

PROCEEDINGS OF THE 18TH BOARD OF STUDIES MEETING HELD ON
30.08.2025 at 11.00 AM

Subject 1	: Welcome address by the Chairman, BoS and introduction of BoS members.					
Resolution	The meeting commenced with the welcome address by the Chairman, BoS, Dr. M.M. Hanamasagar. The Chairman extended a warm welcome to all the members and introduced them to the board.					
Subject 2	: To confirm the minutes of previous 17 th BoS meeting held on 06-12-2024 AT 11:00AM					
Resolution	The minutes of the BoS meeting held on 06.12.2024 were presented before the board and confirmed.					
Subject 3	: Seeking approval for the modified 3 rd to 8 th semester scheme of teaching & examination as per (VTU Guidelines) BEC, Bagalkote guidelines for the admitted batch 2024-25 and 2025-26 lateral admitted batch and 3 rd and 4 th semester syllabus for the academic year 2025-26 (Annexure-I).					
Resolution	The modified scheme of teaching & examination for the 2024-25 admitted and 2025-26 lateral admitted batch and 3 rd and 4 th semester syllabus for the academic year 2025-26 as per VTU guidelines, was presented. The board reviewed, deliberated and approved the scheme.					
Subject 4	: Seeking approval for the modified 5 th to 8 th semester scheme of teaching & examination and syllabus for 5 th and 6 th semester as per VTU guidelines for UG 2023-24 admitted batches for the academic year 2025-26 (Annexure-II)					
Resolution	The modified 5 th to 8 th semester scheme of teaching & examination and syllabus for 5 th and 6 th semester as per VTU guidelines for UG 2023-24 admitted batch for the academic year 2025-26. The board reviewed, deliberated and approved the scheme					
Subject 5	: Seeking approval for the modified 7 th and 8 th semester scheme of teaching & examination and syllabus as per VTU guidelines for UG 2022-23 admitted batch for the academic year 2025-26 (Annexure-III)..					
Resolution	The modified 7 th and 8 th semester scheme of teaching & examination and syllabus as per VTU guidelines for UG 2022-23 admitted batch for the academic year 2025-26. The board reviewed, deliberated and approved the scheme					
Subject 6	Seeking approval for the coding of courses for UG and PG programs for the students admitted to first year from the academic year 2024-25 and 2025-26 and subjected to approval of Academic Council meeting (Annexure-IV).					
Resolution	The modified for the coding of courses for UG programs for the students admitted to first year from the academic year 2024-25 and 2025-26 as per VTU guidelines were presented. The board reviewed and approved them.					
Subject 7	Seeking approval for CIE and SEE assessment for all UG and PG courses for the academic year 2025-26 subjected to approval of Academic Council meeting (Annexure-V).					
Resolution	Modified CIE and SEE assessment for all UG and PG courses for the academic year 2025-26 (Annexure-V). The board deliberated and approved them.					
Subject 8	Seeking post-facto approval for the equivalence of following Open Elective Course.					
	Sl. No.	Title of the Subject	UG	Subject Code	Credits	L-T-P
	01	Disaster Management and Mitigation	UG	21UCV637N (old) 22UCV637N(New)	03 03	3-0-0 3-0-0
	02	Geomorphology	UG	UCV857E(old) 22UCV635E(New)	03 03	3-0-0 3-0-0
	03	Numerical Techniques in Civil Engineering	UG	UCV671E(old) 21UCV601E(old) 22UCV625E(New)	03 03 03	3-0-0 3-0-0 3-0-0

Resolution	The board reviewed the post-facto approval requests for the listed courses in discussed the changes and approved them					
Subject 09	Seeking approval for the Panel of Examiners for UG and PG for the academic year 2025-26 (Annexure-VI).					
Resolution	The panel of examiners for UG and PG courses for the academic year 2025-26 was presented and approved.					
Subject 10	Seeking approval for the list of online courses like MOOCs/ SWAYAM etc., for UG and PG programmes for the academic year 2025-26 (Annexure-VII).					
Resolution	The board reviewed and approved for the list of online courses like MOOCs/ SWAYAM etc., for UG and PG programmes for the academic year 2025-26 (Annexure-VII).					
Subject 11	Seeking approval for the scheme of teaching and evaluation for Mini-project, Project work, Internship and Seminar for the academic year 2025-26 subjected to approval of Academic Council meeting (Annexure-VIII).					
Resolution	The scheme of teaching and evaluation for Mini-projects, Project Work, Internships, and Seminars was reviewed; the respective rubrics were discussed and approved.					
Subject 12	Seeking approval for the equivalence of listed Courses for the AY 2025-26					
	Sl. No.	Title of the Subject	UG	Subject Code	Credits	L-T-P
	01	Deep Foundations	VII	21UCV733E 22UCV722E	03 03	3-0-0 3-0-0
	02	Basics of Soil Dynamics and Earthquake Engineering	VII	21UCV723E 22UCV713E	03 03	3-0-0 3-0-0
	03	Matrix Methods of Structural Analysis	VI VII	UCV664E 22UCV725E	03 03	3-0-0 3-0-0
	04	Mechanics of Materials /Strength of Materials	III	BCVA302C 22UCV310C 22UCV302C 21UCV303C	03 03 03 03	3-0-0 3-0-0 3-0-0 3-0-0
	05	Masonry Structures	V	21UCV616E 22UCV623E 22UCV528E	03 03 03	3-0-0 3-0-0 3-0-0
	06	Concrete Technology	III	21UCV306C BCVA304C	03 03	3-0-0 3-0-0
	07	Highway Geometric Design	VIII VI V VIII VI	UCV866E 22UCV615E 22UCV527E UCV842E UCV654E	03 03 03 03 03	3-0-0 3-0-0 3-0-0 3-0-0 3-0-0
	08	Traffic Engineering	VII V V VII V	UCV722E 22UCV512E 21UCV514E UCV722E UCV555E	03 03 03 03 03	3-0-0 3-0-0 3-0-0 3-0-0 3-0-0
	09	Railway Engineering	VII VII	22UCV714E UCV752E	03 03	3-0-0 3-0-0
	10	Design of Prestressed concrete Structures	VII VII	21UCV731E 22UCV721E	03 03	3-0-0 3-0-0
Resolution	The board examined the equivalence for all the Courses and approved the same.					
Subject 13	Seeking approval for the first year syllabus of the courses Engineering Mechanics, Introduction to Civil Engineering and Mechanics and Materials lab offered for UG First year as per VTU guidelines for 2025-26 admitted batch. (Annexure-IX).					
Resolution	The first year syllabus of the courses Engineering Mechanics, Introduction to Civil Engineering and					

	Mechanics and Materials lab offered for UG First year as per VTU guidelines for 2025-26 admitted batch discussed the changes and approved them
Subject 14	Seeking approval for the post facto approval for the course "advanced construction technology and management" offered for the third semester M.Tech structural engineering students of 23-24 admitted batch
Resolution	Approval for the post facto approval for the course "advanced construction technology and management" offered for the third semester M.Tech structural engineering students of 23-24 admitted batch discussed the changes and approved them
Subject 15	Seeking approval for the scheme of teaching and Syllabus PG Structural Engineering, Geotechnology and Environmental Engineering for the admitted batch 2025-26 for the academic year 2025-26 subjected to approval of Academic Council meeting (Annexure-X)
Resolution	Approval for the scheme of teaching and Syllabus PG Structural Engineering, Geotechnology and Environmental Engineering for the admitted batch 2025-26 for the academic year 2025-26 subjected to approval of Academic Council meeting
Subject 16	Any other matter with permission of the chair
Resolution	Dr.B.M.Doddamani suggested the about Irrigation subject should be elective and water resources subjects should be core and Dr. Amaranth Hegade suggested instead of Soil Mechanics, Geotechnical engineering title is recommended. These suggestions were duly acknowledged and incorporated in coming academic year

Chairman, BoS
Department of Civil Engineering

B V V Sangha,
Basaveshwara Engineering College, Bagalkot
Scheme of Teaching and Evaluation of 1st year Civil Engineering
(2025-26 Admitted Batch) for the academic year 2025-26)

I Semester																(Chemistry Group)			
Sl/ No	Course and Course Code		Course Title	Teaching Dept./PSB	Teaching Hours/Week			SAAE/Per Sem		Examinations Hours				Credits	Contact Hour Per Sem				
					Theory Lecture	Tutorial	Practical/ Drawing	Study Hours	Assig/ Quizes / MCQs etc	Duration in Hours	CIE Marks	SEE Marks	Total Marks						
																L	T	P	
1	ASC	1BMAC101C	Differential Calculus and Linear Algebra for CV Stream	Maths	3	2	0	42	8	03	50	50	100	04	120				
2	ASC(IC)	1BCHC102C	Applied Chemistry for CV stream	CHEM	3	0	2	42	8	03	50	50	100	04	120				
3	ETC	1BAIA103C	Introduction to AI and Applications	Any	3	0	0	42	8	03	50	50	100	03	90				
4	ESC-I	1BMEA104N	Introduction to Mechanical Engineering	Respective	3	0	0	42	8	03	50	50	100	03	90				
5	PLC(IC)	1BCSA105D	Introduction to C Programming	CSE & Allied	3	0	2	42	8	03	50	50	100	04	120				
6	AEC	1BHSB106C	Communication Skills	Humanities	1	0	0	12	6	02	50	50	100	01	30				
7	AEC (NCMC)	1BHSC107M	Indian Constitution & Engineering Ethics	Humanities	1	0	0	12	6	--	100	--	100	PP	30				
8	AEC/SDC	1BCVA108P	Innovation and Design Thinking Lab	Respective	0	0	2	0	2	02	50	50	100	01	30				
	TOTAL				17	02	06	234	54	19	450	350	800	20	630				
9	AICTE Activity Points (students have to earn 100 activity points between 01 to 08 semesters)				Compulsory requirement for the award of a degree														

ASC-Applied Science Course, **ESC**- Engineering Science Courses, **IC** – Integrated Course (Practical Course Integrated with Theory Course), **PLC(IC)**- Programming Language Course (Integrated Course), **AEC**- Ability Enhancement Course, **NCMC**: Non Credit Mandatory Course, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **TD/PSB**- Teaching Department / Paper Setting Board, **S- (SAAE)**-Students' Academic Activity Engagement Hours, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **PP** : (Pass/Pass) is assigned to a noncredit course. “PP” represents pass in a course provided students have successfully completed the CIE requirements. Otherwise, “NP-not pass shall be awarded. “PP” is essential for the award of the degree

Credit Definition: 1- hour Lecture (L) per week= 1Credit 2- hours Tutorial (T) per week= 1Credit 2- hours Practical / Drawing (P) per week= 1Credit	04-Credit courses are designed for 50 hours of Teaching-Learning sessions 04-Credit (IC) courses are designed for 40 hours' theory and 10-12 hours of practical sessions 03-Credit courses are designed for 40 hours of Teaching-Learning Session 02- Credit courses are designed for 25 hours of Teaching-Learning Session 01-Credit courses are designed for 12 hours of Teaching-Learning sessions
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Integrated courses (IC), combining theory with practical components.

- (i) Theory sessions shall be conducted for 3 hours per week, while the practical sessions shall be conducted for 2 hours per week.
- (ii) Theory components shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).
- (iii) The practical component shall be assessed only through CIE.

The Mathematics/Chemistry courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules. The tutorial sessions for the mathematics course shall be conducted in the laboratory environment using Sci lab to enhance computational understanding and application skills.

All students admitted to the engineering program have to complete **Applied Mathematics-I and Applied Mathematics-II** in I and II semesters by selecting the subjects prescribed for their stream, viz. CV, ME, EEE or CSE, under the heading Applied Mathematics-I and Applied Mathematics-II. Those who have completed the chemistry course under the heading Applied Chemistry in I semester have to select the prescribed stream wise physics course under the heading Applied physics during II semester.

Engineering Sciences Courses-I (ESC-I): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other stream courses. Students are required to select and complete two courses that are not belong to their admitted program stream. For example, a student admitted to the any programme of the Civil Engineering stream should not select Introduction to Civil Engineering but any other two. One course shall select under ESC-I and another course under ESC-II. The two courses must be different from the other.

The **Student Induction Programme (SIP)**, initiated by the All India Council for Technical Education (AICTE), is designed to help newly admitted students in technical institutions transition smoothly into the higher education environment. It aims to familiarize students with the institutional culture, foster connections with peers and faculty, and provide a foundation for holistic learning. Activities under SIP may include Physical Activities, Creative Arts, Universal Human Values, Literary Events, and Proficiency Modules. Lectures shall be by Eminent Personalities, Local Area Visits, Department/Branch Familiarization, and Innovation-related sessions.

AICTE Activity Points Requirement for BE/B.Tech. Programmes: As per AICTE guidelines (refer Chapter 6 – *AICTE Activity Point Program, Model Internship Guidelines*), in addition to academic requirements, students must earn a specified number of **Activity Points** to be eligible for the award of the degree. The points to be earned are: **Regular students** admitted to a 4-year degree program must earn **100 Activity Points**. **Lateral entry students** (joining from the second year) must earn **75 Activity Points**. **Students transferred** from other universities directly into the fifth semester must earn **50 Activity Points** from the date of entry into VTU. These Activity Points are **non-credit** and will not be considered for **the SGPA/CGPA** or be used for **vertical progression**. However, earning Activity Points is mandatory for the **award of the degree**, and the points earned will be reflected on the **eighth semester Grade Card**. If a student completes all the semesters (eight or six) at the end of the programme but fails to earn the required Activity Points, the eighth-semester Grade Card will be withheld until the requirement is fulfilled. Also, the degree will be awarded only after the Grade Card has been released. The hours spent earning the activity points will not be counted for regular attendance requirements. Students can accumulate these points at any time during their program period, including weekends, holidays, and vacations, starting from the year of Admission provided they meet the minimum hours of engagement prescribed for each activity by AICTE.

Applied Mathematics-I			Applied Chemistry		
Code	Title	LTP	Code	Title	LTP
1BMAC101C	Differential Calculus and Linear Algebra for CV Stream	320	1BCHC102C	Applied Chemistry for CV stream	302
1BMAM101C	Differential Calculus and Linear Algebra: ME Stream	320	1BCHM102C	Applied Chemistry for (ME stream)	302
1BMAE101C	Differential Calculus and Linear Algebra: EEE stream	320	1BCHE102C	Applied Chemistry for (EEE, ECE stream)	302
1BMAS101C	Calculus And Linear Algebra: CSE stream	320	1BCHS102C	Applied Chemistry for (CSE stream)	302
Engineering Science Courses-I (ESC-I)			Programming Language Courses (PLC)		
Code	Title	LTP	Code	Title	LTP
1BCVA104N	Introduction to Civil Engineering	300	1BCSA105D	Introduction to C Programming (For none IT Programmes)	300
1BEEA104N	Introduction to Electrical Engineering	300	1BBCB105D	Python Programming (for CSE and allied programmes)	300
1BECA104N	Introduction to Electronics and Communication Engineering	300			
1BMEA104N	Introduction to Mechanical Engineering	300			
1BISA104N	Essentials of Information Technology	300			

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Scheme of Teaching and Evaluation of 1st year Civil Engineering
(2025-26 Admitted Batch) for the academic year 2025-26)

II Semester (For those who have studied Chemistry Group in I semester)																(Physics Cycle)			
Sl/ No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week			SAAE/ Sem		Examinations Hours				Credits	Contact Hour Per Sem				
					Theory Lecture	Tutorial	Practical/ Drawing	Study Hours	Assig/Quizes/ MCQs etc	Duration in Hours	CIE Marks	SEE Marks	Total Marks						
																L	T	P	
1	ASC	1BMAC201C	Differential Calculus and Numerical Methods for CV Stream	Maths Dept	3	2	0	42	8	03	50	50	100	04	120				
2	ASC(IC)	1BPHC202C	Physics for Sustainable Structural Systems	PHY Dept	3	0	2	42	8	03	50	50	100	04	120				
3	ESC	1BMEA203C	Computer-Aided Engineering Drawing for CV Stream	ME Dept	2	0	2	42	8	03	50	50	100	03	90				
4	ESC-II	1Bxxx204N 1BEEA204N	Engineering Science Course-II Introduction to Electrical Engineering	Respective Engg Dept	3	0	0	42	8	03	50	50	100	03	90				
5	PSC	1BxxA205C 1BCVA205C	Programme Specific Courses Engineering Mechanics	Respective Engg Dept	3	0	0	42	8	03	50	50	100	03	90				
6	AEC (NCMC)	1BHSA206M	Soft Skills	Humanities Dept	1	0	0	12	6	-	100	---	100	PP	30				
7	HSMC	1BHSA207C/ 1BHSA207C	Sanskritika Kannada/ Balake Kannada	Humanities Dept	1	0	0	12	6	01	50	50	100	01	30				
8	AEC/ SDC	1BCVA208P	Inter disciplinary Project-Based Learning	Combination of Dept	0	0	2	0	2	02	50	50	100	01	30				
9	PSC/ ESC	1BCVA209L	Mechanics and Materials Lab	Respective Dept	0	0	2	0	2	02	50	50	100	01	30				
TOTAL					16	02	08	234	56	20	500	400	900	20	630				
9	AICTE Activity Points (students have to earn 100 activity points between 01 to 08 semesters)				Compulsory requirement for the award of a degree														

ASC-Applied Science Course, **IC** – Integrated Course (Practical Course Integrated with Theory Course), **ESC**- Engineering Science Courses, **PSC**-Programme Specific Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **NCMC**: Non-Credit Mandatory Course, **PP**: (Pass/Pass) is assigned to a non credit course. “PP” represents pass in course provided students have successfully completed the CIE requirements. Otherwise, “NP-not pass shall be awarded. “PP” is essential for the award of the degree **HSMC**-Humanity, Social Science and management Course, **AEC/SDC**- Ability Enhancement Course/Skill Development course, **TD/PSB**- Teaching Department / Paper Setting Board, **CIE** –Continuous Internal Evaluation, **SEE**- Semester End Examination, **S-(SAAE)**-Students’ Academic Activity Engagement Hours.

Integrated courses (IC), combining theory with practical components.			
i) Theory sessions will be conducted for 3 hours per week, while the practical sessions will be conducted for 2 hours per week.			
ii) Theory component shall be evaluated through both Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).			
iii) The practical component will be assessed only through CIE.			
The Mathematics/Physics courses shall be taught by a single faculty member per session, with no sharing of the course (subject) modules. The tutorial sessions for the mathematics course shall be conducted in a laboratory environment using Scilab software to enhance computational understanding and application skills.			
Students admitted to a specific engineering stream are required to select and successfully complete Applied Mathematics-I and Applied Physics courses that are aligned to their program stream.			
Programme Specific Courses (PSC): Programme Specific Courses (PSC) are a set of core courses tailored to a specific branch or discipline of engineering in which a student is enrolled (e.g., Mechanical Engineering, Computer Science, Civil Engineering, etc.). These courses are intended to provide students with in-depth knowledge and specialized skills essential for professional competence in the chosen field. Students must select and complete the course from this group that corresponds to their admitted program stream . Similarly, students are also required to choose and pass laboratory courses that are specific to their stream from the Programme Specific Courses Laboratory (PSCL) Group			
Computer-Aided Engineering Drawing: The courses under this category are stream-specific. Students must select and complete the course that corresponds to their admitted engineering stream.			
Engineering Sciences Courses-II (ESC-II): These courses are designed to broaden the technical knowledge of students beyond their core area of study. These courses enable students to gain a foundational understanding of engineering principles from other disciplines. Students are required to select and complete a course that does not belong to their admitted program stream. Students should select a course other than that was selected under ESC-I and other than course not belonging to their stream			
For the course Interdisciplinary Project (BPRJ259) , it is mandatory to form a team comprising students from multiple engineering disciplines. For example, a project team may include students from Mechanical Engineering, Electronics and Communication Engineering (ECE), and Computer Science and Engineering (CSE), working collaboratively to design and implement the project.			

Applied Mathematics-II					Applied Physics				
Code	Title	L	T	P	Code	Title	L	T	P
1BMAC201C	Differential Calculus and Numerical Methods for CV stream	3	2	0	1BPHC202C	Physics for Sustainable Structural Systems (CV stream)	3	0	2
1BMAM201C	Multivariable Calculus and Numerical Methods: ME stream	3	2	0	1BPHM202C	Physics of Materials (Mech stream)	3	0	2
1BMAE201C	Calculus, Laplace Transform, and Numerical Techniques: EEE stream	3	2	0	1BPHE202C	Quantum Physics & Engineering Materials (EEE stream)	3	0	2
1BMAS201C	Numerical Methods: CSE Stream	3	2	0	1BPHS202C	Quantum Physics and Quantum Computing (CSE stream)	3	0	2
Programme Specific Courses (PSC)					Programme Specific Courses Lab (PSCL)				
1BCVA205C	Engineering Mechanics	3	0	0	1BCVA209L	Mechanics and Materials Lab	0	0	2
1BMEA205C	Elements of Mechanical Engineering	3	0	0	1BMEA209L	Elements of Mechanical Engineering Lab	0	0	2
1BEEA205C	Basic Electrical Engineering	3	0	0	1BEEA209L	Basic Electrical Engineering Lab	0	0	2
1BCEA205C	Fundamentals of Electronics & Communication Engineering	3	0	0	1BCEA209L	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
1BCSA205C	Programming in C	3	0	0	1BCSA209L	C Programming Lab	0	0	2
1BBTA205C	Elements of Biotechnology and Biomimetic	3	0	0	1BBTA209L	Elements of Biotechnology Lab	0	0	2
Engineering Science Courses-II (ESC-II)					Computer-Aided Engineering Drawing				
1BCVA204N	Introduction to Civil Engineering	3	0	0	Code	Title	L	T	P
1BEEA204N	Introduction to Electrical Engineering	3	0	0	1BMEA203C	Computer-Aided Engineering Drawing for CV Stream	2	0	2
1BECA204N	Introduction to Electronics & Communication Engineering	3	0	0	1BMEM203C	Computer-Aided Engineering Drawing for ME stream Engineering	2	0	2
1BMEA204N	Introduction to Mechanical Engineering	3	0	0	1BMEE203C	Computer-Aided Engineering Drawing for EEE	2	0	2
1BISA204N	Essentials of Information Technology	3	0	0	1BMEA203C	Computer-Aided Engineering Drawing for CSE stream	2	0	2

1BCVA205C	ENGINEERING MECHANICS	03-Credits (3:0:0)
Hrs/Week : 03		CIE Marks:50
Total Hours: 40		SEE Marks:50
UNIT – I		10 Hrs
Introduction to Engineering Mechanics: Particle, continuum, rigid body, laws of motion, law of parallelogram, forces, polygon forces, classification of force system, resolution and addition of forces, Principle of transmissibility of force. Resultant of co-planar concurrent force system. Lami’s theorem, Equilibrium of a particle, Numerical problems on coplanar concurrent forces to find resultant of system of forces by composition of forces including law of parallelogram of forces, Triangle law of forces and Rectangular component method.		
UNIT – II		10 Hrs
Moment and couple: Definition of moment, moment of a couple, characteristics of a couple, equivalent force and couple system, Varignon’s principle, resultant of coplanar non concurrent force system. Numerical problems. Support reactions: Types of loadings, beams and supports, Concept of Statically determinate and indeterminate structures, Support reactions: Numerical examples on Statically determinate beams subjected to various loads.		
UNIT - III		10 Hrs
Analysis of Trusses: Introduction, Classification of trusses, analysis of plane perfect trusses by the method of joints and method of sections, Numerical examples. Friction: Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane, equilibrium of blocks on inclined plane, Numerical examples.		
UNIT - IV		10 Hrs
Centroid of plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle and quadrant of a circle using method of integration, centroid of composite areas and simple built up sections: Numerical examples. Moment of Inertia of plane areas: Introduction, Moment of inertia about an axis, Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration. second moment of inertia of square, rectangular, triangular and circular areas from the method of Integration, Moment of inertia of composite areas and simple built-up sections: Numerical Examples.		
Text books:		
1. Rangwala, Building Construction,33rd Edition, 2016, Charotar Publishing House Pvt. Ltd., ISBN-10 : 9385039040, ISBN-13 : 978-9385039041 2. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 3rd Edition, 2015, Laxmi Publications, ISBN: 9789380856674. 3. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 11th Edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896		
Reference Books:		
1. Beer F.P. and Johnston E. R., Mechanics for Engineers: Statics and Dynamics, 4th Edition, 1987, McGraw Hill, ISBN: 9780070045842 2. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–6th Edition,2008, Wiley publication. 3. Irving H. Shames, Engineering Mechanics-Statics and Dynamics, 4th Edition, 2002, Prentice-Hall of India(PHI). 4. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press, New Delhi. 5. Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, 5th Edition, 2017,McGraw Hill Publisher, ISBN: 9781259062667 6. Bhavikatti S S, Engineering Mechanics, 4th Edition, 2018, New Age International Publications. 7. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 3rd Edition 2013, BS Publications		
Question paper pattern for SEE		
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus. 2. Each Question should not have more than four sub divisions. 3. Any FIVE Full questions are to be answered choosing at least one from each unit.		
Course Outcomes: After completion of the course students will be able to		
1. Understand the concept of coplanar and non-coplanar concurrent force system. 2. Apply the principles of force systems and equilibrium to determine support reactions. 3. Analyze the truss and frictional resistance offered by different planes.		

4. Locate the centroid of simple and composite plane area using first principles.

Web links and Video Lectures (e-Resources):

1. <https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT>
2. <https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2>
3. <https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5>
4. <https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18>
5. <https://www.youtube.com/watch?v=3YBXteL-qY4>
6. <https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10>
7. <https://www.youtube.com/watch?v=lheoBL2QaQU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7>
8. https://www.youtube.com/watch?v=atoP5_DeTPE
9. <https://www.youtube.com/watch?v=ksmsp9OzAsI>
10. <https://www.youtube.com/watch?v=x1ef048b3CE>
11. https://www.youtube.com/watch?v=l_Nck-X49qc
12. https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force 3
13. <https://www.youtube.com/watch?v=RIBeeW1DSZg>
14. <https://www.youtube.com/watch?v=R8wKV0UQtlo>
15. https://www.youtube.com/watch?v=0RZHHgI8m_A
16. <https://www.youtube.com/watch?v=BlS5KnQOWkY>

CO MAPPING WITH PO'S AND PSO'S

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	--	--	2	--	3	--	--	--	--	2	--
CO 2	3	3	3	--	--	2	--	3	--	--	--	--	2	--
CO 3	3	3	3	--	--	2	--	3	--	--	--	--	2	--
CO4	3	3	3	--	--	2	--	3	--	--	--	--	2	--
AVG.	3	3	3	--	--	2	--	3	--	--	--	--	2	--

1BCVA104N	INTRODUCTION TO CIVIL ENGINEERING	03-Credits (3:0:0)
Hrs/Week : 03		CIE Marks:50
Total Hours: 40		SEE Marks:50
UNIT - I		10 Hrs
Introduction to building science: Importance and Scope of various fields of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management. Basic Materials of Construction: Types and Uses of Bricks, Stones, Cement, Structural Steel, Wood and Concrete. Structural Elements of a Building: Concept of Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase.		
UNIT – II		10 Hrs
Force Systems: Concept of idealization, System of forces, Principles of transmissibility of a force, Resolution and composition of forces, Law of Parallelogram of forces, Concurrent and non-concurrent coplanar force systems, Moment of forces, Couple, Varignon’s theorem: Numerical examples.		
UNIT - III		10 Hrs
Equilibrium and Support Reactions Free body diagram, equations of equilibrium, Lami’s Theorem, Equilibrium of Coplanar Concurrent and Non -concurrent force systems: Numerical examples. Types of loadings, beams and supports, Concept of Statically determinate and indeterminate structures (Definitions with examples only), Support reactions: Numerical examples on Statically determinate beams.		
UNIT - IV		10 Hrs
Centroid of Plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle and quadrant of a circle using method of integration, centroid of composite areas and simple built up sections: Numerical examples. Moment of Inertia of plane Areas: Introduction, Moment of inertia about an axis, Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration. second moment of inertia of square, rectangular, triangular and circular areas from the method of Integration, Moment of inertia of composite areas and simple built-up sections: Numerical Examples.		
Text books:		
1. Rangwala, Building Construction,33rd Edition, 2016, Charotar Publishing House Pvt. Ltd., ISBN-10 : 9385039040, ISBN-13 : 978-9385039041 2. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 3rd Edition, 2015, Laxmi Publications, ISBN: 9789380856674. 3. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 11th Edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896		
Reference Books:		
1. Beer F.P. and Johnston E. R., Mechanics for Engineers: Statics and Dynamics, 4th Edition, 1987, McGraw Hill, ISBN: 9780070045842 2. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–6th Edition,2008, Wiley publication. 3. Irving H. Shames, Engineering Mechanics-Statics and Dynamics, 4th Edition, 2002, Prentice-Hall of India(PHI). 4. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press, New Delhi. 5. Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, 5th Edition, 2017,McGraw Hill Publisher, ISBN: 9781259062667 6. Bhavikatti S S, Engineering Mechanics, 4th Edition, 2018, New Age International Publications. 7. Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 3rd Edition 2013, BS Publications		
QUESTION PAPER PATTERN FOR SEE		
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus. 2. Each Question should not have more than four sub divisions. 3. Any FIVE Full questions are to be answered choosing at least one from each unit.		
Course Outcomes: After completion of the course students will be able to		
1.Explain the fundamental concepts of building science, disciplines of civil engineering, construction materials, and structural elements of buildings. 2.Evaluate the sustainability aspects of the built environment through appropriate selection of green materials and interpretation of rating systems.		

3. Apply the principles of force systems and equilibrium to determine support reactions.
4. Locate the centroid of simple and composite plane areas using first principles.

Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT>
- <https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2>
- <https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5>
- <https://www.youtube.com/watch?v=3YBXteL-qY4>
- <https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10>
- <https://www.youtube.com/watch?v=ksmsp9OzAsI>
- <https://www.youtube.com/watch?v=x1ef048b3CE>
- https://www.youtube.com/watch?v=l_Nck-X49qc
- <https://www.youtube.com/watch?v=R8wKV0UQtlo>
- https://www.youtube.com/watch?v=0RZHHg8m_A
- <https://www.youtube.com/watch?v=Bl55KnQOWkY>

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- https://www.youtube.com/watch?v=Zrc_gB1YYS0
- https://www.youtube.com/watch?v=Hn_iozUo9m4

CO MAPPING WITH PO'S AND PSO'S

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11		PSO 1	PSO 2	PSO 3
CO 1	3	3	3	--	--	2	--	3	--	--	--		--	2	--
CO 2	3	3	3	--	--	2	--	3	--	--	--		--	2	--
CO 3	3	3	3	--	--	2	--	3	--	--	--		--	2	--
CO4	3	3	3	--	--	2	--	3	--	--	--		--	2	--
AVG.	3	3	3	--	--	2	--	3	--	--	--		--	2	--

1BCVA209L	MECHANICS AND MATERIALS LABORATORY	01-Credits (1:0:0)
Hrs/Week : 02		CIE Marks:50
Total Hours: 26		SEE Marks:50
PART A		
PART – A COVENTIONAL EXPERIMENTS		
1. Verification of Lami’s Theorem. 2. Equilibrium of concurrent forces. 3. Parallel force system- Simply supported beam. 4. Verification of Varignon’s theorem. 5. Specific Gravity of a) Fine aggregates. b) Coarse aggregates. c) Cement. d) Soil. 6. Sieve analysis of soil-Graphical representation of the gradation curve and Visual identification of building materials: Bricks, Stones, Tiles, M-Sand, Bitumen, Fly-Ash, GGBS, Steel Bars of Various Sizes		
PART B		
PART – B TYPICAL OPEN-ENDED EXPERIMENTS		
Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.		
1. Reactions. 2. Field tests on cement. 3. Particle size distribution. 4. Gap graded. 5. Uniformly graded. 6. Well graded.		
Text books:		
Suggested Learning Resources: (Text Book/ Reference Book/ Manuals): 1. M. L. Gambhir : Concrete Manual : Dhanpat Rai & sons New – Delhi, ISBN-135551234001965. 2. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674 3. Ramamrutham.S, Engineering Mechanics, Dhanpat Rai Books, 2013,ISBN: 9789352164271. 4. Soil Mechanics and foundation Engineering by B C Punmia, Ashok kumar jain, Arun kumar jain, 18th edition, 2023, Laxmi Publications New Delhi..		
Reference books / Manuals:		
1. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition,2008, Wiley publication. 2. Rattan S.S., Strength of Materials, Third edition, 2017, McGraw Hill Education; New Delhi. ISBN 13978-9385965517. 3. Bansal R K, Strength of Materials, Laxmi Publications. 2023, 4th Edition, ISBN:978-8131808146. 4. IS 4031 (Part 11):1988 – Specific gravity test for hydraulic cement. 5. IS 383:1970 – Specification for coarse and fine aggregates from natural sources for concrete. 6. IS 2386(Part 3):1963 Methods of test for aggregates for concrete: Part 3 Specific gravity, density, voids, absorption and bulking. 7. IS 2720 (Part 3/Sec 1):1980 – Determination of specific gravity of soil.		
Web links and Video Lectures (e-Resources): 1. https://www.nptel.ac.in/courses/122104015/ 2. https://nptel.ac.in/courses/112103109/ 3. http://vlab.co.in/		
Teaching-Learning Process (Innovative Delivery Methods): The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching learning process and facilitate the achievement of course outcomes.		
1. Active Learning Techniques 2. Problem-Based Learning (PBL) 3. Team-Based Learning (TBL) 4. Hands-On Experiments and Simulations		
Assessment Structure: The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying 50% weightage (i.e., 50 marks each). The CIE		

Theory component will be 25 marks and CIE Practical component will be 25 marks. The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 20 marks. For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

Course Outcomes: After completion of the course students will be able to

1. Analyse coplanar force systems by analytical and graphical methods and verifying Lami's theorem.
2. Compute support reactions in simply supported beams experimentally and analytically.
3. Identify and understand the properties of various construction materials.

Basaveshwar Engineering College, Bagalkote

B.E-2nd Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) 2025-26 Academic Year

III- Semester

Branch: Civil Engineering

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1	BSC	BMAC301C	Mathematics –III for Civil Engineering Stream	Mathematics	3	0	0	50	50	100	3
2	PCC	BCVA302C	Mechanics of Materials	Civil Engineering	3	0	0	50	50	100	3
3	PCC	BCVA303C	Surveying	Civil Engineering	3	0	0	50	50	100	3
4	PCC	BCVA304C	Concrete Technology	Civil Engineering	3	0	0	50	50	100	3
5	PCC	BCVA305C	Building Materials and Construction Technology	Civil Engineering	2	0	0	50	50	100	2
6	PCC	BCVA306C	Engineering Geology	Civil Engineering	3	0	0	50	50	100	3
7	PCC	BCVA307L	Engineering Geology Lab	Civil Engineering	0	0	2	50	50	100	1
8	PCC	BCVA308L	Building Planning and drawing using CAD	Civil Engineering	0	0	2	50	50	100	1
9	PCC	BCVA309L	Basic materials and concrete testing lab	Civil Engineering	0	0	2	50	50	100	1
10	MC		Bridge Course Mathematics-I	Mathematics	3	0	0	50	50	100	0
11	MC	BHSA360M/ BHSB360M/ BHSC360M/	Yoga-1 NSS-1 PE-1	Humanities	-	-	2	-	100	100	0
					20	0	8	500	500	1000	20

Basaveshwar Engineering College, Bagalkote

B.E-2nd Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) 2025-26 Academic Year

IV- Semester

Branch: Civil Engineering

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.											
2.	BSC	BBTA402C	Biology for Engineers	Biotechnology	3	0	0	50	50	100	3
3.	PCC	BCVA403C	Analysis of Statically Determinate Structures	Civil Engineering	3	0	0	50	50	100	3
4.	PCC	BCVA404C	Soil Mechanics	Civil Engineering	3	0	0	50	50	100	3
5	PCC	BCVA405C	Highway Engineering	Civil Engineering	3	0	0	50	50	100	3
6	PCC	BCVA406C	Fluid Mechanics & Hydraulics	Civil Engineering	4	0	0	50	50	100	4
7	PCC	BCVA407L	Surveying practice Lab	Civil Engineering	0	0	2	50	50	100	1
8	PCC	BCVA408L	Highway Materials Testing Lab	Civil Engineering	0	0	2	50	50	100	1
9	PCC	BCVA409L	Fluid Mechanics Lab	Civil Engineering	0	0	2	50	50	100	1
10	HSMC	BHSA424C	UHV-II	Humanities / Civil Engg.	1	0	0	50	50	100	1
11	MC	BHSA460M/ B460M/C460M/ D460M	Yoga-2/NSS-2/PE-2/Music-2	Humanities	-	-	-	-	-	-	0
					20	0	6	500	500	1000	20

Basaveshwar Engineering College, Bagalkote

B.E–3rd Year Scheme of Teaching and Examinations
 (2024-25 Admitted Batch) **Semester** (2026-27 Academic Year)
Branch: Civil Engineering

V Semester

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	PCC	BCVA501C	Water Treatment and Supply Engineering	Civil Engineering	3	0	0	50	50	100	3
2.	PCC	BCVA502C	Analysis of Statically Indeterminate Structures	Civil Engineering	3	0	0	50	50	100	3
3.	PCC	BCVA503C	Foundation Engineering	Civil Engineering	2	0	0	50	50	100	2
4.	PEC	BCVX504E	Professional Elective Course-I	Civil Engineering	3	0	0	50	50	100	3
5.	OEC	BCVX505N	Open Elective Course-I	Respective Department	3	0	0	50	50	100	3
6	PCC	BCVA506P	Mini project	Civil Engineering	0	0	4	50	50	100	2
7	PCC	BCVA507L	Geotechnical Engineering lab	Civil Engineering	0	0	2	50	50	100	1
8	HSMC	BBTAXXXC	Environmental Studies	Biotechnology	1	0	0	50	50	100	1
9	AEC	BHSAXXX	Quantitative Aptitude and Professional Skills	Humanities	2	0	0	50	50	100	2
10	MC	BHS001/002/003M	NSS/Yoga/PE/Music	Humanities	-	-	-				0
					17	0	4	450	450	900	20

Professional Elective Course -I					Open Elective- 1				
Code	Title	L	T	P	Code	Title	L	T	P
BCVA504E	Alternative Building Materials and Technologies	3	0	0	BCVA505N	Groundwater Hydrology	3	0	0
BCVB504E	Water Resources Engineering	3	0	0	BCVB505N	Remote Sensing and GIS	3	0	0
BCVC504E	Air pollution and control	3	0	0	BCVC505N	Process Economics and Plant Design	3	0	0
BCVD504E	Highway Geometric Design	3	0	0	BCVD505N	Sustainable Development	3	0	0
BCVE504E	Advanced Surveying	3	0	0	BCVE505N	Air Pollution and Control	3	0	0
BCVF504E	Masonry Structures	3	0	0	BCVF505N	Green Building Technology	3	0	0

Basaveshwar Engineering College, Bagalkote

B.E-3rd Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) (2026-27 Academic Year)

VI Semester

Branch: Civil Engineering

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	PCC	BCVA601C	Design of RC Structures	Civil Engineering	3	0	0	50	50	100	3
2.	PCC	BCVA602C	Irrigation Engineering	Civil Engineering	2	0	0	50	50	100	2
3.	PCC	BCVA603C	Estimation and Costing	Civil Engineering	3	0	0	50	50	100	3
4.	PCC	BCVA604C	Advanced Wastewater Engineering	Civil Engineering	3	0	0	50	50	100	3
5.	PEC	BCVX605E	Professional Elective Course-II	Civil Engineering	3	0	0	50	50	100	3
6.	OEC	BCVX606N	Open Elective Course-II	Respective Department	3	0	0	50	50.	100	3
7.	PCC	BCVA607L	Software Application Lab	Civil Engineering	0	0	2	50	50	100	1
8.	PCC	BCVA608L	Environmental Engg lab	Civil Engineering	0	0	2	50	50	100	1
9	AEC	BHSA600C	Indian Knowledge System	Humanities	1	0	0	50	50	100	1
10	MC	BHS001/002/003M	NSS/Yoga/PE/Music	Humanities	-	-	-	-	-	-	0
					18	0	6	450	450	900	20

Professional Elective Course-II					Open Elective-II				
Code	Title	L	T	P	Code	Title	L	T	P
BCVA605E	Traffic Engineering	3	0	0	BCVA606N	Energy efficient buildings	3	0	0
BCVB605E	Matrix Methods of Structural Analysis	3	0	0	BCVB606N	Disaster Management and Mitigation	3	0	0
BCVC605E	Geomorphology	3	0	0	BCVC606N	Public Health Engineering	3	0	0
BCVD605E	Advance Concrete Technology	3	0	0	BCVD606N	Occupational Health and Safety	3	0	0
BCVE605E	Ground Improvement Techniques	3	0	0					

Basaveshwar Engineering College, Bagalkote

B.E-4th Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) (2027-28 Academic Year)

VII - Semester

Branch: Civil Engineering

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	PCC	BCVA701C	Design of Steel Structures	Civil Engineering	3	0	0	50	50	100	3
2.	PCC	BCVA702C	Design of Pre-stressed Concrete Structures	Civil Engineering	3	0	0	50	50	100	3
3	HSMC	BCVA703C	Construction Management	Civil Engineering	3	0	0	50	50	100	3
4	PEC	BCVX704E	Professional Elective Course - III	Civil Engineering	3	0	0	50	50	100	3
5	PEC	BCVX705E	Professional Elective Course-IV	Civil Engineering	3	0	0	50	50	100	3
6	Project	BCVA706P	Project Work	Civil Engineering	-	-	18	50	50	100	9
7	MC	BHS001/002/003M	NSS/Yoga/PE/Music	Humanities	-	-	-	-	-	-	0
					15	0	18	300	300	600	24

Professional Elective Course –III					Professional Elective Course -IV				
Code	Title	L	T	P	Code	Title	L	T	P
BCVA704E	Advanced Design of RC Structures	3	0	0	BCVA705E	Design of Bridges	3	0	0
BCVB704E	Numerical Techniques in Civil Engg	3	0	0	BCVB705E	Deep Foundations	3	0	0
BCVC704E	Soil Dynamics and Earthquake Engineering	3	0	0	BCVC705E	Solid Waste Management	3	0	0
BCVD704E	Industrial Waste Water treatment	3	0	0	BCVD705E	Pavement Design	3	0	0
BCVE704E	Design of Hydraulics Structures	3	0	0	BCVE705E	Environmental Impact Assessment	3	0	0
BCVF704E	Railway and Airport Engg								

Basaveshwar Engineering College, Bagalkote

B.E-4th Year Scheme of Teaching and Examinations

(2024-25 Admitted Batch) (2027-28 Academic Year)

VIII –Semester

Branch: Civil Engineering

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	INT	BCVA801I	Research / Industrial Internship	NP	-	-	-	50	50	100	10
2.	AEC	BCVA802O	MOOCs*	NP	3	0	0	50	50	100	3
3.	OEC	BCVA803O	MOOCs*	NP	3	0	0	50	50	100	3
4	MC	BHS001/002/003M	NSS/Yoga/PE/Music	Humanities	-	-	-	-	-	-	-
					6	0	0	150	150	300	16

BCVA302C	MECHANICS OF MATERIALS	Credits: 03
L:T:P – 3 : 0 : 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10 Hrs.
Simple Stresses and Strains: Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, state of simple shear, relationship among elastic constants.	
UNIT-II	10 Hrs.
Compound Stresses: Introduction, state of stress at a point, General two-dimensional stress system, Principal stresses and principal planes. Bending moment and shear force diagrams in beams: Introduction to shear force and bending moment, definitions and sign conventions, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, development of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) with salient values for cantilever, simply supported and overhanging beams for point loads, UDL (Uniformly Distributed Load), UVL (Uniformly Varying Load), Couple and their combinations	
UNIT-III	10 Hrs.
Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for rectangular, 'I', circular and 'T' sections.	
UNIT-IV	10 Hrs.
Deflection of Beams: Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment- curvature equation. Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple. Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.	
Reference Books	
1. Punmia, B. C., Jain, A. K., & Jain, A. K. (2018), <i>Strength of Materials</i> (10th ed.), Laxmi Publications. 2. Bansal, R. K. (2010), <i>A Textbook of Strength of Materials</i> (4th ed., revised), Laxmi Publications. 3. Basavarajaiah, B. S., & Mahadevappa, P. (2010), <i>Strength of Materials in SI Units</i> (3rd ed.), University Press. 4. Rattan, S. S. (2017), <i>Strength of Materials</i> (3rd ed.), McGraw Hill Education (India) Pvt. Ltd. 5. Vazirani, V. N., Ratwani, M. M., & Duggal, S. K. (2009), <i>Analysis of Structures Vol. I</i> (17th ed.), Khanna Publishers. 6. Rajput, R. K. (2018), <i>Strength of Materials</i> (7th ed.), S. Chand Publishing. 7. Bhavikatti, S. S. (2021), <i>Strength of Materials</i> (5th ed.), Vikas Publishing House 8. Beer, F. P., Johnston, E. R., DeWolf, J. T., & Mazurek, D. F. (2020), <i>Mechanics of Materials</i> (8th ed.), McGraw-Hill Education. 9. Hibbeler, R. C. (2024), <i>Mechanics of Materials</i> (11th ed.), Pearson publications	
Course Outcomes	
After completion of the course students will be able to	
1 Evaluate the fundamental concepts of stress, strain, Hooke's law, and elastic constants to analyze deformation in bars and composite members. 2. Determine principal stresses, locate principal planes and construct shear force and bending moment diagrams for beams.	

3. Determine bending and shear stresses in beams of various cross-sections using flexural and shear formulas.
4. Evaluate the deflections in beams and determine the buckling load of the columns for different end Conditions.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	2	1	-	-	-	1	-	2	2	2	-
CO2	3	3	3	2	1	-	-	-	1	-	2	2	2	-
CO3	3	3	3	2	1	-	-	-	1	-	2	2	2	-
CO4	3	3	3	2	1	-	-	-	1	-	2	2	2	-
Average	3	3	3	2	1	-	-	-	1	-	2	2	2	-

BCVA303C	SURVEYING	Credits: 03
L:T:P - 3 : 0 : 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10 Hrs.
Introduction: Definition of surveying, Objectives and importance of surveying. Classification of surveying, Principles of surveying, Units of measurements, Chain and tape types, Surveying measurements and errors. Measurement of Directions and Angles: Compass survey: Basic definitions, meridians, bearings, magnetic and True bearings. Prismatic and surveyor's compasses, temporary adjustments, declination. Quadrantal bearing system, whole circle bearing system, local attraction.	
UNIT-II	10 Hrs.
Levelling: Basic terms and definitions, Methods of levelling-Spirit levelling , Types of levels-Dumpy level, auto level, digital and laser levels-Instrument setup, Booking and reduction of levels-HI method, Rise and fall method. Differential levelling, profile levelling, fly levelling, check levelling, reciprocal levelling, Numerical problems. Contouring: Contours definition and characteristics, Methods of contouring, Interpolation of contours, contour gradient, and contours uses.	
UNIT-III	10 Hrs.
Theodolite Survey: Theodolite and types, Fundamental axes and parts of Vernier Transit theodolite, uses of theodolite, Temporary adjustments, measurement of horizontal angles (Repetition and reiteration methods) and vertical angles Trigonometric Levelling: Determination of Heights and Distances: of an accessible object, Inaccessible object by single plane and double plane methods, Numerical problems.	
UNIT-IV	10 Hrs.
Areas and Volumes- Methods of determining areas by trapezoidal and Simpsons' rule. Measurement of volume by Prismoidal and trapezoidal formula. Earthwork volume calculations from spot levels and from contour maps; Earthwork calculation in Embankments. Curves: Simple curves: Types, Elements, Designation of curves, setting out of simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), and Setting out curves by Rankine's deflection angle method, Numerical problems. Introduction to modern surveying Instruments: Total Station, segments in GPS, working principles & applications. Setting out works using Total Station, Setting out buildings by Centre line method.	
Reference Books *	
1. B.C. Punmia, Surveying, Vol. 1 , 16th Edition, Laxmi Publications, New Delhi.2005 2. S. S. Bhavikatti, 'Surveying & Leveling Vol-I', I. K. International New Delhi, 2008 3. S.K. Duggal, "Surveying Vol. I & II", Tata McGraw Hill Publishing Co. Ltd. New Delhi. 4. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi. 5. David Clerk, Plane and Geodetic Surveying Vol1 and Vol2, CBS publishers 6. B Bhatia, Remote Sensing and GIS, Oxford University Press, New Delhi. 7. T.M Lillesand, R.W Kiefer, . and J.W Chipman, Remote sensing and Image interpretation, 5th edition, John Wiley and Sons India 8. James M Anderson and Adward M Mikhail, Surveying theory and practice, 7th Edition, Tata McGraw Hill Publication	

9. Kang-tsung Chang, Introduction to geographic information systems, McGraw Hill HigherEducation.

Course Outcomes**

After completion of the course student will be able to

1. Students will get the knowledge of basics of surveying and basic instruments used in civil engineering surveys and Application of compass surveying for measurement of areas, bearing and distance along with the direction.
2. Finding the elevation, elevation differences and heights of different objects under different conditions.
3. In finding the elevations of different targets with respect to instruments under different conditions and relative position of different targets with respect to given point.
4. Setting of curves by different methods for different alignments.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	1	2	-	-	-	-	-	1	2	3	1
CO2	3	3	2	1	2	-	-	-	-	-	1	2	3	1
CO3	3	3	2	1	2	-	-	-	-	-	1	2	3	1
CO4	3	3	1	1	2	-	-	-	-	-	1	2	3	1

BCVA304C	CONCRETE TECHNOLOGY	Credits: 03
L:T:P-3: 0:0		CIE Marks:50
Total Hours/Week:3		SEE Marks:50

UNIT-I	10 Hrs.
Cement and Aggregates: Cement , Chemical Composition, Hydration of Cement. Types of cement, Manufacture of cement, Testing of cement - Field testing. Fineness by Sieve test and Blaine's air permeability test, Normal consistency test, Setting time test and Soundness test. Fine aggregates - Grading of aggregates, Specific gravity, Bulking, Moisture content and Deleterious materials. Coarse aggregates -Importance of size, shape and texture. Grading of aggregates, Sieve analysis, and Specific gravity. Flakiness and Elongation index, Crushing, Impact and Abrasion tests.	
UNIT-II	10 Hrs.
Fresh Concrete Properties Workability - Factors affecting workability, Measurement of workability –Slump Test, Flow test, Compacting Factor Test and Vee-bee Consistometer Test. Segregation and Bleeding. Manufacturing process of concrete-Batching, mixing, transporting, placing, compaction and curing.	
UNIT-III	10 Hrs.
Admixtures - Chemical admixtures - plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures- Fly ash, silica fume and rice husk ash. Water proofing compounds. Hardened Concrete Properties: Testing of hardened concrete – Compressive strength, Split tensile strength and Flexural Strength test. Factors affecting strength. w/c ratio, aggregate properties. Relation between Compressive strength and Tensile strength, Bond strength, Modulus of rupture and Elasticity.	
UNIT-IV	10 Hrs.
Durability - Definition, Factors affecting, environmental exposure conditions, Permeability – Definition, factors affecting permeability. Shrinkage, factors affecting shrinkage; Creep - factors affecting creep, effect of creep. Concrete Mix Design Concept of mix design, variables in proportioning, exposure conditions. Procedure of mix design as per IS 10262:2019. Numerical examples of mix design on mix design for OPC concrete mixes and Fly ash concrete mixes.	
Reference Books *	
1. M. S. Shetty Concrete Technology Theory and Practice, S. Chand and Co, New Delhi, 2002. 2. Neville A. M and Brooks, Concrete Technology, J. JELBS Edition, London Delhi, 4 th Edition, 2004. 3. P. Kumar Mehta & Paul J.M, Concrete Technology, Monterio Indian Concrete Institute USA- 1999 4. IS 10262:2019 for concrete mix design. 5. A. R. Santha Kumar, "Concrete Technology", Oxford University Press, New Delhi (New Edition). 6. M. L. Gambhir, "Concrete Technology", Mc Graw Hill Education, 2014. 7. N. V. Nayak, A. K. Jain Hand book on advanced Concrete Technology, ISBN:978-818487-186-9	
Course Outcomes**	

After completion of the course student will be able to

CO1: Explain the manufacturing process, types, chemical composition, and hydration of cement; **analyze** the properties and grading of aggregates; and **perform** relevant standard tests on cement and aggregates.

CO2: Describe the properties of fresh concrete including workability, segregation, and bleeding; **demonstrate** various methods for measuring workability; and **illustrate** the concrete manufacturing process.

CO3: Classify different chemical and mineral admixtures used in concrete; **evaluate** the testing procedures for hardened concrete to determine its mechanical properties.

CO4: Define and **discuss** the factors affecting the durability of concrete; **apply** the IS 10262:2019 guidelines to **design** concrete mixes and **solve** numerical problems related to mix design.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	3	2		1					2	2	
CO2	2	2	2	2	3		1		1			2	2	
CO3	2	3	2	3	2	1	2		1	1	1	2	2	
CO4	3	3	3	3	2	1	2		1	1	2	2	2	

BCVA305C	BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I	10 Hrs.
Building materials: Bricks: Classification of bricks, Tests on bricks. Other Building Materials: Reinforcing steel, Structural steel. Foundations: Safe bearing capacity of soil, Plate load test, Classification of foundations, introduction to spread, combined, strap, mat and pile foundation.	
UNIT-II	10 Hrs.
Masonry: Definition of terms used in masonry, Types of bonds in brickwork, Coursed and Uncoursed rubble masonry, Ashlar masonry. Stairs, doors, windows, and ventilators: Technical terms in stairs, Requirements of a good stair, Geometric design of RCC dog legged and open well stairs (plan and sectional elevation of stairs), Doors: Different types of doors, Windows, and Ventilators.	
UNIT-III	10 Hrs.
Floors: Types of flooring (Materials and methods of laying): Granolithic, Ceramic, Marble, Polished Granite flooring Roofs: Flat Roof (R.C. Flat terraced roofing), Lean to roof, Wooden truss (King post and Queen post truss).	
UNIT-IV	10 Hrs.
Arch, Lintel, Chejja: Classification of arches and Lintels: Types and classifications, Chejja, Functions. Plastering and painting: Purpose of plastering, Materials used for plastering, Lime mortar, Cement Mortar, Methods of plastering, Purpose of Painting, Application of paints to new and old surfaces, Distemper, Plastic emulsion, Enamel Powder coated painting to walls and steel surfaces, Polishing of wood surface.	
Reference Books	
1. Punmia, B. C., Jain, A. K., & Jain, A. K. (2023), <i>Building Construction</i> (12th ed.), Laxmi Publications Pvt. Ltd. 2. Rangwala, S. C. (2022), <i>Building Construction</i> (34th ed.), Charotar Publishing House Pvt. Ltd. 3. Kumar, S. (2023), <i>Building Construction</i> (20th ed. Reprint), Standard Publishers & Distributors. 4. Rangwala, P. C. (c. 2020), <i>Engineering Materials</i> (43rd ed.), Charotar Publishing House Pvt. Ltd. 5. Sushil Kumar, <i>Engineering Materials</i> , Standard Publication and Distributors, New Delhi	
Course Outcomes	
After completion of the course students will be able to 1. Identify and classify common building materials such as bricks and steels and explain testing methods and foundation types based on soil bearing capacity. 2. Describe masonry terms, differentiate between types of bonds and masonry, and interpret design elements of stairs, doors, windows, and ventilators. 3. Explain flooring types and laying methods, identify roof types and trusses, and classify arches, lintels, and chejjas with their functions. 4. Select appropriate plastering and painting materials and demonstrate application techniques for various surfaces in buildings.	

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	2	2	-	-	2	-	-	-	2	1	1	-	-
CO2	2	2	2	-	-	2	-	-	-	2	1	1	-	-
CO3	2	2	2	-	-	2	-	-	-	2	1	1	-	-
CO4	2	2	2	-	-	2	-	-	-	2	1	1	-	-
Average	2	2	2	-	-	2	-	-	-	2	1	1	-	-

BCVA306C	ENGINEERING GEOLOGY	Credits: 03
L-T-P : 3-0-0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I		10 Hrs.
Introduction: Geology- its branches; Engineering geology, its importance in civil engineering; Work activities of engineering geologist. Internal structure and composition of earth. Mineralogy: Definition, importance and general classification of minerals; Study of physical properties, chemical composition and uses of common rock forming and ore forming minerals; Stability of the minerals		
UNIT-II		10 Hrs.
Petrology: Introduction, definitions and general classification of rocks; Rock cycle; Mode of occurrence, structures, textures, classification, descriptions and engineering usage of important igneous, sedimentary and metamorphic rocks Geomorphology and Geo-dynamics: Epigene and hypogene geological agents; Weathering of rocks, types of weathering; Significance of Weathering in Civil Engineering. Soil – its formation, profile, classification, erosion and conservation. Earthquakes - Causes and effects, plate tectonics and elastic rebound theory; Seismic resistant structures. Stability of slopes- Landslides: Causes, effects and preventive measures.		
UNIT-III		10 Hrs.
Structural Geology: Basic definitions - outcrop, inlier, outlier, dip and strike; Use of Clinometer compass and Brunton compass. Study of important Geological structures - Faults, Folds, Joints and Unconformities - definition, classification, recognition in the field and significance in civil engineering. Selection of sites for civil engineering projects - dams, reservoirs and tunnels.		
UNIT-IV		10 Hrs.
Hydrogeology: Hydrological cycle, mode of occurrence and sources of groundwater; Water bearing properties of rocks and soils; Aquifers and their types. Influence of groundwater in engineering construction; groundwater exploration by geophysical method; Artificial recharge of groundwater. Environmental Geology: Definition and fundamental concepts of environmental geology; Interaction between human, geology and environment; Global warming and greenhouse effect; Environmental impacts of mining; Concept of eco friendly mining.		
Text Books		
1. Parbin Singh-A Text book of Engineering & General Geology; S.K. Kataria & Sons, 8th Revised Edn. New Delhi.2008 2. Santoshkumar Garg – Physical and Engineering Geology; Khanna Publishers, 3rd revised and enlarged Edn New Delhi. 1999. 3. P.K Mukerjee-A Textbook of Geology; The World Press,11th reviser Edn Pvt Ltd Calcutta.1990. 4. K.M.Bangar- Principals of Engineering Geology; Standard Publishers and Distributors, New Delhi.2004		

5. D. Venkat Reddy-**Engineering Geology for Civil Engineers**; Oxford & IBH Publishers, New Delhi.1997.
6. N.Chennakesavalu - Text Book of Engineering Geology; Macmillan Publishers 2nd Edn India Ltd. New Delhi. 2009.
7. Vasudev Kanithi – Engineering Geology; Universities Press (India) Pvt. Ltd. Hyderabad. 2018.
8. Subinoy Gangopadhyay- Engineering Geology; Oxford Universities Press New Delhi. 2013.
9. F.G.H.Blyth, M.H.de Freitas –Geology for Engineers; Elsevier publications 7th Edn 1988.
10. KVGK Gokhale-Principles of Engineering Geology; B S Publications, Hyderabad.

REFERENCES BOOKS

1. N.W. Gokhale - **Theory of Structural Geology**; CBS Publishers & Distributors, New Delhi 2nd Edn. 2003.
2. H.H.Read- **Rutley's, Elements of Mineralogy**; CBS Publishers & Distributors, New Delhi 26th Edn 1984.
3. G.W.Tyrrel- **Principles of Petrology**; BI Publications Pvt Ltd, New Delhi 1st Edn 1987.
4. S.K.Duggal, H.K.Pandey, N.Rawal – Engineering Geology, Mc Graw Hill Education publications 2017
5. K.S.Valdiya– Geology, Environment and Society; University Press (India) Pvt.Ltd., Hyderabad

Course Outcomes

After completion of the course student will be able to

CO1 : Explain the fundamental concepts of geology, Earth's structure, and the properties of common rock-forming and ore-forming minerals relevant to civil engineering.

CO2 : Analyze different types of rocks, soils, and geological processes (weathering, earthquakes, landslides) in relation to civil engineering structures.

CO3 : Evaluate geological structures such as folds, faults, joints, and unconformities for their significance in selecting sites for dams, reservoirs, and tunnels.

CO4 : Assess groundwater conditions and environmental geology issues to recommend sustainable solutions for engineering construction and mining.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	2		2	2						1	
CO2	3	3	3	2		2	3						1	
CO3	2	3	2			2	3						1	
CO4	2	2	2	2	3		2						1	

BCV307L	ENGINEERING GEOLOGY LAB	Credits: 01
L-T-P : 0-0-2		CIEMarks:50
Total Hours/Week: 02		SEEMarks:50

LIST OF EXPERIMENTS	
1. Megascopic Identification of Minerals based on their Physical properties; Quartz and its varieties. 2. Megascopic Identification of Minerals based on their Physical properties ; Felspars,Micas, Hornblende, Olivine, Serpentine, Asbestos, Kyanite, Talc, Garnet, Corundumand Barite. 3. Megascopic Identification of Minerals based on their Physical properties ; Carbonates and Ore minerals. 4. Megascopic Identification of Igneous Rocks based on Geological properties : Granite, Syenite, Diorite, Gabbro, Dunite, Porphyries, Dolerite, Pegmatite, Basalt and Pumice. 5. Megascopic Identification of Sedimentary Rocks based on Geological properties:Sandstone, Limestone, Shale, Breccia, Conglomerate and Laterite. 6. Megascopic Identification of Metamorphic Rocks based on Geological Properties : Gneiss, Quartzite, Marble, Slate, Phyllite, Schist and Charnockite. 7. Study and interpretation of standard geological maps. 8. Dip and Strike problems. 9. Bore hole Problems(On Level Ground). 10. Thickness Problems.	
REFERENCE BOOKS	
1. B.S. Satyanarayanswamy- Engineering Geology lab Manual, Eurasia Publication, New Delhi. 2003. 2. M.T.Maruthesha Reddy- Engineering Geology Practicals, New Age International Pvt Ltd , 1st Edn, New Delhi 2002. 3. N.W.Gokhale-Manual of Geological Maps, CBS Publishers & Distributors, 1st Edn, New Delhi.1987. 4. N.W.Gokhale-ExercisesongeologicalMaps&Dip-StrikeProblems,CBSPublishers &Distributors, 1st Edn, New Delhi.1996. 5. N.W.Gokhale-AGuidetoFieldGeology,CBSPublishers&Distributors,1stEdn.New Delhi.2001	
Course Outcomes	
After completion of the course student will be able to CO1: <i>Identify</i> common rock-forming and ore-forming minerals using their physical properties through megascopic examination. CO2: <i>Classify</i> igneous, sedimentary, and metamorphic rocks based on their geological characteristics and field appearances. CO3: <i>Interpret</i> geological maps and <i>solve</i> dip and strike problems, borehole data, and thickness problems relevant to subsurface geology. CO4: <i>Apply</i> geological knowledge to analyze and <i>evaluate</i> subsurface conditions for civil engineering projects using practical data	

[illegible]

BCVA308L	Building Planning and Drawing using CAD	Credits:01
L:T:P-O:0:2		CIE Marks:50
Total Hours/Week:2		SEE Marks:50

List of Experiments

1. Indian Standard- Specifications of Drawings, Introduction to Auto CAD
2. Cross section of stepped wall Foundation, masonry wall.
3. Cross section of masonry wall for one story building.
4. Cross section of masonry wall for two storied building
5. Plan and cross section of staircases – Dog legged.
6. Plan and cross section of staircases – Open well
7. Single Storied Building with one bed room
8. Single Storied Building with two bed room
9. Planning of Primary health center – Single Line Diagram
10. Planning of Primary school building. – Single Line Diagram
11. Planning of PWD division office. – Single Line Diagram
12. Planning of Tahshildar Office. – Single Line Diagram

Reference Books*

1. Shah M.H and Kale C.M., Building Drawing, Tata McGraw Hill Publishing co Ltd., New Delhi, 4th Edi, 2008.
2. Gurucharan Singh, Building Construction, Standard Publishers & distributors, New Delhi, 4th Edn. 1989.
3. Sushil Kumar, Building Construction, Standard Publications, New Delhi, 19th Edn. May 2018.
National Building Code, BIS, New Delhi, Dec 1986.

Course Outcomes

Student will be able

1. To understand the basic concept on Cad software tools.
2. To prepare working drawing for various components of a building and
3. To prepare, read and interpret the detailed drawing for residential building in a professional set up.
4. To prepare the single line diagram for various public buildings.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcome s (PSOs)			
	1	2	3	4	5	6	7	8	9	10	11		1	2	3	
	CO1	1	2	-	2	-	1	-	-	-	1		-	-	-	-
	CO2	-	2	-	2	-	3	-	-	-	-		-	-	-	-
	CO3	-	-	3	-	-	-	3	-	-	-		-	-	-	-
	CO4	-	-	3	3	3	-	-	3	-	-		-	-	-	-

LABORATORY ASSESSMENT:

- Each Laboratory subject is evaluated for 100 marks (50 CIE and 50 SEE).
- Allocation of 50 marks for CIE
 - Performance and journal write - up:
 - Marks for each experiment = 30 marks/ No. of proposed experiments.
 - One Practical test for 20 Marks. (5write-ups, 10 conduction, calculation, results etc. 5viva-voce)
- Allocation of 50 marks for SEE.
 - 25% write-up, 50% conduction, calculation, results etc., 25% viva-voce.

BCVA309L	BASIC MATERIALS AND CONCRETE TESTING LABORATORY	Credits 1:0:0
Hrs/Week : 02		CIE Marks:50
Total Hours:		SEE Marks:50
BASIC MATERIALS		
1. Tension test on HYSD bars 2. Torsion test on mild steel circular sections. 3. Bending test on wood under two-point loading 4. Test on bricks - Compressive strength and Absorption 5. Compression test on wood 6. Tests on Fine aggregates - Sieve Analysis, Moisture content, Specific gravity, Bulk density, Bulking and Silt Content 7. Tests on Coarse aggregates - Sieve Analysis, Water absorption, Moisture content, specific gravity and Bulk density.		
CEMENT & CONCRETE		
1. Tests on cement : Normal consistency, setting time, soundness by Autoclave method, fineness, specific gravity 2. Tests on Fresh concrete : Workability, slump, compaction factor, flow test and Vee-Bee test 3. Tests on Hardened concrete : Compression strength, Split tensile strength and flexural strength		
TEXT BOOKS		
1. Davis, Troxell and Hawk, Testing of Engineering Materials, International Student Edition McGraw Hill Book Co. New Delhi.1982 2. Fenner, Mechanical Testing of Materials, George Newnes Ltd. London.1965 3. Holes K A, English, Experimental Strength of Materials, Universities Press Ltd.London.2010 4. Suryanarayana A K, Testing of Metallic Materials, Prentice Hall of India Pvt. Ltd. New Delhi.2007 5. Kukreja C B, Kishore K. Ravi Chawla, Material Testing Laboratory Manual, Standard Publishers & Distributors 1996. 6. M.L.Gambhir, Concrete Manual, Dhanpat Rai & Sons- New Delhi.2004		
Laboratory Assessment		
1. Each Laboratory Subject is evaluated for 100 marks (50 CIE and 50 SEE) Allocation of 50 marks for CIE Performance and Journal write-up: Marks for each experiment = 30 marks / No. of proposed experiments. One Practical test for 20 marks (5 write-up, 10 conduction, calculation, results etc., 5 viva-voice). 2. Allocation of 50 marks for SEE 25% write-up, 50% conduction, calculation, results etc 25 % viva-voice.		
Course Outcomes: After completion of the course students will be able to		
1. To conduct and analyze mechanical tests on construction materials. 2. Evaluate the physical properties of fine and coarse aggregates 3. Determine the physical properties of cement 4. Assess the workability and strength characteristics of concrete		

CO-PO MATRIX														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
1	3	--	--	--	3	3	3	3	3	3	--	--	3	--
2	3	--	--	--	3	3	3	3	3	3	--	--	3	--
3	3	--	--	--	3	3	3	3	3	3	--	--	3	--
4	3	--	--	--	3	3	3	3	3	3	--	--	3	--
Avg	3	--	--	--	3	3	3	3	3	3	--	--	3	--

BCVA403C	Analysis of Statically Determinate Structures	Credits:03
L: T:P-3:0:0		CIE Marks:50
Total Hours/Week:3		SEE Marks:50

UNIT-I	10Hrs
Introductory Concepts: Structural systems, Forms of structures. One-, two- and three-dimensional structures. Compatibility and Constitutive relations. Material and Geometric linearity and nonlinearity. Determinate and indeterminate structures- Degree of Indeterminacy (Static and Kinematic). Deflection of beams by Moment-Area & Conjugate beam methods: Moment area theorems and conjugate beam theorems. Analysis of statically determinate beams. Numerical problems	
UNIT-II	10Hrs.
Deflection of beams and trusses by strain Energy methods: Strain Energy and Complementary strain energy, Strain energy due to axial load, bending. Principle of virtual work; Castigliano's theorems-I. Numerical problems on deflections of statically determinate beams using Castigliano's theorem-I and unit load methods. Deflection of trusses.	
UNIT-III	10Hrs.
Analysis of Arches: Three hinged parabolic arches with supports at same and different levels determination of thrust, shear and bending moment. Analysis of Cables: Analysis of cables under point load and udl, length of cables, supports at same and different levels	
UNIT-IV	10Hrs.
Rolling Loads and Influence Lines: Rolling Loads, Influence line diagram for reaction, shear force and bending moment at a section for simply supported beams due to point loads and uniformly distributed loads. Uses of Influence lines for analysis of simply supported beam for single and several point loads, uniformly distributed loads	
Reference Books*	
Reference Books * 1. B C Punmia, Ashok Kumar Jain, Aran Kumar Jain Theory of structures Vol-I & II Laxmi Publications, New Delhi-2004 2. C S Reddy-Basic Structural Analysis, 2 Edition, Tata Mc Graw Hill, New Delhi-2003. 3. Ramamrutham, R Narayan-Theory of structures,Dhanpt Rai Publishing Company,8 Edition New Delhi-2008	
Course Outcomes	
1. Compute degree of static and kinematic indeterminacy of structures and determine slopes and deflections for statically determinate beams. 2. Analyze statically determinate beams and trusses for deflections. 3. Analyze three hinged parabolic arches and cables for internal forces. 4. Draw influence lines and determine SF and BM due to rolling loads on simply supported beams	

Course Articulation Matrix (CAM)

[illegible]

BCVA404C	Soil Mechanics	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I	10 Hrs.
Introduction: Formation of soil, phase diagram, basic definitions and their interrelationships. Index Properties-Definitions and their determination, particle size analysis (sieve and Hydrometer analysis) consistency limits and indices, plasticity chart, activity of clay, field identification tests, BIS soil classification (IS: 1498-1970). Clay Mineralogy: Soil structure- single grained, honeycombed, flocculent and dispersed structures, soil-water system, electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures-Kaolinite, Illite and Montmorillonite and their application in engineering.	
UNIT-II	10 Hrs.
Flow Through Soils: Darcy's law-assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, seepage velocity, superficial velocity and coefficient of percolation, capillary phenomena. Seepage Analysis: Laplace equation, assumptions, limitations and its derivation. flow nets-characteristics and applications. Flow nets for sheet piles and below the dam section. Unconfined flow, phreatic line (Casagrande's method-with and without toe filter), flow through dams, design of dam filters.	
UNIT-III	10 Hrs.
Compaction of Soil: Definition, principle of compaction, standard and modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, field compaction control- compactive effort & method of compaction, lift thickness and number of passes, Proctor's needle, compacting equipments and their suitability. Consolidation of Soil: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_c, a_v, m_v and C_v), Time rate of consolidation.	
UNIT-IV	10 Hrs.
Shear Strength of Soils: Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, conventional and modified failure envelopes, total and effective shear strength parameters, concept of pore pressure, factors affecting shear strength of soils, sensitivity and thixotropy of clay. Measurement of shear parameters- direct shear test, unconfined compression test, triaxial compression test and vane shear test, Test under different drainage conditions.	
Reference Books *	
1. G. Ranjan and A.S.R Rao (2022), Basic and Applied Soil Mechanics (4th Edition), New Age International (P) Ltd., New Delhi. 2. B. M. Das (2021), Principles of Geotechnical Engineering (10th Edition), Cengage India Pvt. Ltd. 3. J. Knappett and R. F. Craig (2019), Craig's Soil Mechanics (9th Edition), CRC Press. 4. B. C. Punmia, A. K. Jain and A. K. Jain (2017), Soil Mechanics and Foundation Engineering (17th Edition), Laxmi Publications Co, New Delhi.	

Course Outcomes****After completion of the course student will be able to**

1. Analyse and interpret soil properties and clay mineralogy to effectively apply engineering principles in practical scenarios.
2. Apply Darcy's law, seepage phenomena, and utilize flow nets to solve practical engineering problems related to flow through soils and seepage analysis.
3. Apply the principles of compaction and consolidation to effectively control soil behaviour in engineering projects.
4. Determine settlement of soils and utilize testing methods to find shear strength parameters.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	1						1					3	
CO2	2	1											3	1
CO3	3	2		1				1					3	
CO4	2	2		1				1					3	
	2.5	1.5		1.0				1.0					3	1

BCVA405C	Highway Engineering	Credits: 03
L:T:P - 3 : 0 : 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10Hrs.
Principles of Transportation Engineering: Importance of transportation, Different modes of transportation. Characteristics of road transport, Importance of Roads in India, Current Road development Programs in India. Highway Development and Planning: Highway Development in India, Highway Planning, Planning Surveys and Interpretation. Highway Alignment and Project preparation: Highway Alignment, Engineering Surveys for Highway Alignment, Drawings and Reports, Highway Projects, Preparation of Detailed Project Report	
UNIT-II	10 Hrs.
Highway Geometric Design of horizontal alignment elements: Cross sectional elements, Sight distance, Design of Horizontal alignment, Design of vertical alignment. Pavement Design: Pavement types, component parts of flexible and rigid pavements and their functions, ESWL and its determination (Graphical method only)-Examples.	
UNIT-III	10 Hrs.
Pavement Materials: Sub grade soil -desirable properties-HRB soil classificationdetermination of CBR and modulus of sub grade reaction with Problems. Aggregates- Desirable properties. Bituminous Binders & Mixes- Types, desirable properties. Pavement Quality concrete- Materials, Requirements. Pavement Construction: General features, Embankment and Subgrade, Construction of Flexible pavements, Construction of CC pavements.	
UNIT-IV	10 Hrs.
Highway Drainage: Significance and requirements, Surface drainage system, sub surface drainage system, Types of cross drainage structures, their choice and location. Highway Economics: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual Cost method Benefit Cost Ratio method methods- Examples, Highway financing-BOT-BOOT concepts.	
Reference Books *	
1. Right, Paul H. and Dixon, Karen K., "Highway Engineering", John Wiley and Sons Inc. 2004 2. Khanna, S.K. Justo, C.E.G. and Veeraragavan , A . "Highway Engineering", Nem Chand & Bros. 2015 3. Papacostas, C.S. and Prevedouros, P.D., "Transportation Engineering and Planning", Prentice Hall. 2002 4. JotinKhisty, C. and Kent Lall, B., "Transportation Engineering – An Introduction", Third edition, Pearson India 2016 5. K. Subramaniam, "Transportation Engineering", SciTech Publications, Chennai. 6. SaxenaSubhash C and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi. 7. Chandra S. and Agarwal M.M. "Railway Engineering", Oxford University Press India. 8. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nem Chand and Bros. 9. Relevant Indian Roads Congress Codes – Geometric Aspects: IRC:38, 69, 73, 86, SP-23. Pavements: IRC:37, 58, 15, 44 Others: IRC:SP-42, SP-88, MORT&H Specifications 10. Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi. 11. C. JotinKhisty, B. Kentlal, "Transportation Engineering", PHI Learning Pvt. Ltd. New Delhi.	

Course Outcomes**

After completion of the course student will be able to

1. Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of required data.
2. Design road geometrics, structural components of pavement
3. Evaluate the engineering properties of the materials and suggest the suitability of the same for pavement construction.
4. Evaluate the highway drainage conditions and highway economics by few select methods and also will have a basic knowledge of various highway financing concepts.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1		1				1		1				1		
CO2										1			1	
CO3	1		1			1					1			1
CO4										1			1	

BCVA406C	Fluid Mechanics and Hydraulics	Credits:04
L:T:P-4: 0: 0		CIEMarks:50
Total Hours/Week:4		SEEMarks:50

UNIT-I												13Hrs.			
Properties of fluids: Density, Specific volume, specific weight, Relative density, and viscosity. Surface tension and Capillarity, Newton’s law of viscosity, Types of fluids: Newtonian & Non-Newtonian fluids, Ideal and Real fluids. Numerical some properties, Newton’s law of viscosity. Fluid pressure and it’s measurement: Derivation of Pascal’s law, and Hydrostatic law. Numericals. Types of pressure. Manometers and their classification, theory, derivation and numericals, Mechanical pressure gauges and Bourdon’s pressure gauge.															
UNIT-II												13Hrs.			
Fluid statics: Definition of Total pressure ,Centre of pressure ,Derivation of total hydrostatic force and depth of centre of pressure on a plane surface (Inclined) and numerical. Fluid kinematics: Lagrangian and Eulenan approaches of fluid flow analysis, Classification of flows. Continuity equation, Derivation of Continuity equation in three dimensions , Numericals .															
UNIT-III												13Hrs.			
Pipe flow: Definition, Classification of flows, HGL and TEL, major and minor losses in pipe flows. Derivation of equation for head loss due to friction (Darcy-Weisbach equation).Flow through compound pipes, (Series Parallel, Equivalent size).Problems on major and minor head losses Derivation for pressure rise due to gradual and sudden closure of valve and numerical.															
UNIT-IV												11Hrs.			
Open channel flow: Definition and classification, Derivation of Chezy's and Manning's equations and Numerical. Most economical rectangular, trapezoidal and circular channel sections: Derivations and numerical. Specific energy: Specific energy curve, Derivation of critical depth, critical velocity and minimum specific energy, Numerical. Froude's number and its significance. Hydraulic jump: derivation and numericals.															
Reference Books *															
1. JamesFCruise,VijayP.Singh,ElementaryHydraulics(1stEdition),MohsanM.Sherif,Thomson Learning. April 2006. 2. K.R.Arora Fluid Mechanics, Hydraulic and Hydraulics,StandardBookHouse,NewDelhi-2007. 3. JohnF.Douglas Fluid Mechanics.Pearson EducationNewDelhi,2011. 4. V.L.Streeter &B.Wylie Fluid Mechanics Lakshmi Publications,New Delhi,2007. 5. H.M.Raghunath Fluid MechanicsCBS PublicationNewDelhi.2008. 6. M.Manohar, FluidMechanics .Vol-IVikasPublishinghouse PvtLtdNew Delhi, 2008.															
Course Outcomes															
After completion of the course student will be able to: 1. Students should be able to use fluid properties basics to solve fluid Mechanics problems and compute hydrostatic pressure using various devices available 2. Students should be able apply concepts of hydrostatics and kinematics to real life fluid mechanics problems. 3. Should be able to apply Bernoulli’s principle in fluid mechanics problems and Compute pressure heads and losses in different types of pipe connections. 4. Students will be able to design open channel sections and compute energy losses in hydraulic jumps.															
Course Outcomes		Programme Outcomes										Programme specific Objectives			
		1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2	PSO3
CO 1		3	2	2	1	1	1	-	-	-	-	-	2	2	2
CO 2		3	3	2	1	2	2	-	-	-	-	-	2	2	2
CO 3		3	3	2	2	2	3	-	-	-	-	-	2	2	2
CO 4		3	2	2	2	2	2	-	-	-	-	-	2	2	2

BCVA407L	SURVEYING PRACTICE LAB	Credits:01
L:T:P-O:0:2		CIE Marks:50
Total Hours/Week:2		SEE Marks:50

List of Experiments

1. Demonstration of basic surveying instruments like (Chain, Tape etc...)
2. **Compass**
Setting out hexagon by compass
3. **Levelling**
Differential Levelling
Fly levelling and Fly back leveling
Reciprocal leveling, Profile and cross section levelling
Block Contouring
4. **Theodolite**
Measurement of Horizontal and vertical angles
Determination of elevation of an object: Base accessible
Determination of distance and elevation of an object: Base In-accessible- Single Plane
5. **Total Station**
Introduction → Taking Out Basic Measurements (SHV, REM, MLM)
Total Station –Station orientation, back sighting, Instrument Synchronization & Data recording.
Works on Total Station
Area Measurement
Topographic survey
Set out Parallel Lines
Downloading an contour map compilation only

Reference Books*

1. B.C. Punmia, Surveying, Vol. 1 Laxmi Publications, New Delhi.2005
2. A.M. Chandra, Plane Surveying, Vol-1, Newage International ® Ltd. 2nd Edn 2006
3. K. R. Arora, Plane Surveying, S. Chand and Company Ltd., New Delhi. Laboratory 1998
4. Dr.K.R.Arora, Plane and Advanced Surveying, Standerd Book House, New Delhi, 7th Edition-2009
5. GIS and Remote Sensing by Angireddi- 3rd Edition, Indian Publications, Hyderabad-2014.

Course Outcomes

- CO1:** Demonstrate the use of basic surveying instruments (chain, tape, compass, and level) for linear and angular measurements, and setting out of simple geometrical figures such as a hexagon.
- CO2:** Conduct various levelling techniques including differential, fly, reciprocal, and profile levelling, and interpret the results to generate elevation profiles and contour maps.
- CO3:** Utilize theodolite for measuring horizontal and vertical angles and determine elevations and distances for both accessible and inaccessible locations.
- CO4:** Operate a Total Station for data collection, area measurement, topographic survey, and layout of parallel lines; perform data transfer and compilation of contour maps using software tools.

Sl. No.	Course Outcomes(CO's)	Programme Objectives											PSOs		
		1	2	3	4	5	6	7	8	9	10	11	1	2	3
01	CO1	3	2	-	2	1	-	-	-	2	2	1	-	-	-
02	CO2	3	3	-	3	2	-	-	-	2	2	1	-	-	-
03	CO3	3	3	-	3	3	-	-	-	2	2	2	-	-	-
04	CO4	3	3	2	3	3	-	-	-	3	3	2	-	-	-

LABORATORY ASSESSMENT:

- Each Laboratory subject is evaluated for 100 marks (50 CIE and 50 SEE).
- Allocation of 50 marks for CIE
 - Performance and journal write - up:
 - Marks for each experiment = 30 marks/ No. of proposed experiments.
 - One Practical test for 20 Marks. (5write-ups, 10 conduction, calculation, results etc. 5viva-voce)
- Allocation of 50 marks for SEE.
 - 25% write-up, 50% conduction, calculation, results etc., 25% viva-voce.

BCVA408L	Highway Materials Testing Lab	Credits: 01
L:T:P - 0 : 0: 2		CIEMarks:50
Total Hours/Week: 2		SEEMarks:50

PRACTICAL COMPONENT	
Tests on Aggregates a. Crushing Strength Test b. Los Angeles abrasion test c. Impact test d. Shape tests (combined index and angularity number) Tests on Bituminous Materials a. Penetration test b. Ductility test c. Softening point test d. Specific gravity test e. Viscosity test by tar viscometer f. Flash and fire point test Tests on Soil a. Wet sieve analysis b. CBR Test on soil Design of flexible pavement as per IRC 37-2018 Design of Rigid pavement as per IRC 58-2015 Bituminous Mix Design by Marshall Method (Demonstration only) Traffic Engineering studies.	
Reference Books *	
1. Khanna, S.K. Justo, C.E.G. and Veeraragavan , A . “Highway Engineering lab Manual”, Nem Chand & Bros. 2015 2. Relevant Indian Roads Congress Codes – Geometric Aspects: IRC:38, 69, 73, 86, SP-23. Pavements: IRC:37, 58, 15, 44 Others: IRC:SP-42, SP-88, MORT&H Specifications 3. Specifications for Roads and Bridges-MORT&H, IRC, New Delhi. 4. C. JotinKhisty, B. Kentlal, “Transportation Engineering”, PHI Learning Pvt. Ltd. New Delhi.	
Course Outcomes**	
After completion of the laboratory student will be able to 1 . Acquires capability of choosing the appropriate aggregates for construction and design the pavement as per standard practices. 2. Acquires capability of choosing the appropriate bitumen for construction and design the pavement as per standard practices. 3. Select the appropriate soil for construction and design the pavement as per standard practices. 4. Able to interpret the experimental results of highway materials based on laboratory tests and design the pavement as per IRC guidelines.	

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1		1				1		1				1		
CO2										1			1	
CO3	1		1			1					1			1
CO4										1			1	

BCVA409L	Fluid Mechanics Lab	Credits : 01
Hours/Week (L:T:P): 0:0:2		CIE Marks :50
Course Type: Practical		SEE Marks :50

Course Learning objectives: This course will enable students to

1. Learn the Principles of Kinematics, hydrodynamics and its applications
2. Study the Flow measurements
3. Understand the design of open channels and energy concepts
4. Understand the Working principles of hydraulic turbines and pumps

List of Experiments		
1	Calibration of Venture meter	L1,L2
2	Calibration of Orifice meter	L1,L2
3	Determination of hydraulic coefficients of small vertical orifice mouthpiece	L1,L2
4	Calibration of Rectangular notch	L1,L2
5	Calibration of triangular notch	L1,L2
6	Calibration of Trapezoidal notch	L1,L2
7	Determination of major losses in pipes	L1,L2
8	Determination of minor losses in pipes	L1,L2
9	Determination of Cd for ogee crested weir	L1,L2
10	Determination of Cd for broad crested weir	L1,L2
11	Determination of efficiency of jet on flat and curved vanes	L1,L2
12	Demo of determination of efficiency of centrifugal pump	L1,L2
13	Demo of determination of efficiency of Francis/Kaplan turbine	L1,L2
14	Demo of determination of efficiency of Pelton wheel	L1,L2

Suggested Learning resources

Text Books:

1. P.N. Modi and S.M. Seth-Hydraulics and Fluid Mechanics, including Hydraulic machines, standard Book House, New Delhi
2. K Subramanya- Fluid Mechanics and Hydraulic Machines, Tata McGraw-Hill, New Delhi
3. R.K. Bansal- A text book of Fluid Mechanics and Hydraulic Machines- Laxmi Publications, New Delhi
4. Victor L. Streeter, Benjamin Wyile E and Keith W. Bedford- Fluid Mechanics, Tata McGraw Hill publishing Co Ltd, New Delhi

Course Outcomes:

1. Calibrate discharge measuring apparatus when fluid flows through it.
2. Determine the major and minor in the pipes
3. Determine the impact of water jet flat and hemispherical vanes.
4. Calculate the Hydraulic Coefficients

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
C01	3	3	3			1			2			3	2	
C02	3	3	3			1			2			3	2	
C03	3	3	3			1			2			3	1	
C04	3	3	3			1			2			3	2	

BASAVESHWAR ENGINEERING COLLEGE,BAGALKOTE														
B.E. in Civil Engineering														
Scheme of Teaching and Examinations 2022 (2023-24 Admitted Year) (2025-26 Academic Year)														
V SEMESTER														
Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits	
					Theory	Lecture	Tutorial	Practical	Self - Study	Duration in hours	CIE Marks	SEE Marks		Total Marks
1	PCC	22UCV511C	Irrigation Engg and Hydraulic Structures	TD: CV PSB: CV	3	0	0	0	03	50	50	100	3	
2	PCC	22UCV512C	Geotechnical Engineering	TD: CV PSB: CV	3	0	0	0	03	50	50	100	3	
3	PCC	22UCV513C	Concrete Technology	TD: CV PSB: CV	2	0	0	0	03	50	50	100	2	
4	PCCL	22UCV514L	Environmental Engineering Lab	TD: CV PSB: CV	0	0	2	0	03	50	50	100	1	
5	PEC	22UCV52XE	Professional Elective Course - 1	TD: CV PSB: CV	3	0	0	0	03	50	50	100	3	
6	OEC	22UCV53XN	Open Elective -1	TD: CV PSB: CV	3	0	0	0	03	50	50	100	3	
7	PROJ	22UCV515P	Mini Project	TD: CV PSB: CV	0	0	4	0	03	50	50	100	2	
8	HSSM	22UCV523C	Environmental Studies	TD: CV PSB: CV	1	0	0	0	02	50	50	100	1	
9	HSMC	22UHS522C	Quantitative Aptitude and Professional Skills	TD: CV PSB: CV	2	0	0	0	02	50	50	100	2	
10	MC	22UHS002M	National Service Scheme (NSS)	NSS coordinator	-	-	-	-	-	-	-	-	-	
		22UHS003M	Physical Education (PE)	Physical Director										
		22UHS001M	Yoga	Yoga Teacher										
		22UHS004M	Music	Music Teacher										
Total									450	450	900	20		
Professional Elective Course -1														
22UCV 521E		Water Resource Engineering			22UCV 524E		Solid Waste Management							
22UCV 522E		Occupational Health and Safety			22UCV 525E		Remote Sensing and GIS							
22UCV 523E		Air Pollution and Control			22UCV 526E		Process Economics and Plant Design							
22UCV 527E		Highway Geometric Design			22UCV 528E		Masonry structures							
Open Elective Course -1														
22UCV531N		Air Pollution and Control			22UCV534N		Integrated Waste Management for a Smart City							
22UCV532N		Geographic Information Systems			22UCV535N		Green Building Technology							
22UCV533N		Occupational Health and Safety			22UCV536N		Water conservation and Rainwater Harvesting							

BASAVESHWAR ENGINEERING COLLEGE,BAGALKOTE													
B.E. in Civil Engineering Scheme of Teaching and Examinations2022													
Scheme of Teaching and Examinations 2022 (2023-24 Admitted Year) (2025-26 Academic Year)													
VI SEMESTER													
Sl.No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practica	Self -	Duration in hours	CIE Marks	SEE Marks	Total	
1	PCC	22UCV611C	Design of RC Structures	TD: CV PSB: CV	3	0	0		03	50	50	100	3
2	PCC	22UCV612C	Construction Management	TD: CV PSB: CV	3	0	0		03	50	50	100	3
3	PCC	22UCV613C	Applied Geotechnical Engineering	TD: CV PSB: CV	3	0	0		03	50	50	100	3
4	PCC	22UCV614C	Advanced wastewater Treatment	TD: CV PSB: CV	2	0	0		03	50	50	100	2
5	PEC	22UCV62XE	Professional Elective Course-2	TD: CV PSB: CV	3	0	0		03	50	50	100	3
6	OEC	22UCV63XN	Open Elective Course -2	TD: CV PSB: CV	3	0	0		03	50	50	100	3
7	PCCL	22UCV615L	Geotechnical Engineering Lab	TD: CV PSB: CV	0	0	2		03	50	50	100	1
8	PCCL	22UCV616L	Software Application Lab	TD: CV PSB: CV	0	0	2		03	50	50	100	1
9	AEC	22UHS600C	Indian Knowledge System	TD: CV PSB: CV	1	0	0		03	50	50	100	1
10	MC	22UHS002M	National Service Scheme (NSS)	TD: CV PSB: CV	-	-	-	-	-	-	-	-	-
		22UHS003M	Physical Education (PE)	TD: CV PSB: CV									
		22UHS001M	Yoga	Yoga Teacher									
		22UHS004M	Music	Music Teacher									
Total									400	400	800	20	
Professional Elective Course – 2													
22UCV 621E		Design of Bridges			22UCV 625E		Design and Construction of Highway Pavements						
22UCV 622E		Geomorphology			22UCV 626E		Industrial Wastewater Treatment						
22UCV 623E		Open Channel Flow			22UCV 627E		Traffic Engineering						
22UCV 624E		Matric Methods of structural Analysis			22UCV 628E		Ground Improvement Techniques						
Open Elective Course -2													
22UCV 631N		Occupational Health and Safety			22UCV 634N		Disaster Management and Mitigation						
22UCV 632N		Geographic Information Systems			22UCV 635N		Sustainable Development Goals						
22UCV 633N		Public Health Engineering			22UCV 636N		Water conservation and Rainwater Harvesting						

22UCV511C	Irrigation and Hydraulic Structures	Credits:3
L:T:P-3: 0: 0		CIEMarks:50
Total Hours/Week:3		SEEMarks:50

UNIT-I	10Hrs.
Introduction: Practical application of hydrology, Horton Hydrological cycle, Precipitation: Definition and forms and types of precipitation. Weather seasons in India. Measurement of precipitation by Tipping Bucket Rain gauge. Computation of average depth of Precipitation by Isohytal method , Estimation of missing precipitation record. Numerical WATER LOSSES: Infiltration: Factors affecting infiltration. Double Ring Infiltrometers, infiltration capacity curve, Infiltration indices. Numericals Evaporation: Factors affecting evaporation. Evaporation pans, ISI standard pan, Numericals Evapotranspiration, PET and AET definitions.	
UNIT-II	10Hrs.
Run-off: , factors affecting run off, methods to measure runoff, time of concentration by Kirpitch formula , problems Hydrograph theory: Components of hydrograph. Separation of base flow, Unit hydrograph theory. Derivation of unit hydrograph and derivation of UH of different durations, Numericals. S-curve and its use (Theory only). Ground water hydrology: Occurrence, aquifers, aquitard, aquifuge, aquiclude, perched aquifer. Aquifer parameters and Darcy's law for 1-Dimensional flow only	
UNIT-III	10Hrs.
Irrigation engineering: Necessity, benefits and ill effects of irrigation, Types of Irrigation, Techniques of water distribution in the farm, quality of irrigation water, Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor. Canals: Classifications, Regime theory, Design of canals cross sections by Lacey's method. Water requirement of crops: consumptive use, duty, delta and base period, and problems, factors affecting and methods to improve duty.	
UNIT-IV	10Hrs.
Reservoirs: Investigation for reservoir site, storage zones, determination of storage capacity using mass curve, Economical height of dam. Gravity dams: Forces acting on gravity dam, Profile of gravity dam, Analytical method of Stability analysis and problems, Drainage gallery. Earthen dams: Types, Construction, Causes of failure of earthen dams, Seepage control measures, Spillways: Different types of spill ways (theory and equations only), Energy dissipaters.	
After completion of the course student will be able to 1. After completion of this course students will be able to: 2. Understand components of hydrological cycle, measure and quantify precipitation, Evaporation and infiltration. 3. Estimate runoff and generate hydrographs. 4. To be able to compute duty, delta and frequency of irrigation, and design canal cross sections. 5. Determine storage capacity of reservoirs & understand basics of gravity and earthen dams & spillways.	
Reference Books * 1.S.K..Garg , " Irrigation Engineering and Hydraulic Structures" , , Laxmi Publications, New Delhi, 2005. 2. H. M. Raghunath, Hydrology, New age international publishers, 2006. 3. G. L. Asawa, Irrigation Engineering, New Age international publications, 2005.	

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	2	1	-	-	-	-	-	-	2	2	2
CO 2	3	3	2	2	2	2	-	-	-	-	-	-	2	2	2
CO 3	3	3	2	2	2	3	-	-	-	-	-	-	2	2	2
CO 4	3	2	2	2	2	2	-	-	-	-	-	-	2	2	2
Average	3	2.5	2	2	2	2	-	-	-	-	-	-	2	2	2

22UCV512C	Geotechnical Engineering	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I		10 Hrs.
Introduction: Formation of soil, phase diagram, basic definitions and their interrelationships. Index Properties-Definitions and their determination, particle size analysis (sieve and Hydrometer analysis) consistency limits and indices, plasticity chart, activity of clay, field identification tests, BIS soil classification (IS: 1498-1970). Clay Mineralogy: Soil structure- single grained, honeycombed, flocculent and dispersed structures, soil-water system, electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures-Kaolinite, Illite and Montmorillonite and their application in engineering.		
UNIT-II		10 Hrs.
Flow Through Soils: Darcy's law-assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, seepage velocity, superficial velocity and coefficient of percolation, capillary phenomena. Seepage Analysis: Laplace equation, assumptions, limitations and its derivation. flow nets-characteristics and applications. Flow nets for sheet piles and below the dam section. Unconfined flow, phreatic line (Casagrande's method-with and without toe filter), flow through dams, design of dam filters.		
UNIT-III		10 Hrs.
Compaction of Soil: Definition, principle of compaction, standard and modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, field compaction control- compactive effort & method of compaction, lift thickness and number of passes, Proctor's needle, compacting equipments and their suitability. Consolidation of Soil: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (C_c, a_v, m_v and C_v), Time rate of consolidation.		
UNIT-IV		10 Hrs.
Shear Strength of Soils: Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, conventional and modified failure envelopes, total and effective shear strength parameters, concept of pore pressure, factors affecting shear strength of soils, sensitivity and thixotropy of clay. Measurement of shear parameters- direct shear test, unconfined compression test, triaxial compression test and vane shear test, Test under different drainage conditions.		
Reference Books *		
1. G. Ranjan and A.S.R Rao (2022), Basic and Applied Soil Mechanics (4th Edition), New Age International (P) Ltd., New Delhi. 2. B. M. Das (2021), Principles of Geotechnical Engineering (10th Edition), Cengage India Pvt. Ltd. 3. J. Knappett and R. F. Craig (2019), Craig's Soil Mechanics (9th Edition), CRC Press. 4. B. C. Punmia, A. K. Jain and A. K. Jain (2017), Soil Mechanics and Foundation Engineering (17th Edition), Laxmi Publications Co, New Delhi.		

Course Outcomes****After completion of the course student will be able to**

1. Analyse and interpret soil properties and clay mineralogy to effectively apply engineering principles in practical scenarios.
2. Apply Darcy's law, seepage phenomena, and utilize flow nets to solve practical engineering problems related to flow through soils and seepage analysis.
3. Apply the principles of compaction and consolidation to effectively control soil behaviour in engineering projects.
4. Determine settlement of soils and utilize testing methods to find shear strength parameters.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	1						1					3	
CO2	2	1											3	2
CO3	3	2		1				1					3	
CO4	2	2		1				1					3	
	2.5	1.5		1.0				1.0					3	2

22UCV513C	CONCRETE TECHNOLOGY	Credits: 02
L:T:P-2: 0:0		CIE Marks:50
Total Hours/Week:2		SEE Marks:50

UNIT-I	6 Hrs.
Cement - Chemical Composition, Hydration of Cement. Types of cement, Manufacture of cement, Testing of cement - Field testing. Fineness by Sieve test and Blaine's air permeability test, Normal consistency test, Setting time test and Soundness test.	
UNIT-II	7 Hrs.
Fresh Concrete Properties - Workability - Factors affecting workability, Measurement of workability. Hardened Concrete Properties - Testing of hardened concrete – Compressive strength, Split tensile strength and Flexural Strength test. Factors affecting strength. w/c ratio, aggregate properties. Relation between Compressive strength and Tensile strength, Bond strength.	
UNIT-III	6 Hrs.
Elasticity, Creep & Shrinkage – Modulus of elasticity, Poisson's ratio, Creep of concrete, Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage, environmental exposure conditions.	
UNIT-IV	7 Hrs.
Concrete Mix Design - Concept of mix design, variables in proportioning, exposure conditions. Procedure of mix design as per IS 10262:2019. Numerical examples of mix design on mix design for OPC concrete mixes and Fly ash concrete mixes.	
Reference Books *	
1. M. S. Shetty Concrete Technology Theory and Practice, S. Chand and Co, New Delhi, 2002. 2. Neivelle A. M and Brooks, Concrete Technology, J.JELBS Edition, London Delhi, 4th Edition, 2004. 3. P. Kumar Mehta & Paul J.M, Concrete Technology, Monterio Indian Concrete Institute USA- 1999 4. IS 10262:2019 for Concrete Mix Design. 5. A. R. SanthaKumar, "Concrete Technology", Oxford University Press, New Delhi(New Edition). 6. M. L. Gambhir, "Concrete Technology", Mc Graw Hill Education, 2014. 7. N. V. Nayak, A. K. Jain Hand book on advanced Concrete Technology, ISBN:978-818487-186-9 8. Design of Concrete Mixes by N. Krishna Raju, CBS Publications, 2000.	
Course Outcomes**	
After completion of the course student will be able to	
CO1: Explain the manufacturing process, types, chemical composition, and hydration of cement, perform relevant standard tests on cement and aggregates.	
CO2: Evaluate the properties of fresh and hardened concrete by analyzing factors affecting workability and strength, and conduct standard tests.	
CO3: Analyze the fundamental concepts of elasticity, creep, and shrinkage in concrete, including their influencing factors and effects on structural performance under various environmental exposure conditions.	
CO4: Apply the IS 10262:2019 guidelines to design concrete mixes and solve numerical problems related to mix design.	

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	3	2		1					2	2	
CO2	2	2	2	2	3		1		1			2	2	
CO3	2	3	2	3	2	1	2		1	1	1	2	2	
CO4	3	3	3	3	2	1	2		1	1	2	2	2	

22UCV514L	Environmental Engineering Lab	Credits: 01
L:T:P - 0: 0: 2		CIE Marks: 50
Total Hours/Week: 2		SEE Marks: 50

I. Tests on Water Quality

i. Physical Parameters

- 1) To find the colour of a given sample of water.
- 2) To find the turbidity of a given sample of water.
- 3) To determine the conductivity of a given sample of water.
- 4) To determine the temperature of a given sample of water.

ii. Chemical Parameters

- 1) To find out total dissolved solid, settle able solids, suspended solids and volatile solids of the given sample.
- 2) To determine the pH value of a given sample of water.
- 3) To determine the acidity of a given sample of water.
- 4) To determine the carbonate, bicarbonate, and hydroxide alkalinity of a sample.
- 5) To find out the concentration of chlorides in the given sample of water.
- 6) To estimate the hardness of the given sample of water by standard EDTA method.
- 7) To determine the sulphate of a given sample of water.
- 8) To determine the fluoride of a given sample of water.
- 9) To determine the Iron of a given sample of water.
- 10) To determine residual chlorine in a given sample of water.
- 11) To determine chlorine demand for the given sample of water.
- 12) To determine nitrate in a given sample of water.
- 13) To determine dissolved oxygen in a given sample of water.

iii. Bacteriological Parameters

- 1) To determine MPN of coliforms of the given sample.
- 2) Microbial Examination of Water Samples Using the Membrane Filtration Technique.

II. Tests on Sewage

- 1) To determine biochemical oxygen demand (BOD) exerted by the given wastewater sample.
- 2) To determine Chemical oxygen demand (COD) exerted by the given wastewater sample.

III. Other Tests

- 1) To determine the optimum dose of alum required to treat the given water.
- 2) To determine the percentage of chlorine present in the given bleaching powder.

References

1. Manual of Water and Wastewater Analysis- NEERI Publication 1988.
2. Standard methods for Examination of Water and Wastewater Analysis APHA, AWWA. 2011.
3. Manual for Sewer and Sewerage, Central Public Health & Environmental Engineering Organization, Ministry of Housing and Urban Development, Govt. of India.
4. Manual for water supply and treatment, Central Public Health & Environmental Engineering Organization, Ministry of Housing and Urban Development, Govt. of India.

Course Outcomes**

After completion of the course student will be able to

1. Able to determine the physical, chemical and biological parameters for drinking purpose as per BIS standards.
2. Analyze the test results and recommend the water for its potability.
3. Identify and characterize wastewater using standard methods.
4. Analyze the test results and recommend wastewater for its disposal.

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	3	3	2	2	2	2	2	-	2	1	-	2	3	2	
CO2	3	3	2	2	1	1	2	-	1	1	-	2	3	2	
CO3	3	3	2	2	2	1	2	-	2	1	-	2	3	2	
CO4	3	2	-	-	-	-	-	-	-	-	-	-	2	2	

22UCV515P	EXTENSIVE SURVEY PROJECT	Credits:2
L:T:P-0:2:2		CIE Marks: 50
Total Hours/Week:4		SEEMarks:50

1. NEW TANK PROJECTS: The work shall consist of;

- a. Reconnaissance survey for selection of site and conceptualization of project.
- b. Alignment of Centre line of the proposed bund, Longitudinal and cross sections of the centre line.
- c. Detailed survey required for project execution like Capacity surveys, Details at Waste weir and sluice points, Canal alignment etc. as per requirement
- d. Design and preparation of drawing with report.

2. WATER SUPPLY AND SANITARY PROJECT: The work shall consist of;

- a. Reconnaissance survey for selection of site and conceptualization of project.
- b. Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population.
- c. Preparation of village map by using total station.
- d. Survey work required for laying of water supply and UGD pipelines
- e. Location of sites for water tank. Selection of type of water tank to be provided (ground level, overhead and underground)
- f. Design of all elements and preparation of drawing with report.

3. HIGHWAY PROJECT: The work shall consist of;

- a. Reconnaissance survey for selection of site and conceptualization of project.
- b. Preliminary and detailed investigations to align a new road (min. 1.5 to 2 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. Surveying by using conventional instruments and total station.
- c. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed.
- d. Drawing shall include key plan, alignment, and longitudinal section along alignment, typical cross sections of road.

EXAMINATION

1. The student shall submit a project report consisting of designs and drawings.
2. Drawings should be done using CAD and survey work using total station.

3. Students should learn data download from total station, generation of contours, block levelling, longitudinal and cross sectional diagrams, and capacity volume calculation by using relevant software.

EVALUATION FOR CIE (FOR 50 MARKS)

1. Field work : 12.5Marks
2. Office work (Design and drawing): 12.5Marks
3. Presentation of the prepared report: 12.5Marks
4. Final report submission: 12.5Marks

EVALUATION FOR SEE (FOR 50 MARKS)

1. Presentation of the prepared report: 37.5Marks
2. Viva: 12.5Marks

Course Outcomes

1. Apply Surveying knowledge and tools effectively for the projects.
2. Understanding Task environment, Goals, responsibilities, Task focus, working in Teams towards common goals, Organizational performance expectations, technical and behavioural competencies in designing New tank project, water supply & sanitary project and Highway projects.
3. Application of individual effectiveness skills in team and at organizational level.

COURSE ARTICULATION MATRIX

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	1	2	-	3	1	1	-	3	2	2	2	3	2	2
CO 2	3	3	3	2	3	3	3	2	3	3	3	2	3	3	3
CO 3	3	2	-	-	-	1	-	2	3	3	2	3	3	1	3
CO 4	3	3	3	2	3	3	3	2	3	3	3	2	3	3	3
Average	3	2.25	2	1	2.25	2	1.75	1.5	3	2.75	2.5	2.25	3	2.25	2.75

22UCV522E	Occupational Safety and Health	Credits: 03
L:T:P – 3:0:0		CIE Marks:50
Total Hours/Week: 03		SEE Marks:50

UNIT-I	10 Hrs.
Introduction - History and Development, Occupational Safety and Health Act. Occupational Safety and Health Administration, Right to know Laws. Accident Causation-Need for Accident Investigation, Accident investigation plan, Methods of acquiring Accident Facts, Correcting Missing Skills, Investigator Tendencies and Characteristics, Supervisory Role in Accident investigation. Human Error Model, Petersew's Model, Epidemiological Models. Ergonomics- Ergonomics at workplace, Ergonomic Task Analysis, Preventing Ergonomic Hazards, Setting up of Ergonomics Programme.	
UNIT-II	10 Hrs.
Occupational Hazard and Control- Hazard Analysis, Human Error Analysis in Causation with Hazard Analysis, Fault Tree Analysis, Emergency Response. Decision for Action, Purpose and Considerations, Right Decision, Wrong Remedy, Hazard Control Measures, Hazards and their Control in Pharmaceutical, Construction, Textiles, Petroleum Refineries and LPG Bottling, Iron and Steel industries	
UNIT-III	10 Hrs.
Fire prevention and Protection- Fire Development and its Severity effects. Enclosure, need for early Detection of Fire, Extinguishing Fire Electrical Safety Product Safety, Technical Requirements of Product Safety Programme. Environmental Safety and ISO 14000 ISO series of standards, ISO14001Standards, Environmental Management systems. (EMS) Total quality Management (TQM) and Total safety Management (TSM).	
UNIT-IV	10 Hrs.
Occupational Health-Health and Safety Considerations, Personal Protective Equipment's, Effects of Exposure and Treatment for Metal Working Trades, Municipal Solid Waste, Epoxy Resins, Foundries. Occupational Health and Safety Considerations in Wastewater Treatment Plants.	
Reference Books *	
1. Nemerow N. N., Liquid waste of industry theories, practices and treatment, Addison Willey, New York, 1971. 2. Azad N. S., Industrial waste water management handbook, Mc Graw Hill book, co. New York. 3. Ross R. D., Industrial waste disposal, Reinhold environmental series, New York, 1968 4. Eckenfelder, W.W., "Industrial Water Pollution Control", McGraw-Hill, 1999.	
Course Outcomes**	
1. Design policies and regulations for the development and maintenance of a healthy and safe work environment. 2. Interpret and apply legislative requirements, industry standards, and best practices in a variety of workplaces and apply risk management principles to anticipate, identify, evaluate and control physical, chemical, biological and psychosocial hazards. 3. Analyse the change by advancing OH&S principles within management systems, cultures, practices, and priorities. 4. Construct the Occupational Health and Safety Considerations in Wastewater Treatment Plants.	

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	2	2	-	-	-	-	-	1	2	2	
CO2	3	2	3	-	2	1	-	-	-	-	-	1	2	2	
CO3	3	2	3	-	3	-	-	-	1	-	-	1	2	2	
CO4	2	1	1	-	2	1	-	-	1	-	-	1	2	2	

22UCV523E	Air Pollution and Control	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

UNIT-I		10 Hrs.
Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Atmosphere and water bodies, Photo-chemical Smog, .		
UNIT-II		10 Hrs.
Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths. Development of air quality models-Gaussian dispersion model and Numerical problems.		
UNIT-III		10Hrs.
Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM _{2.5} , PM ₁₀ , SO _x , NO _x , CO, NH ₃) and Air pollution emission standards and Numerical problems		
UNIT-IV		10 Hrs.
Control Techniques: Air pollution control devices, equipment and their design. Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & ESP. Including Numerical problems. Indoor air quality- sources, types and control of air pollutants		
Reference Books *		
1. M. N. Rao and H V N Rao, "Air pollution", Tata Mc-G raw Hill Publication. 2. H. C. Perkins, "Air pollution". Tata McGraw Hill Publication 3. Mackenzie Davis and David Cornwell, " Introduction to Environmental Engineering" McGraw-Hill Co. Noel De Nevers, "Air Pollution Control Engineering" , Waveland Pr Inc. Anjaneyulu Y, "Text book of Air Pollution and Control Technologies", Allied Publishers		
Course Outcomes		
After studying this course, students will be able to: 1. Identify the major sources of air pollution and understand their effects on health and environment. 2. Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models. 3. Ascertain and evaluate sampling techniques for atmospheric and stack pollutants. 4. Choose and design control techniques for particulate and gaseous emissions		

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	1	2	1								1	1	2	1	
CO 2	1	1	2								2	1	2	1	
CO 3	1	2	1								1	1	2	1	
CO 4	1	1	1								2	1	2	1	

22UCV524E	Solid Waste Management	Credits: 03
L:T:P – 3:0:0		CIE Marks:50
Total Hours/Week: 03		SEE Marks:50

UNIT-I	10 Hrs.
Solid Waste: Definition and scope, Necessity and importance, Sources, Classification, Integrated Solid Waste Management (ISWM), Hierarchy of waste management options, 4 R's - reduce, recover, recycle and reuse, Physical, Chemical and Biological characteristics of municipal solid waste (MSW), Generation rates and methods, Chemical composition, Numerical problems. Functional elements: Flow chart, Waste generation, Storage, Collection, Transfer and transport, Processing and recovery, Disposal. Collection, Transfer and Transport: Collection equipment, systems of collection - hauled container system, stationary container system, numerical problems; Transfer stations, Bailing and Compacting	
UNIT-II	10 Hrs.
Separation and Processing Technologies: Size reduction, Size separation, Density separation, Magnetic & Electric Field separation, Densification (Compaction), Design of Material Recovery Facilities (MRFs), Numerical problems. Thermal Treatment Processes: Combustion Systems (Mass-Fired Combustion Systems, RDF-Fired Combustion Systems, Fluidized Combustion Systems, Heat recovery systems, Water wall Combustion Systems, Waste heat boiler) Pyrolysis Systems, Gasification Systems, Environmental Control Systems, Energy Recovery Systems	
UNIT-III	10 Hrs.
Disposal methods: Types, Selection of suitable site, Ocean disposal, Feeding to hogs, Merits and demerits of various disposal methods. Open dumping: Environmental implications of open dumping, Construction debris - management & handling, Rag pickers and their role Sanitary land filling: Definition, methodology, Types - trench, area, ramp, pit methods, Basic steps involved, Site selection, Prevention of site pollution, Landfill remediation, Geo-technical considerations, Densification - earthen, Geo-membrane, Geo-synthetics and Geo-textiles	
UNIT-IV	10 Hrs.
Operational aspects of Landfills: Daily cover, Final cover, Leachate disposal, Ground water monitoring, Leachate and its treatment, Gas collection and re-circulation systems, Post-closure environmental monitoring. Treatment of other wastes: E-Waste Management, Hazardous waste management and Bio-medical waste.	
Reference Books *	
1. George Tchobanoglous, Hilary Theisen, Samuel A. Vigil, Integrated Solid Waste Management- Engineering Principles and Management Issues, McGraw-Hill, International Editions, 1993. 2. Ramachandra T.V., Management of Municipal Solid Waste, The Energy and Resources Institute, TERI, ISBN: 9788179931875, 9788179931875, 2006 3. Peavy and Tchobanoglous, Environmental Engineering, McGraw-Hill International Editions, 1985.	
Course Outcomes**	

After completion of the course student will be able to

1. Design Appropriate treatment component for municipal and certain industrial effluents
2. Evaluate the operational problems of treatment units and apply the solutions in water and wastewater treatment plant.
3. Construct appropriate treatment schemes to remove certain pollutants present in water or wastewater
4. Construct the alternative sludge processing techniques apply the knowledge in nutrient removal from the wastewater

Course out come	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	3		2						2	2	2	
2	1	2	2	2		2						2	2	2	
3	2	2	1	2		1						2	2	2	
4	3	2	2	1		2						2	2	2	

22UCV525E	REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS	Credits: 03
L:T:P – 3:0:0		CIE Marks:50
Total Hours/Week: 03		SEE Marks:50

UNIT-I	10 Hrs.
Basics: Fundamentals of Remote Sensing, Electromagnetic Spectrum, Process of remote sensing, Types of reflections, Energy Interactions with earth atmosphere and surface features, spectral reflectance curves- For Vegetation, soil & water, Idealised Remote Sensing System Sensors: Definition, Sensor Parameters, Types, Choice of sensor, Optical Remote Sensing, Across and Along track scanning systems. Platforms: Definition, Space borne platform attitudes (only definitions, No Problems). Indian Remote Sensing Programme: Definition and Objectives Satellite Specifications for IRS-1C, 1D, CARTOSAT-1 & CARTOSAT-2 - Ikonos, Quick bird, Riset.	
UNIT-II	10 Hrs.
Visual Image Interpretation: Definition, Objectives, Keys & Elements of Visual Image interpretation. Digital Image Processing (DIP):(No problems/programming on DIP) Definition, Image Rectification & Restoration, image enhancement (contrast manipulation-Grey Level Thresholding, Level Slicing only), Supervised Image Classification using minimum distance to means classifier algorithm- GIS integration – stages & procedure., Image Filtering (spatial filters) -Low Pass and High pass image filters.(Brief discussion only, no problems or programming) Applications of REMOTE sensing in urban applications and water resource management	
UNIT-III	10 Hrs.
Maps and Projections:Map Projections Plane and geodetic , latitude and longitude map projections, types of map projections Spheroid, Datum (WGS84 Datum) and UTM (No Problems) GIS: History, Definition, Components, concept, Data acquisition for GIS input-Spatial (Vector, Raster & Surface data) & Non spatial data, rectification, processing, verification & Data Editing, Storage and Output. GIS functions in vector and raster data- Input, Analysis and out put GIS Analysis (Vector Data- Buffering & Overlay analysis using overlay operators) GIS Analysis (Raster Data-Local Operations and neighbourhood using arithmetic, Logical and Overlay operators) Cartography-Definition, basic map layout, significance of cartography Data Standards in GIS errors, precision and accuracy-Definition and Types	
UNIT-IV	10 Hrs.
Advanced Concepts: GPS.- Definition, working principle, segments and uses (Brief Discussion only) Drones- Classification of drones, Basics of drones part, basics of drone surveying, Property mapping using drones Applications of GIS and Remote Sensing: 1) Identifying suitable site for urban development 2) Planning of network for sewage collection and transport (laying of sewer lines) 3) Land Use Land Cover mapping (LU/LC). Drainage Patterns- Definition, Types, significance. .	

Reference Books *

Text books:

1. Thomas.m.lillysand & ralph.w.keifer, “remote sensing & image interpretation” —7th edition, weiley india publications, new delhi, august 8, 2015.
2. Basudeb.bhatta, “remote sensing and gis”, -2nd edition”, oxford press publications, 2011.
3. M. Angireddy, “ textbook of remote sensing and geographical information systems”, 3rd edition, b.s.publications, hyderabad, january 1 2005, telangana, india. Isbn:978-81-7800-135-7.
- 4.c.p.lo albert .k.w.yeung, ”concepts and techniques in geographic information systems”, 2nd edition, prentice hall publications, august 10th 2006, ontario usa. .

Course Outcomes**

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	3	2	2	1	2	2	-	-	-	-	-	-	2	2	2
CO 2	3	3	2	1	2	2	-	-	-	-	-	-	2	2	2
CO 3	3	3	2	2	2	3	-	-	-	-	-	-	2	2	2
CO 4	3	2	2	2	2	2	-	-	-	-	-	-	2	2	2
Average	3	2.5	2	1.5	2	2.5	-	-	-	-	-	-	2	2	2

22UCV526E	PROCESS ECONOMICS AND PLANT DESIGN (Open Elective)	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I	10 Hrs.
PROCESS DESIGN DEVELOPMENT: Design project procedure, design information from the literature and other sources of information, flow diagrams, preliminary design and equipment design and specialization, safety factors specifications, and materials of construction.	
GENERAL DESIGN CONSIDERATIONS: Marketability of the product, availability of technology, raw materials, human resources, land and utilities, site characteristics, plant location, plant layout, plant operation and control, utilities, storage, materials handling, materials and fabrication selection. Waste disposal community factors. Safety and hazard control measures.	
UNIT-II	10 Hrs.
CAPITAL INVESTMENTS: Fixed capital investments including land, building, equipment and utilities, installation costs, (including equipment, instrumentation, piping, electrical installation and other utilities), working capital investments.	
MANUFACTURING COSTS AND PLANT OVERHEADS: Manufacturing Costs: Direct Production costs (including raw materials, human resources, maintenance and repair, operating supplies, power and other utilities, royalties, etc.), fixed charges Plant Overheads: Administration, safety and other auxiliary services, Conceptual numerical	
UNIT-III	10 Hrs.
COST ANALYSIS: Cost Analysis: Factors involved in project cost estimation, methods employed for the estimation of the capital investment. Estimation of working capital and	
DEPRECIATION: Different type of depreciation methods of and calculations, Conceptual numerical	
UNIT-IV	10 Hrs.
PROFITABILITY ANALYSIS: Methods for the evaluation of profitability. Return on original investment, interest rate of return, Cash flow diagrams. Break-even analysis. Conceptual numerical.	
Reference Books *	
Text Books: 1. Peters and Timmerhaus (1989) Plant Design and Economics for Chemical Engineers, 4th edn., McGraw Hill. 2. Rudd and Watson (1987) Strategy of Process Engineering, Wiley. 3. Poornima M C (2006) Entrepreneurship Development and Small Business Enterprises", Pearson education.	
Reference Books: 1. Vasanth Desai (2007) Dynamics of Entrepreneurial Development & Management", Himalaya Publishing House. 2. Khanka SS (2004) Entrepreneurship Development, S Chand & Co. 3. Thomas W. Zimmer, Norman M. Scarborough.(2007), Essentials of Entrepreneurship and small Business Management	
Course Outcomes**	
Course outcomes: After studying this course, students will be able to: 1. To understand the process design of plant. 2. To study the feasibility survey for the plant design. 3. To Calculate the project profitability and alternative investment 4. To identify the cost analysis involved in the design of plant.	

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	2	2	1	1			1	1	1		2		2	2	
CO 2	2	1	2	1			1	1	1		3		2	2	
CO 3	1	2	1	2			1	1	1		2		1	2	
CO 4	2	1	2	2			1	1	1		3		2	2	

22UCV527E	HIGHWAY GEOMETRIC DESIGN	Credits: 3
L:T:P - 3 : 0 : 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10Hrs.
INTRODUCTION: Geometric control factors like Topography- design speed- design vehicle- Traffic- Capacity- volume- environmental & other factors as per IRC & AASHTO standards & specifications- PCU concepts- factors controlling PCU for different design purpose. CROSS SECTIONAL ELEMENTS: Pavement surface characteristics- friction- skid resistance- pavement unevenness- light reflecting characteristics-camber-objectives-types of camber- method of providing cambers in the field- problems- carriage way- kerb- median- shoulder- foot path- parking lanes- service roads- cycle tracks- Driveways- Right of way- Factors influencing right of way- Design of Road humps as per latest IRC provision.	
UNIT-II	10 Hrs.
SIGHT DISTANCE: Importants, types, SSD, OSD & Sight distances at uncontrolled intersections, derivations, factors affecting sight distance, IRC, AASHTO standards, problems on above. HORIZONTAL ALIGNMENT: Definition, Checking the stability of vehicle, while moving on horizontal curve, Super elevation, Ruling minimum & maximim radius, Assumptions- problems- methods of providing super elevation for different curves- Extra widening of pavement on curves- Objectives- Mechanical widening- Psychological widening- Transition curve- Objectives- Ideal requirments- Types of transition curves- Method of evaluating length of transition curve- Setting the transition curve in the field, set back distance on horizontal curve & problems on above.	
UNIT-III	10 Hrs.
VERTICAL ALIGNMENT: Gradient- Types of gradient- Design criteria of summit & valley curve- Design of vertical curves based on SSD-OSD-Night visibility considerations-Design standards for hilly roads- problems on the above. INTERSECTION DESIGN: Principle- At grade & Grade separated junctions- Types- Channelization- Features of channelizing Island- Median opening- Gap in median at junction	
UNIT-IV	10 Hrs.
ROTARY INTERSECTIONS: Elements- Advantages- Disadvantages- Design guide lines- problem on above- Grade seperated intersection- Three legged intersection- Diamond interchange- Half clover leaf- Clover leaf- Advantages- Disadvantages only HIGHWAY DRINAGE: Importance – sub surface drinage- surface drinage- Design of road side drives- Hydrological- Hydraulic considerations and design of filter media, problems on above.	
Reference Books *	
1. Khanna, S.K. Justo, C.E.G. and Veeraghavan A “Highway Engineering”, Nem Chand & Bros. 2015 2. Papacostas, C.S. and Prevedouros, P.D., “Transportation Engineering and Planning”, Prentice Hall. 2002 3. JotinKhisty, C. and Kent Lall, B., “Transportation Engineering – An Introduction”, Third edition, Pearson India 2016 4. K. Subramaniam, “Transportation Engineering”, SciTech Publications, Chennai. 5. Relevant Indian Roads Congress Codes – 6. C. Jotin Khisty, B. Kentlal, “Transportation Engineering”, PHI Learning Pvt. Ltd. New Delhi. 7. Right, Paul H. and Dixon, Karen K., “Highway Engineering”, John Wiley and Sons Inc. 2004	
Course Outcomes**	

1. Describe various geometric elements like speed, topography, traffic volume, Design hourly, traffic volume etc.
2. Determine the various sight distances, evaluate extra widening required for horizontal curves
3. Design and setting out of Summit and Valley curves and describe different types of at-grade, grade separated intersection and channelization.
4. Design Rotary intersection, surface and subsurface drainage system.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1		1		1							1	1		
CO2	1				1				1				1	
CO3			1			1	1				1			1
CO4	1			1						1			1	

22UCV528E	MASONRY STRUCTURES	Credits: 03
L-T-P : 3-0-0		CIE Marks:50
Total Hours/Week: 03		SEE Marks:50

UNIT-I	10 Hrs.
MASONRY UNITS, MORTARS, TYPES AND MASONRY CONSTRUCTION: Brick, stone, concrete block, stabilized mud block masonry units-strength, modulus of elasticity, and initial rate of absorption (IRA) of brick, classification and properties of mortar, workability of fresh mortar, water retentivity of mortar, stress-strain behavior of mortar, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking and remedial measures.(5 Hrs) STRUCTURAL MASONARY: Introduction, stresses in masonry in compression, factors influence compressive strength of masonry; effect of unit strength, unit height, hollowness and moisture absorption, effect of mortar strength, plasticity, joint thickness, type of masonry loading, modular ratio of unit and mortar and direction of loading. Strength formulae and mechanism of failure for masonry prism subjected to direct compression. (5 Hrs)	
UNIT-II	9 Hrs.
DESIGN CONSIDERATIONS: Boundary conditions and the effective height of wall in the design of masonry wall and column; effective length of wall based on conditions of support and, effective thickness for solid wall, cavity wall with and without stiffeners; slenderness ratio; assessment of eccentricity of loading on walls. (5 Hrs) PERMISSIBLE STRESSES: Permissible compressive stress in masonry wall, stress reduction, area reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses in masonry wall. (4 Hrs)	
UNIT-III	9 Hrs.
DESIGN OF MASONRY WALLS: Reduction of basic compressive strength to allow slenderness ratio and eccentricity; elastic buckling of brittle columns. Design of load bearing masonry for building up to three storeys using IS: 1905-1987. (5 Hrs) DESIGN OF SOLID WALLS: Design of axially loaded unstiffened solid wall; determination of safe load carrying capacity of wall. Design of solid wall with piers. Solid wall supported at the ends by cross wall. (4 Hrs)	
UNIT-IV	10 Hrs.
DESIGN OF CAVITY WALL: Design of cavity wall with and without piers. Design of cavity wall with cross wall. Determination of safe load carrying capacity of cavity wall. (5 Hrs) DESIGN OF FREE-STANDING WALL: Transverse load acts perpendicular to plane of wall. Lateral load acts in the plane of wall. Design of free-standing walls with and without staggered, design of masonry tabular structure representing a chimney. (5 Hrs)	

TextBooks															
1. Brick and Reinforced Brick Structures Dayaratnam P.: Oxford & IBH, 1987 2. Alternative Building Materials and Technologies K S Jagadish, B V Venkatarama Reddy, K S Nanjunda Rao, 2008 3. Design of Masonry structures Sinha B.P Davies S.R: E & FN spon, 1997															
REFERENCES BOOKS															
1. Structural Masonry Henry, A.W.: Macmillan Education Ltd, 1990 2. IS 1905-1987 Code of practice for structural use of un-reinforced masonry (3rd revision) BIS, New Delhi. 3. SP 20 (S&T)-1991, Hand book on Masonry design and construction (1st revision) BIS, New Delhi.															
Course Outcomes															
After completion of the course student will be able to CO1: Identify various materials used in masonry, their characteristics and the influence of various parameters on the stability of concentrically loaded masonry walls. Factors influence the compressive strength of masonry. CO2: Apply boundary conditions to evaluate the effective height, length and thickness of wall in the design of masonry wall and column; Slenderness ratio: Determine the slenderness ratio of walls and reduction factors, to evaluate the permissible stresses. CO3: Analyse the reduction of basic compressive strength due to slenderness ratio and eccentricity, elastic buckling of brittle columns. Design of masonry up to three storeys. CO4: Design the cavity wall. Design the free-standing walls subjected to wind load perpendicular to plane of wall, and wind load acts in the plane of wall.															

COURSE ARTICULATION MATRIX

Course Outcomes	Programme Outcomes (POs)												Programme Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	1	1	1	1	1	1				1	2	1	1
CO2	3	2	2	3	2	2	1					1	1	2	1
CO3	3	3	3	2	1	3	1	1				2	3	3	2
CO4	3	3	3	2		2	1	1				2	3	3	2
Average	2.75	2.25	2.25	2.00	1.33	2.00	1.00	1.00	0	0	0	1.50	2.25	2.25	1.50

22UCV531N	AIR POLLUTION AND CONTROL	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I		10 Hrs.
Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Atmosphere and water bodies, Photo-chemical Smog, .		
UNIT-II		10 Hrs.
Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths. Development of air quality models-Gaussian dispersion model and Numerical problems.		
UNIT-III		10Hrs.
Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM _{2.5} , PM ₁₀ , SO _x , NO _x , CO, NH ₃) and Air pollution emission standards and Numerical problems		
UNIT-IV		10 Hrs.
Control Techniques: Air pollution control devices, equipment and their design. Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & ESP. Including Numerical problems. Indoor air quality-sources, types and control of air pollutants		
Reference Books *		
1. M. N. Rao and H V N Rao, "Air pollution", Tata Mc-G raw Hill Publication. 2. H. C. Perkins, "Air pollution". Tata McGraw Hill Publication 3. Mackenzie Davis and David Cornwell, " Introduction to Environmental Engineering" McGraw-Hill Co. Noel De Nevers, "Air Pollution Control Engineering" , Waveland Pr Inc. Anjaneyulu Y, "Text book of Air Pollution and Control Technologies", Allied Publishers		
Course Outcomes		
After studying this course, students will be able to: 1. Identify the major sources of air pollution and understand their effects on health and environment. 2. Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models. 3. Ascertain and evaluate sampling techniques for atmospheric and stack pollutants. 4. Choose and design control techniques for particulate and gaseous emissions		

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	1	2	1								1	1	2	1	
CO 2	1	1	2								2	1	2	1	
CO 3	1	2	1								1	1	2	1	
CO 4	1	1	1								2	1	2	1	

22UCV532N	GEOGRAPHIC INFORMATION SYSTEMS	Credits:3
L:T:P-3: 0: 0		CIEMarks:50
Total Hours/Week:4		SEEMarks:50

UNIT-I	10Hrs.
Basics: Fundamentals of Remote Sensing, Electromagnetic Spectrum, Process of remote sensing, Types of reflections, Energy Interactions with earth atmosphere and surface features, spectral reflectance curves-For Vegetation, soil & water, Idealized Remote Sensing System Sensors: Definition, Sensor Parameters, Types, Choice of sensor, Optical Remote Sensing, Across and Along track scanning systems. Platforms: Definition, Space borne platform attitudes (only definitions, No Problems). Indian Remote Sensing Programme: Definition and Objectives Satellite Specifications for IRS-1C, 1D, CARTOSAT-1 & CARTOSAT-2 - Ikonos, Quick bird, RISAT	
UNIT-II	10Hrs.
Visual Image Interpretation: Definition, Objectives, Keys & Elements of Visual Image interpretation. Digital Image Processing (DIP): (No problems/programming on DIP) Definition, Image Rectification & Restoration, image enhancement (contrast manipulation-Grey Level Thresholding, Level Slicing only), Supervised Image Classification using minimum distance to means classifier algorithm- GIS integration –stages & procedure., Image Filtering (spatial filters) -Low Pass and High pass image filters.(Brief discussion only, no problems or programming) Applications of REMOTE sensing in urban applications and water resource management	
UNIT-III	10Hrs.
Maps and Projections : Map Projections Plane and geodetic , latitude and longitude map projections, types of map projections Spheroid, Datum (WGS84 Datum) and UTM (No Problems) GIS: History, Definition, Components, concept, Data acquisition for GIS input-Spatial (Vector, Raster & Surface data) & Non spatial data, rectification, processing, verification & Data Editing, Storage and Output. GIS functions in vector and raster data- Input, Analysis and out put GIS Analysis (Vector Data- Buffering & Overlay analysis using overlay operators) GIS Analysis (Raster Data- Local Operations and neighborhood using arithmetic, Logical and Overlay operators) Cartography-Definition, basic map layout, significance of cartography Data Standards in GIS errors, precision and accuracy-Definition and Types	
UNIT-IV	10Hrs.
Advanced Concepts: GPS.- Definition, working principle, segments and uses (Brief Discussion only) Drones- Classification of drones, Basics of drones part, basics of drone surveying, Property mapping using drones Applications of GIS and Remote Sensing: 1) Identifying suitable site for urban development 2) Ground water Vulnerability assessment.	
Reference Books *	
TEXT BOOKS: 1.Thomas.M.LILLYSAND & RALPH.W.KEIFER, "REMOTE SENSING & IMAGE INTERPRETATION" —7 TH EDITION, Weiley INDIA Publications, New Delhi, August 8, 2015 2. Basudeb.BHATTA, "REMOTE SENSING AND GIS", -2 nd edition", Oxford press publications, 2011. 3.M. ANGIREDDY , " TEXTBOOK OF REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS", 3 rd EDITION, B.S.Publications, Hyderabad, January 1 2005, Telangana, India. ISBN:978-81-7800-135-7. 4.C.P.LO ALBERT .K.W.YEUNG , "Concepts and Techniques in GEOGRAPHIC INFORMATION SYSTEMS", 2 nd	

REFERENCE BOOKS

1. George Joseph, "Fundamentals of Remote Sensing", 2nd edition, University press, Hyderabad, 2005.
2. Micheal.F.Goodchild, Paul.A.Longely, "Geographic Information Science and Systems", 4th edition, Wiley publications, April 24/2015.
3. S.Kumar, "Basics of Remote Sensing and GIS", 2nd Edition, Laxmi Publications, New Delhi, January 1/2016.

WEB SITES

1. WWW.GISDEVELOPMENT.NET
 2. WWW.JSYS.ORG
 3. WWW.NRSC.GOV.IN
- NPTEL NOTES, IIRS NOTES

Learning Objectives*

1. Acquire knowledge of Basics of remote sensing, its need and advantages in civil engineering , method of acquiring satellite images, ISRO satellite launch programs (This will be useful in choicing the type of satellite image for a particular application in civil engineering works)
2. To apply the concept of Remote Sensing for engineering planning purposes
3. Analyse the application of GIS and modern tools like GPS for quantification of parameters needed for Infrastructure planning purposes.
4. Assess the utility of GIS and RS for real time engineering application with case studies.

After Learning the Course, the student will be able to

1. Differentiate the procedure of data acquisition between remote sensing and conventional methods
2. Apply the concept of remote sensing to asses the ground properties of a region and quantify the ground properties.
3. Choice the tools and techniques needed for generation of quantified data required for engineering and infrastructure planning purposes.
4. Assess, the application RS and GIS techniques for real time engineering applications.

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	3	2	2	1	1	1	-	-	-	-	-	-	2	2	2
CO 2	3	3	2	1	2	2	-	-	-	-	-	-	2	2	2
CO 3	3	3	2	2	2	3	-	-	-	-	-	-	2	2	2
CO 4	3	2	2	2	2	2	-	-	-	-	-	-	2	2	2
Average	3	2.5	2	1.5	1.75	2	-	-	-	-	-	-	2	2	2

22UCV533N	OCCUPATIONAL SAFETY AND HEALTH	Credits: 03
L:T:P – 3:0:0		CIE Marks:50
Total Hours/Week: 03		SEE Marks:50

UNIT-I	10 Hrs.
Introduction - History and Development, Occupational Safety and Health Act. Occupational Safety and Health Administration, Right to know Laws. Accident Causation-Need for Accident Investigation, Accident investigation plan, Methods of acquiring Accident Facts, Correcting Missing Skills, Investigator Tendencies and Characteristics, Supervisory Role in Accident investigation. Human Error Model, Petersew's Model, Epidemiological Models. Ergonomics- Ergonomics at workplace, Ergonomic Task Analysis, Preventing Ergonomic Hazards, Setting up of Ergonomics Programme.	
UNIT-II	10 Hrs.
Occupational Hazard and Control- Hazard Analysis, Human Error Analysis in Causation with Hazard Analysis, Fault Tree Analysis, Emergency Response. Decision for Action, Purpose and Considerations, Right Decision, Wrong Remedy, Hazard Control Measures, Hazards and their Control in Pharmaceutical, Construction, Textiles, Petroleum Refineries and LPG Bottling, Iron and Steel industries	
UNIT-III	10 Hrs.
Fire prevention and Protection- Fire Development and its Severity effects. Enclosure, need for early Detection of Fire, Extinguishing Fire Electrical Safety Product Safety, Technical Requirements of Product Safety Programme. Environmental Safety and ISO 14000 ISO series of standards, ISO14001Standards, Environmental Management systems. (EMS) Total quality Management (TQM) and Total safety Management (TSM).	
UNIT-IV	10 Hrs.
Occupational Health-Health and Safety Considerations, Personal Protective Equipment's, Effects of Exposure and Treatment for Metal Working Trades, Municipal Solid Waste, Epoxy Resins, Foundries. Occupational Health and Safety Considerations in Wastewater Treatment Plants.	
Reference Books *	
1. Nemerow N. N., Liquid waste of industry theories, practices and treatment, Addison Willey, New York, 1971. 2. Azad N. S., Industrial waste water management handbook, Mc Graw Hill book, co. New York. 3. Ross R. D., Industrial waste disposal, Reinhold environmental series, New York, 1968 4. Eckenfelder, W.W., "Industrial Water Pollution Control", McGraw-Hill, 1999.	
Course Outcomes**	
1. Design policies and regulations for the development and maintenance of a healthy and safe work environment. 2. Interpret and apply legislative requirements, industry standards, and best practices in a variety of workplaces and apply risk management principles to anticipate, identify, evaluate and control physical, chemical, biological and psychosocial hazards. 3. Analyse the change by advancing OH&S principles within management systems, cultures, practices, and priorities. 4. Construct the Occupational Health and Safety Considerations in Wastewater Treatment Plants.	

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	2	2	-	-	-	-	-	1	2	2	
CO2	3	2	3	-	2	1	-	-	-	-	-	1	2	2	
CO3	3	2	3	-	3	-	-	-	1	-	-	1	2	2	
CO4	2	1	1	-	2	1	-	-	1	-	-	1	2	2	

22UCV535N	GREEN BUILDING TECHNOLOGY	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I	10 Hrs.
Introduction, Concept of green building, History of green building, Need of green building in present scenario, Importance of green building Merits and demerits, Classification of green building, Assessment methods Global assessment and certification, Local assessment, LEED (Leadership in energy and environmental design) GRIHA (Green Rating for Integrated Habitat Assessment), IGBC (Indian Green Building Council) and Green star rating systems.	
UNIT-II	10 Hrs.
Principles and elements of design of green building; Sustainability: concept and reality Climate responsive process of design: Climatic zones, design sequence, shelter or form, land form, vegetation, water bodies, street widths, open spaces, ground character, plan form, orientation, roof form Shading devices and their effect.	
UNIT-III	10 Hrs.
Thermal comfort inside the building: Factors affecting, indices, cooling and heating requirement, Heat transmission through building sections, thermal performance of building sections, simple calculation for U value and insulation thickness Day lighting Ventilation.	
UNIT-IV	10 Hrs.
Water conservation: 3 R's for water conservation, rain water harvesting, low flow fixtures, grey water recycling Material conservation: concept of embodied energy, low energy materials, sustainable materials, alternative materials Concept of carbon emission and its reduction Bureau of energy efficiency: Functions, policies, guidelines, Energy Conservation Building Code, Study of existing green buildings.	
REFERENCE BOOKS**	
1. Climate responsive architecture (A design hand book for energy efficient buildings), Arvind Krishnana, Simos Yannas, Nick Baker, S V Szokolay, McGraw hill Education, Seventh reprint, 2013. 2. Renewable Energy and Environment -A Policy Analysis for India, H, Ravindranath, K Usha Rao, B Natarajan, P Monga, Tata McGraw Hill, 2000. Energy and the Environment, JM Fowler, McGraw Hill, New York, 2nd Edition, 1984. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.	
Course Outcomes**	
After completion of the course student will be able to 1. Understand, recognize, and evaluate green building's significance, principles, and advantages and disadvantages in sustainable construction. 2. Gain a comprehensive understanding of green building design principles and sustainability concepts, with a focus on climate-responsive design processes, shading devices, and their	

effects on building performance.

3. Proficiently optimize thermal comfort, daylighting, and ventilation in buildings, creating sustainable and comfortable indoor environments.
4. Understand and apply water and material conservation techniques, grasp the concept of embodied energy and carbon emissions reduction, and analyze existing green buildings and the role of the Bureau of Energy Efficiency.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	-	-	-	2	3	2	-	-	2	2		
CO2	3	2	-	-	-	1	3	2	-	-	2	2		
CO3	3	2	-	-	-	-	3	2	1	-	2	2		
CO4	2	2	-	-	-	1	3	2	1	-	2	2		

22UCV611C	DESIGN OF RC STRUCTURES	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50
UNIT-I		10 Hrs
General features reinforced concrete: Introduction, Design loads, Materials for reinforced concrete, Code requirements of reinforcements, Elastic theory of RC sections, Moment of resistance of section, Balanced, under reinforced and over reinforced section. Principles of limit state design and ultimate strength of RC section: Philosophy of Limit state design, Principles of limit states, Factor of safety, Characteristic and design loads, Characteristic and design strength, General aspects of ultimate strength, Stress block parameters for limit state of collapse, Ultimate flexural strength of rectangular sections, Ultimate flexural strength of flanged sections, Ultimate flexural strength of doubly reinforced sections, Ultimate shear strength of RC sections, Ultimate torsional strength of RC sections, Concepts of development length and anchorage, Analysis examples for rectangular sections, flanged sections, doubly reinforced, sections, shear strength and development length.		
UNIT-II		11 Hrs.
Limit state: General aspects, Deflection limits in IS: 456-2000, Calculation of deflection (Theoretical method), Cracking Serviceability in structural concrete members. Design of beams: Practical requirements of an RCC beam, Size of the beam, Cover to the Reinforcement, Spacing of bars, Design procedure, Critical sections for moments and Shear, Anchorage of bars: check for development length, Reinforcement requirements, Slenderness limits for beams to ensure lateral stability, Design examples for simply supported and cantilever beams (rectangular).		
UNIT-III		09 Hrs.
Design of slabs: Introduction, General consideration of design of slabs, Rectangular slabs spanning in one direction, Rectangular slabs spanning in two directions for various boundary conditions, Design of simply supported slabs, cantilever slabs. Design of stair case: General features, types of stair case, Loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, design of stair cases.		
UNIT-IV		09 Hrs.
Design of columns: General aspects, Effective length, Loads on columns, Slenderness limits for columns, Minimum eccentricity, Design of short axially loaded columns, Design of column subject to combined axial load and uniaxial moment using SP 16. Design of footings: Introduction, Load for foundation, Design basis (limit state method), Design of isolated square or rectangular footing for axial load.		
Reference Books *		
1. Unnikrishnan and Devadas Menon, Design of reinforced concrete structures, PHI, New Delhi. 2013. 2. Karve S.R. and Shah V.L, Limit state theory and design of reinforced concrete, Vidyarthi Prakashan, Pune. 2017. 3. A.K. Jain, Limit state method of design, Nemchand and Bros, Roorikee, Jan 2012. 4. Park and Paulay, Reinforced concrete, John Wiley & Sons. 1975. 5. Kong and Evans, Reinforced and prestressed concrete, ELBS, London 6. H.J. Shah, Reinforced concrete Vol. I, Charotor Publishing House, Anand. Jan 2016. 7. IS: 456-2000, SP-24, SP-16. (Note: Use of IS: 456-2000 is permitted and SP-16 to be used in design of columns only).		

Course Outcomes**

After completion of the course student will be able to

1. Students will have the knowledge of methods of design of RC sections & will analyse the different RC sections.
2. Students will be able to solve the problems related to serviceability conditions and design different beam sections.
3. Students will be able to design different slab and staircase.
4. Students will be able to design columns and isolated footings.

Course Outcomes	Programme Outcomes											Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO 1	3	3										2	1	
CO 2	3	3										2	2	
CO 3	3	3	3	3								2	2	
CO 4	3			2								2	1	
Average	3	3	3	2.5								2	1.5	

22UCV612C	CONSTRUCTION MANAGEMENT	Credits 3:0:0
Hrs/Week : 03		CIE Marks:50
Total Hours: 40		SEE Marks:50
UNIT – I		10 Hrs
Construction industry and Management: Introduction to construction industry, value engineering, labour, time, financial and material management, organization and administration.		
Construction safety: Introduction, causes of accidents, general safety precautions during excavation, demolition of buildings, erection of steel structures, storing and blasting of explosives, general concreting works, pile operations.		
UNIT – II		10 Hrs
Engineering Economics: Introduction, project feasibility report, basic concepts of economic analysis, Interest and time value of money: concept of simple and compound interest, interest formula or single payment, equal payment and uniform gradient series.		
Comparison of alternatives: Present worth, future worth, annual equivalent, capitalized and rate of return methods, break even analysis, Problems.		
UNIT – III		10 Hrs
Construction planning: Introduction, planning methods of projects, Bar and Mile stone charts, Critical Path Method, Earliest and latest event times, Activity time, slack, Critical path, Float, A-O-A and A-O-N networks. Program Evaluation and Review Technique, time estimates, Earliest expected time, Latest allowable occurrence time, Probability of completion time for a project.		
UNIT - IV		10 Hrs
Project Cost: Cost model, direct, indirect and optimum costs, optimum duration and numerical problems.		
Resource Management: Introduction, types of resources, resource allocation, updating and line of balance technique.		
Transportation Problems: Introduction, balanced and unbalanced types of transportation problems, methods for initial basic feasible solution, North west corner method, Lowest cost entry method, Vogel's approximation methods.		
TEXT BOOKS		
1. R. Panneerselvam, Engineering economics, PH1 Publications, 2010, New Delhi		
2. S.C. Sharma, Construction equipment and its management, Khanna Publishers, 5th Ed, Delhi, 2016.		
3. S. Seetharaman, Construction engineering and management by, Umesh Publishers, 4th Ed, Delhi, 2008.		
4. L.S. Srinath, EWP PERT and CPM principles and applications, Affiliated east west press Pvt. Ltd, 3 rd Ed, 2001.		
5. SP 7:2005, “National Building Code of India”, Bureau of Indian Standards, New Delhi.		
6. SP 70:2001, “Handbook on Construction safety Practices”, Bureau of Indian Standards, New Delhi.		
7. S.S. Chitkara, “Construction project management: Planning, scheduling and controlling”, McGraw Higher Ed., New Delhi.		
QUESTION PAPER PATTERN FOR SEE		
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.		
2. Each Question should not have more than four sub divisions.		
3. Any FOUR Full questions are to be answered choosing at least one from each unit.		
Course Outcomes: After completion of the course students will be able to		
1. Demonstrate the concept of management, value engineering, organization and safety measures in construction industry.		
2. Apply fundamental principles of engineering economics to evaluate project feasibility through economic analysis.		
3. Develop and analyze project schedules using planning tools such as Bar charts, Milestone charts, Critical Path Method (CPM), and Program Evaluation and Review Technique (PERT)		
4. Apply cost modeling techniques and resource management strategies to optimize project duration and cost, and solve transportation problems using standard methods		

CO-PO Matrix															
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1	1	2	2	2	2	1	3	2	2	2	1
2	3	2	3	2	2	2	2	2	2	2	3	2	2	2	2
3	2	3	3	2	2	2	2	2	2	2	3	2	2	2	2
4	2	3	3	2	2	2	2	2	2	2	3	2	2	2	2
Avg	2.5	2.5	2.75	1.75	1.75	2	2	2	2	1.75	3	2	2	2	1.75

22UCV613C	APPLIED GEOTECHNICAL ENGINEERING	Credits: 3
L:T:P - 3:0:0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I	10Hrs.
Subsurface exploration- Importance of exploration program, methods of exploration: boring, sounding tests, geophysical methods-electrical resistivity and seismic refraction methods. Types of samples-undisturbed, disturbed and representative samples samplers, sample disturbance, area ratio, recovery ratio, clearance stabilisation of boreholes - typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.	
UNIT-II	10 Hrs.
Stress in Soils- Introduction, Boussinesq's and Westergaard's theory of concentrated load, circular and rectangular load, equivalent point load method, pressure distribution diagrams and contact pressure, Newmark's chart. Effective Stress Analysis- Geostatic stresses, effective stress concept-total stress, effective stress and neutral stress and impact of the effective stress in construction of structures, quick sand phenomena	
UNIT-III	11 Hrs.
Lateral earth pressure- Active and passive earth pressures, earth pressure at rest, earth pressure coefficient. Earth pressure theories - Rankine's and Coulomb's – assumptions and limitations, graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods lateral earth pressure in cohesive and cohesionless soils, earth pressure distribution. Stability of earth slopes - Types of slopes, causes and type of failure of slopes. Definition of factor of safety, stability of finite and infinite slopes - method of slices, friction circle method, Fellenius method, Taylor's stability number	
UNIT-IV	9 Hrs.
Bearing Capacity of Shallow Foundation- Types of foundations, Determination of bearing capacity by Terzaghi's and BIS method (IS: 6403), Modes of shear failure, Factors affecting Bearing capacity of soil. Effect of water table and eccentricity on bearing capacity of soil, field methods of determining bearing capacity of soil - SPT and plate load test. Foundation settlement-Types of settlements and importance, Computation of immediate and consolidation settlement, permissible differential and total settlements (IS 8009 part 1).	
Reference Books *	
1. G. Ranjan and A.S.R Rao. (2022), "Basic and Applied Soil Mechanics". New Age International (P) Ltd., New Delhi. 2. B.C. Punmia (2021), 17th Edition "Soil Mechanics and Foundation Engg". Laxmi Publications Co. , New Delhi 3. B. M. Das and N. Sivakugan, Principles of Foundation Engineering with MindTap, Cengage Learning, 9th Edition, 2019. 4. V.N.S. Murthy (2018), 4th Edition, "Soil Mechanics and Foundation Engineering".UBS Publishers and Distributors, New Delhi. 5. C.Venkatrahmaiah (2018), 6th Edition "Geotechnical Engineering". New Age International (P) Ltd., New Delhi. 6. A. Singh and Chowdhary G.R. (2017), "Soil Engineering in Theory and Practice". CBS Publishers and Distributors Ltd., NewDelhi. 7. J.E. Bowles (2017), 5th Edition, "Foundation Analysis and Design". McGraw Hill Pub. Co. New York. 8. I. H. Khan (2005), 2nd Edition, Text Book of Geotechnical Engineering- PHI, India. 9. B. M. Das (2002), 5th Edition, Principles of Geotechnical Engineering- Thomson Business Information	

Course Outcomes**

After completion of the course student will be able to:

- 1) Evaluate and interpret various soil test results to determine soil properties and geotechnical parameters for engineering design.
- 2) Demonstrate proficiency in determining vertical stress in the soil, effective stresses by considering pore water pressure and their role in soil behavior and stability analysis.
- 3) Apply knowledge of lateral earth pressure and slope stability to real-world engineering projects, considering slope geometry and soil types.
- 4) Calculate and interpret ultimate and allowable bearing capacities and settlement of soil using different methods

COURSE ARTICULATION MATRIX:

Course Outcomes	Programme Outcomes											Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO 1	3	-	-	-	-	-	-	-		-	-	2	1	-
CO 2	3	1	-	-	-	-	-	-	-	-	-	2	1	1
CO 3	3	2	2	2	-	-	-	-	-	-	-	2	1	1
CO 4	3	2	2	2	-	-	-	-	-	-	-	2	1	1

22UCV614C	ADVANCED WASTEWATER TREATMENT	Credits: 02
L:T:P - 2 : 0: 0		CIE Marks: 50
Total Hours/Week: 2		SEE Marks: 50

UNIT-I	07 Hrs.
Introduction: Necessity for sanitation, Sewerage systems and their suitability. Estimation of Wastewater Flows: Dry weather flow, factors affecting, Flow variations and their effects on design of sewerage system, Numerical problems. Computation of sewage and storm water discharge, Numerical problems. Design of Sewers: Self cleansing and non-scouring velocities, Numerical problems. Self Study: Laying of sewers, joints and testing of sewers, ventilation and cleaning of sewers.	
UNIT-II	07 Hrs.
Sewer Appurtenances: Catch basin, manholes, flushing tanks, oil and grease traps Sewage Characteristics: Sewage Sampling. Physical, Chemical and Biological characteristics, with emphasis on BOD & COD, BIS and CPCB standards, Numerical problems. Self Study: Drainage traps, Basic principles of house drainage, Typical layout plan showing house drainage connections, maintenance of house drainage.	
UNIT-III	07Hrs.
Sewage Treatment - Primary Treatments: Flow diagram of municipal wastewater treatment plant. Primary treatment Screening, grit chambers, skimming tanks, primary sedimentation tanks- Theory and Design. Secondary Treatments: Fixed film bioprocess-Trickling filter theory and design. Self study: Suspended growth system-Activated sludge process-Theory and design.	
UNIT-IV	07 Hrs.
Sludge Treatment Methods: Sludge digestion tanks, Sludge drying beds. Low cost wastewater treatment -Septic tanks. Sewage Disposal: Dilution method - self-purification phenomenon. Streeter-Phelps equation, Oxygen sag curve, Zones of purification and numerical. Self study: Oxidation Pond and Oxidation ditches, Land disposal: Sewage farming, sewage sickness.	
Reference Books *	
1. Environmental Engineering, Peavy H. S., Rowe D. R. and George Tchobanoglous, McGraw-Hill International. 2. Garg, S.K., "Environmental Engineering", Vol. 1 & II Khanna Publishers, New Delhi, 2005. 3. Water Supply and Sewerage, McGhee T. J., McGraw-Hill Inc., 4. Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, McGraw Hill Education, 2017, 4th Edition. 5. APHA, Standard Methods Examination of Water and Wastewater, American Public Health Association, Washington DC, 1995. 6. CPCB, Guide Manual: Water and Wastewater Analysis.	

Course Outcomes**

After completion of the course student will be able to

1. To estimate sewage and drainage quantity, for the design of sewers and drainage sections.
2. To demonstrate the characterization of sewage and sewer appurtenances.
3. To identify the impact of sewage disposal on water and land and minimum treatment necessary for sewage.
4. To design biological treatment units for sewage and knowledge of sludge disposal.

* Books to be listed as per the format with decreasing level of coverage of syllabus

** Each CO to be written with proper action word and should be assessable and quantifiable

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	1	1	3	3	-	-	-	-	2	2	3	3
CO2	3	-	-	3	2	3	3	-	-	-	-	1	3	2	3
CO3	2	2	1	2	2	3	3	-	-	-	-	2	2	2	2
CO4	3	3	3	2	2	2	3	-	-	-	-	1	3	3	3

22UCV615L	Geotechnical Engineering Lab	Credits: 01
L:T:P - 0: 0: 2		CIEMarks:50
Total Hours/Week: 2		SEEMarks:50

Sl. No	Experiments
1.	Water content determination by oven drying and Rapid moisture meter method
2.	Determination of specific Gravity of fine grained and course grained soil
3.	Grain size analysis (Sieve analysis of soil)
4.	In-situ density tests i) Core-cutter method ii) Sand replacement method
5.	Consistency limits i) Liquid limit test (by Casagrande's and cone penetration method) ii) Plastic limit test iii) Shrinkage Limit
6.	Co-efficient of permeability test i) Constant head test ii). Variable head test
7.	Standard compaction test (light compaction only)
8.	Direct shear test
9.	Unconfined compression test
10.	Laboratory vane shear test
11.	Triaxial test (unconsolidated undrained test only)
12.	Field Identification of soil
13.	Demonstration of Standard penetration test & Boring equipment
14.	Demonstration of Proctors Needle

Reference Books *

1. Soil Testing for Engineers by S. Mittal and J.P. Shukla 2020
2. Manual of Soil Laboratory Testing- Head K.H., (1986)- Vol. I, II, III, Princeton Press, London 2006
3. Punmia B C, Soil Mechanics and Foundation Engineering, Laxmi Publications co., New Delhi. 2017

Course Outcomes**

After completion of the course student will be able to

1. Carry out experiments to assess the index properties of soil
2. Evaluate consistency and plasticity characteristics of soils through Atterberg limit tests and assess their significance in soil classification
3. Conduct in-situ density measurements and assess compaction characteristics of soils through laboratory compaction tests.
4. Assess permeability and strength parameters of soils using laboratory methods

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	-	-	-	-	2	-	-	3	-	3	-
CO2	3	3	3	2	-	-	-	2	-	-	2	-	3	-
CO3	3	3	3	2	-	-	-	2	-	-	2	-	3	-
CO4	3	1	3	2	-	-	-	2	-	-	2	-	3	-

22UCV621E	DESIGN OF BRIDGES	Credits: 03
L:T:P-3: 0:0		CIE Marks:50
Total Hours/Week:3		SEE Marks:50

UNIT-I	10 Hrs.
Introduction & Design of Slab Culvert: Overview of bridge engineering and its development in the past. Ideal site selection for bridges and bridge classifications. Discussion of forces acting on bridges and analysis for maximum bending moment (BM) and shear force (SF) at critical sections for dead and live loads, as per IRC Class A, B, and AA tracked and wheeled vehicles. Structural design of slab culverts using the limit state method including reinforcement details.	
UNIT-II	10 Hrs.
Box Culvert: Introduction to box culverts and advantages of structural continuity. Analysis involves determining maximum bending moment (BM) and shear force (SF) at critical sections using the moment distribution method for various load combinations, including dead, surcharge, soil, water, and live loads (as per IRC Class A, B, and AA for tracked and wheeled vehicles). The structural design will utilize the Limit State Method with detailed reinforcement specifications.	
UNIT-III	10 Hrs.
T-Beam Bridge: Components of T-Beam Bridge, Load transfer mechanism, Proportioning the Components, Analysis of Slab using Pigeauds Method for maximum BM and SF at critical sections for Dead and Live load as per IRC class A, B, AA tracked and wheeled vehicles and design of Slab using limit state method with reinforcement details. Analysis of Cross Girder for maximum BM and SF at critical sections for Dead and Live load as per IRC class A, B, AA tracked and wheeled vehicles and design of slab using limit state method with reinforcement details. Analysis of Main Girder using Courbon's Method for maximum BM and SF at critical sections for Dead and Live load as per IRC class A, B, AA tracked and wheeled vehicles and design of Main Girder using limit state method with reinforcement details	
UNIT-IV	10 Hrs.
PSC-Bridge: Introduction to Pre & Post Tensioning, Proportioning of Components, 28032025 Analysis & Structural Design of Slab, Analysis of Main Girder Using Courbon's Method for IRC Class AA, Tracked vehicle, Calculations of Pre-stressing Force, Calculations of Stresses, Cable profile, Design of End Block, Detailing of Main Girder.	
Reference Books *	
1. Essentials of Bridge Engineering by Dr. D Johnson Victor , Oxford & IBH Publishing Co New Delhi 2. Design of Bridges by Dr N Krishna Raju, Oxford & IBH Publishing Co New Delhi 3. References: 4. Principles and Practice of Bridge Engineering by S P Bindra, Dhanpat Rai & Sons New Delhi 5. IRC 6 -1966 Standard Specifications And Course Code Of Practice For Road Bridges Section II Loads and Stresses, The Indian Road Congress New Delhi 6. IRC 21 - 1966 Standard Specifications And Course Code Of Practice For Road Bridges Section III Cement Concrete (Plain and reinforced) The Indian Road Congress New Delhi 7. IS 456 -2000 Indian Standard Plain and Reinforced Concrete Course Code of Practice (Fourth Revision) BIS New Delhi 8. IS 1343-Indian Standard Pre-stressed Concrete Course Code of Practice BIS New Delhi	
Course Outcomes**	

After completion of the course student will be able to

CO1: Select a suitable site and bridge type. **Calculate** design parameters for a slab culvert at critical sections as per IRC guidelines, and **outline** the design and detailing procedures required for project implementation.

CO2: Analyze the structural behavior of a box culvert as per IRC provisions to **determine** design parameters. **Design** and **detail** the structural components using standard IS code procedures.

CO3: Apply Pigeaud's and Courbon's Methods to **analyze** T-beam bridges as per IRC standards. **Design** key components to obtain safe dimensions and **evaluate** reinforcement requirements in accordance with IS code guidelines.

CO4: Utilize Courbon's Method to **analyze** prestressed concrete (PSC) bridges as per IRC standards. **Design** structural elements by determining suitable prestressing force values and **ensure** that stress levels comply with codal provisions using IS code procedures.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	2	1	2	1					1	3	2	
CO2	3	3	3	2	2	1					1	3	2	
CO3	3	3	3	2	2	1					1	3	2	
CO4	3	3	3	2	2	1					1	3	2	

22UCV622E	GEOMORPHOLOGY	Credits: 03
L:T:P - 0:0:3		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.
INTRODUCTION: Introduction to Geomorphology- Definition meaning, nature, development and scope; Basic concepts; Geological Time Scale; Distribution of continents and oceans; Internal structure of the earth.	
UNIT-II	10 Hrs.
EARTH MOVEMENTS: Epierogenic and Orogenic earth movements; Theories of continental drift , plate tectonics, sea floor spreading, Isostasy ,Earthquakes, volcanoes and their distribution.	
UNIT-III	10 Hrs.
GEOMORPHIC PROCESSES AND AGENTS: Constructive and destructive processes: exogenetic and endogenetic processes and agents. Agents of Denudation: River; Drainage patterns, Groundwater, Sea Waves, Wind and Glaciers. Weathering, erosion and mass wasting.	
UNIT-IV	10 Hrs.
EVOLUTION OF LANDFORMS: Meaning, types and factors controlling landforms development. Slope development; concept and types, Concept of Cycle of Erosion–W.M. Davis and W. Penck. Erosional and depositional landforms made by wind, rivers, glaciers and underground water. Application of geomorphology.	
Reference Books *	
1. Ahmed E. (1985) Geomorphology, Kalyani Publishers, New Delhi. 2. Strahler A.N. (1968) The Earth Sciences, Harper & Row Intl. Edn, New York 3. Thornberry W.D. (1969) Principles of Geomorphology 2nd Edition, Wiley International Edn. & Wiley Eastern Reprints 1984. 4. Verstappen H. (1983) Applied Geomorphology, Geomorphological Surveys for Environmental Development, Elsevier, Amsterdam 5. Woodridge S.W and R.S. Morgan (1991) An Outline of Geomorphology, The Physical Basis of Geography, Orient Longman, Kolkata. 6. Dayal P. (1995) A Text Book of Geomorphology 2nd Edition. Sukla Book/Dept. Patna. 7. Homes A. (1965) Principles of Physical Geology, 3rd Edition, ELBSS Edn. 8. Goudie Anrew et.al. (1981) Geomorphological Techniques, George Allen & Unwin,London. 9. Bloom A.L. (1978) Geomorphology: A Systematic Analysis of Late Cenozoic Landforms Prentice Hall of India, New Delhi. 10. Brunsden D. (1985) Geomorphology in the Service of Man: The Future of Geography, Methnen, U.K. 11. Worcester P.G. (1965), A Text Book of Geomorphology, Can North and 2nd Edition, East West Edn. New Delhi. 12. William D. Thornbury(2004). Principles of Gomorphology, 2nd Edition, CBS Publisher and Distributor Pvt. Ltd, New Delhi 13. Vishwas S. Kale, Avijit Gupta (2018), Introduction to Geomorphology, Universities Press.	

Course Outcomes**

After completion of the course student will be able to

1. Define the field of Geomorphology, its basic principles and interior of earth.
2. To outline the mechanism and theories of dynamic nature of the Earth.
3. To illustrate the geomorphic processes, agents and their effects on the earth.
4. To explain the conceptual and dynamic aspects of landform development

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1							2				1		1	
CO2							2				1		2	
CO3							1				1		1	
CO4							1				1		2	

22UCV 623E	Open Channel Flow	Credits: 3
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I											10 Hrs.			
Definition and classification: open vs closed conduit flow, types of open channels: natural and artificial, Types of flow: steady/unsteady, uniform/non-uniform, subcritical/supercritical, Velocity distribution in open channels, Energy and momentum principles, Pressure distribution in open channel flow, Hydraulic radius, hydraulic depth. Numerical Examples														
UNIT-II											10 Hrs.			
Chezy's equation and Manning's formula Most efficient channel sections (rectangular, trapezoidal, circular) Computation of uniform flow and normal depth Flow resistance and estimation of roughness coefficients Velocity measurement in open channels.														
UNIT-III											10 Hrs.			
Dynamic equation of gradually varied flow Classification of channel slopes and flow profiles Characteristics of water surface profiles Methods of computation of GVF (direct step, standard step, graphical integration) Practical applications of GVF analysis (e.g., backwater curves)														
UNIT-IV											10 Hrs.			
Hydraulic jump: types, characteristics, energy dissipation Flow over spillways, sluice gates, and weirs Critical flow concepts: critical depth and critical velocity Specific energy and specific force concepts Surges and moving hydraulic jumps Introduction to flow transitions and control structures														
Text Books *														
1. Open Channel Flow" by F.M. Henderson- Macmillan 2. Open Channel Hydraulics" by Terry W. Sturm -McGraw-Hill 3. Flow in Open Channels" by K. Subramanya- McGraw-Hill Education (India) 4. Open-Channel Hydraulics" by Ven Te Chow -McGraw-Hill Education														
REFERENCE BOOKS**														
1. "Hydraulics of Open Channel Flow" by Hubert Chanson. 2. "Fluid Mechanics with Engineering Applications" by Finnemore & Franzini														
Course Outcomes**														
After completion of the course student will be able to														
1. Explain the characteristics and classifications of open channel flows. 2. Apply hydraulic principles to compute uniform flow and design efficient channel sections. 3. Analyze gradually varied flows using differential equations and numerical methods. 4. Evaluate rapidly varied flow phenomena and design hydraulic structures like weirs and spillways.														
Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2			2	1					1		2	
CO2	3	2	3		3	2							2	
CO3	3	3	2	2	3						1		2	
CO4	3	3	3	2	3	2				1	1		2	

UNIT-I	10 Hrs.
Definitions and Concepts: Comparison of classical, matrix and approximate methods of structural analysis, System approach versus Element approach, degrees of freedom, coordinate systems, stiffness and flexibility coefficients, Flexibility and stiffness methods. Flexibility Method: Introduction, element flexibility matrix, Principle of contragradience, construction of member and structure flexibility matrix, determination of member forces. Procedure for analysis of indeterminate structures: analysis of continuous beams and plane frames.	
UNIT-II	10 Hrs.
Flexibility Method Continued: Analysis of indeterminate structures: analysis of plane trusses. Stiffness Method: Introduction, element stiffness matrix, Principle of contragradience, construction of member and structure stiffness matrix, determination of member displacements. Procedure for analysis of indeterminate structures: continuous beams.	
UNIT-III	10 Hrs.
Stiffness Method continued: Analysis of indeterminate structures: plane frames and Plane trusses.	
UNIT-IV	10 Hrs.
Direct Stiffness Method: Introduction, transformation of variables, transformation of stiffness matrix for member of truss and continuous beams. Global stiffness matrix, Boundary conditions, computation of internal forces, analysis of plane trusses and continuous beams.	
Reference Books *	
1. S. Rajasekaran and G. Sankarasubramanian - Computational Structural Mechanics, PHI Learning, 2023. 2. Kassimali Aslam – Matrix Analysis of Structures, Cengage Learning Custom Publishing, Boston USA, 2011. 3. William Weaver Jr. and James M. Gere– Matrix Analysis of Framed Structures, CBS Publishers and distributors, New Delhi, 2018. 4. Neville A M and Ghali A- Structural Analysis: A Unified Classical and Matrix Approach, CRC Press, 2009.	
Course Outcomes**	
CO1: <i>Explain</i> the definitions, basic concepts, and differences between classical and matrix methods, including force and displacement methods, as well as system and element approaches. <i>Analyze</i> and <i>evaluate</i> member forces for continuous beams and plane frames using the force transformation method. CO2: <i>Apply</i> the flexibility matrix method to determine member forces in trusses. <i>Explain</i> the fundamental concepts related to the stiffness matrix method. <i>Evaluate</i> member forces for continuous beams using the displacement transformation method. CO3: <i>Apply</i> the displacement transformation method to <i>analyze</i> and <i>evaluate</i> member forces in plane frames and trusses. CO4: <i>Illustrate</i> the core concepts of the direct stiffness method. <i>Apply</i> the method to <i>evaluate</i> member forces in plane trusses and continuous beams.	

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	2								2	2	3
CO2	3	3	2	2								2	2	3
CO3	3	3	2	2								2	2	3
CO4	3	3	2	2								2	2	3

22CV613E	DESIGN AND CONSTRUCTION OF HIGHWAY PAVEMENTS	Credits: 03
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10Hrs.
Introduction and Subgrade Materials: Overview of highway - Classification of roads, Pavement Layers – Components and Functions, Highway alignment and Survey, road development in India, Components and Geometric Standards of Highway Design Pavement subgrade material: Soils, Soil Characteristic Evaluation, desirable properties, tests (Virtual) - Liquid Limit, Plastic limit, Shrinkage Limit, Grain size analysis - Wet sieve and Hydrometer analysis, Water Content, Specific gravity, Free swell index, Relative density, Heavy compaction, California Bearing Ratio	
UNIT-II	10 Hrs.
Pavement Materials Stone aggregates: Desirable properties, tests (Virtual) - Sieve analysis, Specific gravity, Water absorption, Bulk density, Wet Sieve analysis, Aggregate crushing value, Aggregate impact value, Combined Flakiness and Elongation index, Aggregate abrasion value, Soundness of aggregate, Characteristic evaluation Bituminous binders: Desirable properties, tests (Virtual) - Specific gravity, Penetration, Softening Point, Ductility, Elastic recovery, Flash point, Separation, Loss on heating, Matter soluble in trichloro ethylene, Absolute, Kinematic and Rotational Viscosity, Aging of Bitumen, Characteristic evaluation. Bituminous paving mix: Desirable properties, tests (Virtual) - Stripping value of coarse aggregate, Stone polishing value of coarse aggregate, Maximum specific gravity of bituminous mix, Marshall stability & flow, Binder content, Bulk specific gravity and density, Indirect tensile strength, Resilient Modulus (indirect tension test), Resistance of compacted asphalt mixtures to moisture-induced damage, Characteristic evaluation Cement: Desirable properties, tests (Virtual) - Consistency, Initial Setting Time, Final Setting Time, Mortar Cube compressive strength, Fineness of cement, Specific gravity of cement, Soundness of cement, Characteristic evaluation Concrete: Desirable properties, requirements, tests (Virtual) - Workability, Compressive Strength, Flexural strength, Characteristic evaluation	
UNIT-III	10 Hrs.
Principles and Design of Pavements Flexible Pavement: Introduction, composition, factors governing design, design of flexible pavements as per IRC; Bituminous mix design (Marshall method), IIT Pave Software; Case study - Design Problem Rigid pavement: Introduction, composition, factors governing design, DLC and PQC mix design; design of concrete pavements as per IRC; Joints; Case study-Design problem Plants and Machinery: Introduction; Asphalt Hot Mix Plant, Concrete Batching Plant, Wet Mix Macadam Plant, Earthmoving and Excavation Equipment, Paving Equipment, Slipform Paver, Paver Milling and Road Marking Equipment; Factors affecting output of Plant & Equipment; Initiatives to improve quality Construction Planning: Concept of Highways, Planning; Schedules in Planning; Monitoring; Software in Planning	
UNIT-IV	10 Hrs.
Subgrade and Base Layer: Construction Practices and Quality Control; Granular Sub-base Construction Activities; Cement Treated Sub-base Construction Activities Flexible Layers: Wet Mix Macadam; Construction Practices of Wet Mix Macadam; Hot Mix Asphalt; Construction Practices of Hot Mix Asphalt Layer, Quality Control of Flexible Layers Rigid Layers: Dry Lean Concrete; Construction Practices of Dry Lean Concrete; Pavement Quality Concrete; Construction Practices of Pavement Quality Concrete, Quality Control of Rigid Layers	

Pavement Evaluation: Introduction, Pavement Condition Survey, Pavement Evaluation Functional and Structural, Distresses - Flexible and Rigid Pavement, Overlay Design of Flexible Pavement.

Reference Books *

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017
2. Partha Chakraborty, "Principles of Transportation Engineering", PHI Learning,
3. Principles and Practices of Highway Engineering by Kadiyali L.R and Dr.Lal N.B., Khanna Publishers, New Delhi, 2003
4. Relevant IRC and IS Codes of Practices, MoRTH Specification

Course Outcomes**

At the end of the course, the student will be able to :

1. Develop an understanding of the fundamentals of pavement layer behaviour.
2. Comprehend the material specifications by interpreting the relationship between material properties and pavement behaviour.
3. Conduct different tests on road construction materials to evaluate their characteristics
4. Carry out the design of flexible and rigid pavements Acquire skilful knowledge of pavement construction practices, plant and machinery selection and quality control

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			1	1				1			1	1	1		
CO2	1				1				1			1		1	
CO3			1			1	1	1			1	1	1		1
CO4	1		1	1				1		1		1		1	

22UCV626E	INDUSTRIAL WASTEWATER TREATMENT	Credits: 03
L:T:P – 3:0:0		CIE Marks:50
Total Hours/Week:03		SEE Marks:50

UNIT-I	10 Hrs.
Effects of industrial waste water on receiving water bodies, Effect of organic wastes on the DO profile of the stream, Streeter Phelps model, oxygen sag curve and numerical there upon. Receiving water quality protection measures – receiving water quality standards and stream quality control, Sample-Grab, composite and integrated samples, stream sampling. Economics of industrial waste water treatment systems primary/secondary benefits, intangible benefits, Quantification of benefits, Relationship of treatment cost to benefits.	
UNIT-II	10 Hrs.
Waste minimizing techniques– Volume reduction, Strength reduction, Neutralization, Equalization and Proportioning, Removal of suspended, colloidal, inorganic and organic dissolved solids. Treatment and disposal of sludge solids, Sludge characteristics, Sludge volume and solids content relationship	
UNIT-III	10 Hrs.
Manufacturing process, waste water characteristics, treatment and disposal of waste water of following industries: Dairy, Distillery, Sugar, Textile, Paper and pulp, Pharmaceutical, Fertilizer.	
UNIT-IV	10 Hrs.
Effects of industrial waste water on sewage treatment plants, Limiting values for discharge into municipal sewer systems, Joint treatment of industrial and domestic waste water, Membrane filter, electro dialysis and bioremediation techniques of waste water treatment. Radioactive waste treatment, Environmental auditing, Regulatory norms for waste water treatment, present scenario of waste water treatment in India	
Reference Books *	
1. Nemerow N. N., Liquid waste of industry theories, practices and treatment, Addison Willey, New York, 1971. 2. Azad N. S., Industrial waste water management handbook, Mc Graw Hill book, co. New York. 3. Ross R. D., Industrial waste disposal, Reinhold environmental series, New York, 1968 4. Eckenfelder, W.W., “Industrial Water Pollution Control”, McGraw-Hill, 1999.	
Course Outcomes**	
Students will be able to 1. Assess the impact of industrial waste discharges on the water quality of stream and take the necessary measures to protect the water quality. 2. Analyze the economics of industrial wastewater treatment vis -a- vis water quality of the stream for its best designated uses. 3. Implement the modern technical tools like waste minimization, strength reduction etc, in efficient and cost-effective practice. 4. Demonstrate the understanding of green environment and practicing the environmentally friendly processes for the manufacture of various industrial products and also implementing the state-of-art technologies for wastewater treatment.	

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	2	2	-	-	-	-	-	1	2	2	
CO2	3	2	3	-	2	1	-	-	-	-	-	1	2	2	
CO3	3	2	3	-	3	-	-	-	1	-	-	1	2	2	
CO4	2	1	1	-	2	1	-	-	1	-	-	1	2	2	

22UCV627E	TRAFFIC ENGINEERING	Credits: 3
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10 Hrs.
Introduction: Definition-Objective Scope of Traffic Engineering. Road User and Vehicle Characteristics Static and Dynamic characteristics- Power performance of vehicles- Resistances to the motion of vehicles- Reaction time of driver- Problems of above	
UNIT-II	10 Hrs.
Traffic Parameter Studies and Analysis: Various types of traffic engineering studies, data collection, Objectives and Method of study. Definition of study area- Sample size- Data Collection and Analysis- Interpretation of following Traffic Studies- Volume, Spot Speed study, presentation of spot speed data problems on spot speed, Speed and Delay study Origin and Destination. Parking-on Street and off Street Parking, Accidents-Causes, Analysis (collision with parked vehicle only) Measures to reduce Accident,	
UNIT-III	10 Hrs.
Traffic Flow Theories: Traffic flow theory Green shield theory Goodness of fit correlation and regression analysis (linear only)- Queuing theory Car following theory relevant Problems on above. Traffic Regulation- Driver, Vehicle and Road controls- Traffic Regulations- One Way- Traffic Signs- Traffic Markings-Canalization, Classified traffic volume at intersections, PCU, Traffic Rotary elements, analysis of capacity of rotary.	
UNIT-IV	10 Hrs.
Traffic Control: Traffic operation Traffic Signals-Vehicle actuated and synchronized signals Signal Coordination – Intelligent Transport system- Webster's method of signal Design, IRC Method, Street lighting Road Side Furniture.	
Reference Books *	
1. Khanna and Justo., "Highway Engineering" Nemchand Bros 2. L.R. Kadiyali., " Traffic Engineering and Transport Plankling". Khann Publisher. 3. Matson, Smith and Hurd., " Traffic Engineering ", McGraw Hill and Co 4. Traffic flow theory Drew McGraw Hill Co., REFERENCE BOOKS: 1. Pignataro., " Traffic Engineering" ., Prentice Hall 2. Highway capacity Manual-2000 3. An Introduction to Transportation Engineering, Jotin Khistey and Kent Lall, PHI. 4. Traffic Engineering-Mc Shane and Roess, PHI	
Course Outcomes**	
After completion of the course student will be able to 1. Able to analyze the vehicles behavior and reaction time of driver 2. Able to interpret the traffic data in analyzing different vehicular speeds. Able to provide different parking facilities and analyze the accidents and give the remedial measures 3. Understand the traffic flow behavior able to design rotary and channelization 4. Design the signals by different methods and understands ITS	

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	2	2	-	-	-	-	-	-	3		
CO2	3	2	3	-	2	1	-	-	-	-	-	-		2	
CO3	3	2	3	-	3	-	-	-	1	-	-	-			
CO4	2	1	1	-	2	1	-	-	1	-	-	1			2

22UCV628E	GROUND IMPROVEMENT TECHNIQUES	Credits: 03
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I		10 Hrs.
Introduction: Principles and objectives of ground improvement and History of ground improvement developments. Classification of ground improvement techniques, Factors affecting ground improvement. Mechanical modification: Mechanical modification method of ground improvement; Theory of compaction, moisture-density relationship, optimum moisture content and maximum dry density; Laboratory compaction test using Proctor's mould and modified Proctor Mould, Factors affecting compaction .		
UNIT-II		10 Hrs.
Field compaction: Dead weight surcharge for compaction;; Equipment for field compaction: smooth wheel rollers, pneumatic rollers, sheep foot rollers, grid rollers, Power rammers. Role of vibrations in dynamic compaction; Dynamic Field Compaction Equipment: Impact type of compaction, Vibratory rollers, Vibratory pneumatic tyre, compaction piles, vibroflotation, vibratory probes, compaction sand columns and sand piles, underground blasts. Specifications for field compaction Hyd. Modification: Preloading by lowering ground water table, Filters, Control of ground water seepage, Sand drains and wick drains, Well point system, Vertical drains, Electrosmosis and its application in ground improvement.		
UNIT-III		10 Hrs.
Chemical modification: Factors affecting chemical modification, Lime stabilization, Cement stabilization, Bitumen stabilization, Chemical Stabilization, Methods of construction- mix in place method, traveling plant and stationary plant methods. Grouting: Factors affecting grouting, Grout ability, Grouting materials and their properties, Pressure grouting, Compaction grouting, Grouting procedures, Applications of grouting		
UNIT-IV		10 Hrs.
Applications of Geosynthetics for ground improvement Miscellaneous: Rock cutting, anchoring, heating, soil nailing.		
Reference Books *		
1. Purushothama Raj., Ground Improvement Techniques, Laxmi Publications Pvt Ltd, 2 nd edition, 2016 2. Manfired R.H. (1990), Engineering Principles of Ground Modification, McGraw-Hill Pub. 3. Koerner R M., Construction and Geotechnical Methods in Foundation Engineering, McGraw-Hill Pub Co New York, 1985. 4. Hausmann, M R, Engineering Principles of Ground Modifications, McGraw Hill Pub NewYork, 1990. 5. Ingles O G and Metcalf J B., Soil Stabilisation: Principles and practice, Butterworths, London, 1972. 6. Nelson J D and Miller D J., Expansive soils, John Wiley and sons. Inc new, 1992.		
Course Outcomes**		
After completion of the course student will be able to - perform the laboratory tests to determine compaction properties and characterize problematic soils - improve the properties of soil in field by mechanical techniques like blasting, vibro compaction, dynamic tamping, compaction piles etc... and Describe various dewatering methods with various hydraulic ground modification techniques. - explore the concept of soil chemical modification techniques and method of grouting - recognize the need for Soil reinforcement technique like reinforcement with strip, in-situ ground reinforcement, ground anchors and soil nailing etc... and geosynthetics		

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
C01	3	2	2		-	-	-	-	-	-	3	-	3	-
C02	3	3	2		-	-	-	-	-	-	2	-	3	-
C03	3	3	2		-	-	-	-	-	-	2	-	3	-
C04	3	1	2		-	-	-	-	-	-	2	-	3	-

22UCV631N	OCCUPATIONAL SAFETY AND HEALTH	Credits: 03
L:T:P – 3:0:0		CIE Marks:50
Total Hours/Week: xx		SEE Marks:50

UNIT-I	10 Hrs.
Introduction - History and Development, Occupational Safety and Health Act. Occupational Safety and Health Administration, Right to know Laws. Accident Causation-Need for Accident Investigation, Accident investigation plan, Methods of acquiring Accident Facts, Correcting Missing Skills, Investigator Tendencies and Characteristics, Supervisory Role in Accident investigation. Human Error Model, Petersew's Model, Epidemiological Models. Ergonomics- Ergonomics at workplace, Ergonomic Task Analysis, Preventing Ergonomic Hazards, Setting up of Ergonomics Programme.	
UNIT-II	10 Hrs.
Occupational Hazard and Control- Hazard Analysis, Human Error Analysis in Causation with Hazard Analysis, Fault Tree Analysis, Emergency Response. Decision for Action, Purpose and Considerations, Right Decision, Wrong Remedy, Hazard Control Measures, Hazards and their Control in Pharmaceutical, Construction, Textiles, Petroleum Refineries and LPG Bottling, Iron and Steel industries	
UNIT-III	10 Hrs.
Fire prevention and Protection- Fire Development and its Severity effects. Enclosure, need for early Detection of Fire, Extinguishing Fire Electrical Safety Product Safety, Technical Requirements of Product Safety Programme. Environmental Safety and ISO 14000 ISO series of standards, ISO14001Standards, Environmental Management systems. (EMS) Total quality Management (TQM) and Total safety Management (TSM).	
UNIT-IV	10 Hrs.
Occupational Health-Health and Safety Considerations, Personal Protective Equipment's, Effects of Exposure and Treatment for Metal Working Trades, Municipal Solid Waste, Epoxy Resins, Foundries. Occupational Health and Safety Considerations in Wastewater Treatment Plants.	
Reference Books *	
1. Nemerow N. N., Liquid waste of industry theories, practices and treatment, Addison Willey, New York, 1971. 2. Azad N. S., Industrial waste water management handbook, Mc Graw Hill book, co. New York. 3. Ross R. D., Industrial waste disposal, Reinhold environmental series, New York, 1968 4. Eckenfelder, W.W., "Industrial Water Pollution Control", McGraw-Hill, 1999.	
Course Outcomes**	
1. Design policies and regulations for the development and maintenance of a healthy and safe work environment. 2. Interpret and apply legislative requirements, industry standards, and best practices in a variety of workplaces and apply risk management principles to anticipate, identify, evaluate and control physical, chemical, biological and psychosocial hazards. 3. Analyse the change by advancing OH&S principles within management systems, cultures, practices, and priorities. 4. Construct the Occupational Health and Safety Considerations in Wastewater Treatment Plants.	

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	2	2	-	-	-	-	-	1	2	2	
CO2	3	2	3	-	2	1	-	-	-	-	-	1	2	2	
CO3	3	2	3	-	3	-	-	-	1	-	-	1	2	2	
CO4	2	1	1	-	2	1	-	-	1	-	-	1	2	2	

22UCV532N	GEOGRAPHIC INFORMATION SYSTEMS	Credits:3
L:T:P-3: 0: 0		CIEMarks:50
Total Hours/Week:4		SEEMarks:50

UNIT-I	10Hrs.
Basics: Fundamentals of Remote Sensing, Electromagnetic Spectrum, Process of remote sensing, Types of reflections, Energy Interactions with earth atmosphere and surface features, spectral reflectance curves-For Vegetation, soil & water, Idealized Remote Sensing System Sensors: Definition, Sensor Parameters, Types, Choice of sensor, Optical Remote Sensing, Across and Along track scanning systems. Platforms: Definition, Space borne platform attitudes (only definitions, No Problems). Indian Remote Sensing Programme: Definition and Objectives Satellite Specifications for IRS-1C, 1D, CARTOSAT-1 & CARTOSAT-2 - Ikonos, Quick bird, RISAT	
UNIT-II	10Hrs.
Visual Image Interpretation: Definition, Objectives, Keys & Elements of Visual Image interpretation. Digital Image Processing (DIP): (No problems/programming on DIP) Definition, Image Rectification & Restoration, image enhancement (contrast manipulation-Grey Level Thresholding, Level Slicing only), Supervised Image Classification using minimum distance to means classifier algorithm- GIS integration –stages & procedure., Image Filtering (spatial filters) -Low Pass and High pass image filters.(Brief discussion only, no problems or programming) Applications of REMOTE sensing in urban applications and water resource management	
UNIT-III	10Hrs.
Maps and Projections : Map Projections Plane and geodetic , latitude and longitude map projections, types of map projections Spheroid, Datum (WGS84 Datum) and UTM (No Problems) GIS: History, Definition, Components, concept, Data acquisition for GIS input-Spatial (Vector, Raster & Surface data) & Non spatial data, rectification, processing, verification & Data Editing, Storage and Output. GIS functions in vector and raster data- Input, Analysis and out put GIS Analysis (Vector Data- Buffering & Overlay analysis using overlay operators) GIS Analysis (Raster Data- Local Operations and neighborhood using arithmetic, Logical and Overlay operators) Cartography-Definition, basic map layout, significance of cartography Data Standards in GIS errors, precision and accuracy-Definition and Types	
UNIT-IV	10Hrs.
Advanced Concepts: GPS.- Definition, working principle, segments and uses (Brief Discussion only) Drones- Classification of drones, Basics of drones part, basics of drone surveying, Property mapping using drones Applications of GIS and Remote Sensing: 1) Identifying suitable site for urban development 2) Ground water Vulnerability assessment.	
Reference Books *	
TEXT BOOKS: 1.Thomas.M.LILLYSAND & RALPH.W.KEIFER, "REMOTE SENSING & IMAGE INTERPRETATION" --7 TH EDITION, Wiley INDIA Publications, New Delhi, August 8, 2015 2. Basudeb.BHATTA, "REMOTE SENSING AND GIS", -2 nd edition", Oxford press publications, 2011. 3.M. ANGIREDDY , " TEXTBOOK OF REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS", 3 rd EDITION, B.S.Publications, Hyderabad, January 1 2005, Telangana, India. ISBN:978-81-7800-135-7. 4.C.P.LO ALBERT .K.W.YEUNG ,"Concepts and Techniques in GEOGRAPHIC INFORMATION SYSTEMS", 2 nd	

REFERENCE BOOKS

1. George Joseph, "Fundamentals of Remote Sensing", 2nd edition, University press, Hyderabad, 2005.
2. Micheal.F.Goodchild, Paul.A.Longely, "Geographic Information Science and Systems", 4th edition, Wiley publications, April 24/2015.
3. S.Kumar, "Basics of Remote Sensing and GIS", 2nd Edition, Laxmi Publications, New Delhi, January 1/2016.

WEB SITES

1. WWW.GISDEVELOPMENT.NET
 2. WWW.JSYS.ORG
 3. WWW.NRSC.GOV.IN
- NPTEL NOTES, IIRS NOTES

Learning Objectives*

1. Acquire knowledge of Basics of remote sensing, its need and advantages in civil engineering , method of acquiring satellite images, ISRO satellite launch programs (This will be useful in choicing the type of satellite image for a particular application in civil engineering works)
2. To apply the concept of Remote Sensing for engineering planning purposes
3. Analyse the application of GIS and modern tools like GPS for quantification of parameters needed for Infrastructure planning purposes.
4. Assess the utility of GIS and RS for real time engineering application with case studies.

After Learning the Course, the student will be able to

1. Differentiate the procedure of data acquisition between remote sensing and conventional methods
2. Apply the concept of remote sensing to asses the ground properties of a region and quantify the ground properties.
3. Choice the tools and techniques needed for generation of quantified data required for engineering and infrastructure planning purposes.
4. Assess, the application RS and GIS techniques for real time engineering applications.

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	3	2	2	1	1	1	-	-	-	-	-	-	2	2	2
CO 2	3	3	2	1	2	2	-	-	-	-	-	-	2	2	2
CO 3	3	3	2	2	2	3	-	-	-	-	-	-	2	2	2
CO 4	3	2	2	2	2	2	-	-	-	-	-	-	2	2	2
Average	3	2.5	2	1.5	1.75	2	-	-	-	-	-	-	2	2	2

22UCV633N	PUBLIC HEALTH ENGINEERING	Credits: 03
L:T:P - 3 : 0 : 0		CIE Marks: 50
Total Hours/Week: 3		SEE Marks: 50

UNIT-I		10 Hrs.
Introduction: Water: Need for protected water supply, Demand of Water: Types of water demands – domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation, factors affecting per capita demand, Variations in demand of water, Peak factor. Numericals Design period and factors governing design period. Methods of population forecasting and numerical problems. Physico-chemical characteristics of water ,Numerical		
UNIT-II		10 Hrs.
Water Treatment: Objectives, Unit flow diagrams – significance of each unit, Aeration process Limitations and types, Sedimentation – Theory, settling tanks, types and design with numericals, Coagulation and flocculation, types of coagulants, Filtration: mechanism, theory of filtration, types of filters: slow sand, rapid sand and pressure filters. Operation and cleaning. Design of slow and rapid sand filter without under drainage system Numericals		
UNIT-III		10Hrs.
Disinfection: Methods of disinfection with merits and demerits. Breakpoint of chlorination Softening: Lime soda and Zeolite process. Wastewater: Introduction: Need for sanitation, methods of sewage disposal, types of sewerage systems, Treatment of municipal wastewater: Wastewater characteristics sampling, significance and techniques, physical, chemical and biological characteristics, Numericals on BOD		
UNIT-IV		10 Hrs.
Treatment Process: flow diagram for municipal wastewater treatment unit operations and process Screens: types, disposal. Grit chamber, oil and grease removal. primary and secondary settling tanks (no numerical), Suspended growth system – conventional activated sludge process and its modifications		
Reference Books *		
➤ Howard S. Peavy, Donald R. Rowe, George T, “Environmental Engineering” - Tata McGraw Hill, New York, Indian Edition, 2013 ➤ S. K. Garg, Environmental Engineering vol-I, Water supply Engineering – M/s Khanna Publishers, New Delhi2010 ➤ B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi2010. ➤ B C Punmia, “Environmental Engineering vol-II”, Laxmi Publications 2nd, 2016 ➤ Karia G.L., and Christian R.A, “Wastewater Treatment Concepts and Design Approach” , Prentice Hall of India Pvt. Ltd., New Delhi. 3rd, Edition, 2017 ➤ S.K.Garg, “Environmental Engineering vol-II, Water supply Engineering”, Khanna Publishers, – New Delhi, 28th edition and 2017		
Course outcomes: At the end of the course the student will be able to : CO1 Estimate average and peak water demand for a community. CO2 Evaluate water quality and environmental significance of various parameters and plan suitable treatment system. CO3 Design the different units of water treatment plant CO4 Understand and design the various units of wastewater treatment plant		

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	1	2	1								1	1	2		
CO 2	1	1	2								2	1	2		
CO 3	1	2	1								1	1	2		
CO 4	1	1	1								2	1	2		

22UCV634N	DISASTER MANAGEMENT AND MITIGATION	Credits: 3
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	08 Hrs.
Introduction: Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency, capacity, impact, prevention, mitigation. India's natural disaster proneness and disaster prone zones .	
UNIT-II	10 Hrs.
Disasters classification: Natural disasters (floods, draughts, cyclones, volcanoes, earthquakes, tsunamis. Landslides etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, transportation accidents, terrorist strikes, etc.)	
UNIT-III	10 Hrs.
Disaster Impacts and Mitigation measures: Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters; mitigation measures and case studies of common disasters .	
UNIT-IV	12 Hrs.
Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Importance of disaster education and community awareness and preparedness in disaster management. Roles and responsibilities of citizens, technology, media, community, government and non-government organizations in disaster management; Policies and legislation for disaster risk reduction; Disaster management system in India.	
Reference Books *	
1. R. Subramanian, 2021, Disaster Management, Vikas publishing house Pvt. Ltd., Noida, India. 2. A.K. Srivastava, 2021, Text book of Disaster Management, Scientific publishers, India. 3. Tushar Bhattacharya, 2012, Disaster science and Management, Tata McGraw Hill publications, New Delhi, India. 4. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall. 5. Singh B.K., 2008, Handbook of Disaster Management: Techniques and Guidelines, RajatPublication. 6. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation. 7. Jagbir Singh, 2007, Disaster Management, I.K International Publishing House, New Delhi. 8. Vinod.K.Sharma, 2013, Disaster Management, second Edn., Scientific International Pvt. Ltd., New Delhi, India. 9. Carter.W.Nick, 1991, Disaster Management: A Disaster Manager's Hand book, Asia Development Bank, Manila. 10. Government of India website on Disaster Management : www.ndmindia.nic.in	
Course Outcomes**	
After completion of the course student will be able to: CO1: Explain the concepts of disaster management and disaster profile of India.	

CO2: Categorize the disasters and their causes

CO3: Predict the various impacts of disasters and their mitigation measures.

CO4: Evaluate the significance of disaster management cycle along with role of various government and non-government organizations in disaster risk reduction.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1						1	1				1		2	
CO2						1	1				1		2	
CO3						2	2						2	
CO4							1		1	1			2	

22UCV621E	SUSTAINABLE DEVELOPMENT GOALS	Credits: 3
L:T:P -3: 0: 0		CIE Marks: 50
Total Hours/Week:3		SEE Marks: 50

UNIT-I	10 Hrs.
Introduction to Sustainable Development and SDGs: Concept and evolution of sustainable development, Need for sustainability in engineering and infrastructure, Overview of the United Nations Sustainable Development Goals (UN SDGs Relevance of SDGs in India and in the Civil Engineering domain, SDG integration in urban planning, transportation, water, and housing. Role of civil engineers in achieving sustainability	
UNIT-II	10 Hrs.
SDGs and Infrastructure Development: Infrastructure and its impact on social, economic, and environmental aspects. Sustainable infrastructure principles and Green buildings, Sustainable transportation systems. Affordable and resilient housing (Pradhan Mantri Awas Yojana), smart cities and SDG implementation	
UNIT-III	10Hrs.
Sustainable Development in Construction: Recycled and reused materials. Bio-based materials: bamboo, hempcrete, mycelium, etc. Low-carbon concrete and geopolymer cement. Energy-efficient insulation materials. Stages of Life Cycle Assessment (LCA): extraction, production, transportation, use, disposal. Affordable and resilient materials for sustainable housing.	
UNIT-IV	10 Hrs.
Environmental Sustainability and Climate Action: SDG 13: Climate Action – Civil engineering role in mitigation and adaptation, Sustainable construction practices (low carbon footprint, waste reduction, recycling). Environmental Impact Assessment (EIA) and Life Cycle Assessment (LCA). Role of civil engineers in reducing urban heat islands, air and noise pollution. Disaster-resilient infrastructure (SDG 11 and SDG 13 linkage). Role of policy, public participation, and governance	
Reference Books*	
1. Civil and Environmental Engineering for the Sustainable Development Goals: Emerging Issues, Manuela Antonelli & Gabriele Della Vecchia (Springer, 2022) 2. Civil Engineering Innovations for Sustainable Communities with Net-Zero Targets, Sreevalsa Kolathayar et al. (Taylor & Francis, 2024) 3. Sustainable Civil Engineering: Principles and Applications, Varinder Kanwar, Sanjay K. Shukla & Siby John (Taylor & Francis, 2023) 4. An Introduction to Sustainable Development, Peter P. Rogers, Kazi F. Jalal & John A. Boyd (Earthscan, 2007) 5. The Role of Civil Engineering in Achieving UN SDGs, chapter in Advances in Sustainable Materials and Resilient Infrastructure (Springer, 2022) 6. Engineering for Sustainable Development: Delivering on the SDGs (UNESCO) – An interdisciplinary engineering-policy guide	
Course Outcomes**(Students will be able to...)	
CO1: Explain the concept of sustainable development and illustrate the relevance of the United Nations Sustainable Development Goals (SDGs) in civil engineering practices. CO2: Analyze the sustainability aspects of civil infrastructure such as transportation, housing, and urban development in alignment with SDG targets. CO3: Evaluate the sustainability potential of recycled, bio-based, and low-carbon construction materials by applying Life Cycle Assessment (LCA) principles to recommend affordable and resilient solutions for sustainable housing. CO4: Apply environmental and climate-responsive strategies in civil engineering projects to promote sustainable construction, disaster resilience, and reduced ecological footprint.	

COs	Programme Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1				2	3					2			3
CO2	2	3	2	2	2	2	3					2			3
CO3	2	3	3	2	2	2	3					2			3
CO4	2	2	3	2	2	2	3					2			3
Average	2	2.25	2	2	2	2	3					2			3

Basaveshwar Engineering College, Bagalkote
B.E-4th Year Scheme of Teaching and Examinations
(2022-23 Admitted Batch) (2025-26 Academic Year)

VII - Semester

Branch: Civil Engineering

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1	PCC	22UCV701C	Design of Steel Structures	Civil Engineering	3	0	0	50	50	100	3
2.	PEC	22UCV71XE	Professional Elective Course - III	Civil Engineering	3	0	0	50	50	100	3
3.	PEC	22UCV72XE	Professional Elective Course-IV	Civil Engineering	3	0	0	50	50	100	3
4.	Project	22UCV704P	Project Work	Civil Engineering	-	-	-	50	50	100	12
5.	AEC	22UHS711C	Research Methodology and IPR	Humanities	3	0	0	50	50	100	3
					12	0	0	250	250	500	24

Professional Elective Course -III					Professional Elective Course -IV				
Code	Title	L	T	P	Code	Title	L	T	P
22UCV711E	Advanced Design of RC Structures	3	0	0	22UCV721E	Design of Pre-stressed Concrete Structures	3	0	0
22UCV712E	Industrial Wastewater treatment	3	0	0	22UCV722E	Deep Foundations	3	0	0
22UCV713E	Soil Dynamics and Earthquake Engineering	3	0	0	22UCV723E	Solid Waste Management	3	0	0
22UCV714E	Railway and Airport Engineering	3	0	0	22UCV724E	Pavement Design	3	0	0
22UCV715E	Design of Irrigation Structures	3	0	0	22UCV725E	Matrix Methods of Structural Analysis	3	0	0

Basaveshwar Engineering College, Bagalkote B.E–
4th Year Scheme of Teaching and Examinations
 (2022–23Admitted Batch) (2025-26 Academic Year)

VIII –Semester

Branch: Civil Engineering

Sl. No.	Course			Teaching Department	Teaching hours and Scheme of Evaluation						
	Category	Code	Title		Lecture	Tutorial	Practical/ Drawing	CIE Marks	SEE Marks	Total Marks	Credits
					L	T	P				
1.	INT	22UCV801I	Research/Industrial Internship	NP	-	-	-	50	50	100	10
2.	AEC	22UCV802O	MOOCs*	NP	3	0	0	50	50	100	3
3.	OEC	22UCV803O	MOOCs*	NP	3	0	0	50	50	100	3
					6	0	0	250	250	500	16

22UCV701C	DESIGN OF STEEL STRUCTURES	03-Credits (3:0:0)
Hrs/Week : 03		CIE Marks:50
Total Hours: 40		SEE Marks:50
UNIT - I		10 Hrs
Introduction: Advantages & Disadvantages of steel structures, Loads & Load combinations, Limit State method of design, section classification. Plastic behavior of structural steel: Introduction, Plastic theory, plastic hinge concept, plastic collapse load, condition of plastic analysis, theorem of plastic collapse, methods of plastic analysis, plastic analysis of continuous beam.		
UNIT – II		10 Hrs
Bolted Connections: Introduction, Behavior of bolted joints, design strength of ordinary black bolts, simple connections, moment resistant connections, beam to beam connections. Welded Connections: Introduction, advantages of welding, types and properties of welds, types of joints, weld symbols, weld specifications, effective area of welds, design of fillet welds, moment resistant connections, continuous beam to beam connections.		
UNIT - III		10 Hrs
Design of Compression members: Introduction, failure modes, Behavior of compression member, sections used for compression members, effective length, design of compression members, Columns including built up sections Laced and Battened systems, slab base connections.		
UNIT - IV		10 Hrs
Design of Tension members: Introduction, Types of tension members, factors affecting the strength of tension member, design of tension member with bolted and welded connections. Design of Flexural members Introduction, beam types, section classification, design of laterally supported and unsupported beams.		
Reference Books: 1. N. Subramanian, Design of Steel Structures, Oxford Publications, 2008 2. Ramachandra, Design of Steel Structures, Standard Book House, New Delhi, 2016. 3. Duggal, S. K, Design of Steel Structure, Tata McGraw Hill Publications, 2017. 4. Punmia, B. C, Comprehensive Design of Steel Structures, Laxmi Publications, 2015. 5. Karve, Design of Steel Structures (Limit State Method), Structures Publications, Pune. 6. Bhavikatti S.S, Design of Steel Structures (Limit State Method), I K International Publishing house Pvt. Ltd, 2012 7. Negi, Design of Steel Structures, Tata McGraw Hill Publications, New Delhi, 2nd Edition, 2017.		
CODE BOOKS IS-800-2007, Steel tables (to be supplied in examinations)		
QUESTION PAPER PATTERN FOR SEE 1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus. 2. Each Question should not have more than four sub divisions. 3. Any FOUR Full questions are to be answered choosing at least one from each unit.		
Course Outcomes: After completion of the course students will be able to 1. Analyze types of loads and their combinations along with an approach to plastic analysis in designing the steel sections with limit state approach. 2. Demonstrate different types of bolts and welds with their connections. 3. Design the compression members along with different built up sections like lacings and battens. 4. Design tension members and flexural members their connections.		

CO MAPPING WITH PO'S AND PSO'S															
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11		PSO 1	PSO 2	PSO 3
CO 1	3	3	3	--	--	2	--	3	--	--	--		--	2	--
CO 2	3	3	3	--	--	2	--	3	--	--	--		--	2	--
CO 3	3	3	3	--	--	2	--	3	--	--	--		--	2	--
CO4	3	3	3	--	--	2	--	3	--	--	--		--	2	--
AVG.	3	3	3	--	--	2	--	3	--	--	--		--	2	--

22UCV704P	PROJECT WORK	Credits: 12
L:T:P		CIEMarks:50
Total Hours/Week:		SEEMarks:50

Project Work 1) CIE- 50 Marks CIE Marks to be awarded by Project Coordinator/ Faculty In-charge Departmental Committee (DC) will conduct the CIE examination. 2) SEE – 50 Marks SEE Marks to be awarded by PEC members Project Evaluation Committee (PEC) will conduct the SEE examination. 3) Consolidated marks will be signed by Projector Coordinator and HOD DC MEMBERS: i) HOD or his Nominee ii) Project Coordinator PEC MEMBERS: i) Internal Examiner ii) External Examiner iii) HOD/ Nominee	

Subject Code: 22UCV711E	ADVANCED DESIGN OF RC STRUCTURES	Credits:03
L: T:P-3:0:0		CIE Marks:50
Total Hours/Week:3		SEE Marks:50

UNIT-I	10Hrs
Design of combined footing: a) Slab and Beam type - Equal loading. b) Slab and Beam type - Unequal loading	
UNIT-II	10Hrs.
Design of Retaining Wall (RW): a) Cantilever Retaining Wall b) Counter fort Retaining Wall.	
UNIT-III	10Hrs.
Portal Frames:(Single Bay and Single Storey) a) Fixed Base b) Hinge Base	
UNIT-IV	10Hrs.
Design of Water Tanks:(Resting on Ground) a) Circular tanks (Flexible Base) b) Rectangular tanks	
Reference Books*	
1. Unnikrishnan and Devadas Menon, Design of reinforced concrete structures, PHI, New Delhi. 2013. 2. Karve S.R. and Shah V.L, Limit state theory and design of reinforced concrete, Vidyarthi prakashan, Pune. 2017. 3. A.K.Jain,Limit state method of design,Nemchand and Bros,Roorisee.Jan2012. 4. Parkand Paulay,Reinforced Concrete,John Wiley & Sons.1975. 5. Kongand Evans.Reinforced and prestressed concrete,ELBS,London 6. H.J.Shah,Reinforced concrete Vol.I,Charotor Publishing House,Anand.Jan2016. 7. IS: 456-2000, SP-24, SP-16. IS: 3370 Part I, II III and IV (Note: Use of IS:456-2000 is permitted and SP-16 to be used in design of columns only)	
Course Outcomes	
After completion of the course students will be able to:	
1. Students will analyze and design the combined footing.	

2. Students will understand the design and solving technique of retaining walls.
3. Students will analyze and design the portal frames.
4. Students will design water tanks.

Course Articulation Matrix (CAM)

Sl. No.	Course Outcomes (CO's)	Program outcomes (PO's)											PSOs		
		1	2	3	4	5	6	7	8	9	10	11	1	2	3
01	CO1	3	1	2	1	1	3	3	1	-	-	1	2	3	1
02	CO2	3	2	2	2	2	2	3	2	1	-	2	3	2	2
03	CO3	3	1	2	2	-	3	3	2	3	3	3	1	2	2
04	CO4	3	3	3	1	1	3	3	2	2	1	3	2	1	1

22UCV712E	INDUSTRIAL WASTEWATER TREATMENT	Credits: 03
L:T:P – 3:0:0		CIE Marks:50
Total Hours/Week:03		SEE Marks:50

UNIT-I	10 Hrs.
Effects of industrial waste water on receiving water bodies, Effect of organic wastes on the DO profile of the stream, Streeter Phelps model, oxygen sag curve and numerical there upon. Receiving water quality protection measures – receiving water quality standards and stream quality control, Sample-Grab, composite and integrated samples, stream sampling. Economics of industrial waste water treatment systems primary/secondary benefits, intangible benefits, Quantification of benefits, Relationship of treatment cost to benefits.	
UNIT-II	10 Hrs.
Waste minimizing techniques– Volume reduction, Strength reduction, Neutralization, Equalization and Proportioning, Removal of suspended, colloidal, inorganic and organic dissolved solids. Treatment and disposal of sludge solids, Sludge characteristics, Sludge volume and solids content relationship	
UNIT-III	10 Hrs.
Manufacturing process, waste water characteristics, treatment and disposal of waste water of following industries: Dairy, Distillery, Sugar, Textile, Paper and pulp, Pharmaceutical, Fertilizer.	
UNIT-IV	10 Hrs.
Effects of industrial waste water on sewage treatment plants, Limiting values for discharge into municipal sewer systems, Joint treatment of industrial and domestic waste water, Membrane filter, electro dialysis and bioremediation techniques of waste water treatment. Radioactive waste treatment, Environmental auditing, Regulatory norms for waste water treatment, present scenario of waste water treatment in India	
Reference Books *	
1. Nemerow N. N., Liquid waste of industry theories, practices and treatment, Addison Willey, New York, 1971. 2. Azad N. S., Industrial waste water management handbook, Mc Graw Hill book, co. New York. 3. Ross R. D., Industrial waste disposal, Reinhold environmental series, New York, 1968 4. Eckenfelder, W.W., "Industrial Water Pollution Control", McGraw-Hill, 1999.	
Course Outcomes**	
Students will be able to 1. Assess the impact of industrial waste discharges on the water quality of stream and take the necessary measures to protect the water quality. 2. Analyze the economics of industrial wastewater treatment vis -a- vis water quality of the stream for its best designated uses. 3. Implement the modern technical tools like waste minimization, strength reduction etc, in efficient and cost-effective practice. 4. Demonstrate the understanding of green environment and practicing the environmentally friendly processes for the manufacture of various industrial products and also implementing the state-of-art technologies for wastewater treatment.	

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	2	2	-	-	-	-	-	1	2	2	
CO2	3	2	3	-	2	1	-	-	-	-	-	1	2	2	
CO3	3	2	3	-	3	-	-	-	1	-	-	1	2	2	
CO4	2	1	1	-	2	1	-	-	1	-	-	1	2	2	

22UCV713E	SOIL DYNAMICS AND EARTHQUAKE ENGINEERING	Credits: 03
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10 Hrs.
Historical development of soil dynamics and its importance. Effects of vibrations on foundations. Types of dynamic loads encountered in civil engineering. Occurrence of earthquakes, Types of seismic waves & their properties, and their uses in subsoil exploration. Propagation of wave in elastic medium. Problems on computation of wave velocities. Location of epicentre, Magnitude of earthquake.	
UNIT-II	10 Hrs.
Vibration Theory: Degrees of freedom; Vibration of Single degree of freedom systems, Undamped and damped free and forced vibrations; Natural frequency and resonance & its effects.	
UNIT-III	10 Hrs.
Liquefaction of soils: Occurrence of liquefaction and its significance in geotechnical engineering; factors affecting liquefaction; liquefaction analysis; measures for reducing the damage to structures due to liquefaction	
UNIT-IV	10 Hrs.
Vibration Isolation: Introduction, Active and Passive Isolation and methods of vibration isolation. Dynamic Soil Properties: Laboratory methods and field testing techniques.	
Reference Books *	
1. Das B. M. and Ramana G. V. (2011) "Principles of Soil Dynamics", 2nd Edition, CENGAGE Learning, USA. 2. Day R. W. (2002) "Geotechnical Earthquake Engineering Handbook". McGraw Hill, NewYork. 3. Kameshwar Rao, (1998) "Vibration Analysis and Foundation Dynamics", Wheeler Publishing. 4. Kramer S. L. (1996) "Geotechnical Earthquake Engineering", Prentice Hall International Series. 5. Prakash S. (1981) "Soil Dynamics", McGraw Hill Book Co., New York. 6. Okamoto, S.(1973), "Introduction to Earthquake Engineering", John Wiley & Sons, New York. 7. Richarts F. E., Hall Jr. J. R. and Woods R. D. (1970) "Vibrations of Soils and Foundations", Prentice Hall International Series. 8. Barkan D. D. (1962) "Dynamics of Bases and Foundations", McGraw Hill Book Co., New York.	
Course Outcomes**	

After completion of the course student will be able to

1. Acquire basic knowledge of soil dynamics and earthquake engineering.
2. Apply theory of vibrations to solve dynamic soil problems.
3. Analyse the potential of soil for liquefaction and apply mitigation techniques against it.
4. Analyse vibration isolation and apply mitigation techniques against them. Calculate the dynamic properties of soils using laboratory and field tests.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	3	2	-	-	-	-	-	-	3	-	3	-
CO2	3	3	3	2	-	-	-	-	-	-	2	-	3	-
CO3	3	3	3	2	-	-	-	-	-	-	2	-	3	-
CO4	3	1	3	2	-	-	-	-	-	-	2	-	3	-

22UCV714E	RAILWAY AND AIRPORT ENGINEERING	Credits: 3
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10 Hrs.
Railway Planning: Significance of Road, Rail, Air and Water transports – Coordination of all modes to achieve sustainability – Elements of permanent way, - Rails, Sleepers, Ballast, rail fixtures and fastenings, – Track Stress, coning of wheels, creep in rails, defects in rails Route alignment surveys, conventional and modern methods- – Soil suitability analysis – Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings (Explanation & Sketches of Right- and Left-hand turnouts only).	
UNIT-II	10 Hrs.
Railway Construction and Maintenance: Earthwork – Stabilization of track on poor soil, Calculation of Materials required for track laying – Construction and maintenance of tracks – Modern methods of construction & maintenance – Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.	
UNIT-III	10 Hrs.
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	10 Hrs.
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.	
Reference Books *	
1. Y.H. Huang, Pavement Analysis and Design, Prentice Hall, New Jersey, 2003. 2. R. Horonjeff and F.X. Mckelvey, Planning and Design of Airports, McGraw Hill, New York, 1994. 3. S.C. Sexena and S.P. Arora, A Text Book of Railway Engineering, Dhanpat Rai & Sons, New Delhi, 1998. 4. W.W. Hay, Railroad Engineering, Wiley, New York, 1988.	
Course Outcomes**	
After completion of the course student will be able to	
1 . Acquires capability of choosing alignment and also design geometric aspects of railway system, runway and taxiway. 2. Suggest and estimate the material quantity required for laying a railway track and also will be able to determine the hauling capacity of a locomotive. 3. Develop layout plan of airport, harbour, dock and will be able relate the gained knowledge to identify required type of visual and/or navigational aids for the same. 4. Apply the knowledge gained to conduct surveying, understand the tunnelling activities.	

*Books to be listed as per the format with decreasing level of coverage of syllabus

** Each CO to be written with proper action word and should be assessable and quantifiable

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	1			2		2					1	1		
CO2		1											1	
CO3	1		1											1
CO4		1		2		2		1					1	

22UCV715E	DEIGN OF IRRIGATION STRUCTURES	Credits:3
L:T:P-3: 0: 0		CIEMarks:50
Total Hours/Week:4		SEEMarks:50

UNIT-I	10Hrs.
Irrigation engineering: Necessity, benefits and ill effects of irrigation, Types of Irrigation, Techniques of water distribution in the farm, quality of irrigation water, Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor. Water requirement of crops: consumptive use, duty, delta and base period, and problems, factors affecting and methods to improve duty,	
UNIT-II	10Hrs.
Canals: Classifications, Regime theory, Design of canals cross sections by Lacey's Method, canal gradient considerations, design of canal gradient, Design of lined canal by Chezy method, most economical canal cross sections with design considerations,	
UNIT-III	10Hrs.
Cross Drainage Works; Design of Aqueduct, super pass, flumes by Mitra and Chaturvedi method, RCC SLAB CULVERT with deck slab, Design of wier,	
UNIT-IV	10Hrs.
Reservoirs: Investigation for reservoir site, storage zones, determination of storage Economical height of dam by area elevation curve (Graphical method) Gravity dams: Forces acting on gravity dam, Profile of gravity dam, Analytical method of Stability analysis and problems, Drainage gallery. Design of gravity dam Earthen dams: Types, Construction, Causes of failure of earthen dams, Seepage control measures, design of earthen dam, Pheratic line and filter bed considerations in the design, stability analysis of earthen dam cross section. Spillways: Different types of spill ways	
After completion of the course student will be able to 1. After completion of this course students will be able to: 2. Understand components of hydrological cycle, measure and quantify precipitation, evaporation and infiltration. 3. Estimate runoff and generate hydrographs. 4. To be able to compute duty, delta and frequency of irrigation, and design canal cross sections. 5. Determine storage capacity of reservoirs & understand basics of gravity and earthen dams & spillways.	

Reference Books *

1. s.k.Garg , “ Irrigation Engineering and Hydraulic Structures” , , Laxmi Publications, New Delhi, 2005.
2. H. M. Raghunath, Hydrology, New age international publishers, 2006.
3. G. L. Asawa, Irrigation Engineering, New Age international publications, 2005.

Course Outcomes	Programme Outcomes												Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	2	1	-	-	-	-	-	-	2	2	2
CO 2	3	3	2	2	2	2	-	-	-	-	-	-	2	2	2
CO 3	3	3	2	2	2	3	-	-	-	-	-	-	2	2	2
CO 4	3	2	2	2	2	2	-	-	-	-	-	-	2	2	2
Average	3	2.5	2	2	2	2	-	-	-	-	-	-	2	2	2

22UCV721E	DESIGN OF PRE-STRESSED CONCRETE STRUCTURES	Credits: 3
L:T:P-3:0:0		CIE Marks: 50
Total Hours/Week: 4		SEE Marks:50
UNIT I		10Hrs
Materials: High strength concrete and steel, stress-strain characteristics and properties. Basic Principles of Prestressing : Fundamentals, Load balancing concept, stress concept, centre of thrust, pre-tensioning and post-tensioning systems, tensioning methods and end anchorages.		
UNIT II		10Hrs
Analysis of sections for flexure: Stresses in concrete due to prestress and loads, stresses in steel due to loads, cable profile. Losses of prestress: Various losses encountered in pretensioning and post tensioning methods, determination of jacking force.		
UNITIII		10Hrs
Deflections: Prediction of short term and long term deflections of un-cracked members. Limit State of collapse and serviceability: I.S. code recommendations-ultimate flexural and shear resistance of sections, shear reinforcement, Limit state of serviceability-control of deflections and cracking.		
UNIT IV		10Hrs
Design of End blocks: Transmission of Prestressing pre-tensioned members, transmission length, and anchorage stress in post-tensioned members, bearing stress and bearing tensile stress in end block, Methods, I.S. code provision for the design of end block reinforcement. Design of Beams: Design of pretensioned and post-tensioned symmetrical sections, permissible stress, design of Prestressing force and eccentricity		

REFERENCE BOOK*

1. N.Krishna Raju, Prestressed Concrete Design, McGrawHill Publications, 6th edition, 2018.
2. P. Dayaratnam, Prestressed Concrete Design, Medtechpublishers, 7th edition, 2017.
3. N.Rajgopalan, Prestressed Concrete Design, Narosa Publishers 2nd edition, 2010.
4. E.G.Nawy, Prestressed Concrete Design, Pearson publication, 2nd edition, 1995.

COURSEOUTCOMES**

1. Students will remember and recall materials used in PSC, their characteristics and basic principles of prestressing including pretensioning and posttensioning constructions.
2. Students will apply basic engineering principles to evaluate stresses due to loads in concrete and steel under flexure and shear.
3. Students will understand concepts and analyze the different losses and evaluate losses of prestress and deflections.
4. Students will understand the concepts and apply them to evaluate / estimate the ultimate resistance capacity of PSC members in flexure and shear.

COURSE ARTICULATION MATRIX		
	Pre-req	Co-req
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102	102	102
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22UCV722E	DEEP FOUNDATIONS	Credits:3
L: T: P-3:0:0		CIEMarks:50
Total Hours/Week:3		SEEMarks:50

UNIT-I	10 Hours
Introduction to Foundation Engineering: Necessity, classification, Shallow Vs Deep foundation. Pile Foundation: Pile classification based on their friction, composition and Method of installation. Axial load carrying capacity of single pile by different methods: By use of Static bearing capacity equations and dynamic formulae. Pile load tests and Negative skin friction.	
UNIT-II	10 Hours
Pile group: Group efficiency, Problems related to load on each pile: Pile group with vertical and inclined piles (Culman's graphical method- no problems). Laterally loaded vertical piles: Pile resistance and deflection under lateral loads, elastic method and Under-reamed piles: construction stages.	
UNIT-III	10 Hours
Well Foundations & Caissons: Introduction, Different shapes and characteristics of wells. Components of well foundation. Forces acting on well foundation. Sinking of wells. Causes and remedies of tilts and shifts. Drilled Piers & Caissons: Introduction, construction, advantages and disadvantages of drilled piers. Design of open, pneumatic and floating caissons. Advantages and disadvantages of floating caissons.	
UNIT-IV	10 Hours
Foundations on expansive soils: Introduction, Definition, Identification, Mineral Structure, Index properties of expansive soils, Swell potential and swell pressure, Free swell, CNS layer, foundation treatment for structures in expansive soil. Machine Foundations: Introduction, Types of Machine foundations, basic definitions, degree of freedom of a block foundation, general criteria for design of machine foundation.	
Reference Books*	
1. B. C. Punmia, Ashok. K. Jain and Arun. K. Jain (2017), Soil Mechanics and Foundation Engg. (17th edition) Laxmi Publications Co., New Delhi. 2. Gopal Ranjan and A.S.R. Rao (2022), Basic and Applied Soil Mechanics (4th Edition), New Age International(P) Ltd., New Delhi. 3. Davis and Poulos (1980), Pile Foundation Analysis and Design, John Wiley & Sons Inc. 4. P. Purushotham Raj (2013), Soil Mechanics and Foundation Engineering (2nd Edition), Dorling Kindersley, Pvt. Ltd. 5. Dr. C. Venkataramaiah (2010), Geotechnical Engineering (4th edition), New Age Publications. 6. Dr. P. C. Varghese (2005), Foundation Engineering, Prentice Hall of India.	
Course Outcomes**	
1. Understand the necessity and classification of foundations, and differentiate between shallow and deep foundations based on geotechnical considerations and structural requirements. 2. Analyze laterally loaded pile behavior, evaluate group efficiency, and explain under-reamed pile construction and applications. 3. Explain the types, components, and construction methods of well foundations, caissons, and drilled piers and evaluate the causes and remedies for tilts and shifts. 4. Understand expansive soil behavior and machine foundation types, design criteria, treatments, and dynamic considerations.	

COURSE ARTICULATION MATRIX:

Course Outcomes	Programme Outcomes											Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO 1	3	3	3	2	-	-	-	-		-	-	2	3	2
CO 2	3	3	3	2	-	-	-	-	-	-	-	2	3	2
CO 3	3	3	3	2	-	-	-	-	-	-	-	2	3	2
CO 4	3	1	3	3	-	-	-	-	-	-	-	2	2	2

22UCV723E	SOLID WASTE MANAGEMENT	Credits: 03
L:T:P – 3:0:0		CIE Marks:50
Total Hours/Week: 03		SEE Marks:50

UNIT-I	10 Hrs.
Solid Waste: Definition and scope, Necessity and importance, Sources, Classification, Integrated Solid Waste Management (ISWM), Hierarchy of waste management options, 4 R's - reduce, recover, recycle and reuse, Physical, Chemical and Biological characteristics of municipal solid waste (MSW), Generation rates and methods, Chemical composition, Numerical problems. Functional elements: Flow chart, Waste generation, Storage, Collection, Transfer and transport, Processing and recovery, Disposal. Collection, Transfer and Transport: Collection equipment, systems of collection - hauled container system, stationary container system, numerical problems; Transfer stations, Bailing and Compacting	
UNIT-II	10 Hrs.
Separation and Processing Technologies: Size reduction, Size separation, Density separation, Magnetic & Electric Field separation, Densification (Compaction), Design of Material Recovery Facilities (MRFs), Numerical problems. Thermal Treatment Processes: Combustion Systems (Mass-Fired Combustion Systems, RDF-Fired Combustion Systems, Fluidized Combustion Systems, Heat recovery systems, Water wall Combustion Systems, Waste heat boiler) Pyrolysis Systems, Gasification Systems, Environmental Control Systems, Energy Recovery Systems	
UNIT-III	10 Hrs.
Disposal methods: Types, Selection of suitable site, Ocean disposal, Feeding to hogs, Merits and demerits of various disposal methods. Open dumping: Environmental implications of open dumping, Construction debris - management & handling, Rag pickers and their role Sanitary land filling: Definition, methodology, Types - trench, area, ramp, pit methods, Basic steps involved, Site selection, Prevention of site pollution, Landfill remediation, Geo-technical considerations, Densification - earthen, Geo-membrane, Geo-synthetics and Geo-textiles	
UNIT-IV	10 Hrs.
Operational aspects of Landfills: Daily cover, Final cover, Leachate disposal, Ground water monitoring, Leachate and its treatment, Gas collection and re-circulation systems, Post-closure environmental monitoring. Treatment of other wastes: E-Waste Management, Hazardous waste management and Bio-medical waste.	
Reference Books *	
1. George Tchobanoglous, Hilary Theisen, Samuel A. Vigil, Integrated Solid Waste Management-Engineering Principles and Management Issues, McGraw-Hill, International Editions, 1993. 2. Ramachandra T.V., Management of Municipal Solid Waste, The Energy and Resources Institute, TERI, ISBN: 9788179931875, 9788179931875, 2006 3. Peavy and Tchobanoglous, Environmental Engineering, McGraw-Hill International Editions, 1985.	
Course Outcomes**	

After completion of the course student will be able to

1. Design Appropriate treatment component for municipal and certain industrial effluents
2. Evaluate the operational problems of treatment units and apply the solutions in water and wastewater treatment plant.
3. Construct appropriate treatment schemes to remove certain pollutants present in water or wastewater
4. Construct the alternative sludge processing techniques apply the knowledge in nutrient removal from the wastewater

- After completion of the course student will be able to**
1. Design Appropriate treatment component for municipal and certain industrial effluents
 2. Evaluate the operational problems of treatment units and apply the solutions in water and wastewater treatment plant.
 3. Construct appropriate treatment schemes to remove certain pollutants present in water or wastewater
 4. Construct the alternative sludge processing techniques apply the knowledge in nutrient removal from the wastewater

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22UCV724E	PAVEMENT DESIGN	Credits: 3
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 3		SEEMarks:50

UNIT-I	10 Hrs.
Introduction: Desirable characteristics of pavement, Types and components, Difference between Highway pavement and Air field pavement, Design strategies of variables, Functions of sub grade, 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 problems on above.	
UNIT-II	10 Hrs.
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, IRC Method (old), CSA method using IRC-37-2001, 2012 problems on above.	
UNIT-III	10 Hrs.
Flexible Pavement Failures, Maintenance and Evaluation: Types of failures, Causes, Remedial/Maintenance measures in flexible pavements, Functional Evaluation by Visual inspection and unevenness measurements.	
UNIT-IV	10 Hrs.
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: 58-2002 for dual and Tandem axle load, Reinforcement in slabs, Design of Dowel bars, Design of Tie bars.	
Rigid Pavement Failures, Maintenance and Evaluation: Types of failures, causes, remedial/maintenance measures in rigid pavements.	
Reference Books *	
1. S K Khanna, C E G Justo, and A Veeraragavan, "Highway Engineering", Nem Chand & Brothers 2. L.R Kadiyali and Dr.N.B. Lal, "Principles and Practices of Highway Engineering", Khanna publishers 3. Yang H. Huang, "Pavement Analysis and Design", University of Kentucky 4. Yoder & Wit Zorac, "Principles of pavement design", John Wiley & Sons. 5. Subbarao's, "Principles of Pavement Design" . 6. R Srinivasa Kumar, "Pavement Design", University Press. 7. Relevant recent IRC codes	
Course Outcomes**	
After completion of the course student will be able to 1. Systematically generate and compile required data for design of pavement (Highway & Airfield). 2. Analyze stress, strain and deflection by boussinesq's, bur mister's and westergaard's theory. 3. Design rigid pavement and flexible pavement conforming to IRC58-2002 and IRC37-2001. 4. Evaluate the performance of the pavement and also develops maintenance statement based on site specific requirements	

***Books to be listed as per the format with decreasing level of coverage of syllabus**

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	2	3	2	-	2	2	-	-	-	-	-	1		
CO2	3	2	3	-	2	1	-	-	-	-	-		1	
CO3	3	2	3	-	3	-	-	-	1	-	-	1		
CO4	2	1	1	-	2	1	-	-	1	-	-			1

22UCV725E	MATRIX METHODS OF STRUCTURAL ANALYSIS	Credits: 03
L:T:P-3: 0:0		CIE Marks:50
Total Hours/Week:3		SEE Marks:50

UNIT-I	10 Hrs.
Definitions and Concepts: Comparison of classical, matrix and approximate methods of structural analysis, System approach versus Element approach, degrees of freedom, coordinate systems, stiffness and flexibility coefficients, Flexibility and stiffness methods. Flexibility Method: Introduction, element flexibility matrix, Principle of contragradience, construction of member and structure flexibility matrix, determination of member forces. Procedure for analysis of indeterminate structures: analysis of continuous beams and plane frames.	
UNIT-II	10 Hrs.
Flexibility Method Continued: Analysis of indeterminate structures: analysis of plane trusses. Stiffness Method: Introduction, element stiffness matrix, Principle of contragradience, construction of member and structure stiffness matrix, determination of member displacements. Procedure for analysis of indeterminate structures: continuous beams.	
UNIT-III	10 Hrs.
Stiffness Method continued: Analysis of indeterminate structures: plane frames and Plane trusses.	
UNIT-IV	10 Hrs.
Direct Stiffness Method: Introduction, transformation of variables, transformation of stiffness matrix for member of truss and continuous beams. Global stiffness matrix, Boundary conditions, computation of internal forces, analysis of plane trusses and continuous beams.	
Reference Books *	
1. S. Rajasekaran and G. Sankarasubramanian - Computational Structural Mechanics, PHI Learning, 2023. 2. Kassimali Aslam – Matrix Analysis of Structures, Cengage Learning Custom Publishing, Boston USA, 2011. 3. William Weaver Jr. and James M. Gere– Matrix Analysis of Framed Structures, CBS Publishers and distributors, New Delhi, 2018. 4. Neville A M and Ghali A- Structural Analysis: A Unified Classical and Matrix Approach, CRC Press, 2009.	
Course Outcomes**	
After completion of the course student will be able to CO1: <i>Explain</i> the definitions, basic concepts, and differences between classical and matrix methods, including force and displacement methods, as well as system and element approaches. <i>Analyze</i> and <i>evaluate</i> member forces for continuous beams and plane frames using the force transformation method. CO2: <i>Apply</i> the flexibility matrix method to determine member forces in trusses. <i>Explain</i> the fundamental concepts related to the stiffness matrix method. <i>Evaluate</i> member forces for continuous beams using the displacement transformation method.	

CO3: *Apply* the displacement transformation method to *analyze* and *evaluate* member forces in plane frames and trusses.

CO4: *Illustrate* the core concepts of the direct stiffness method. *Apply* the method to *evaluate* member forces in plane trusses and continuous beams.

CO3: *Apply* the displacement transformation method to *analyze* and *evaluate* member forces in plane frames and trusses.

CO4: *Illustrate* the core concepts of the direct stiffness method. *Apply* the method to *evaluate* member forces in plane trusses and continuous beams.

*Books to be listed as per the format with decreasing level of coverage of syllabus

**** Each CO to be written with proper action word and should be assessable and quantifiable**

Course Outcomes	Programme Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2									2	2	3
CO2	3	3	2	2									2	2	3
CO3	3	3	2	2									2	2	3
CO4	3	3	2	2									2	2	3

22UCV801I	RESEARCH / INDUSTRIAL INTERNSHIP	Credits: 10
L:T:P -		CIEMarks:50
Total Hours/Week:		SEEMarks:50

Research Internship/ Industry Internship Guidelines	
1. Student's Diary/ Daily Log Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed by the internal guide, immediately after the completion of the internship. It will be evaluated based on the following criteria: • Regularity in maintenance of the diary. • Adequacy & quality of information recorded. • Drawings, sketches and data recorded. • Thought process and recording techniques used. • Organization of the information. 2. Internship Report The Internship report will be evaluated based on following criteria: • Originality. • Adequacy and purposeful write-up. • Organization, format, drawings, sketches, style, language etc. • Variety and relevance of learning experience. • Practical applications, relationships with basic theory and concepts taught in course. 3. Evaluation through Seminar Presentation/Viva-Voce at the Institute The student will give a seminar based on his/her training/internship report, before an expert committee constituted by the concerned department as per norms of the institute. The evaluation will be based on the following criteria: • Quality of content presented. • Proper planning for presentation. • Effectiveness of presentation. • Depth of knowledge and skills. • Attendance record, daily diary, departmental reports shall also be analyzed along with the Report.	

Scheme of Evaluation for Research Internship /Industry Internship

The students pursuing the course of Research Internship /Industry Internship shall submit the diary recordings of day-to-day activities and monthly report to the concerned guide. Student should report progress achieved in the course and seek guidance to proceed with the internship. The interns should provide all the details to the guide, so that he/she can discuss with the employer to make the internship successful. The intern should constantly update the guide about the progress of the internship. The guide should know the interns internship tasks, duties, responsibilities, and potential projects. The hardcopy or softcopy of the diary maintained by the interns must be signed at least once in a month by the guide. Illustrations, drawings, photos, forms, samples, classified materials, etc., are to be included in the report only after obtaining the consent of the concerned authorities and should indicate the source of all such material. The final report, should also be submitted to the place where internship was carried out. The report should avoid a tone that is predominantly cynical or unduly critical of the internship provider or of those with whom the student intern worked. The content of the report must be of interns own work.

The guide must issue a recommendation letter to state whether the intern,

- (i) Exceeded the expectations of the internship.
- (ii) Met the expectations of the internship.
- (iii) Did not meet the expectations of the internship.
- (iv) Did work to a satisfactory level.
- (v) Did an unsatisfactory internship.

And same should be attached in the report.

Assessment of Continuous Internal Evaluation (CIE)

Assessment of CIE for 100 marks shall be awarded by a committee consisting of the Head/Nominee of the concerned department and two faculty members of the department, one of whom shall be the guide in case of single discipline and guides in case of interdisciplinary. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the interns shall be based on the rubrics (Annex 1).

Assessment of Semester End Evaluation (SEE)

Assessment of SEE for 100 marks shall be awarded as per the rubrics (Annex 2) by a committee consisting of the Head of the concerned department and two faculty members of the department, one of whom shall be the guide in case of single discipline and guides in case of interdisciplinary.

Single discipline: Contribution to the internship and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department. Marks shall be awarded based on the evaluation of the diary, report, presentation skill and question and answer session in the ratio 50:25:25.

Interdisciplinary: Contribution to the internship and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted separately at the departments to which the student/s belong to. Marks shall be awarded based on the evaluation of the diary, report, presentation skill and question and answer session in the ratio 50:25:25.

22UHS753C	RESEARCH METHODOLOGY&IPR (Common to All Branches)	Credits: 02
Hrs/Week: 2:0:0		CIE Marks: 50
Total Hours: 26Hrs		SEE Marks: 50

Course Objectives:

1. To understand the basics of research and its types.
2. To learn the concept of Literature Review, Technical Reading, Attributions and Citations.
3. To learn Ethics in Engineering Research.
4. To Integrate Intellectual Property Rights with engineering sciences to cater to R&D requirements.

UNIT - I	5Hrs
Introduction to Engineering Research Fundamentals of Research: Meaning, objectives, and motivation in engineering research. Types of Engineering Research: Basic, applied, and translational research; identifying and solving Worthwhile problems. Research Ethics: Ethics in engineering research and practice, types of research misconduct, and ethical issues in authorship.	
UNIT - II	5 Hrs
Literature Review and Citations Technical Reading & Analysis: Methods for reviewing literature, analyzing priorart, and synthesizing new and existing knowledge. Bibliographic Databases: Web of Science, Google, Google Scholar, effective search strategies. Conceptualizing Research: Critical and creative reading, taking notes, reading mathematical models, algorithms, and datasheets. Citations & Acknowledgments: Attribution, citation styles, impact of keywords, citing datasets, and knowledge dissemination.	
UNIT - III	8Hrs
Intellectual Property Rights (IPR) & Patents: Introduction to Intellectual Property: Concepts of property and rights, forms of IPR, role in research and economic development, IP governance, and global innovation indicators. Patents: Definition, objectives, criteria for patentability, software/business method patents, infringement, compulsory licensing, and government use of inventions. Patent Process: Prior art search strategies, patent databases (free and paid), drafting specifications and claims, filing requirements, jurisdiction, opposition procedures, and renewal. Filing Requirement of patent: Patent Application Forms. Work flow chart in obtaining Patents, Jurisdiction of Filing Patent Application. Pre-grant & Post-grant Opposition. Forms to be submitted, filing mechanism through Individual patent office and PCT route. Need for a Patent Attorney/AgentRevocation. Term of Patent, Patent renewal and Fee Structure National Bodies Dealing with Patent Affairs. Utility Models	
UNIT - IV	8Hrs
Copyrights, Trademarks, Industrial Design & GI Copyrights: Nature, subject matter, authorship, digital copyright, fair use, infringement, enforcement, and international agreements. Trademarks: Meaning, functions, distinctiveness, registration, non-conventional marks, infringement, and domain name issues. Industrial Design: Definition, registration process in India, infringement, and case laws. Geographical Indications (GI): Acts, laws, ownership rights, registered GIs in India, protection,	

certification marks, enforcement, and registration process.

IP Organizations & Policies: Overview of IP schemes, national programs, and regulatory bodies in India.

Case Studies & Applications

Patents: Case studies on Curcuma (Turmeric), Neem, and Basmati patents.

Copyright & Trademark Disputes: Interesting Copyrights Cases, Case studies (e.g., Coca-Cola vs. Bisleri, Apple vs. Samsung).

Course Outcomes:

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

CO1: Integrate research methodology in engineering sciences in relevant trades.

CO2: Exhibit reflective thinking in problem solving exercises.

CO3: Identify criteria to fit one's own intellectual work in particular form of IPRs and able to apply statutory provisions and procedure to protect different forms of IPRs at National and international level.

CO4: Develop skill of making search using modern tools and techniques and also student is able to become patent agent by cracking patent agent exam.

Course Outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	-	-		-	-	-	
CO2	-	2	2	-	1	2	2	3	-	2	-	2
CO3	-	-	-	-	-	3	2	2	-	2	-	1
CO4	-	-	-	-	3	-	-	-	1	1	-	2

Basaveshwar Engineering College, Bagalkote

Department of Civil Engineering

To,

The Principal
Basaveshwar Engineering College,
Bagalkote

Respected Sir,

Sub: Equivalence of theory subjects having same / different title, different subject codes but having minimum 75% same syllabus content, same credits and same L-T-P schemes for the academic year 2025-26 reg.

With reference to the matter cited above, the following theory subjects of B.E Civil engineering having same / different titles, different subject codes but having minimum 75% same syllabus content, same credits and same L-T-P schemes. Delivery of the content, extent, transfer of knowledge and skills being same and hence the subjects mentioned in the table below are verified and approved for equivalence in BoS meeting Conducted on 30.08.2025 at 11.00 am.

Sl. No	Existing Courses for the A.Y: 2025-26				Equivalence Courses			
	Course Title	Course Code	L-T-P	Credits	Course Title	Course Code	L-T-P	Credits
1	Geomorphology	BCVC605E	3-0-0	03	Geomorphology	UCV857E	3-0-0	03
						22UCV635E	3-0-0	03
						22UCV622E	3-0-0	03
2	Disaster Management and Mitigation	BCVB606N	3-0-0	03	Disaster Management and Mitigation	21UCV637N	3-0-0	03
						22UCV637N	3-0-0	03
						UCV733N	3-0-0	03
3	Introduction to Civil Engineering	1BCVA104N/ 1BCVA204N	3-0-0	03	Introduction to Civil Engineering	BCVA104N/ BCVA204N	3-0-0	03
						22UCV118N/ 22UCV218N	3-0-0	03
4	Highway Geometric Design	22UCV527E	3-0-0	03	Highway Geometric Design	UCV866E	3-0-0	03
						UCV842E	3-0-0	03
						UCV654E	3-0-0	03
						22UCV615E	3-0-0	03
5	Railway and Airport Engg	22UCV527E	3-0-0	03	Railway and Airport Engg	UCV752E	3-0-0	03
6	Traffic Engineering	22UCV512E	3-0-0	03	Traffic Engineering	UCV722E	3-0-0	03
						21UCV514E	3-0-0	03
						UCV555E	3-0-0	03
7	Engineering Mechanics	1BCVA205C	3-0-0	03	Engineering Mechanics	BCVA203C	3-0-0	03
						22UCV117C	3-0-0	03
						21UCV111C	3-0-0	03
						21UCV211C	3-0-0	03
						UCV170C	3-0-0	03
						UCV270C	3-0-0	03

8	Design of Steel Structures	BCVA701C	3-0-0	03	Design of Steel Structures	22UCV701C	3-0-0	03
						UCV741C	3-0-0	03
						UCV761C	3-0-0	03
						21UCV603C	3-0-0	03
9	Construction Management	BCVA703C	3-0-0	03	Construction Management	UCV841H	3-0-0	03
						UCV812H	3-0-0	03
						21UCV701C	3-0-0	03
						22UCV612C	3-0-0	03
10	Analysis of Statically Determinate Structures	BCVA402C	3-0-0	03	Analysis of Statically Determinate Structures	22UCV403C	3-0-0	03
						21UCV403C	3-0-0	03
					Structural Analysis - I	UCV452C	3-0-0	03
11	Analysis of Statically Indeterminate Structures	BCVA502C	3-0-0	03	Analysis of Statically Indeterminate Structures	21UCV501C	3-0-0	03
					Structural Analysis - II	22UCV502C	3-0-0	03
12	Structural Analysis- II	UCV552C	3-0-0	03	Structural Analysis - II	UCV542C	3-0-0	03
13	Deep Foundations	22UCV722E	3-0-0	03	Deep Foundations	21UCV733E	3-0-0	03
14	Green Building Technology	22UCV536N	3-0-0	03	Green Building Technology	22UCV536N	3-0-0	03
15	Design of Pile Foundation	UCV683E	3-0-0	03	Pile Foundation Design	UCV861E	3-0-0	03
16	Concrete Technology	BCVA304C	3-0-0	03	Concrete Technology	UCV355C	3-0-0	03
						UCV345C	3-0-0	03
						21UCV304C	3-0-0	03
						22UCV306C	3-0-0	03
17	Buildings Materials and Construction Materials	BCVA305C	3-0-0	03	Buildings Materials and Construction Materials	UCV343C	3-0-0	03
						UCV345C	3-0-0	03
						UCV352C	3-0-0	03
						21UCV306C	3-0-0	03
						22UCV307C	3-0-0	03
18	Numerical Techniques in Civil Engineering	22UCV734E	3-0-0	03	Numerical Techniques in Civil Engineering	UCV651E	3-0-0	03
						UCV671E	3-0-0	03
						UCV844E	3-0-0	03
						22UCV625E	3-0-0	03
					Numerical Techniques in Civil Engineering	21UCV601C	3-0-0	03
19	Matrix Methods of Structural Analysis	22UCV624E	3-0-0	03	Matrix Methods of Structural Analysis	22UCV725E	3-0-0	03
						UCV664E	3-0-0	03
						UCV682E	3-0-0	03
						21UCV611E	3-0-0	03
20	Estimation and Costing	22UCV712C	3-0-0	03	Estimation and Costing	22UCV603C	3-0-0	03
					Quantity Surveying and Estimation	21UCV702C	3-0-0	03
						UCV742C	3-0-0	03
21	Ground Improvement Techniques	22UCV628E	3-0-0	03	Ground Improvement Techniques	UCV673E	3-0-0	03
22	Mechanics of Materials	BCVA302C	3-0-0	03	Strength of Materials	22UCV310C	3-0-0	03
					Mechanics of Materials	UCV351C	3-0-0	03
						21UCV303C	3-0-0	03

						22UCV304C	3-0-0	03
23	Design of Pre-Stressed Concrete Structures	22UCV721E	3-0-0	03	Design of Pre-Stressed Concrete Structures	UCV743C	3-0-0	03
						21UCV731E	3-0-0	03
24	Advance Design of RC Structures	22UCV711E	3-0-0	03	Advance Design of RC Structures	21UCV721E	3-0-0	03
25	Wastewater Treatment Engineering	21UCV625E	3-0-0	03	Wastewater Treatment Engineering	UCV751E	3-0-0	03
26	Public Health Engineering	22UCV633N	3-0-0	03	Public Health Engineering	21UCV633N	3-0-0	03
27	Air Pollution and control	22UCV531N	3-0-0	03	Air Pollution and control	21UCV533N	3-0-0	03
28	Water Treatment and Supply Engineering	22UCV501C	3-0-0	03	Water Treatment and Supply Engineering	UCV652C 21UCV503C	3-0-0	03
29	Advanced Wastewater Treatment	22UCV614C	2-0-0	03	Wastewater Treatment Engineering	22UCV604E	2-0-0	03
30	Masonry Structure	22UCV528E	3-0-0	03	Masonry Structure	22UCV516E 21UCV623E UCV685E UCV554E	3-0-0	03
31	Basics of Soil Dynamics and Earthquake Engineering	22UCV713E	3-0-0	03	Basics of Soil Dynamics and Earthquake Engineering	21UCV723E	3-0-0	03
32	Surveying	BCVA303C	3-0-0	03	Surveying-I	UCV313C UCV342C UCV354C 22UCV406C 22UCV311C 21UCV404C	3-0-0	03
33	Geotechnical Engineering	22UCV512C	3-0-0	03	Geotechnical Engineering-I	UCV456C	3-0-0	03
					Soil Mechanics	22UCV403C	3-0-0	03
					Geotechnical Engineering-I	UCV543C		
					Soil Mechanics	BCVA403C		
					Soil Mechanics	21UCV502C		
34	Hydrology and Water Resource Engineering	22UCV521E	3-0-0	03	Hydrology and Water Resource Engineering	21UCV405C	3-0-0	03
35	Foundation Engineering	BCVA503C	3-0-0	03	Geotechnical Engineering-II	UCV553C	3-0-0	03
					Foundation Engineering	22UCV503C	3-0-0	03
					Applied Geotechnical Engineering	22UCV613C	3-0-0	03
					Geotechnical Engineering-II	UCV642C	3-0-0	03
					Geotechnical Engineering-II	21UCV624E	3-0-0	03
36	Soil Dynamics and	22UCV713E	3-0-0	03	Basic Soil Dynamics	21UCV723E	3-0-0	03

	Earthquake Engineering				and Earthquake Engineering			
					Basic Soil Dynamics and Earthquake Engineering	UCV863E	3-0-0	03
					Basic Soil Dynamics and Earthquake Engineering	UCV855E	3-0-0	03

This is for your kind information.

Thanking You