process, categories of thermal conversion, Combustion Systems-Mass fired combustion systems, RDF-Fired combustion system, Fluidized bed combustion. Pyrolysis Systems, Gasification Systems. Environmental and air pollution control systems. Air Quality standards as per Solid Waste Management Rules-2016.

UNIT – IV **8 Hours**

DISPOSAL OF SOLID WASTES:

Sanitary landfills- Definition, environmental impact and its minimization, Landfilling methods-trench method, area method and canyon method. Essential components, site selection, landfill planning and design. Generation, movement and control of landfill gases. Formation, movement and control of leachate. Different types of Liner systems. Landfill closure and post closure care. Numerical on landfill area estimation. Specifications for Sanitary Landfills as per Solid Waste Management Rules-2016.

UNIT – V **8 Hours**

SPECIAL WASTE MANAGEMENT:
Definition, importance of special waste Management, Automotive Wastes, Construction and Demolition Wastes, Electronic Wastes, Industrial Solid Wastes, Medical Wastes, Plastic Wastes, Lead Battery Wastes (environmental significance, recovery, recycle and current management systems). Waste Management Laws in India.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and waste collection and disposal site visit.

Course Outcomes: The students will be able to	
CO1	Narrate the basics of solid waste management towards sustainable development.
CO2	Apply technologies to process waste for product and energy recovery options.
CO3	Comprehend the principles and practices involved in the safe and environmentally sound disposal Technique.
CO4	Analyze the need for special wastes management for safe and sustainable disposal.

Text Books:	
1	Integrated Solid Waste Management: Tchobanoglous: M/c Graw Hill. 2012
2	Solid Waste Management in developing countries. Bhide and Sunderashan. 2017
3	Environmental Engineering – Vol II.: S.K. Garg. 2015

Reference Books	
1	Ramesha Chandrappa and Diganta Bhusan Das "Solid Waste Management: Principles and Practice", Springer Berlin Heidelberg, 2012.
3	William A. Worrell and P. Aarne Vesilind, "Solid Waste Engineering", Cengage Learning Inc, 2012.
4	Dr. R.Saravanan, "Municipal Solid Waste Management", Suchitra Publications, 2017.
5	P. White, M. Franke, P. Hindle "Integrated Solid Waste Management: A Lifecycle Inventory", 1995.
6	Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, "Environmental Engineering", McGraw Hill International Editions, 1985.
7	Sunil Kumar, "Municipal Solid Waste Management in Developing Countries", CRC Press, 2016.

Process of Assessment (both CIE and SEE):
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- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.

- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3						2					1
CO2	3	2					2					1
CO3	3			3			2					1
CO4	3						2					1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**AIR POLLUTION AND CONTROL METHODS**						
Course Code	**22CVT604B**						
Category	**Open Elective Course (OEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective:

Understand primary pollutants and study the formation of secondary air pollutants in the atmosphere. Study the influential factors (meteorological parameters) of air pollutants transportation in the atmosphere. Study the effects of air pollution on receptor (human, different species, and environment, etc., Learn the various air pollution control methods and to create awareness through community participation and legislation.

UNIT – I **8 Hours**

INTRODUCTION:

Definition – Classification and Characterization of Air Pollutants, Emission Sources, Behaviour and Fate of air Pollutants, Chemical Reactions in the Atmosphere, Photo - chemical Smog, Coal-induced smog, Air Pollution Inventories.

EFFECTS OF AIR POLLUTION:

On Human Health, Animals, Plants and Materials – Major Environmental Air Pollution Episodes – London Smog, Los Angeles Smog & Bhopal Gas Tragedy.

UNIT – II **8 Hours**

METEOROLOGY:

Introduction – Meteorological Variables, Primary and Secondary Meteorological Variables, Stability Conditions, Wind rose, General Characteristics of Stack Plumes and Inversions, Dispersion Models – Gaussian Plume Model.

UNIT – III **8 Hours**

METEOROLOGY: (Contd.)

Factors to be considered in Industrial Plant Location and Planning.

SAMPLING AND ANALYSIS:

Sampling and Measurement of Gaseous and Particulate matter, Stack Sampling, Analysis of Air Pollutants, Smoke and Smoke Measurement.

UNIT – IV **8 Hours**

AIR POLLUTION CONTROL METHODS:

Air Pollution Control Methods – Particulate Emission Control; Gravitational Settling Chambers, Cyclone Separators, Fabric Filters, Electrostatic Precipitators, Wet Scrubbers, Selection of a Particulate Collecting Equipment, Control of Gaseous Emissions; Adsorption by Liquids, Adsorption by Solids, Combustion Odours and their control.

UNIT – V **8 Hours**

AIR POLLUTION DUE TO AUTOMOBILES:

Air Pollution due to Gasoline Driven and Diesel Driven Engines, Effects, Direct and Indirect Methods of control.

ENVIRONMENTAL ISSUES:

- ✓ Acid Rain
- ✓ Global Warming
- ✓ Ozone Depletion in Stratosphere
- ✓ Indoor Air Pollution

ENVIRONMENTAL LEGISLATION:

Environmental Policy, Environmental Protection Act, Air Pollution Standards.

Course Outcomes: The students will be able to	
CO 1	Identify the various sources and formation of pollutants thoroughly and explain the effect of air pollutants on receptors (human, different species, materials and surrounding environment).
CO 2	Assess the behaviour of pollutants in the atmosphere and the importance of the meteorological parameters and various dispersion Modelling methods.
CO 3	Classify the various air pollutants sampling methods, analysis methods and also the factors to select a suitable industrial plant location to prevent and control the global air pollution.
CO 4	Discus the air pollution episodes, control policies and climate changes like global warming, Ozone depletion, Indoor air pollution, Acid rain and vehicular pollution.

Text Books	
1	Boubel, R.W., Donald, L.F., Turner, D.B., and Stern, A.C. (1994). Fundamentals of Air Pollution. Academic Press.
2	Rajni Kant, Keshav Kant (2019). Air Pollution and Control. Khanna Publishing House.
3	K.V.S.G. Murali Krishna (2017). Air Pollution and Control. USP Publishers.
4	Mackenzie Davis, David Cornwell (2023). Introduction to Environmental Engineering. McGraw-Hill Education.

Reference Books:	
1	Boubel, R.W., Donald, L.F., Turner, D.B., and Stern, A.C., (1994), Fundamentals of Air Pollution – Academic Press.
2	Crawford, M., (1980), Air Pollution Control Theory –TMH Edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi
3	Henry. C. Perkins, (1980), Air Pollution –McGraw Hill.
4	Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986), Environmental Engineering –Mc Graw Hill Book Co
5	Sincero, A.P and Sincero, G.A., (1999), Environmental Engineering – A Design Approach –Prentice Hall of India.
6	Wark, K., Warner, C.F. and Davies, W.T., (1998), Air Pollution- Its Origin and Control –Harper & Row Publishers, New York

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- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
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- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

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- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3						2					1
CO2		3										1
CO3	3											1
CO4							2					1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**URBAN TRANSPORT SYSTEM**						
Course Code	**22CVT604C**						
Category	**Open Elective Course (OEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	0	0	0	3	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand and apply the basic concepts and methods of urban transportation planning, to explain the various methods of designing, conducting and administering surveys to provide the data required for transportation planning, to understand the process of developing an organized mathematical modeling approach to solve select urban transportation planning problem and to illustrate the various types of models used for travel forecasting, prediction of future travel patterns.

UNIT – I **8 Hours**

INTRODUCTION:

Urbanization, urban class groups, transportation problems and identification, impacts of transportation, urban transport system planning process, modeling techniques in planning.

Urban mass transportation systems: urban transit problems, travel demand, types of transit systems, public, private, Para-transit transport, mass and rapid transit systems, BRTS and Metro rails, capacity, merits and comparison of systems, coordination, types of coordination.

UNIT – II **8 Hours**

DATA COLLECTION AND INVENTORIES:

Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT – III **8 Hours**

TRIP GENERATION :

Trip purpose, Factors governing trip generation and attraction, Category analysis, Problems.

TRIP DISTRIBUTION:

Methods, Growth factors methods and problems.

UNIT – IV **8 Hours**

TRIP DISTRIBUTION:

Synthetic methods- Fractor and Furness method and problems.

MODAL SPLIT:

Factors affecting, characteristics of split, Model split in urban transport planning, problems.

UNIT – V **8 Hours**

TRIP ASSIGNMENT:

Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. Numerical problems on Traffic Assignment. Introduction to land use planning models, land use and transportation interaction.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

Course Outcomes: The students will be able to

CO1	Understand the importance of urban transport planning and administer surveys to provide the data required for transportation planning.
CO2	Supervise the process of data collection about travel behaviour and analyse the data for use in transport planning.
CO3	Apply the fundamental principles of mathematical models for the trip generation and its assignment techniques for modal split and trip distribution methods

Text Books:	
1	'Traffic Engineering and Transportation Planning' Dr. Kadiyali. L. R., Khanna Publishers, New Delhi.
2	Principles of urban transport systems planning by Hutchinson, B. G. Publication date: 1974 Publisher: Washington, Scripta Book Co.
3	Introduction to transportation engineering- Jotin Kristey and Kentlal - PHI, New Delhi.

Reference Books:	
1	Urban Transport planning- Black John, Croom Helm limited- 1981, London, England.
2	Urban and Regional models in geography and planning- Wilson, A. G– John Wiley & Sons Inc Publishers
3	Transportation Engineering and Planning- Papacostas, Publisher-Prentice Hall India Learning Private Limited; 3rd edition

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CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2				3						1
CO2	2	2	2	2		3			1			1
CO3	2	2	2	2		3			1			1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**NATURAL DISASTER MITIGATION AND MANAGEMENT**						
Course Code	**22CVT604D**						
Category	**Open Elective Course (OEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	0	0	0	3	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand fundamental concepts relevant to natural disasters, their significance, types, and factors that cause the disaster and disaster management cycle, apply the approaches of disaster risk reduction (DRR) and the inter-relationship between disaster and development, as well as the regulations and application of science and technology in disaster management and disaster risk management in India.

UNIT – I **8 Hours**

INTRODUCTION TO DISASTERS:

Understanding the concepts and definitions of Disaster, Hazard, Vulnerability, Resilience, Risks, Capacity, Disaster and Development, and Disaster Management. Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warming Systems, building design and construction in highly seismic zones, retrofitting of buildings.

UNIT – II **8 Hours**

DIFFERENT DISASTERS:

Causes, Impacts: Geological Disasters (earthquakes, landslides, tsunami), Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder, storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire). Technological Disasters (electrical, chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, mining, road and rail accidents) Global Disaster Trends, Emerging Risks of Disasters, Climate Change and Urban Disasters.

UNIT – III **8 Hours**

RISK REHABILITATION AND RECOVERY:

Disaster Management Cycle, Pre-Disaster, Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Capacity Development, Awareness During Disaster, Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation, Post-disaster, Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment.

UNIT – IV **8 Hours**

INTER-RELATIONSHIP BETWEEN DISASTERS & DEVELOPMENT:

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc., Climate Change Adaptation, IPCC Scenario and Scenarios in the context of specific region, Relevance of indigenous knowledge, appropriate technology, and local resources.

UNIT – V **8 Hours**

DISASTER RISK MANAGEMENT IN INDIA:

Hazard and Vulnerability profile of India, Mega disasters of India, Emergency Management Systems (EMS): Emergency medical and essential public health services, response and recovery operations, reconstruction, and rehabilitation. Disaster Management Act and Policy, Disaster Safe Designs and Constructions S&T Institutions for Disaster Management in India

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the concepts of disaster, various types of disasters, causes and their impact on environment and society.
CO2	Discuss vulnerability, risk rehabilitation and recovery, disaster preparedness.
CO3	Discuss the impacts and relation between the disasters and development.
CO4	Summarize the hazards and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment, Act and Policies.

Text Books:	
1	Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2	Iyengar, "Natural Hazards in the Urban Habitat", C.B.R.I., Tata Mc graw Hill. Pub
3	Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4	Jagbir Singh, Disaster Management-Future Challenges & Opportunities, I.K. International Publishing House.

Reference Books:	
1	R B Singh, Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, 2006.
2	Brig Khanna & Nina Khanna, Disasters: Strengthening Community Mitigation and Preparedness, New India Publishing Agency – NIPA, 2011.

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Question paper pattern:

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• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											1
CO2	1	1				1	1					1
CO3	1	1		1		1						1
CO4	1											1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**SOFTWARE APPLICATION LAB**						
Course Code	**22CVL606**						
Category	**Professional Core Course Lab (PCCL)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	0	**0**	**2**	**0**	**2**	**25**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: To attain skill sets to analyze structure-using software. Learn the application of MS Excel and STAAD PRO to solve Civil Engineering problems.

UNIT – I **14 Hours**

Applications of MS Excel

i) Design of doubly reinforced rectangular beams
ii) Design of two way slabs.
iii) Design of Stair case
iv) Design of isolated footing.
v) Preparation of Bar bending schedules for the above RCC Elements
vi) Preparation of mix design as per IS 10262:2019.

UNIT – II

STAAD Pro **11 Hours**

i) Introduction to STAAD Pro
ii) Analysis and Design of a Simply Supported Beam carrying UDL and a Column Carrying Axial Load
iii) Analysis and Design of Portal Frames
iv) Analysis and Design of a Steel Roof Truss
v) Analysis and Design of a Framed Structure Building

Course Outcomes: The students will be able to	
CO1	Understand the applications of software in analysing different RC structural components.
CO2	Develop worksheets for different Civil Engineering problems using MS excel.
CO3	Understand the Design of a Framed Structure using software

Teaching & Learning Process:
Chalk and talk, Powerpoint presentations, Animations and Videos and experiential learning in Laboratory.

Text Books:	
1	Learning Bentley Staad.Pro V8I for Structural Analysis – Sham Tickoo, Dreamtech Press New Delhi, ISBN-13 - 978-9351198093
2	Design of Reinforced Concrete Structures- Unnikrishnan and Devadas Menon, 4th Edition, 2021, McGraw Hill, New Delhi, ISBN 978-9354601026
3	An Introduction to EXCEL for Civil Engineers (2016)- Gunthar Pangaribuan- E book
3	IS 456:2000 - Plain and reinforced concrete - Code of practice
4	IS 10262:2019 - Concrete Mix Proportioning - Guidelines

Reference Code Books:	
1	IS 456:2000 - Plain and reinforced concrete - Code of practice
2	IS 10262:2019 - Concrete Mix Proportioning - Guidelines

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1				3							1
CO2	1				3							1
CO3	1		1		3			3				1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**INTRODUCTION TO TECHNICAL PAPER WRITING**						
Course Code	**22CVT607A**						
Category	**Ability Enhancement Course (AEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	1	**0**	**0**	**0**	**1**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 01 Hours**		

Course Learning Objectives: To understand the technique to improve technical report writing skills and level of readability. And to learn about what write in contents section of a technical report. Analyze the contents of literature. Create a typical technical article.

UNIT – I	**3 Hours**
Planning and preparation, word order, breaking up long sentences, structuring paragraphs and sentences, being concise and removing redundancy, avoiding ambiguity and vagueness.	
UNIT – II	**3 Hours**
Clarifying who did what, highlighting your findings, hedging and criticizing, Paraphrasing and plagiarism, sections of paper, Abstracts, Introduction.	
UNIT – III	**3 Hours**
Review of the literature, literature gap, objectives, methods, results, discussion, conclusions and the final check.	
UNIT – IV	**3 Hours**
Key skills needed when writing a title, key skills needed when writing an abstract, key skills needed when writing an introduction, skills needed when writing a review of the literature.	
UNIT – V	**3 Hours**
Key skills needed when writing the methods, key skills needed when writing the results, skills needed when writing a discussion, skills needed when writing the conclusions.	

Course Outcomes: The students will be able to	
CO1	Describe the importance of basics of technical writing skills.
CO2	Review and emphasise the result of literature review.
CO3	Discuss the importance of various sections of technical report.
CO4	Develop a complete conceptual technical report.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	Sharma, R.C. and K. Mohan. 2016. Business Correspondence and Report Writing. Fifth Edition. New Delhi: Tata McGraw Hill
2	Raman, Meenakshi and Sangeeta Sharma, 2011. Technical Communication: Principles and Practice. Second Edition. New Delhi: Oxford University Press.
3	Gerson, Sharon J and Stern M. Gerson. 2000. Technical Writing: Process and Product. Third Edition. India: Pearson Education Asia.

Reference Books:	
1	Goldbort (2006) writing for science, Yale University Press (Available on Google books)
2	Day R (2006) How to write and publish a scientific paper, Cambridge university Press.
3	Highman N (1998) Handbook of writing for the mathematical sciences, SIAM, Highman's book.

4	AdianWallwork, English for writing research papers, Springer New York Dordrecht Heidelberg London, 2011

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5^{th} week of the semester
2. Second test at the end of the 10^{th} week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4^{th} week of the semester
2. Second assignment at the end of 9^{th} week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities / Seminar / Quiz will be for 50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											
CO2	1	1										
CO3	1	1								1		1
CO4	1	1								1		1

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**INTRODUCTION TO REAL ESTATE MANAGEMENT**						
Course Code	**22CVT607B**						
Category	**Ability Enhancement Course (AEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**15**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 02 Hours**		

Course Learning Objectives:

To offer hands on experience that is vital to excel in the real estate market by understanding the principles and practices of real estate.

To explore real-world scenarios, best practices and effective management techniques for competing successfully in today's dynamic global markets.

UNIT – I **3 Hours**

REAL ESTATE MARKET:

Real estate scope, Classification of real estate activities and peculiarities, Factors affecting real estate market - role of government in real estate market, Statutory provisions, laws, rules, and regulations application, Land use controls in property development

UNIT – II **3 Hours**

PARTICIPANTS AND STAKEHOLDERS:

Role, Scope, Working characteristics and Principal functions of real estate participants and stakeholders - real estate consultants and their activities - Roles and responsibilities of property managers, Good practices and managerial responsibilities.

UNIT – III **3 Hours**

REAL ESTATE DEVELOPMENT:

Functions of real estate development like project formulation, Feasibility studies, Risk management, Marketing/advertising, Post construction management- real estate investment, Sources and related issues.

UNIT – IV **3 Hours**

DOCUMENTATION:

Interest rates in real estate - documentation in real estate processes - Transfer of titles and title records - Real estate appraisal

UNIT – V **3 Hours**

REAL ESTATE MANAGEMENT SKILLS:

Promote innovation within team, Project team building, Motivation techniques, Legal framework

Course Outcomes: The students will be able to	
CO1	Understand the classification, factors affecting and regulations in real estate market.
CO2	Reiterate the roles, responsibilities, rights and liabilities of different real estate stakeholders.
CO3	Describe the functions of real estate management and related issues.
CO4	Summarize the documentation procedures for different real estate and skills needed for real estate management.

Teaching & Learning Process:
Chalk and talk, Power point presentations.

Text Books:	
1	A.K.Jain, “Real Estate Management”, Discovery Publishing House, 2013

2	Mike E. Miles, "Real Estate Development- Principles and process", 5th Edition, 2015
3	Institute of Real Estate, "Principles of Real Estate Management", 18th Edition, 2023

Reference Books:	
1	Ashwinder R Singh, "Master Residential Real Estate" Zebra learn books,2023

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5thweek of the semester
2. Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3									2		
CO2						3					2	
CO3								2			2	1
CO4			2			3			2			1

High: 3, Medium: 2 & Low: 1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**MS OFFICE FOR CIVIL ENGINEERS**						
Course Code	**22CVT607D**						
Category	**Ability Enhancement Course / Skill Enhancement Course (AEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	1	**0**	**0**	**0**	**1**	**15**	**01**
CIE Marks: 50	**SEE Marks:50**		**Total Max. Marks: 100**		**Duration of SEE: 01 hour**		

Course Learning Objective: To understand the basics of MS office. To create the documents using MS word. To develop data sheets and charts using MS Excel. To design power point presentation using MS office.

UNIT – I **3 Hours**

INTRODUCTION MS WORD:

Usage of various tools of tool bar – Open, Save document, Style, Font, Size of text, Text alignment, Line Spacing, Inserting Bullets and Numbering, Insert table, pictures, shapes, charts, Inserting page breaks and section breaks, Inserting header and footer, Inserting equations and symbols, Setting size, orientation, margins, columns using page layout tool, spelling check and grammar using references tool.

UNIT – II **3 Hours**

REPORT WRITING USING MS WORD:

Generation of table of contents, List of figures, List of tables. Referencing styles, proofing and printing.

UNIT – III **3 Hours**

INTRODUCTION TO MS EXCEL:

Introduction to excel, formatting excel work book, Perform calculations with functions, sort and filter data with excel, create effective charts and present data visually and graphically, analyse data using pivot tables and pivot charts, protecting and sharing of workbook, use macros to automate tasks.

UNIT – IV **3 Hours**

INTRODUCTION TO MS POWER POINT:

Setting up power point environment, creating slides and applying various tools, working with bullets and numbering, working with objects, hyperlinks and action buttons, usage of smart art and tables, animation and slide transition.

UNIT – V **3 Hours**

PREPARATION OF POWER POINT PRESENTATION FOR PROJECT:

Using templates and create own design.

Teaching & Learning Process:
Power point presentations, videos and hands on training.

Course Outcomes: At the end of the course the student will be able to:	
CO1	Understand the basics of MS office.

CO2	Create the documents using MS word.
CO3	Develop data sheets and charts using MS Excel.
CO4	Design of power point presentation using MS office.

Text Books:	
1	Randy Nordell, Kathleen Stewart, Annette Easton and Pat Graves, "Microsoft office 365: In practice". McGrawhill 1st Edtion, 2023, ISBN10: 1266773150
2	Mansifield and Ron, "Working in Microsoft office". Tata McGrawhill, 2008, ISBN:9780074632673
3	Jow Habraken, "Microsoft office 2003 all in one". Que 1st edition, 2003, ISBN:0789729369

Reference Books:	
1	Leonard J Ledger , Microsoft Office 365 For Beginne, Teams & Access, July 2023.
2	Tom Bunzel, "Sams teach yourself Microsoft office power point". Sams 1st edition, 2003, ISBN:0672325551

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					3				3	3		3
CO2					1				1	1		2
CO3					1				1	1		2
CO4					1				1	2		2

High-3, Medium-2 & Low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**WATER AND WASTEWATER TREATMENT**						
Course Code	**22CVU701**						
Category	**Integrated Professional Core Course (IPCC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**2**	**0**	**5**	**50**	**04**
CIE Marks: 50			**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Objectives: This Course will enable the students to	
1	Analyse the variations of water demand, sources, collection and conveyance system, and quantify the amount of water requirement for a community.
2	Study the drinking water quality, standards, qualitative analysis and various treatment methods to attain the required water quality standards.
3	Apply the mind to learn and understand the importance of providing the water carriage system of sewerage at all places, quantification and characterization of sewage.
4	Acquire the knowledge and importance of waste water treatment and disposal with sustainable concept.
5	Understand and design of different unit operations and unit process involved in water and wastewater treatment process.

Unit No.	Syllabus	No. of Hours
I	**INTRODUCTION:** Water supply engineering, importance and necessity of planned w/s, water treatment, importance and reliability of water works. **WATER DEMANDS:** Various types, total requirement of water for a town or a city, per capita demand, factors affecting percapita demand, variations in demand, factors affecting losses and wastes, effect of variations in demand on the design capacities of water supply components, design periods, population data and population growth, population forecasting methods.	**08**
II	**SOURCES:** Surface and subsurface sources – suitability with regard to quality and quantity. **COLLECTION AND CONVEYANCE OF WATER:** Intakes, types of intakes. Conveyance of water; open channel, aqueducts, tunnels, flumes, pipes of different types, joints. **QUALITY OF WATER:** Wholesome water, impurities in water, physical tests, chemical tests, biological tests, standards of water quality. Maintenance of purity of water – water borne diseases, suitability of water for trade purposes.	**08**
III	**WATER TREATMENT AND DISTRIBUTION:** General introduction, objectives of water treatment, methods of water treatment, screening, aeration, plain sedimentation, sedimentation with coagulation, filtration, types of filters – sand filters, pressurefilter-operational problem in filters. **DISINFECTION OF WATER:** Requirements of disinfectants, methods of disinfection; disinfection, chlorination, chlorine demand, breaking point chlorination, super chlorination, de-chlorination, residual chlorine, miscellaneous treatments.	**08**

	DISTRIBUTION: Methods of water distribution- gravity, pumping, combined gravity and pumping system. Dead end, radial, circular system, Hardy cross method, Hazen William formula.	
IV	**SANITARY ENGINEERING:** Introduction, types of sewage and types of sewerage system, components of sewerage system. System of sanitation, methods of collection, conveyance system with its merits and demerits, water carriage system with its merits and demerits. Sewerage system, separate, combined and partially separate systems with their merits and demerits, comparison of these studies, patterns of collection system. **QUANTIFICATION OF SEWAGE:** Sources of sewage, factors affecting sewage, determination of rainfall intensity, quality of storm water, the rational method, runoff coefficient, empirical formula for rainfall intensities, time concentration, numerical problems. **CHARACTERISATION OF SEWAGE:** Physical, chemical and biological characteristics, decomposition of sewage, examination and sampling of sewage, solids- total solids, volatile solids, suspended solids, dissolved solids, fixed solids, determination of DO, BOD rates, COD, Chlorides and Sulphides, Nitrogen, P^H, oil and grease, fat.	**08**
V	**TREATMENT AND DISPOSAL OF SEWAGE:** Classification of treatment processes; screening, grit removal, oil and grease removal, sedimentation design, sedimentation aided with coagulation design, treatment through biological filtration, activated sludge process design, TF's, rotatory biological contactors (RBC), oxidation ponds and aerated lagoons, anaerobic treatment; septic tank, Imhoff tanks, sludge treatment, sludge drying. **DISPOSAL OF SEWAGE:** Disposal by dilution, land disposal, sewage farming.	**08**

Expt. No	**LABORATORY EXPERIMENTS**	**No. of Sessions**
1	Determination of Acidity and Alkalinity, pH and Turbidity.	**10**
2	Determination of Hardness by EDTA method.	
3	Determination of Chlorides in drinking water sample.	
4	Determination Residual Chlorine and Chlorine demand.	
5	Determination of D.O content.	
6	Determination of Total solids in Municipal sewage.	
7	Determination of BOD of Combined wastewater.	
8	Determination of C O D of Combined waste water.	
9	Determination of Optimum Coagulant dosage (ALUM)	
10	Virtua Lab: Determination of MPN and C O D of Combined waste water.	

Course Outcomes: At the end of the course the student will be able to	
CO1	Analyse the various water demand, quantify the requirement, selection of suitable source and plan for suitable intake structures for supply water for a community.
CO2	Evaluate the water source for physical, chemical and biological characteristics, select and design a suitable treatment processes for the source and also a suitable distribution methods to fulfill the various water demand of a society.
CO3	Apply the knowledge to manage the sewage and sewerage systems, quantify the sewage generated

	by various activities and also its characteristics.
CO4	Plan and design a suitable water treatment process's, distribution methods and also use various laboratory analytical methods for water analysis.
CO5	Plan and design a suitable wastewater treatment process's, disposable methods and also use various laboratory analytical methods for wastewater analysis.

Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation, animations, visit to in around water and waste water treatment plants, disposal and reuse Units.

Suggested Text Book(s):	
1	Water Supply and Sewerage, Steel. E. W. & Terence J. M. Ghees, Mc Graw – Hill International Book Co. 1979
2	Water Supply & Sanitary Engineering, G. S. Birdie and J. S. Birdie, Dhanpat Rai Publishing Company (2015, Ninth Edition)
3	Wastewater Engineering – S. K. Garg, Khanna Publishers 2017
4	Environmental Engineering II – B. C. Punmia and Ashok Jain, 2010
Suggested Reference Book(s):	
1	Wastewater Treatment, Disposal and Reuse, Metcalf and Eddy Inc. Tata Mc Graw Hill Publications (2003 Edition).
2	Water and Wastewater Technology-SI Version, Hammer. M. J. (1986), 2nd Edition, John Wiley and Sons.
3	Environmental Engineering, Peavy, H. S., Rowe, D. R. and Tchobanoglous, G. McGraw Hills, New York 1985.
4	Karia G.L., and Christian R.A, "Wastewater Treatment Concepts and Design Approach", Prentice Hall of India Pvt. Ltd., New Delhi. 3rd, Edition, 2017
5	Howard S. Peavy, Donald R. Rowe, George T, "Environmental Engineering" - Tata McGraw Hill, New York, Indian Edition, 2013

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(i) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(ii) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for

25 Marks and scaled down to 05 Marks.

- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(iii)Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

CIE score = (Test 1 + Test 2) × 0.6 + Laboratory Component

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO – PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1				3	3					1
CO2	2	1		1		3	3					1
CO3	2	1				3	3					1
CO4	2	1	1			3	3					1
CO5	2	1				3	3					1

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ESTIMATION AND VALUATION**						
Course Code	**22CVU702**						
Category	**Integrated Professional Core Course (IPCC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**2**	**0**	**4**	**50**	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives:
To inculcate the knowledge of measuring the quantity and checking the executed quantity in civil Engineering works, to develop the knowledge of calculating the rate of items of work using civil engineering methods, to understand the specification of all the civil engineering works to be executed as per the standards/design and to gain knowledge of land appreciation and depreciation value.

UNIT – I **8 Hours**
ESTIMATION:
Study of various drawings with estimates, important terms, Units of measurement, Different type of estimates, Approximate methods of estimating buildings, Cost of materials.
Abstract methods of taking out quantities and cost– Long and short wall method, Centre line method.
Preparation of detailed and abstract estimates Buildings, RCC framed structures with all Building components.

UNIT – II **8 Hours**
ESTIMATION (continued):
Preparation of detailed and abstract estimates for the following Civil Engineering works-
Estimation of wooden joineries such as doors, Windows and ventilators;
Estimation of manhole and septic tanks, RCC Culverts; Steel truss (Fink and Howe truss)

UNIT – III **8 Hours**
SPECIFICATIONS:
Definition of specifications, Objective of writing specifications, Essentials in specifications, General and detailed specifications of common item of works in buildings.
RATE ANALYSIS:
Definition and purpose, Working out quantities and rates as per SR for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, Centering and form work for different RCC items, wood and steel works for doors, windows and ventilators.

UNIT – IV **8 Hours**
CONTRACT MANAGEMENT:
Invitation to tender, Prequalification, Pre-tender study, Administrative approval & Technical sanction, Bid submission and Evaluation process. Earnest money deposit, Security deposit,
Types of contract, Essentials of contract agreement- Legal aspects, Penal provisions on breach of contract, Acceptance of contract documents, Termination of contract, Preparation of bills, Indian contract act, Arbitration.

UNIT – V **8 Hours**
VALUATION:
Definitions of terms used in valuation process, Purpose of valuation, Cost, Estimate, Value and its relationship, Capitalized value, Freehold, Lease hold and Easement, Sinking fund, Depreciation– methods of estimating depreciation, RBI inflation formula, RERA.

TECHNIQUES:
Market analysis, Legal and political analysis, The role of valuation in real estate investment, Process and methods of valuation: Rent fixation, Valuation for mortgage, Valuation of land.

Expt. No	LABORATORY EXPERIMENTS	No. of Sessions
1	Introduction to Schedule of Rates (SR) – Structure, Unit Rates, and Item Codes	**10**
2	Estimation of wooden joinery components- Doors and types.	
3	Estimation of wooden joinery components- Windows and types.	
4	Rate analysis of earthwork in excavation in foundation, lime concrete in foundation.	
5	Rate analysis of First class brickwork in superstructure, cement concrete.	
6	Rate analysis of Plastering, damp proof course and painting.	
7	Drafting Invitation to Tender and Bid Submission.	
8	Preparation of Contract Documents and Evaluation of Bid.	
9	Estimation of Depreciation Using Different Methods.	
10	Valuation of Land using Market Analysis.	

Course Outcomes: The students will be able to	
CO1	Understand the fundamental concepts of estimation.
CO2	Perform detailed and abstract estimates for construction works.
CO3	Conduct rate analysis and determine the cost of materials.
CO4	Analyse and apply the principles of valuation.
CO5	Gain knowledge of contract management processes.

Teaching & Learning Process:
Chalk and talk, Power point presentations.

Text Books:	
1	Estimating & Costing, B. N. Dutta, Chand Publisher, 28th Edition, 2021.
2	Estimating & Specification - Charotar Publishing House Pvt. Ltd.; 17th Edition, 2017.
3	Estimating, Costing, Specification and Valuation in Civil Engineering, Chakraborti; 29th Edition, 2006.
References:	
1	Estimating & Costing- G. S. Birdie, Dhanpath Rai and sons: New Delhi 2014.
2	Contracts and Estimates, B. S. Patil, 4th Edition University Press, 2015.
3	Estimating and Costing (Civil), D. D. Kohli and R.C. Kohli, S Chand, 13th Edition.
4	Quantity Surveying- P. L. Basin S. Chand, 3rd Edition, New Delhi, 2003.
5	Schedule of Rates book, 2024 (KPWD/CPWD)
6	IS 1200:1992, IS 3861:2002- Method of measurement of building and Civil Engineering works.
7	SP 27:1987- Handbook of method of measurement of buildings.

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):
The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(iv) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(v) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(vi) Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

CIE score = (Test 1 + Test 2) × 0.6 + Laboratory Component

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO – PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3				1	1						
CO2		3	1		2	1						
CO3			1		2	1						
CO4	1		1			1					1	
CO5	2		1			1					1	

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**DESIGN OF RC AND STEEL STRUCTURES**						
Course Code	**22CVU702**						
Category	**Professional Core Course (PCC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**2**	**0**	**0**	**5**	**50**	**04**
CIE Marks: 50			**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Objectives:	
1	To gain knowledge about the behaviour of RC and Steel structural elements and understand field problems in construction.
2	To learn the Design and detailing of various RC structural elements based on Limit state design as per latest Code of Practice IS: 456, IS: 3370 [Part IV].
3	To learn the Design and detailing of various Steel structures and their connections based on Limit state design as per latest Code of Practice IS: 800.

Syllabus	**No. of Hours**
Part - A	
Design and Detailing of Rectangular Combined Footing - Slab and Beam Type.	**09**
Design and Detailing of Retaining Walls [Cantilever and Counter fort Type].	**08**
Design and Detailing of Circular and Rectangular Water tanks resting on a ground and free at top [Flexible base and Rigid base] using IS: 3370 [Part IV] only.	**08**
Part - B	
Design and Detailing of Roof Truss [Forces in the members to be given].	**09**
Design and Detailing of Gantry Girder.	**08**
Design and detailing of Bolted and Welded plate girder	**08**

Course Outcomes: At the end of the course the student will be able to	
CO1	Analyze and Design rectangular combined footing.
CO2	Analyze and Design RCC retaining wall and water tank.
CO3	Analyze and design roof truss.
CO4	Analyze and design gantry and plate girder.
CO5	Detail RCC and steel structures based on the design.

Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation, animations.

Suggested Text Book(s):	
1	Structural Design and Drawing of Reinforced Concrete and Steel - N Krishna, Oxford University Press.
2	Reinforced Concrete Structures - B C Punmia – Laxmi Publishers.
3	Design of Steel structures - N. Subramnian, Oxford University Press.
4	Design of Steel structures - Negi, Tata McGraw Hill Publishers.
5	IS: 456, IS: 3370 Code [Part IV], SP 16 – for RC Structures.

	IS: 800 Code, IS Steel table – for Steel Structures.

Suggested Reference Book(s):	
1	Reinforced Concrete Design, S N Sinha, McGraw Hill publication.
2	Structural Design and Drawing, Krishnamurthy [Concrete structures], New Delhi, McGraw Hill publication.
3	K. S Sai.Ram, Design of Steel structures, Pearson Publishers.
4	Dr. Ramachandra and Virendra Gehlot, Design of Steel Structures 1 & 2, SCEINTIFIC [INDIA] Publishers.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions, selecting one full question from each unit / module.

CO - PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3					2				1
CO2	3	2	3					2				1
CO3	3	2	3					2				1
CO4	3	2	3					2				1
CO5	2	2	3					2				1

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru – 560056
Department of Civil Engineering

Course Title	**ENVIRONMENTAL IMPACT ASSESSMENT**						
Course Code	**22CVT704A**						
Category	**Professional Elective Course (PEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives:
To foresee the potential environmental problems that would arise out of a proposed development, examine and select the suitable methodology for the various project options and predict significant environmental impact, identify the appropriate abatement and mitigating measures for the implementation of projects.

UNIT – I **8 Hours**
INTRODUCTION TO ENVIRONMENTAL IMPACT ASSESSMENT (EIA):
Ecological Factors and Development Activity and, EIA, Rapid and Comprehensive EIA, EIS, FONSI. Need for EIA Studies, Baseline Information, Step-by-step procedures for conducting EIA, Limitations of EIA.

UNIT – II **8 Hours**
METHODOLOGIES OF ENVIRONMENTAL IMPACT ASSESSMENT:
Frame work of Impact Assessment, Developmental Projects- Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies, Techniques of EIA.

UNIT – III **8 Hours**
ENVIRONMENTAL ATTRIBUTES:
Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

UNIT – IV **8 Hours**
PUBLIC PARTICIPATION PROGRAM :
Public Participation in Environmental Decision making, Practical Considerations in preparing Environmental Impact Assessment and Statements, Salient Features of the Project Activity-Environmental Parameter Activity Relationships - Matrices.

UNIT – V **8 Hours**
ENVIRONMENTAL IMPACT ASSESSMENT FOR PROJECTS:
EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

Course Outcomes: The students will be able to	
CO1	Explain systematic identification and evaluation of the potential impacts of proposed projects on components of the total environment.
CO2	Apply and identify the measures to be adopted to avoid environmental impact and reinforce a commitment in an organized and systematic approach by involving agencies and public participation.
CO3	Develop environmental protection mechanism for the proposed projects to protect and restore good environment with sustainable development.
CO4	Analyze and interpret Environmental Impact Assessment (EIA) reports, Environmental Management Plans (EMPs), and related regulatory frameworks to ensure compliance and effective environmental management.

CO5	Critically evaluate the role of monitoring, auditing, and post-project assessment in ensuring the effectiveness of environmental protection measures and achieving sustainable development goals.

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	Methodologies for Environment Impact Assessment - Anjaneyalu. Y, B S publications. 3rd Edition: Published in 2021.
2	Environment Impact Assessment – N.S. Raman, A.R Gajbhiye and S.R. Khandeshwar, dreamtech Press. 2019.
3	Environment Impact Assessment – R.R. Barthwal, New Age International Publishers. Third Edition 2024.

Reference Books:	
1	Environmental Impact Analysis-Jain R.K.-Van Nostrand Reinhold Co. 2nd edition published in 1980.
2	Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.2006
3	Environment Impact Assessment - Larry W. Canter - McGraw HillA 2nd edition published in 1996.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.

- ✓ Selecting one full question from each unit / module.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3					2	2					
2		3				3				3		
3	3						3		3		3	
4			3			3						
5	2			3				3		3		

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Department of Civil Engineering

Course Title	**REINFORCED EARTH STRUCTURES AND GEOSYNTHETICS**						
Course Code	**22CVT704B**						
Category	**Professional Elective Course (PEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: This course will enable students to: Create an understanding of the latest technique such as reinforcing the soil, Analyze the concept of reinforced earth, so as to ascertain stability of Reinforced Earth structures, Understand the different reinforcing materials that can be used efficiently in soils, understand design concepts of different Reinforced earth structures including introductory concepts of Foundations resting of Reinforced earth soil bed.

UNIT – I **8 Hours**

BASICS OF REINFORCED EARTH CONSTRUCTION:

Definition, Historical Background, Components, Mechanism and Concept, Advantages and Disadvantage of reinforced earth Construction, Sandwich technique for clayey soil.

GEOSYNTHETICS AND THEIR FUNCTIONS:

Historical developments, Recent developments, manufacturing process woven and non-woven, Raw materials – Classification based on materials type – Metallic and Non-metallic, Natural and Man-made, Geosynthetics.

PROPERTIES AND TESTS ON MATERIALS PROPERTIES:

Physical, Chemical, Mechanical, Hydraulic, Endurance and Degradation requirements, Testing and Evaluation of properties, Typical numerical problems.

UNIT – II **8 Hours**

DESIGN OF REINFORCED EARTH RETAINING WALLS:

Concept of Reinforced earth retaining wall, Internal and external stability, Selection of materials, Typical design problems.

SOIL NAILING TECHNIQUES:

Concept, Advantages and limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, Typical design problems.

UNIT – III **8 Hours**

DESIGN OF REINFORCED EARTH FOUNDATIONS:

Modes of failure of foundation, Determination of force induced in reinforcement ties – Location of failure surface, tension failure and pull-out resistance, length of tie and its curtailment, Bearing capacity improvement in soft soils, General guidelines, Typical design problems.

UNIT – IV **8 Hours**

GEOSYNTHETICS FOR ROADS AND SLOPES:

Roads - Applications to Temporary and Permanent roads, Role of Geosynthetic in enhancing properties of road, control of mud pumping, enhancing properties of subgrade, Typical design problems.

Design requirements Slopes – Causes for slope failure, Improvement of slope stability with Geosynthetic, Drainage requirements, Construction technique, Typical design problems.

UNIT – V **8 Hours**

GEOSYNTHETICS - FILTER, DRAIN AND LANDFILLS:

Filter and Drain – Conventional granular filter design criteria, Geosynthetic filter design requirements, Drain and filter properties, Design criteria – soil retention, Geosynthetic permeability, anti-clogging, survivability and durability, Typical design problems.

Landfills – Typical design of Landfills – Landfill liner and cover, EPA Guidelines, Barrier walls for existing landfills and abandoned dumps, Typical design problems.

Course Outcomes: The students will be able to	
CO1	Identify, formulate reinforced earth techniques that are suitable for different soils and in different structures.
CO2	Analyse how the polymeric composite manufactured, and what factors were used to increase the tensile strength
CO3	Design retaining structures/slopes/cuts using soil nailing technique.
CO4	Determine the load carrying capacity of Foundations resting on RE soil bed and asses the use of Geo synthetics in drainage requirements and landfill designs.
CO5	Explain the concepts of using Geosynthetics as filter, drainage and materials and design landfill as per standard guidelines.

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	Koerner, R.M. Designing with Geosynthetics. Vols. 1& 2, 6th Edition, Xlibris Corporation, USA, 2012.
2	Koerner. R.M. Wesh, J.P, "Construction and Geotechnical Engineering using synthetic fabrics", Wiley Inter Science, New York, 1980.
3	Sivakumar Babu G. L., "An introduction to Soil Reinforcement and Geo synthetics", Universities Press, Hyderabad, 2005.
4	Swami Saran, "Reinforced Soil and its Engineering Applications", Tech sar Pvt. Ltd, 3rd Edition, 2017.
5	Venkattappa Rao, G., & Suryanarayana Raju., G. V.S, "Engineering with Geosynthetics", Tata McGraw Hill publishing Company Limited, New Delhi, 2018.

Reference Books:	
1	Jones, "Earth reinforcement and Soil structure", CJEP Butterworths, London, 1996.
2	Ingold, T.S. & Millar, K.S, "Geotextile Hand Book", Thomas, Telford, London, 1996.
3	Hidetoshi Octial, Shigenori Hayshi& Jen Otani, "Earth Reinforcement Practices",Vol. I, A.A. Balkema, Rotterdam, 1992.
4	Bell F.G, "Ground Engineer's reference Book", Butter worths, London, 1987.
5	Ingold, T.S, "Reinforced Earth", Thomas, Telford, London, 1982.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs

and PSo.

- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1				2		2					1
CO2	1	3			2		2					1
CO3	1	3		3	2		2					1
CO4	1	3		3	2		2					1
CO5	1	3		3	2		2					1

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Department of Civil Engineering

Course Title	**DESIGN OF IRRIGATION & HYDRAULIC STRUCTURES**						
Course Code	**22CVT704C**						
Category	**Professional Elective Course (PEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objectives: Analyze and design of gravity and earth dams, Design spillways and aprons for diversion head works and design cross drainage works and chose appropriate canal works.

UNIT – I **08 Hours**

RESERVOIR PLANNING:

Introduction, classification of Reservoirs, Storage zones of a reservoir, Mass curve, fixing capacity of a reservoir, safe yield, problems, Reservoir sedimentation, life of a reservoir, economic height of a dam, Environmental effects of reservoirs.

UNIT – II **08 Hours**

GRAVITY DAMS:

Forces acting on a gravity dam, load combination for design, reaction of foundation and distribution of vertical stress at the base of dam - middle third rule, principal and shear stresses, modes of failure of dam – stability requirements.

UNIT – III **08 Hours**

EARTH DAMS:

Types of earth dams, causes of failure earth dams, safety against overtopping, standard slice method, stability of earth dam against horizontal shear developed at the base of the dam, check for free passage of water through earth dams, safety against piping, protection of upstream slope of an earth dam, protection of downstream slope of an earth dam.

UNIT – IV **08 Hours**

SPILL WAYS:

Introduction, essentials of a spillway, spillway components, factors affecting type & design of spillways. Ogee spillway. Energy dissipation below spillways.

UNIT – V **08 Hours**

DRAWING (Draw only sketch for the given design details without projected views on the working sheet):

- ✓ Surplus weir with stepped apron.
- ✓ Tank Plug sluice without tower head.
- ✓ Tank Plug sluice with tower head.
- ✓ Canal regulator.
- ✓ Earthen Bunds.

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand various aspects of Reservoir planning.
CO2	Analyse the design and construction of gravity dams.
CO3	Analyse the design and construction of earthen dams.
CO4	Design spillways and aprons for various diversion head works and select particular type of cross drainage work for canal network.
CO5	Prepare drawing for construction of various hydraulic structures

Text Books:	
1	Irrigation Engineering and Hydraulic Structures, S. K. Garg, 12th edition, Khanna Publishers, 2006.
2	Irrigation and Water Resources Engineering, Ashwa G. L., 6th edition, New age Publishers, 2005
3	Irrigation and Waterpower Engineering, B. C. Punmia, 16th edition, Laxmi Publishers, 2019.
4	Irrigation, Waterpower and Water Resources Engineering, K. R. Arora, 4th edition, Standard book house Publishers, 2014.

Reference Books:	
1	Dam hydraulics, D. L. Visher, W. H. Hager, 8th edition, Wiley Publishers, 2012.
2	Irrigation Water Resources and Water Power Engineering, P. N. Modi, 9th edition, Standard book house Publishers, 2008.
3	Irrigation Engineering, R. K. Sharma, 1st edition, S. Chand Publishers, 2017.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

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- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
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Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

- ✓ **Four** questions are to be set from Units 1, 2, 3 & 4 of which **Two** full questions are to be answered for 40 marks.
- ✓ **Two** questions are to be set from Unit 5 (excluding Earthen Bunds) of which **One** full question is to be

answered for 45 marks (drawings to be drawn for the given Data on the Drawing sheet).

- ✓ **One** Question is to be set from Earthen Bunds which is compulsory for 15 marks (To draw sketches for the given details on the drawing sheet).

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3			2							1
CO2	2	3			2							1
CO3	2		2				1			2		1
CO4	2		3		2		1					1
CO5	2		2		2		1					1

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Department of Civil Engineering

Course Title	**NATURAL DISASTER MITIGATION AND MANAGEMENT**						
Course Code	**22CVT704D**						
Category	**Professional Elective Course (PEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	0	0	0	3	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand fundamental concepts relevant to natural disasters, their significance, types, and factors that cause the disaster and disaster management cycle, apply the approaches of disaster risk reduction (DRR) and the inter-relationship between disaster and development, as well as the regulations and application of science and technology in disaster management and disaster risk management in India.

UNIT – I **8 Hours**

INTRODUCTION TO DISASTERS:

Understanding the concepts and definitions of Disaster, Hazard, Vulnerability, Resilience, Risks, Capacity, Disaster and Development, and Disaster Management. Basic principles of disasters management, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management, Early Warming Systems, building design and construction in highly seismic zones, retrofitting of buildings.

UNIT – II **8 Hours**

DIFFERENT DISASTERS:

Causes, Impacts: Geological Disasters (earthquakes, landslides, tsunami), Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder, storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire). Technological Disasters (electrical, chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, mining, road and rail accidents) Global Disaster Trends, Emerging Risks of Disasters, Climate Change and Urban Disasters.

UNIT – III **8 Hours**

RISK REHABILITATION AND RECOVERY:

Disaster Management Cycle, Pre-Disaster, Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Capacity Development, Awareness During Disaster, Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation, Post-disaster, Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment.

UNIT – IV **8 Hours**

INTER-RELATIONSHIP BETWEEN DISASTERS & DEVELOPMENT:

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc., Climate Change Adaptation, IPCC Scenario and Scenarios in the context of specific region, Relevance of indigenous knowledge, appropriate technology, and local resources.

UNIT – V **8 Hours**

DISASTER RISK MANAGEMENT IN INDIA:

Hazard and Vulnerability profile of India, Mega disasters of India, Emergency Management Systems (EMS): Emergency medical and essential public health services, response and recovery operations, reconstruction, and rehabilitation. Disaster Management Act and Policy, Disaster Safe Designs and Constructions S&T Institutions for Disaster Management in India

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand basic concepts, types and principles of disaster and disaster management.
CO2	Identify causes, impacts and types of natural and man-made disasters.
CO3	Apply disaster risk reduction strategies, including risk management, evacuation and rehabilitation.
CO4	Analyse the relationship between development, vulnerability and disaster risk.
CO5	Describe India's disaster risk management system, policies and institutional frameworks.

Text Books:	
1	Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2	Iyengar, "Natural Hazards in the Urban Habitat", C.B.R.I., Tata Mcgraw Hill. Pub.
3	Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011.
4	Jagbir Singh, Disaster Management-Future Challenges & Opportunities, I.K. International Publishing House.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5^{th} week of the semester and Second test at the end of the 10^{th} week of the semester.
- ✓ The makeup test at the end of the 15^{th} week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13^{th} week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:
• The question paper will have ten full questions carrying equal marks. • Each full question will be for 20 marks. • There will be two full questions (with a maximum of three sub - questions) from each unit. • Each full question will have sub - question covering all the topics under a unit. • The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1					2	1					1
CO2	1	2				2	1					1
CO3	1	2	2	2		2	1					1
CO4	1					2	1					1
CO5	1					2	1				1	1

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Department of Civil Engineering

Course Title	**TRAFFIC ENGINEERING**						
Course Code	**22CVT704E**						
Category	**Professional Elective Course (PEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	0	0	0	3	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To understand the fundamental knowledge of traffic engineering, scope, basic techniques for collecting and analysing traffic data, diagnosing problems with effective design of facilities and to apply probabilistic and queuing theory techniques for the analysis of traffic flow situations and emphasis the interaction of flow efficiency and traffic safety. Analyse the traffic issues including safety, planning, design, operation and Control by intelligent transport system and its applications in the present traffic scenario.

UNIT – I **8 Hours**

INTRODUCTION:

Definition, objectives of Traffic Engineering and scope of Traffic Engineering. Urban Traffic problems in India, Integrated planning of town, country, regional and all urban infrastructures,

TRAFFIC CHARACTERISTICS:

Road user characteristics, vehicular characteristics, static and dynamic characteristics, power performance of vehicles, Resistance to the motion of vehicles – Reaction time of driver – Problems on above.

UNIT – II **8 Hours**

TRAFFIC STUDIES:

Various types of traffic engineering studies, data collection, analysis objectives and method of study,

INTERPRETATION OF TRAFFIC STUDIES:

Classified traffic Volume at mid-block and intersections, PCU, origin and destination, spot speed, speed and delay, parking – on street parking & off street parking, Accident – causes, analysis measures to reduce accidents – problems on above.

UNIT – III **8 Hours**

TRAFFIC FLOW THEORIES:

Traffic flow theory, Green shield theory –correlation and regression analysis (linear only), Queuing theory and relevant problems.

STATISTICAL ANALYSIS:

Poisson's distribution and Normal Distribution, application to traffic engineering Traffic forecast – simulation techniques.

UNIT – IV **8 Hours**

TRAFFIC REGULATION AND CONTROL:

Driver, vehicle and road controls – Traffic regulations, one way, Traffic markings, Traffic signs, Traffic signals – Vehicle actuated and synchronized signals – Signals co-ordination. Webster's method of signal design, IRC method, traffic rotary elements and designs, traffic operation – Street lighting, Road side furniture, Relevant problems on above.

UNIT – V **8 Hours**

TRAFFIC SAFETY AND ENVIRONMENT:

Road accidents, Causes, effect, prevention, and cost, Street lighting, Traffic and environment hazards, Air and Noise Pollution, causes, abatement measures, Promotion and integration of public transportation, Promotion of non-motorized transport**.**

INTELLIGENT TRANSPORT SYSTEM:

Definition, Necessities, Application in the present traffic scenario.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the relation between various types of traffic engineering studies with respect to objectives, scope of traffic characteristics, regulation, and safety.
CO2	Explain the fundamental principles of statistics for analysing the traffic flow by various mathematical models to control and implement regulations based on environment and safety concern
CO3	Outline the relation between traffic flow, its regulation and control by improvising the various road elements with their design for safe traffic operations.
CO4	Analysing the impact of traffic on safety and environment and promoting the utilization of public transport system.
CO5	Compare the various types of vehicular transportation system for the better future traffic management and environmental concern

Textbook Books	
1	Traffic Engineering and Transport Planning 5th edition, L.R. Kadiyali- Khanna Publishers, New Delhi, 2015
2	Highway Engineering, 10th edition, Nandchand & Bros- Khanna & Justo, Roorkee (UA), 2019.
3	Traffic Engineering. - Matson and Smith:-Mc.Graw Hill and Co publisher, 2012.
4	Traffic flow theory – Drew- Mc. Graw Hill and Co publisher, 2015.
5	https://archive.nptel.ac.in/courses/105/105/105105215/- Traffic Engineering Nptel Video link
6	https://onlinecourses.nptel.ac.in/noc22_ce41/- Traffic Engineering Course material Nptel link

Reference Books	
1	Traffic Engineering, all edition, Pignataro- Prentice Hall publisher, 2015.
2	An introduction to traffic engineering- JotinKhistey and Kentlal- PHI publisher, 2019.
3	Traffic Engineering- Mc Shane &Roess- PHI publisher, 2019.

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.

- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		2								1
CO2	2	2	2									1
CO3	2	2	2									1
CO4	2	2			1		2					1
CO5		2	1									1

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Department of Civil Engineering

Course Title	**MATRIX METHOD OF STRUCTURAL ANALYSIS**						
Course Code	**22CVT704F**						
Category	**Professional Elective Course (PEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives:

To make students to learn principles of Structural Analysis, to implement these principles through different methods and to analyze various types of structures, to evaluate the force and displacement parameters of the structures by Flexibility and Stiffness matrix methods and to learn various solution techniques.

UNIT – I **8 Hours**

FUNDAMENTAL CONCEPTS:

Static and Kinematic indeterminacy, Concepts of stiffness and flexibility, Energy concepts, Principle of minimum potential energy and minimum complementary energy, Development of element flexibility and element stiffness matrices for truss, beam and grid elements, Geometric and materials non-linearity.

UNIT – II **8 Hours**

ANALYSIS USING FLEXIBILITY METHOD:

Force-transformation matrix using Flexibility method**,** Development of global flexibility matrix for continuous beams, plane trusses and rigid plane frames (having not more than six co-ordinates – 6x6 flexibility matrix), Analysis of continuous beams and rigid plane frames by flexibility method (having not more than 3 coordinates – 3x3 flexibility matrix).

UNIT – III **8 Hours**

ANALYSIS USING STIFFNESS METHOD:

Displacement-transformation matrix using Stiffness Method, Development of global stiffness matrix for continuous beams, plane trusses and rigid plane frames (having not more than six co-ordinates – 6x6 stiffness matrix), Analysis of continuous beams, plane trusses and rigid plane frames by stiffness method (having not more than 3 coordinates – 3x3 stiffness matrix).

UNIT – IV **8 Hours**

EFFECTS OF TEMPERATURE CHANGE AND LACK OF FIT:

Numerical problems on Flexibility and Stiffness method.

UNIT – V **8 Hours**

SOLUTION TECHNIQUES:

Solution techniques including numerical problems for simultaneous equation, Gauss elimination and Cholesky method, Bandwidth consideration, Newton-Raphson method and Modified Newton Method.

Course Outcomes: The students will be able to	
CO1	Understand the fundamental concepts of stiffness, flexibility and energy.
CO2	Apply the concepts of flexibility matrices.
CO3	Apply the concepts of stiffness matrices.
CO4	Apply knowledge of local and global coordinate system to develop displacement transformation matrices due to temperature change and lack of fit.
CO5	Elucidate solution techniques.

Teaching & Learning Process: Chalk and talk, Power-point presentations, Animations and Videos.

Text Books:

1. Weaver W and Gere J H, “Matrix Analysis of Framed Structures”, CBS publications, 1990, New Delhi.

2	Rajasekaran S, "Computational Structural Mechanics", PHI, 2001, New Delhi.
3	Madhujit Mukhopadhay and Abdul Hamid Sheikh, "Matrix and Finite Element Analysis of Structures", 2009, Ane Books Pvt. Ltd.
References:	
1.	H C Martin, "Introduction to Matrix Methods in Structural Analysis", International textbook company, McGraw Hill, 1993.
2.	A K Jain, "Advanced Structural Analysis", Nemchand Publications, 1996, Roorkee.
3.	Manikaselvam, "Elements of Matrix Analysis and Stability of Structures", Khanna Publishers, 2021, New Delhi.

Process of Assessment (both CIE and SEE):

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Continuous Internal Evaluation (CIE):

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- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
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- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		1								1
CO2	1	2		1								1
CO3	1	2		1								1
CO4	1	2		1								1
CO5	1	2		1								1

High-3, Medium-2 & low-1.

Course Title	**ECOLOGY & ENVIRONMENTAL IMPACT ASSESSMENT**						
Course Code	**22CVT705A**						
Category	**Open Elective Course (OEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives:

To foresee the potential environmental problems that would arise out of a proposed development, examine and select the suitable methodology for the various project options and predict significant environmental impact, identify the appropriate abatement and mitigating measures for the implementation of projects.

UNIT – I **8 Hours**

INTRODUCTION TO ECOLOGY & ENVIRONMENTAL IMPACT ASSESSMENT (EIA):

Ecological Factors and Development Activity and, EIA, Rapid and Comprehensive EIA, EIS, FONSI. Need for EIA Studies, Baseline Information, Step-by-step procedures for conducting EIA, Limitations of EIA.

UNIT – II **8 Hours**

METHODOLOGIES OF EIA:

Frame work of Impact Assessment. Developmental Projects- Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies, Techniques of EIA.

UNIT – III **8 Hours**

ENVIRONMENTAL ATTRIBUTES:

Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for Development Projects, Rapid and Comprehensive EIA.

UNIT – IV **8 Hours**

PUBLIC PARTICIPATION PROGRAM :

Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact Assessment and Statements, Salient Features of the Project Activity-Environmental Parameter Activity Relationships - Matrices.

UNIT – V **8 Hours**

EIA FOR PROJECTS:

EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

Course Outcomes: The students will be able to	
CO1	Explain systematic identification and evaluation of the potential impacts of proposed projects on components of the total environment.
CO2	Apply and identify the measures to be adopted to avoid environmental impact and reinforce a commitment in an organized and systematic approach by involving agencies and public participation.
CO3	Develop environmental protection mechanism for the proposed projects to protect and restore good environment with sustainable development.
CO4	Analyze and interpret Environmental Impact Assessment (EIA) reports, Environmental Management Plans (EMPs), and related regulatory frameworks to ensure compliance and effective

	environmental management.
CO5	Critically evaluate the role of monitoring, auditing, and post-project assessment in ensuring the effectiveness of environmental protection measures and achieving sustainable development goals.

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	Methodologies for Environment Impact Assessment - Anjaneyalu. Y, B S publications. 3rd Edition: Published in 2021.
2	Environment Impact Assessment – N.S. Raman, A.R Gajbhiye and S.R. Khandeshwar, dreamtech Press. 2019.
3	Environment Impact Assessment – R.R. Barthwal, New Age International Publishers. Third Edition 2024.

Reference Books:	
1	Environmental Impact Analysis-Jain R.K.-Van Nostrand Reinhold Co. 2nd edition published in 1980.
2	Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.2006
3	Environment Impact Assessment - Larry W. Canter - McGraw HillA 2nd edition published in 1996.

Process of Assessment (both CIE and SEE):

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- ✓ First assignment at the end of 4^{th} week and Second assignment at the end of 9^{th} week of the semester.
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- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
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- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.

- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub - questions) from each unit.
- Each full question will have sub - question covering all the topics under a unit.
- The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3					2	2					
2		3				3				3		
3	3						3		3		3	
4			3			3						
5	2			3				3		3		

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Department of Civil Engineering

Course Title	**OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION**						
Course Code	**22CVT705B**						
Category	**Open Elective Course (OEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives: To gain an historical, economic, and organizational perspective of occupational safety and health, to investigate current occupational safety and health problems and solutions, to identify the causes that influence occupational safety and health and to demonstrate the knowledge and skills needed to identify work place problems and safe work practice.

UNIT – I **8 Hours**

OCCUPATIONAL HAZARD AND CONTROL PRINCIPLES:

Safety, History and development, National Safety Policy. Occupational Safety and Health Act (OSHA), Occupational Health and Safety Administration - Laws governing OSHA and right to know. Accident – causation, Investigation, Investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation.

UNIT – II **8 Hours**

ERGONOMICS AT WORK PLACE:

Ergonomics task analysis, Preventing ergonomic hazards, Work space envelops, Visual ergonomics, Ergonomic standards and Ergonomic programs. Emergency response - Decision for action – purpose and considerations.

UNIT – III **8 Hours**

FIRE PREVENTION AND PROTECTION:

Fire Triangle, Fire development and its severity, Effect of enclosures, Early detection of fire, Classification of fire, Fire extinguishers and Fire suppression system, Fire hydrant, Yard hydrant, Sprinkler system, Fire drill, Fire Fighting NOC, Introduction to provisions of fire and life safety as per National Building Code of India, Electrical safety.

UNIT – IV **8 Hours**

HEALTH CONSIDERATIONS AT WORK PLACE:

Types of diseases and their spread, Health emergency. Personal Protective Equipment (PPE) – Types and advantages, Effects of exposure and Treatment for engineering industries, Municipal solid waste. Environment Management Plans (EMP) for safety and sustainability.

UNIT – V **8 Hours**

OCCUPATIONAL HEALTH AND SAFETY CONSIDERATIONS:

Handling of chemicals and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites. Policies, roles and responsibilities of workers, supervisors and managers.

Course Outcomes: The students will be able to	
CO1	Acquire knowledge on history of OSHA policies, laws and regulations.
CO2	Identify hazards in the workplace that pose a danger or threat to the safety or health of people.
CO3	Control unsafe or unhealthy hazards and propose methods to eliminate the fire hazards.
CO4	Discuss the role of health and safety in the workplace and effects of industries on environment.
CO5	Discuss workplace hazards, safety considerations and roles and responsibilities of workers, supervisors and managers.

Text Books:	
1	S Sharma, Vineet Kumar, "Safety, Occupational Health and Environmental Management in Construction". Khanna Publisher, 2013.
2	R K Jain, Sunil S Rao, "Industrial Safety, Health and Environment Management Systems". Createspace Independent Publishing Flat form, 2000.
3	Charles D Reese, "Occupational Safety and Health Fundamental principles and Philosophies", Tailor and Francis Ltd, 2017.

Reference Books:	
1	Sudhakar Paul T Rani, "Occupational Safety and Health", Createspace Independent Publishing Platform, 2018.
2	Rana S P, Goswami P K, and Indu Rathee, "Handbook of Occupational Safety and Industrial Psychology". S. Chand and Company Ltd, 2014.
3	Goetsch D. L., "Occupational Safety and Health for Technologists, Engineers and Managers", Prentice Hall Publishers, 2010.
4	National Building Code of India 2016 – Volume 1

Process of Assessment (both CIE and SEE):

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Semester End Examination (SEE):

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- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
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should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

Teaching & Learning Process:
Chalk and talk, Power point presentations, Animations and Videos and demonstrational learning

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2			2		3						1
CO2	2			2	2	3						1
CO3	2			2	2	3						1
CO4	2			2		3	2					1
CO5	2			2		3	2					1

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Department of Civil Engineering

Course Title	**INTELLIGENT TRANSPORTATION SYSTEM**						
Course Code	**22CVT705C**						
Category	**Open Elective Course (OEC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	0	0	0	3	40	03
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objective: To have an awareness and scope of transport issues, such as, traffic safety, public transport, advanced vehicle management and control. Learn how Intelligent transport systems (ITS) involve the application of information technology and telecommunications to control traffic, inform travelers and drivers, operate public transport, automating payments, handle emergencies and incidents, operate commercial fleets and freight exchange, and automate driving and safety.

UNIT-1 **8 Hours**

Introduction to Intelligent Transportation Systems (ITS)

Basic elements of intelligent transportation systems (ITS), focusing on technological, systems and institutional aspects. Benefits of ITS -ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

UNIT-2 **8 Hours**

ITS functional areas:

Advanced traveler information systems; transportation network operations; commercial vehicle operations and intermodal freight.

UNIT-3 **8 Hours**

ITS Planning:

Public transportation applications, ITS and regional strategic transportation planning, including regional architectures.

UNIT-4 **8 Hours**

ITS Operations:

ITS and changing transportation institutions, ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS and sustainable mobility.

UNIT-5 **8 Hours**

ITS applications:

Travel demand management, electronic toll collection, and ITS and road-pricing. Automated Highway Systems- Vehicles in Platoons –ITS in World – Overview of ITS Implementations in developed countries, ITS in developing countries.

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to

CO1	Understand the fundamental components, benefits and technologies used in Intelligent Transportation systems including data collection and processing methods.
CO2	Analyze the functional areas of ITS such as traveler information systems, network operations, and commercial vehicle applications.
CO3	Apply ITS strategies in transportation planning and integration with regional and strategic frameworks to improve public mobility.
CO4	Evaluate the operational impacts of ITS on safety, security, institutional transformations, and sustainable transport initiatives.

CO5	Critically assess various ITS applications including electronic tolling, travel demand management, automated highways and global ITS practice.

Reference Books:	
1	Choudury M A and Sadek A, "Fundamentals of Intelligent Transportation Systems Planning" Artech House.
2	Pradip Kumar Sarkar, Amit Kumar Jain, "Intelligent Transport Systems", PHI Learning Publishers
3	Kan Paul Chen, John Miles, "Recommendations for World Road Association (PIARC)" ITS Hand Book 2000.
4	Sussman, J. M., "Perspective on ITS", Artech House Publishers, 2005.
5	US Department of Transportation, "National ITS Architecture Documentation", 2007 (CDROM).
7	Turban. E and Aronson. J. E, "Decision Support Systems and Intelligent Systems", Prentice Hall
8	https://nptel.ac.in/courses/105105204
9	https://youtu.be/6I3LtFNUvZk
10	https://onlinecourses.nptel.ac.in/noc23_ce75

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:
• The question paper will have ten full questions carrying equal marks. • Each full question will be for 20 marks. • There will be two full questions (with a maximum of three sub - questions) from each unit. • Each full question will have sub - question covering all the topics under a unit. • The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1		1								
CO2	3	1	1								1	
CO3	2	1	1								1	
CO4	3	1			1						1	
CO5	1				2						1	

High-3, Medium-2 & low-1.

Dr. Ambedkar Institute of Technology, Bengaluru - 560056

Department of Civil Engineering

Course Title	**CONSERVATION OF NATURAL RESOURCES**						
Course Code	**22CVT705D**						
Category	**Open Elective Course (OEC)**						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 Hours**		

Course Learning Objectives:

To learn types of Natural resources and associated problems, comprehend soil as a natural resources types of landforms, soil conservation and sustainable land use planning and understand the availability and distribution of water, discuss biodiversity and its role in ecosystem functioning. Ascertain Social issues, human population and their relation with the Environment.

UNIT – I **8 Hours**

NATURAL RESOURCES:

Renewable and non-renewable resources:

Natural resources and associated problems;

a) Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
c) Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.
d) Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers-pesticides problems, water logging and salinity.
e) Energy Resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

UNIT – II **8 Hours**

ECO SYSTEMS:

Concept of an eco-system, Structure and function of an eco-system, Producers, consumers, decomposers, Energy flow in the ecosystems, Ecological succession, Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structure and function of the following ecosystems:

a) Forest ecosystem
b) Grass land ecosystem
c) Desert ecosystem.
d) Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT – III **8 Hours**

SOIL:

Soil as a resource, types of lands, conservation of land forms, deforestation and effect of land use changes. Soil health, ecological and economic importance of soil, impact of soil degradation on agriculture and food security, need for soil conservation, sustainable land use planning.

WATER:

Indian water resources, Resources system planning. Water use sectors- domestic, industrial, agriculture. Water deficit and water surplus basins in India, equitable distribution, Inter-basin water transfers, Himalayan component, peninsular component, issues involved. Ground water, it's potential in India, conjunctive use, recharge of ground water. Contamination of ground water, sea water ingress, problems and solutions.

UNIT – IV **8 Hours**

BIODIVERSITY:

Introduction: Definition: Genetic, Species and Ecosystem diversity, Bio Geographical classification of India, Value of Bio Diversity: consumptive use, productive use, social use, ethical use, aesthetic use and

option values, Bio Diversity at Global, National and local levels, India as a mega diversity nation, Hot spots of Bio Diversity, Threats to Bio Diversity: Habitat loss, poaching of wild life, man wildlife conflicts, endangered and endemic species of India, conservation of Bio Diversity: in-situ and ex-situ conservation of Bio Diversity, Biological Diversity Act 2002.

UNIT – V **8 Hours**

SOCIAL ISSUES, HUMAN POPULATION, ANIMAL POPULATION & THE ENVIRONMENT:

Social Issues and the Environment: Environment from unsustainable to sustainable development, Urban problems related to energy water conservation, rainwater harvesting, watershed management,

Resettlement and rehabilitation of people: its problems and concerns, case studies

Environmental Ethics: issues and possible solutions, climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and holocaust, case studies, waste land reclamation, consumerism and waste products.

Environment (protection) Act: Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife (protection) Act, Forest (conservation) Act, issues involved in enforcement of environmental legislation, public awareness.

Human Population, Animal Population and the Environment: Population growth, variation among nations,

Population explosion: family welfare program, environment and human health, human rights value education, HIV/AIDS, women and child welfare, role of information technology in environment and human health, case studies.

Course Outcomes: The students will be able to	
CO1	Identify different types of Natural Resources and associated problems.
CO2	Understand the concept of an eco-system, types, features, structure and functions of different eco system.
CO3	Comprehend Soil as a resource, types of landforms and understand the availability and distribution of water.
CO4	Discuss biodiversity and its role in ecosystem functioning.
CO5	Ascertain Social issues, human population and their relation with the Environment.

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos.

Text Books:	
1	"Biodiversity & Ecosystem function", by E D Schulze & H A Mooney, Springer Publishers, 2nd edition, 1994, ISBN-13 978-3540581031.
2	Human Population & the Environmental crisis, Ben Zuckerman & David Jefferson, Jones & Bartlett Publishers, 1996, ISBN-13 : 086720966-978 2.

Reference Books:	
1	"Irrigation & Drainage Engineering", by Peter Waller & MulunehYitayew, Springer Publishers, 1st edition, 2016, ISBN-13 : 978-3319056982.
2	"Biodiversity & Ecosystem functioning", by Michel Loreau ,Shahid Naeem & Pablo Inchausti, Oxford publishers, 2nd Edition 2002, ISBN-13 : 978-0198515715
3	" Human population & its Influence on Biological Diversity", bu R P Cincotta & L J Gorenflo, Springer Publishers,2011th edition , ISBN-13 : 978-3642267116

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End

Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

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- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions.
- ✓ Selecting one full question from each unit / module.

Question paper pattern:

• The question paper will have ten full questions carrying equal marks.
• Each full question will be for 20 marks.
• There will be two full questions (with a maximum of three sub - questions) from each unit.
• Each full question will have sub - question covering all the topics under a unit.
• The students will have to answer five full questions, selecting one full question from each unit.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1					1	2					1
CO 2	1					1	2					1
CO 3	1					1	2					1
CO 4	1					1	2					1
CO 5	1					1	2					1

High-3, Medium-2 & low-1.

Course Title	**Environmental remediation of contaminated sites**						
Course Code	**22CVT802C**						
Category	**Open Elective Course (Online Course)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**12 Week**	**03**

Course Learning Objective

The course details the usual remediation techniques practiced worldwide and provide an understanding of the relevant theoretical concepts.

The current course will enable a student to:

• Develop understanding of integrated approaches to remediating contaminated sites.

• Develop the ability to screen, choose and design appropriate technologies for remediation.

Week 1 & 2 :

I. Introduction

II. Laws, Regulations and Remediation

A. Legal Concepts

1. Types of Law
2. Regulations

a)Federal

B. Laws/Regulations

a) History
b) Objectives
c) Remediation Process
d) Definition of hazardous waste
e) Waste Classification
f) Corrective Action

Week 3: III. Risk Assessment

A. Introduction

1. Terminology
2. History

B. Steps in Human Health Risk Assessment

1. Data Collection and Evaluation
2. Exposure Assessment
3. Toxicity Assessment
4. Risk Characterization
5. Risk Management
6. Risk Communication

C. Ecological Risk Assessment

D. Risk-based Corrective Action

Week 4, 5 & 6: IV. Remedial Options

A. Introduction

B. Administrative Options

C. Groundwater

1. Plume Containment
   a) introduction
   b) extraction wells
   c) extraction trenches
   d) injection wells/trenches
   e) wells/barriers
2. Pump and Treat
   a) Introduction
   b) Contaminant behavior
   c) Design considerations
3. Source Control
   a) Philosophy
   b) Options
4. Permeable Reactive Barriers
   a) Introduction
   b) Redox reactions
   c) Kinetics
   d) Design considerations
5. Monitored Natural Attenuation
   a) Introduction
   b) Evaluation
   c) Monitoring
   d) Mechanisms
   e) Plume Types
   f) Lines of Evidence
   g) Case Study

Week 7,8 &9: D. Soils/Sediments

1. Excavation
   a) Use
   b) Techniques
   c) Control of contaminant transport
   d) Typical costs
2. Landfill
   a) Hazardous waste landfill
   b) Solid waste landfill
3. Containment
   a) characteristics of barrier materials
   b) alternatives
4. Solidification/Stabilization
   a) Introduction
   b) Fundamentals
      (1) Chemical
      (2) physical
   c) Leaching
      (1) single-component
      (2) multi-component
   d) Design Considerations
      (1) TCLP-based approach
      (2) Risk-based approach

	5. Chemical Treatment a) Non-redox reactions b) Reductive processes c) Oxidative processes (ISCO) 6. Surfactant extraction a) Introduction b) Surfactant properties c) Configurations 7. Soil Vapor Extraction a) Introduction b) Fundamentals c) Design considerations
Week 10&11:	8. Bioremediation a) Introduction b) Fundamentals c) Important processes d) Examples 9. Phytoremediation a) Mechanisms b) Examples
Week 12:	10. Thermal Processes a) Introduction b) Incineration c) Thermal Desorption d) Aqueous Oxidation 11. Soil Washing a) Introduction b) Process Description c) Design Considerations

Course Title	**Fundamentals of Artificial Intelligence**						
Course Code	**22CVT802D**						
Category	**Open Elective Course (Online Course)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**12 Week**	**03**

Course Learning Objective: An overview of the principles and practices of AI to address such complex real-world problems. The course is designed to develop a basic understanding of problem solving, knowledge representation, reasoning and learning methods of AI.

Week 1:	AI and Problem Solving by Search
Week 2:	Problem Solving by Search
Week 3:	Problem Solving by Search
Week 4:	Knowledge Representation and Reasoning
Week 5:	Knowledge Representation and Reasoning
Week 6:	Knowledge Representation and Reasoning
Week 7:	Reasoning under Uncertainty
Week 8:	Planning
Week 9:	Planning and Decision Making
Week 10:	Machine Learning
Week 11:	Machine Learning
Week 12:	Machine Learning

Course Title	**Advanced Foundation Engineering**						
Course Code	**22CVT801A**						
Category	**Open Elective Course (Online Course)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**12 Week**	**03**

Course Learning Objective:

Week 1:	Introduction to Soil exploration.
Week 2:	Shallow foundation: Bearing capacity - I
Week 3:	Shallow foundation: Bearing capacity - II
Week 4:	Shallow foundation: Bearing capacity - III
Week 5:	Shallow foundation: settlement - I
Week 6:	beams on elastic foundation.
Week 7:	Design of shallow foundation.
Week 8:	Pile foundation: Bearing capacity - I
Week 9:	Pile foundation: Bearing capacity - II
Week 10:	Pile foundation: Bearing capacity - III
Week 11:	Introduction to Machine foundation
Week 12:	Design of Machine foundation.

Course Title	**HYDROLOGICAL MEASUREMENTS AND ANALYSIS OF DATA**						
Course Code	**22CVT801C**						
Category	**Open Elective Course (Online Course)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objectives: The students will learn to measure, process and analyze the hydrological data. They also will get insights on the measurement, processing procedure of precipitation data, streamflow data and meteorological data. They will get some basic about the statistical analysis of the various data in addition to the regression and correlation analysis.

WEEK 1: Introduction – the Hydrologic Cycle
WEEK 2: Measurement and Processing of Hydrological Data
WEEK 3: Measurement and Processing of Rainfall Data
WEEK 4: Measurement and Processing of Streamflow Data
WEEK 5: Measurement and Processing of Meteorological Data
WEEK 6: Measurement and Processing of Water Quality Data
WEEK 7: Ground Water and Other Data
WEEK 8: Acquisition and management of spatial data
WEEK 9: Hydrological databases and Dissemination of Data
WEEK 10: Statistical Analysis of Hydrological Data
WEEK 11 & 12: Regression, Correlation and Data Generation

Course Outcomes: The students will be able to	
CO1	Understand the basics of hydrological cycle and how to measure and process the hydrological data
CO2	Understand how to measure and process the rainfall data
CO3	Understand how to measure and process the stream flow data
CO4	Understand how to measure and process the meteorological data
CO5	Elucidate how to manage and analyse the hydrological data

References:	
1	Hydrological Measurements and Analysis of Data- NPTEL Course by Dr. Sharad Kumar Jain, **IIT Roorkee** https://nptel.ac.in/courses/105107129
2	Herschey, R. W.(Editor).(1995). Streamflow Measurement. Chapman & Hall, E & F N SPON, London.
3	WMO (2008). Guide to Hydrological Practices. WMO No. 168. World Meteorological Organization, Geneva.
4	Bureau of Indian Standards: http://www.bis.org.in/
5	Central Water Commission: http://www.cwc.gov.in/
6	India Meteorological Department: http://www.imd.gov.in/
7	International Standards Organization: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_tc_browse.htm?commid=51678

CO-PO-PSO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2					1	2			3		2	1
CO2	3	2					1	2			3	1	2	1
CO3	3	2					1	2			3	1	2	
CO4	3	2			2		1	2			3	1		1
CO5	3	2			2		1	2			3	1	2	1

MUNICIPAL SOLID WASTE MANAGEMENT (22CVT801D)
NPTEL ONLINE COURSE
Open Elective Course (Online Course)

Module 1: Evolution, Sources, Types and Generation of Solid Waste

- Lec 1: Introduction to solid waste
- Lec 2: Functional elements
- Lec 3: Types and sources of solid waste
- Lec 4: Sampling and characteristics
- Lec 5: Estimation of solid waste quantity
- Lec 6: Factors affecting solid waste generation rate

Module 2: Waste Handling, Storage, Processing and Types of Collection of Solid Waste

- Lec 7: Handling, separation and storage at source
- Lec 8: Processing at source
- Lec 9: Primary collection
- Lec 10: Types of collection system

Module 3: Analysis of Solid Waste Collection System and Types of Transfer Station

- Lec 11: Analysis of collection system (Part I)
- Lec 12: Analysis of collection system (Part II)
- Lec 13: Analysis of collection system (Part III)
- Lec 14: Need and types of transfer station

Week 4: Solid Waste Transport Means, Methods, Separation and Processing

- Lecture 15: Transport means and methods
- Lecture 16: Unit operation for component separation
- Lecture 17: Material recovery facilities (MRF)
- Lecture 18: Recycling of dry waste components

Week 5: Incineration

- Lecture 19: Waste as a fuel
- Lecture 20: Incineration/Combustion
- Lecture 21: Flue gas characteristics and treatment
- Lecture 22: Solid residue generation, characterization and treatment
- Lecture 23: Waste-to-energy (WtE) plants (case studies) pyrolysis and gasification

Week 6: Composting - I

- Lecture 24: Definition and phases of composting
- Lecture 25: Factors affecting composting process
- Lecture 26: Types of composting - I

Week 7: Composting - II

- Lecture 27: Types of composting - II
- Lecture 28: Compost quality
- Lecture 29: Vermicomposting

Week 8: Anaerobic Digestion

- Lecture 30: Definition, stages and factors affecting anaerobic digestion
- Lecture 31: Pretreatment and co-digestion for enhancement of biogas production
- Lecture 32: Types of biogas digesters

Week 9: Landfill - I

- Lecture 33: Site selection and types of landfill
- Lecture 34: Leachate collection and treatment

Week 10: Landfill - II

- Lecture 35: Landfill gas collection and treatment
- Lecture 36: Design of landfill & Bio-minning of old dumpsite

Week 11: Special Waste and Integrated Solid Waste Management

- Lecture 37: Construction and demolition waste
- Lecture 38: Management of bio-medical, e-waste and inert waste
- Lecture 39: Integrated solid waste management (ISWM)
- Lecture 40: Municipal solid waste management rules

Week 12: Finance and PPP Related to Solid Waste Management

- Lecture 41: Financing in MSWM projects
- Lecture 42: Public-Private-Partnership (PPP)
- Lecture 43: Public-Private-Partnership (PPP) in MSWM projects

Course Title	**Retrofitting and Rehabilitation of Civil Infrastructure**						
Course Code	**22CVT801D**						
Category	**Open Elective Course (Online Course)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**12 Week**	**03**

Course learning Objective: This course is to give an in-depth understanding of the various methods of repair, retrofitting and rehabilitation techniques for masonry and concrete structures, the causes and types of deterioration, the evaluation of the existing condition of infrastructure, the materials for repair and retrofitting, the maintenance and strengthening techniques.

Week 1:	Overview of Retrofitting and Rehabilitation of Civil Infrastructure
Week 2:	Condition Evaluation and Testing
Week 3:	General Repair and Strengthening of Concrete Structures
Week 4:	Fiber Reinforced Polymer Composites (FRPC) and its Characteristics
Week 5:	Retrofitting by FRP Composites
Week 6:	Retrofitting by FRP Composites (continued…)
Week 7:	Retrofitting by FRP Composites (continued…)
Week 8:	Concrete Overlay for Pavement Rehabilitation
Week 9:	Retrofitting of Masonry Structures
Week 10:	Retrofitting of Building structures damaged due to seismic event
Week 11:	Retrofitting of Special structures damaged due to seismic events
Week 12:	Retrofitting of Steel Structures